Appendix B

Measurement of Thorium and Thoron Hazards

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18. J. N. P. Lawrence, Health Aspects of Handling Uranium-233 Feed Material, *Proc. 2nd Intern. Conf. Peaceful Uses At. Energy, Geneva 1958*, 23: 330 (1958).
19. A. J. Breslin and W. B. Harris, Use of Thoriated Tungsten Electrodes in Inert Gas Shielded Arc Welding—Investigation of Potential Hazard, *Am. Ind. Hyg. Assoc. Quart.*, 13: 4 (1952).
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CHAPTER 11

Measurement of Thorium and Thoron Hazards

1. Air Monitoring

1.1. Dust Sampling Methods

Filter paper is the most commonly used sampling medium for thorium and thoron daughters although various sampling devices are available, including filters, inertial samplers (conifuges, cyclones, and cascade impactors), electrostatic dust samplers, thermal precipitators, optical analyzers, and elutriators. Membrane filters are particularly suitable for collecting thoron daughters because of their high efficiency; since they become optically transparent under immersion oil, they are useful for particle size measurements.[1]

There are two general methods of air sampling: (1) breathing zone sampling and (2) general air sampling. General air samples integrate the air concentrations in areas of the plant outside the immediate vicinity of process equipment and include places ordinarily not considered as contaminated, e.g., rest or smoking areas and change rooms. Air contamination and residence times in such areas frequently contribute significally to the weighted average exposure.

Breathing zone samples provide an estimate of the effective exposure to the individual worker.

The most meaningful measure of an airborne hazard is the weighted average exposure, which is defined as "the sum of the different exposure rates encountered in an individual's working environment multiplied by the length of time that he will be exposed to these various exposure rates; all of these are then averaged over the entire work period of concern." The weighted average exposure is therefore derived from breathing zone and general air samples and is based on an analysis of the work cycle of each employee.

The hazard to the lung from airborne radioactive dust depends on its aerodynamic behavior; this in turn depends on the size distribution of the particles, as well as their shape and density. Two-stage samplers have been designed to simulate the particle retention characteristics of the lung.

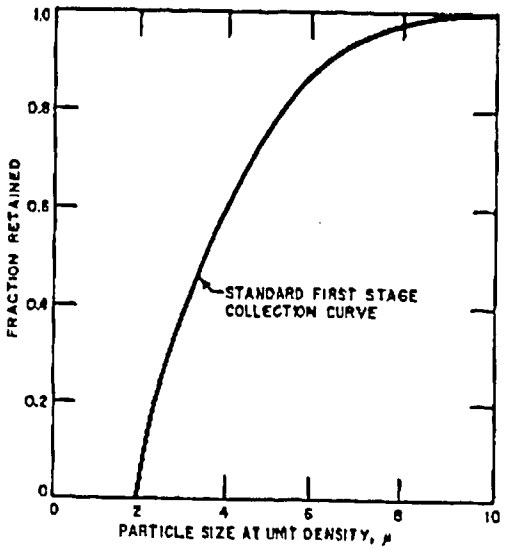
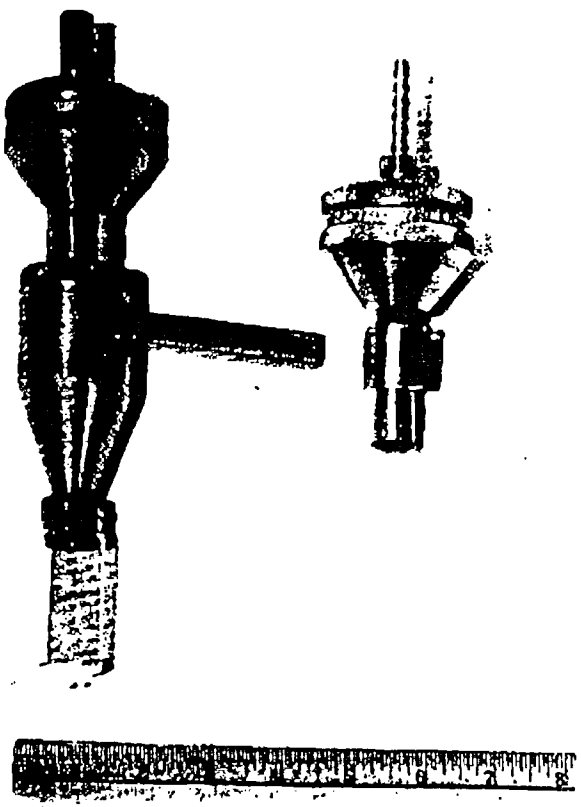


FIG. 11.1 (left). Curve showing collection efficiency of the first stage of a two-stage particulate sampler. After Hyatt, *Radiol. Health Safety Mining Milling Nucl. Mater. Proc. Symp., Vienna, 1963.*[4]

FIG. 11.2 (below). Photograph of a pair of two-stage particular samplers. (Courtesy Los Alamos Scientific Laboratory, Los Alamos, N.M.)



Particles are collected in two fractions, one of which represents "respirable" dust and the other, "nonrespirable" dust. Respirable dust includes those particles which are deposited in the nonciliated portion of the lung. Nonrespirable dust is deposited in the nose or on the ciliated part of the bronchial tree and is cleared from the lung rapidly. The data of Brown and Hatch[3] have been used to characterize respirable dust in terms of the particle size of unity density spheres; this curve (Fig. 11.1) serves as a standard for the performance of two-stage samplers.[4] Particle sizes to left of this curve are respirable and are deposited on the second stage of the collector. Figure 11.2 shows a pair of two-stage air samplers.[4] In both instruments, the sampled air passes first through a cyclone and then a filter paper; the collection efficiency of the cyclone approximates the curve in Fig. 11.1.

1.2. Thoron Decay Products

Thoron gas has a half-life of only about 1 min. The first decay product, Po^{216} (thorium A), is very short-lived (half-life, 0.16 sec) and is not present in air in significant quantities. The second decay product, Pb^{212} (thorium B), (half-life, 10.6 hr) controls the decay of subsequent members of the series, of which the longest lived member is Bi^{212} (thorium C) (half-life, 60.6 min).

Two alpha particles are emitted in the decay of Rn^{220} (thoron) to Pb^{212} (thorium B). After Pb^{212}, one alpha and two beta particles are emitted to yield stable Pb^{208}.

When an atmosphere containing thoron decay products is drawn through a collector, and R_1 and R_2 are the collection rates for Pb^{212} and Bi^{212} (in atoms per minute), the number of Pb^{212} atoms on the collector for a sampling time is given by

$$P = \frac{R_1}{\lambda_B}(1 - e^{-\lambda_B t})$$

where λ_B is the decay constant of Pb^{212} (thorium B) and t is the sampling time in minutes.

The number of Bi^{212} (thorium C) atoms formed on the collector from the decay of Pb^{212} is given by

$$Q_1 = R_1\lambda_C \frac{1 - e^{-\lambda_B t}}{\lambda_B(\lambda_C - \lambda_B)} + \frac{1 - e^{-\lambda_C t}}{\lambda_C(\lambda_B - \lambda_C)}$$

where λ_C is the decay constant of Bi^{212}. The number of thorium C atoms collected directly is given by

$$Q_2 = \frac{R_2}{\lambda_C}(1 - e^{-\lambda_C t})$$

The total number of thorium C atoms on the collector is

$$Q = Q_1 + Q_2$$

The growth of activity of thorium B and thorium C relative to thoron in a source whose activity is held constant by a continuous fresh supply of thoron is shown in Fig. 11.3.[5] After the sampling is stopped, the collected thorium C decays with a 1-hr half-life while the thorium C alpha activity builds up from the decay of thorium B as shown in Fig. 11.4.[5] The total thorium C alpha activity is the sum of these two curves.

The decay curve of alpha activity varies in shape depending on the relative amounts of thorium B and thorium C. By 5 hr after the end of sampling, the thorium C collected from the air is completely decayed and the alpha activity curve follows the 10.6-hr half-life of thorium B.

The energy released by the complete decay of thorium B is about ten times greater than that of thorium C for equal initial microcurie activities, because the number of atoms of thorium B is ten times greater than thorium C. Hence, the hazard from thoron daughters is not very dependent on the amount of airborne thorium C and the levels can be accurately measured in terms of thorium B. To do this, the sample measurement is delayed for about 5 hr after the end of the collection period.

The alpha activity may reflect the presence of long-lived decay products as well as thoron daughters. If the sample is recounted several hours after the 5-hr measurement, the long-lived activity may be calculated[6] from the following equation

$$A = \frac{(d_2 - d_1)e^{-\lambda_{ThB}}}{1 - e^{-\lambda_{ThB}}}$$

where A equals the long-lived activity in disintegrations per minute; d_1, measured disintegrations per minute at first count; d_2, measured disintegrations per minute at second count; t, time between counts (λ and t are in same units); λ_{ThB}, decay constant for Pb^{212}.

After correction for the long-lived activity, the thorium B activity is extrapolated to the start of the collection period.

It has been suggested (Chapter 9, Section 3) that the permissible exposure level for thoron should be equal to that for radon and expressed in terms of the "working level" of radon (10^{-10} c/liter in equilibrium with daughters or 1.3×10^5 Mev of potential alpha energy per liter).[7] The potential alpha energy per disintegration of each thorium B atom is 7.84 Mev; one working level is $(1.3 \times 10^5 \text{ Mev})/7.84 = 1.65 \times 10^4$ atoms of thorium B per liter. This number of thorium B atoms is equivalent to 17.6 dis/min or 8 pc/liter. As a convenience for field work, the measured alpha activity of the example can be multiplied by the appropriate

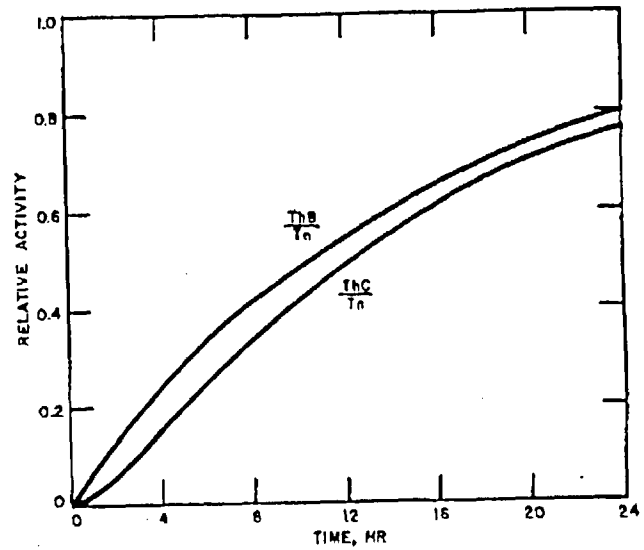


FIG. 11.3. The growth of activity of thorium B and thorium C relative to thoron in a source whose activity is held constant by a continuous fresh supply of thoron from thorium X. After Aub *et al.*, *Medicine*.[5]

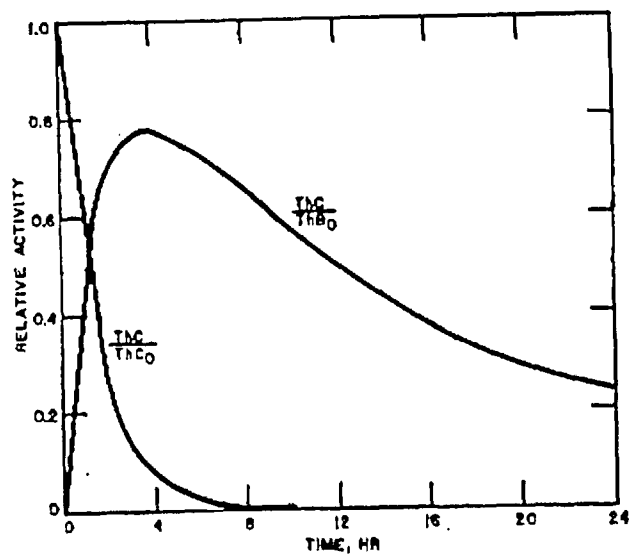


FIG. 11.4. The alpha activity from thorium C after removal of a constant source of thoron which had caused, in an observed time, the accumulation of activities ThB and ThC. After Aub *et al.*, *Medicine*.[5]

factor[7] (shown in Fig. 11.5) to derive an estimate of the atmospheric activity in terms of multiples of the suggested working level.

Although the relative concentration of thorium B and thorium C in the air is not a particularly important factor in the inhalation hazard from

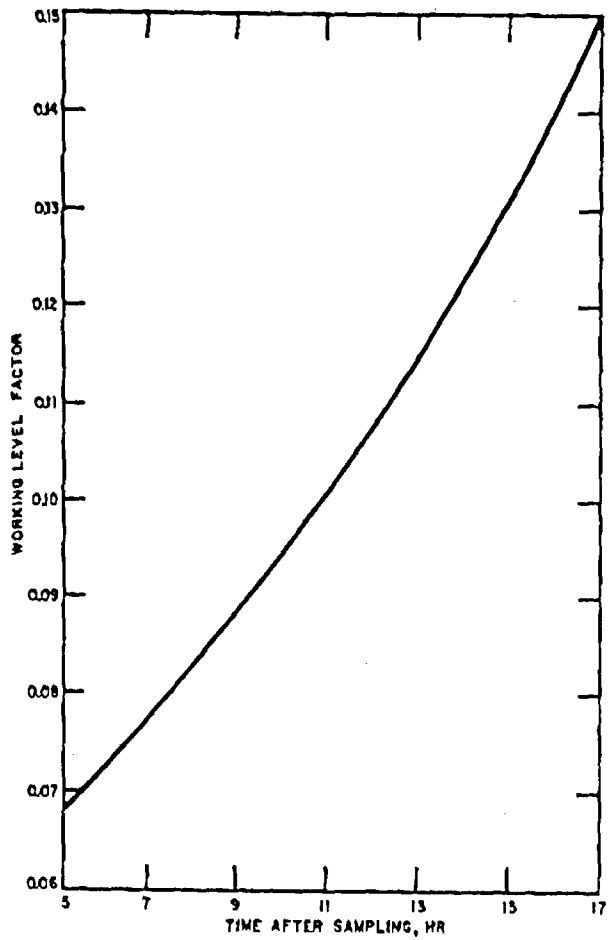


FIG. 11.5. The working level factor curve for thoron daughters. After Blanchard and Holaday, *Am. Ind. Hyg. Assoc. J.*[7]

thoron daughters, the ratio of these two decay products can be used as a measure of ventilation. Equilibrium activities of thorium B and thorium C occur only in nonventilated air; ventilation depresses the concentration of thorium C to a greater extent than that of ThB. If ρ is the number of air changes per minute, it will be seen[8] in Fig. 11.6 that the shape of the

alpha decay curve is remarkably sensitive to variations of ρ in the ra from 10^{-4} to about 1. Hence, the ratio of counts at 30 and 150 min co be used for estimating effective ventilation in areas where thoron released into the atmosphere.

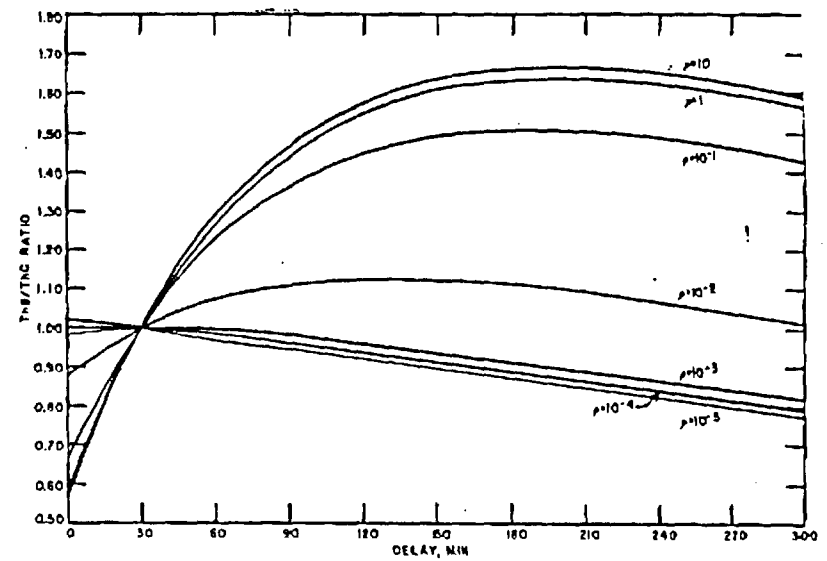


FIG. 11.6. Alpha decay curves of filter paper air samples for various degrees o ventilation. After Somayajulu, *Health Phys.*[8]

The shape of the decay curve after electrostatic sampling is similar t that for filter paper sampling and also reflects the variation in the rati of thorium B to thorium C ions due to ventilation.

1.3. Measurement of Atmospheric Thorium

The interpretation of airborne thorium activity in terms of maximum permissible limits is complicated. Unlike most other important industria radioactive materials, thorium consists of several different isotopic subseries, each of which has its own MPC in air. Freshly separated natural uranium does not develop appreciable daughter alpha activity for many years because the daughter isotopes of U^{234} have very long half-lives. However, there are no "stoppers" in the Th^{232} decay series, and the decay chain isotopes form rapidly.

As indicated in Chapter 9, Section 4, the ICRP permissible limit calculations assume that each parent of a decay series in the Th^{232} chain enters the body alone. From the standpoint of hazard, the important

isotopes in the Th^{232} series are Th^{232}, Th^{228}, Ra^{228}, and Ra^{224}, each of which has its own MPC in air. The relative magnitudes of the MPC values for these isotopes in the form of insoluble particles are Th^{232}, 1.0; Th^{228}, 0.6; Ra^{228}, 4.0; and Ra^{224}, 70.0. For soluble particles the MPC ratios are Th^{232}, 1.0; Th^{228}, 4.5; Ra^{228}, 35.0; and Ra^{224}, 2500.

It is apparent that the important parent isotopes are Th^{232}, Th^{228}, and Ra^{228}. If the entire Th^{232} decay chain were in equilibrium, as is the case for "natural thorium," six alpha particles would be emitted for each disintegration of Th^{232}. One microcurie of natural thorium, by definition, consists of 1 μc each of Th^{232} and Th^{228}. The alpha activity on an air sample of equilibrated natural thorium dust can be readily interpreted in terms of the MPC for natural thorium. However, when the Th^{232}/Th^{228} ratio becomes greater than unity, as occurs with repeated chemical separations, the contribution of Th^{232} to the measured alpha activity would be abnormally large and hence the hazard would be increased relative to natural thorium.

Since heat treatment of thorium can volatilize and segregate radium daughters, the aerosol may be enriched or depleted in Ra^{228} and Ra^{224}. A high alpha activity from radium enrichment would be less hazardous than the equivalent activity from natural or depleted thorium. However, if the airborne activity arose from radium-enriched material which had been aged for several weeks, the beta-emitting Ra^{228} would predominate because of its relatively long half-life compared to Ra^{224} and the alpha activity could seriously underestimate the inhalation hazard. It is apparent that a meaningful assessment of the isotopic composition of thorium dust may require detailed analysis.

Five hours after the end of the collection period, the radon daughter activity on the air sample has disappeared and the thoron daughters have reached equilibrium. The thoron daughter activity is eliminated by decay in another 3 or 4 days. Thereafter, one or more repeated alpha counts over a period of weeks permits the estimation of Ra^{224} unsupported by Th^{228}. The formula for calculating unsupported Ra^{224} activity[8] is

$$C_L = \frac{C_2 - C_1 e^{-0.19t}}{1 - e^{-0.19t}}$$

where C_1 and C_2 are the first and second counts and t is the time in days between the two counts. This method has some value for determining whether or not most of the activity is short-lived, but it is not very precise.

Thorium-232 can be measured by chemical or radiometric methods; however, the required sensitivity is very high. The MPC in air for natural

thorium in unrestricted areas is 2×10^{-12} μc/cm³, which is equal to 9 μg/m³ or an alpha activity of 8.8 dis/min/m³. Because of its low specific activity, the chemical determination of Th^{232} (discussed in Section 2) is the method of choice.

The degree of Ra^{224} enrichment in an air sample can be determined by combining the results of the chemical analysis and alpha activity measurement. The alpha counting is generally done with a proportional gas flow counter or a scintillation counter with a thin layer of powdered phosphor covering the face of the photomultiplier tube.[10] Both methods have high efficiencies (~33%) with low backgrounds (3–5 counts/min).

As an alternative to the combined chemical and gross alpha measurement of air samples, the analysis can be done by alpha spectroscopy. The alpha spectrometer that is useful for materials of very low specific activity (e.g., about 10^{-12} counts/g), consists of a pulse ionization chamber using either a cylindrical or parallel plate Frisch grid electrode system.[11] A half-width resolution of 50 to 80 kev is obtainable on air samples that have been collected by electrostatic precipitation. The background counting rate, in the energy range from 4 to 6 Mev, is about 2 counts/min.

An average of six alpha particles are emitted per disintegration of Th^{232} from seven of the members in the equilibrated Th^{232} decay chain. The alpha energies range from 3.947 to 9.78 Mev. Figure 11.7 shows an alpha spectrum[9] from a sample of thorium having a Th^{232}–Th^{228} ratio of about 2. The energy peaks of the individual alpha emitters are quite distinct. In practice, alpha spectrometry has been found to be somewhat imprecise for the measurement of Th^{232} and Th^{228} in the presence of large amounts of Ra^{224} and its daughters.[11]

Gamma spectroscopy is useful for determining the degree of enrichment of radium daughters in thorium on the basis of the gamma activity of Ac^{228} (0.9 Mev) and Tl^{208} (2.6 Mev). Figure 11.8 shows the gamma spectra[9] from two thorium samples, one of which is depleted of radium daughters. The ratio of gamma-ray activities in the 0.9 and 2.6 Mev energy regions is used to determine the activity ratio of Ra^{228} to Ra^{224}. In radium-enriched material, the Ra^{224} is unsupported by Th^{228} and decays much faster than Ra^{228}, causing a high Ra^{228} to Ra^{224} ratio. In radium-depleted material, the Ra^{224} grows rapidly, unlike Ra^{228}, causing a low Ra^{228} to Ra^{224} ratio.

In a radium fraction which is devoid of thorium the Ra^{228} to Ra^{224} ratio builds up to a peak in about 35 days and then falls off slowly,[12] as shown in Fig. 11.9, because of the slow production of Th^{228} from the decay of Ra^{228}.

The procedure for analyzing air samples for thorium[13] in the Oak Ridge Y-12 Plant is as follows.

The samples are alpha counted after a 48-hr delay period to allow for decay of thoron daughters. A screening limit of 10^{-11} $\mu c/cm^3$ is used on the empirical basis that samples with less than this activity level seldom have a thorium concentration greater than 2×10^{-12} $\mu c/cm^3$. Moreover,

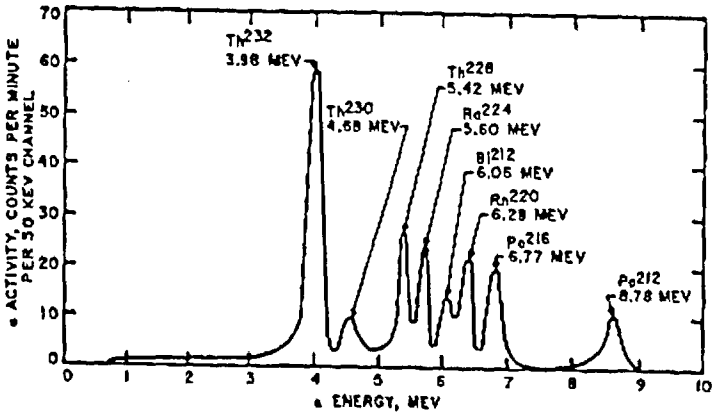


Fig. 11.7. Alpha spectrum of thorium and its daughters for a Th^{232}–Th^{228} ratio of 2.23. After West, *Health Phys.*[9]

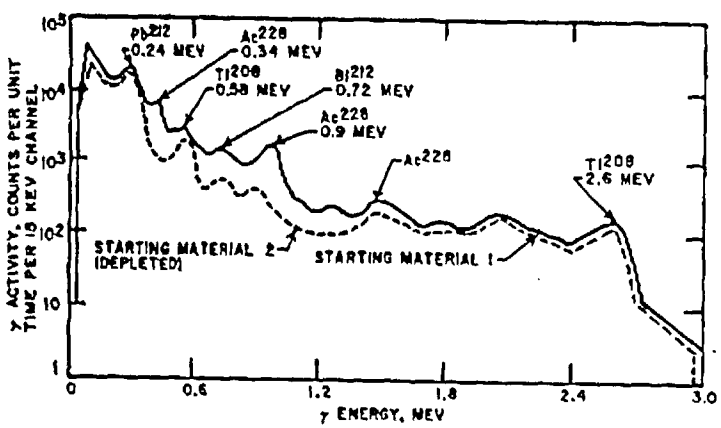


Fig. 11.8. Gamma spectra from two starting materials, normalized at 2.6 Mev. Starting material 2 is depleted of radium daughters. After West, *Health Phys.*[9]

10^{-11} $\mu c/cm^3$ is less than the MPC in air for either Ra^{224} or Ra^{228}. If the screening limit is exceeded, a chemical analysis for thorium is done by an adaptation of the colorimetric procedure of Thomason *et al.*[14] The Ra^{224} concentration is then calculated and a beta count is used to estimate the level of Ra^{228}.

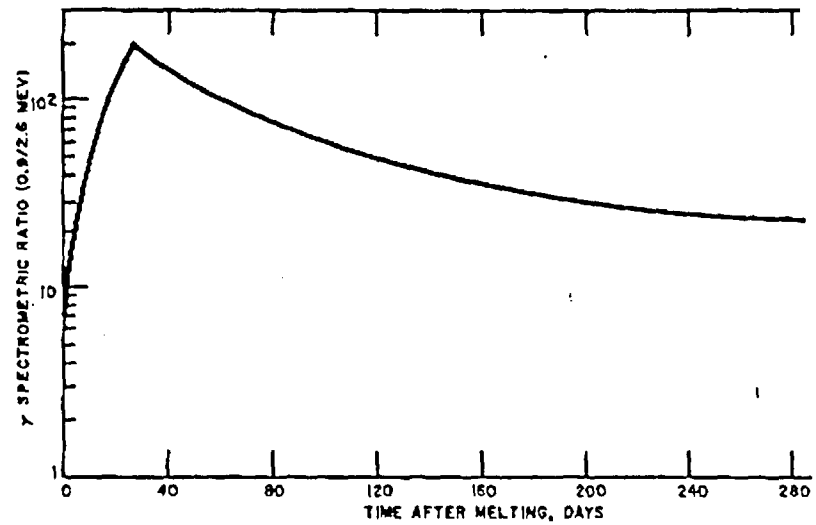


Fig. 11.9. Long-term behavior of gamma ratio for a thorium-free radium fr After Cofield, *Health Phys.*[11]

2. Bioassay

There are three potentially useful methods of estimating the burden of thorium: analysis of the breath for thoron, measureme gamma emission from the chest, and urinalysis. Thorium in the fe not a good measure of the body burden since it represents inhaled tho which has impacted on the pharynx and therefore never reached the l thorium particles which were deposited in the bronchial tree and cl by ciliary action and swallowed, and thorium which was ingested dire

2.1. Breath Thoron

Breath thoron measurements were used from 1930 to 1936 to mo the body burdens of several persons who were engaged in refining m thorium at the University of Missouri.[15,16] The maximum atmospl thoron levels in this installation were about 10^{-9} c/liter, but no meas ments were made for airborne thorium or thoron daughters.

Breath thoron was measured by collecting expired air in an ioniza chamber attached to a gold-leaf electroscope. The breath thoron le appeared to reflect the severity of exposure and also declined du vacations. A series of observations on one individual showed an incre level of breath thoron whenever he had an upper respiratory infect

Since then, breath thoron measurements have not been used for rou bioassay in industry. Evans measured breath thoron with an electrost

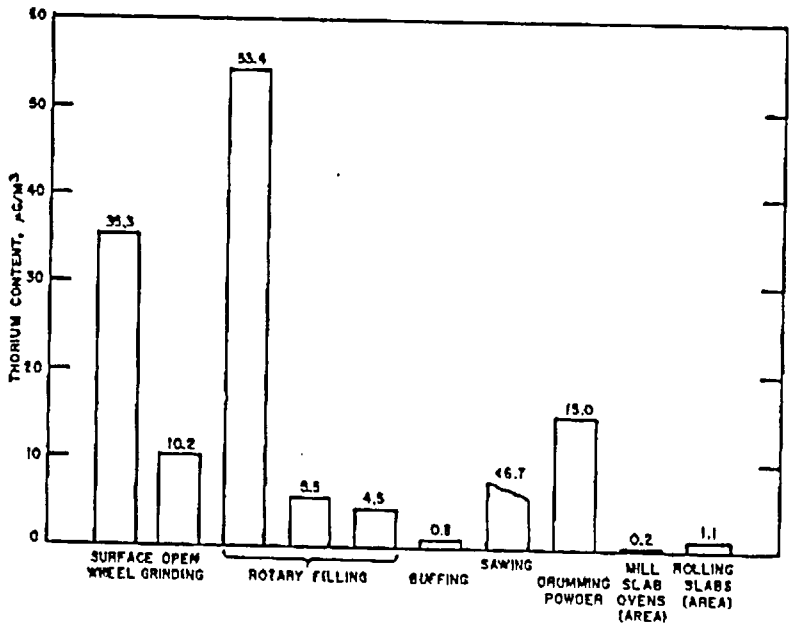


FIG. 10.6. Results of air samples taken with an electrostatic precipitator at some of the mechanical operations involved in processing thorium-magnesium alloys. (Courtesy the Dow Chemical Company, Midland, Michigan.[14])

8. Thoriated Tungsten

The production of 1 to 2% thoriated tungsten involves mixing or "doping" tungsten powder with thorium nitrate and conversion of the powder to the oxide at 600°C. The powder is pressed into bars and sintered at high temperatures in the presence of hydrogen. The metal bars are reduced to thin rods by swaging. The bars are heated white hot and passed repeatedly through the swaging dies, which pound the rods to a smaller diameter from which thoriated tungsten wire can be drawn.

Information on the operational experience with the control of thorium hazards is available for one of the major producers of thoriated tungsten. At this plant, standard industrial hygiene control measures are carried out in the above processes. Most of the operations are done under hoods or near exhaust vents. The operators wear gloves and aprons. Monitoring procedures include breathing zone air samples, as well as smear samples taken on surfaces. The operators wear film badges.

Film badge readings for a 6-month period on employees most directly concerned with the thoriated tungsten process averaged 10 mr/month, with occasional readings as high as 120 mr/month. Air concentrations of thorium were variable, but did not exceed 10^{-11} μc/ml.

One survey showed levels which ranged from 5 to 36.5 ×
Other survey reports had intermediate values. The most
operations in the fabrication of thoriated tungsten were: (1) t
of thorium nitrate, (2) the transfer of the blended thorium r
sten powder to the oxide conversion furnace, (3) the sieving
ated tungsten metal powder, and (4) the pressing of the metal
ingots prior to the sintering step. It is apparent from the air s
that the control of exposure is primarily a matter of care by th
operators in the handling of the materials.

9. Handling Neutron-Irradiated Thorium and U^{233} Feed Material

The purpose of irradiating thorium with neutrons is to
fissionable isotope U^{233}. The neutron reactions that produ
discussed in Chapter 4, Section 1.2.

For neutron bombardment in a reactor, thorium can b
blanket around the core of fuel or mixed together with th
reactor core (U^{235} or Pu^{239}). In either case, the irradiated
highly radioactive since it contains large quantities of fissi
It requires decontamination by remote chemical separation

After removal of fission products, the radiation hazard fr
irradiated thorium and uranium is largely determined by th
tions of U^{232} (half-life of 73.6 years) and Th^{234} (half-life of
Thorium-234 is the immediate daughter of U^{238} and dec
through Pa^{234} to the long-lived U^{234} (2.6×10^5 years), with
of 60 to 90 kev gamma rays.

Uranium-232 decays to Th^{228} (1.9 years), which is a me
Th^{232} decay series. The decay of Th^{228} and its daughters is ass
the emission of high energy gamma radiation.

Following the end of irradiation, the Th^{234} activity diminisl
active decay and that of Th^{228} builds up from the decay of
the greater the delay between the end of irradiation and chem
tion, the more Th^{228} and the less Th^{234} are carried along wit

The generation rate of Th^{234} is dependent on the neutron flu
up to an equilibrium level in less than half a year. For examp
of Th^{234} to Th^{232}, on a mole basis, after the attainment of eq
a flux of 10^{14} neutrons per square centimeter per second is abo
the activity of Th^{234} per gram of Th^{232} at the end of irradiat
10 mc.[16]

If the Th^{234}–Pa^{234} chain is permitted to decay, the Th^{228} ch
the important source of radiation hazard. The build-up of Th
to the total exposure, the number of recycles, and the cooli

Thorium rods and wires have been successfully produced by drawing. Very small wire has been made from arc-melted thorium sheathed in copper.

The machining qualities of high purity thorium are similar to those of copper. The machining qualities of graphite-melted thorium are comparable to those of mild steel. Thorium is considerably softer than uranium but, in most respects, the properties of the two metals are quite similar. Shops that are familiar with uranium have no difficulty machining thorium.

7.5. Powder Metallurgy

Powder metallurgy techniques have been developed extensively for thorium. These techniques permit fabrication of high reactivity metals and metals of widely different densities into dense homogeneous shapes that are impossible to produce by other methods. The disadvantages of powder metallurgy are the high costs and the hazards of handling pyrophoric, radioactive powders.

Powdered thorium has been obtained by calcium reduction and electrolysis, as described in Section 5, and by the decomposition of thorium hydride.

In the hydride process, thorium powder is made by reacting massive thorium metal, in the form of chips or sponge, with hydrogen at 1 atm. At 600° to 650°C ThH_2 is formed. During this step, the charge swells but remains solid; when the temperature is lowered to 250°C, ThH_2 is converted to Th_4H_{15}, which is a coarse powder. The Th_4H_{15} reverts to ThH_2 at 500°C, and then under vacuum at 700°C, ThH_2 decomposes to thorium powder.

Electrolytically deposited thorium, prepared from anhydrous thorium chloride fused with sodium chloride, can be stripped from the electrode and pulverized into a powder.

Metal shapes are readily fabricated by cold compacting, hot compacting, and sintering.

8. Thorium-Magnesium Alloys

Thorium imparts some very desirable heat-resistant characteristics to magnesium; as a result, this alloy has had considerable use in the last decade for the construction of aircraft engines, airplane frames, and missiles.[18]

The alloy manufacturing normally takes place in two steps. First, a master alloy containing roughly equal parts of thorium and magnesium is prepared. Subsequently, the master alloy is remelted and further diluted with magnesium to a maximum concentration of 4% thorium.

Standard magnesium foundary practices are used for melting, casting, grinding, and welding operations.

9. Thoriated Tungsten Electrodes

Thoriated tungsten alloy is used principally for inert gas, shielded arc welding electrodes. These welding electrodes contain 1 to 2% thoria.[19] The thorium confers the advantageous properties of instant arc starting and improved arc stability.[20] The ability of thorium to produce high electron emission with relatively little energy expenditure (low work function) is utilized in thoriated tungsten electrodes for several types of electron tubes.

The first step in the production of 1 or 2% thoriated tungsten involves "doping" or mixing a thorium nitrate solution with tungsten powder. The thorium nitrate, in preweighed plastic bags, containing 5–10 kg each, is added to water in a stirred vat. The thorium nitrate solution is then fed through a hose into the blender containing the tungsten powder during the mixing operation. The doped tungsten powder is loaded into pans and fired at 900°C in an open furnace to convert the thorium nitrate to the oxide. The thoriated tungsten oxide is pulverized in a grinder and drummed for storage, pending the reduction process. The conversion to metal is done in hydrogen reduction (graded temperature zone) tube furnaces. The thoriated tungsten oxide is loaded into crucibles and pushed through the furnace and is then put through a tumbler and sieving operation. The powder is pressed into 2-kg bars in the same type of operation that is used for the pure thorium metal. The sintering of the pressed bars is done in vertical induction furnaces under a hydrogen atmosphere at a temperature of about 2500°C.

10. Thoria Refractories

Thorium oxide is the most refractory of the ceramic oxides, having a melting point of 3300°C. It is used for those applications where temperatures may exceed the melting points of the other more common ceramic oxide refractories. These applications include components for magneto hydrodynamic generators, magneto plasmadynamic generators, and thermionic generators.

The refractoriness of thorium oxide and its chemical inertness combine to make it useful as a crucible material in many metallurgical applications. Its chemical inertness makes thorium oxide suitable for chemical fuel cells, both as a porous membrane and as a container material for molten salts at elevated temperatures. These properties are also useful for thermocouple insulation although the electrical conductivity of thoria be

comes appreciable at very high temperatures. Applications such as these are increasing rapidly, and the demand for thoria refractorics is rising.

Thorium oxide ceramics may be fabricated by many of the common ceramic fabrication techniques, including cold pressing, hot pressing, slip casting, extrusion, isostatic pressing, tamping, and injection molding. The same types of binder, lubricating agents, and plasticizers are required in fabricating thorium oxide ceramics as have been found necessary with pure oxide fabrication of alumina, beryllia, and similar materials.

II. Fabrication of Thorium Mantles

The process for manufacturing thorium mantles has not changed substantially over the years. It is a hand operation that is currently done on a small scale. The essential features of the production method are as follows. A highly absorbent rayon stocking (or webbing) is dipped in a concentrated solution of thorium nitrate containing about 1% cerium nitrate, for luminosity, and some aluminum and beryllium nitrate to add strength to the mantle. The impregnated web is exposed to ammonia fumes, which convert the thorium and other nitrates to the insoluble hydroxide. The rayon stocking is rinsed to remove ammonium nitrate and is dried.

At this stage, the mantle can be finished in either of two ways. (1) To make "soft" mantles, the stocking is cut off, sewn shut at one end, and then packaged for use. (2) "Hard" mantles, which are currently used for some kerosene lamps and are the type that were used in old-fashioned street lamps, are made by igniting the rayon. The open end of the impregnated mantle is fastened to a nichrome mounting base and the mantle is passed through a gas flame which ignites the rayon, leaving a skeleton of oxides. The oxide skeleton is fragile and is therefore dipped in collodion to prevent breakage during shipment. The collodion burns off in use.

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Appendix B

Supporting Documentation
Extended Scoping Survey of Structures

Appendix B
Supporting Documentation
Extended Scoping Survey of Nonimpacted Structures

The information contained in this appendix consists of supporting documentation for the extended scoping survey activities performed for the nonimpacted structures located within the former operational area of the Tulsa facility. The six site structures were surveyed as one Class 3 survey unit for the purpose of verifying their initial classification of "nonimpacted" during the Historical Site Assessment. The Class 3 survey unit was subdivided into 13 subunits consisting of the floor surfaces of the structures.

Extended scoping activities performed include scans and fixed-count time measurements of the structural surfaces with appropriate instrumentation, as well as the collection and analysis of removable contamination (smear) samples for each survey subunit. The following outlines are presented as a brief overview of the information that is contained in each subappendix.

Appendix B-1
Survey Data Summary by Instrument and Date

Appendix B-1 contains summary tables of the fixed-count time measurement survey data by instrument, date of survey, and survey subunit. This information is compiled in this fashion to allow for the presentation of daily background measurements, specific instrument efficiencies, the calculation of minimum detectable concentrations, and the conversion of data from counts per minute to disintegrations per minute.

Appendix B-2
Survey Data Summary by Survey Subunit

Appendix B-2 contains summary tables of the total and removable contamination activity levels (dpm/100 square centimeters) by survey subunit. The summary tables also contain a statistical analysis of the survey data by survey subunit.

Appendix B-3
Analytical Data Reports

Appendix B-3 contains the laboratory analytical data reports and supporting chain-of-custody forms for the smear samples that were collected as part of the extended scoping surveys for the structures of the former operational area.

Appendix B-4
Quality Assurance/Quality Control Documentation

Appendix B-4 contains quality assurance/quality control laboratory analytical data reports for the smear samples and the field instrumentation calibration certificates.

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Appendix B-1

Survey Data Summary by Instrument and Date
Extended Scoping Survey of Structures

Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240

Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 4, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/4/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-001	Survey Subunit:	SS4
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	63	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
4.04	27.6	30	60	43	0.72	-0.33	-9.1	9.2
16.52	38.4	37	60	94	1.57	0.52	14.1	11.2
22.76	38.4	36	60	79	1.32	0.27	7.3	10.7
13.4	11.4	13	60	108	1.80	0.75	20.5	11.7

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-002/003	Survey Subunit:	SS4
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	67	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	19

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
29	16.8	16	60	95	1.58	0.47	12.8	11.4
22.76	16.8	17	60	80	1.33	0.22	5.9	10.8
25.88	22.2	25	60	99	1.65	0.53	14.6	11.5
25.88	11.4	15	60	93	1.55	0.43	11.9	11.3
25.88	8.6	5	60	78	1.30	0.18	5.0	10.8

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-004	Survey Subunit:	SS1
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	47	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
27.6	6.6	6	60	94	1.57	0.78	21.4	10.6

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Table B-1-1
Survey Data Summary by Instrument and Date
Insrument No. 138240
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-003	Survey Subunit:	SS4
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	67	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	19

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
25.88	0.6	5	60	78	1.30	0.18	5.0	10.8

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 6, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/6/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-006	Survey Subunit:	SS3
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	75	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
18.76	8.4	6	60	95	1.58	0.33	9.1	11.7

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 7, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/7/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-012	Survey Subunit:	SS5
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	67	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	19

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
25.76	12.8	18	60	82	1.37	0.25	6.8	10.9
22.64	18.2	20	60	82	1.37	0.25	6.8	10.9
35.12	7.4	8	60	69	1.15	0.03	0.9	10.4

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 7, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/7/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-010	Survey Subunit:	SS3
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	71	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	19

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
9.4	13.8	11	60	110	1.83	0.65	17.8	12.0
6.28	8.4	8	60	71	1.18	0.00	0.0	10.7

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 8, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/8/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-014	Survey Subunit:	SS6
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	65	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
6.47	2.47	J2	60	81	1.35	0.27	7.3	10.8

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 8, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/8/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-013	Survey Subunit:	SS5
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	80	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
16.4	18.2	21	60	78	1.30	-0.03	-0.9	11.2

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 8, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/8/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-016	Survey Subunit:	SS13
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	62	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
16.48	1.2	2	60	102	1.70	0.67	18.2	11.4

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 8, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/8/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-015	Survey Subunit:	SS12
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	73	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
28.48	3	5	60	105	1.75	0.53	14.6	11.9

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 9, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/9/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-020	Survey Subunit:	SS9
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	63	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
39	16	20	60	108	1.80	0.75	20.5	11.7

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 9, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/9/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-019	Survey Subunit:	SS10
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	61	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
10.64	4.6	3	60	73	1.22	0.20	5.5	10.3

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 10, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/10/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-023	Survey Subunit:	SS7
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	67	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	19

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
12	6.2	3	60	74	1.23	0.12	3.2	10.6
15.12	0.8	1	60	73	1.22	0.10	2.7	10.6

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 16, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/16/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-027/029	Survey Subunit:	N/A
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	62	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Tile #2-1		BKG	60	56	0.93	-0.10	-2.7	9.7
Tile #2-2		BKG	60	46	0.77	-0.27	-7.3	9.3
Tile #2-3		BKG	60	49	0.82	-0.22	-5.9	9.4
Tile #2-4		BKG	60	70	1.17	0.13	3.6	10.3
Tile #2-5		BKG	60	53	0.88	-0.15	-4.1	9.6
Carpet #2-1		BKG	60	60	1.00	-0.03	-0.9	9.9
Carpet #2-2		BKG	60	48	0.80	-0.23	-6.4	9.4

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 17, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/17/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-030	Survey Subunit:	N/A
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	56	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Carpet#2-3		BKG	56	60	1.07	0.14	3.8	10.0
Carpet#2-4		BKG	49	60	1.22	0.29	8.0	10.8
Carpet#2-5		BKG	36	60	1.67	0.73	20.1	13.3

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 17, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/17/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-031/032	Survey Subunit:	N/A
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	42	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Concrete#2-1		BKG	60	91	1.52	0.82	22.3	10.3
Concrete#2-2		BKG	60	54	0.90	0.20	5.5	8.8
Concrete#2-3		BKG	60	64	1.07	0.37	10.0	9.2
Concrete#2-4		BKG	60	52	0.87	0.17	4.6	8.7
Concrete#2-5		BKG	60	64	1.07	0.37	10.0	9.2
Wood #2-1		BKG	60	66	1.10	0.40	10.9	9.3
Wood #2-2		BKG	60	52	0.87	0.17	4.6	8.7
Wood #2-3		BKG	60	76	1.27	0.57	15.5	9.7
Wood #2-4		BKG	60	66	1.10	0.40	10.9	9.3
Wood #2-5		BKG	60	69	1.15	0.45	12.3	9.4

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 29, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/29/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-033	Survey Subunit:	SS7
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	80	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
5.76	17	9	60	80	1.33	0.00	0.0	11.3

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 29, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/29/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-034	Survey Subunit:	SS5
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	74	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
10.16	18.2	22	60	85	1.42	0.18	5.0	11.3
7.04	12.8	15	60	73	1.22	-0.02	-0.5	10.8
10.6	7.4	12	60	88	1.47	0.23	6.4	11.4
0.8	2	1	60	85	1.42	0.18	5.0	11.3

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 29, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/29/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-035	Survey Subunit:	SS12
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	78	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
3.52	13.8	11	60	86	1.43	0.13	3.6	11.4
22.24	11.8	14	60	78	1.30	0.00	0.0	11.2
31.6	8.4	6	60	94	1.57	0.27	7.3	11.7
12.88	8.4	9	60	99	1.65	0.35	9.6	11.9
16	3	3	60	98	1.63	0.33	9.0	11.9

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-036	Survey Subunit:	SS13
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	55	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	17

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
28.96	1.2	4	60	102	1.70	0.78	21.4	11.2
7.12	6.6	9	60	89	1.48	0.57	15.5	10.7
19.6	6.6	7	60	95	1.58	0.67	18.2	10.9
10.24	12	12	60	92	1.53	0.62	16.9	10.8
22.72	12	14	60	84	1.40	0.48	13.2	10.5
35.2	12	16	60	86	1.43	0.52	14.1	10.6

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-039	Survey Subunit:	SS9
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	44	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
35.88	10.6	8	60	75	1.25	0.52	14.1	9.8
29.64	10.6	9	60	65	1.08	0.35	9.6	9.3

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-037	Survey Subunit:	SS11
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	60	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
10.36	7.4	3	60	75	1.25	0.25	6.8	10.4

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-038	Survey Subunit:	SS10
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	64	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
10.64	4.6	2	60	79	1.32	0.25	6.8	10.7
1.28	10	8	60	63	1.05	-0.02	-0.5	10.1
23.12	15.4	12	60	80	1.33	0.27	7.3	10.7

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 31, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/31/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-040	Survey Subunit:	SS9
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	58	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
14.04	16	16	60	66	1.10	0.13	3.6	10.0
17.16	10.6	11	60	48	0.80	-0.17	-4.6	9.2
1.65	5.2	1	60	94	1.57	0.60	16.4	11.0

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 31, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/31/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-042	Survey Subunit:	SS4
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	30	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	13

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
19.64	11.4	14	60	57	0.95	0.45	12.3	8.3
13.4	0.6	3	60	55	0.92	0.42	11.4	8.2

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
January 31, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/31/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-041	Survey Subunit:	SS3
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	44	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
0.04	19.2	19	60	69	1.15	0.42	11.4	9.5
6.28	19.2	18	60	74	1.23	0.50	13.7	9.7
12.52	19.2	17	60	63	1.05	0.32	8.7	9.2
6.28	30	28	60	62	1.03	0.30	8.2	9.2
18.76	30	26	60	59	0.98	0.25	6.8	9.1

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-044	Survey Subunit:	SS4
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	39	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
7.16	33.00	32	60	76	1.27	0.62	16.9	9.6

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-043	Survey Subunit:	SS1
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	42	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
12.00	12.00	12	60	74	1.23	0.53	14.6	9.6
8.88	6.60	9	60	69	1.15	0.45	12.3	9.4

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-046	Survey Subunit:	SS6
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	37	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	14

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
2.50	1.15	2	60	63	1.05	0.43	11.9	8.9

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Table B-1-1
Survey Data Summary by Instrument and Date
Instrument No. 138240
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-047	Survey Subunit:	BKG
Instrument Serial #:	138240	Calibration Due Date:	12/27/02
Detector Serial #:	148933	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.116
BKG Counts:	58	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
		BKG	60	68	1.13	0.17	4.6	10.0
		BKG	60	72	1.20	0.23	6.4	10.2
		BKG	60	78	1.30	0.33	9.1	10.4

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483

Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 4, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/4/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-001	Survey Subunit:	SS4
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	55	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	17

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
10.28	38.4	38	60	67	1.12	0.20	5.4	9.7
13.4	33	33	60	81	1.35	0.43	11.7	10.2
0.92	22.2	21	60	56	0.93	0.02	0.4	9.3
10.28	16.8	19	60	58	0.97	0.05	1.3	9.3

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-002/003	Survey Subunit:	SS4
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	59	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	17

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
4.04	16.8	20	60	85	1.42	0.43	11.7	10.5
0.92	11.4	11	60	94	1.57	0.58	15.7	10.9
4.04	6	10	60	70	1.17	0.18	4.9	10.0

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-004	Survey Subunit:	SS1
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	46	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
2.64	17.4	18	60	87	1.45	0.68	18.4	10.1
2.64	6.6	10	60	45	0.75	-0.02	-0.4	8.4
0.6	1.2	3	60	56	0.93	0.17	4.5	8.9

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 7, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/7/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-012	Survey Subunit:	SS5
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	39	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	14

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
7.4	2	2	60	67	1.12	0.47	12.6	9.0
13.28	2	3	60	49	0.82	0.17	4.5	8.2
16.4	7.4	11	60	65	1.08	0.43	11.7	9.0

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 8, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/8/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-015	Survey Subunit:	SS12
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_I (Instrument Efficiency):	0.118
BKG Counts:	34	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
3.52	3	1	30	33	1.10	0.53	14.3	11.3
9.76	3	2	30	36	1.20	0.63	17.0	11.7
19.12	8.4	8	30	37	1.23	0.67	17.9	11.9

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 8, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/8/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-013	Survey Subunit:	SS5
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	60	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
25.76	2	4	60	63	1.05	0.05	1.3	9.7
25.76	7	5	60	82	1.37	0.37	9.9	10.5

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 8, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/8/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-016	Survey Subunit:	SS13
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	60	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
32.08	6.6	5	60	78	1.30	0.30	8.1	10.3

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 9, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/9/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-017	Survey Subunit:	SS13
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	35	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	14

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
25.84	5	6	60	76	1.27	0.68	18.4	9.3

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 10, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/10/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-024	Survey Subunit:	SS8
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	67	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
3	0.2	1	60	65	1.08	-0.03	-0.9	10.1

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 15, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/15/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-025	Survey Subunit:	SS8
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	80	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
9.24	0.2	2	60	101	1.68	0.35	9.4	11.8
6.12	5.6	4	60	59	0.98	-0.35	-9.4	10.4
9.24	11	6	60	69	1.15	-0.18	-4.9	10.7
12.36	16.4	8	60	63	1.05	-0.28	-7.6	10.5

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 15, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/15/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-026	Survey Subunit:	SS7
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	66	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
18.24	6.2	2	60	80	1.33	0.23	6.3	10.6

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 16, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/16/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-027/028	Survey Subunit:	N/A
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	34	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Tile #4-1		BKG	30	20	0.67	0.10	2.7	9.4
Tile #4-2		BKG	30	17	0.57	0.00	0.0	8.9
Tile #4-3		BKG	30	19	0.63	0.07	1.8	9.2
Tile #4-4		BKG	30	21	0.70	0.13	3.6	9.5
Tile #4-5		BKG	30	12	0.40	-0.17	-4.5	8.0
Carpet #4-1		BKG	30	19	0.63	0.07	1.8	9.2
Carpet #4-2		BKG	30	16	0.53	-0.03	-0.9	8.7
Carpet #4-3		BKG	30	11	0.37	-0.20	-5.4	7.8
Carpet #4-4		BKG	30	16	0.53	-0.03	-0.9	8.7
Carpet #4-5		BKG	30	9	0.30	-0.27	-7.2	7.4

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 17, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/17/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-031/032	Survey Subunit:	N/A
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	44	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Concrete#4-1		BKG	60	46	0.77	0.03	0.9	8.3
Concrete#4-2		BKG	60	49	0.82	0.08	2.2	8.5
Concrete#4-3		BKG	60	48	0.80	0.07	1.8	8.4
Concrete#4-4		BKG	60	54	0.90	0.17	4.5	8.7
Concrete#4-5		BKG	60	66	1.10	0.37	9.9	9.2

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 29, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/29/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-033	Survey Subunit:	SS7
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	66	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
8.88	11.6	6	60	76	1.27	0.17	4.5	10.5

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 29, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/29/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-034	Survey Subunit:	SS5
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	69	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	19

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
3.92	18.2	23	60	85	1.42	0.27	7.2	10.9
13.28	12.8	16	60	60	1.00	-0.15	-4.0	10.0
19.52	12.8	17	60	90	1.50	0.35	9.4	11.1
3.92	7.4	13	60	51	0.85	-0.30	-8.1	9.6

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 29, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/29/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-035	Survey Subunit:	SS12
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	81	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
9.76	13.8	12	60	90	1.50	0.15	4.0	11.5
16	13.8	13	60	80	1.33	-0.02	-0.4	11.2
28.48	11.8	15	60	69	1.15	-0.20	-5.4	10.8
25.36	8.4	7	60	75	1.25	-0.10	-2.7	11.0
6.64	8.4	10	60	68	1.13	-0.22	-5.8	10.7
22.24	3	4	60	75	1.25	-0.10	-2.7	11.0

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 29, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-037	Survey Subunit:	SS11
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	68	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	19

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
1	2	1	60	80	1.33	0.20	5.4	10.7

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-036	Survey Subunit:	SS13
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	76	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
22.27	1.2	3	60	88	1.47	0.20	5.4	11.3
10.24	1.2	1	60	96	1.60	0.33	9.0	11.5
0.88	6.6	10	60	85	1.42	0.15	4.0	11.2
4	12	11	60	83	1.38	0.12	3.1	11.1
16.48	12	13	60	105	1.75	0.48	13.0	11.8
28.96	12	15	60	102	1.70	0.43	11.7	11.7

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-038	Survey Subunit:	SS10
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	65	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
4.4	4.6	1	60	69	1.15	0.07	1.8	10.2
7.52	10	7	60	71	1.18	0.10	2.7	10.2
16.88	15.4	11	60	69	1.15	0.07	1.8	10.2

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-039	Survey Subunit:	SS9
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	50	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
39	5.2	7	60	60	1.00	0.17	4.5	9.2
32.76	5.2	6	60	74	1.23	0.40	10.8	9.8

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 31, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/31/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-040	Survey Subunit:	SS9
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	42	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC (dpm/100cm^2):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination (dpm/100cm^2)	95% CL Uncertainty (dpm/100cm^2)
East (E)	North (N)							
20.28	16	17	60	59	0.98	0.28	7.6	8.8
10.92	10.6	12	60	59	0.98	0.28	7.6	8.8
7.8	5.2	2	60	87	1.45	0.75	20.2	10.0

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 31, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/31/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-042	Survey Subunit:	SS4
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	28	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	12

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
7.16	11.4	12	60	40	0.67	0.20	5.4	7.2
0.92	0.6	1	60	57	0.95	0.48	13.0	8.1

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
January 31, 2002
Extended Scopiing Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/31/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-041	Survey Subunit:	SS3
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	42	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
3.16	24.6	20	60	75	1.25	0.55	14.8	9.5
3.16	13.8	10	60	56	0.93	0.23	6.3	8.7
15.64	13.8	12	60	68	1.13	0.43	11.7	9.2
25	8.4	5	60	54	0.90	0.20	5.4	8.6
15.64	24.6	22	60	39	0.65	-0.05	-1.3	7.9

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-043	Survey Subunit:	SS 1
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	30	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	13

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
5.76	12.00	11	60	40	0.67	0.17	4.5	7.4
30.72	12.00	14	60	74	1.23	0.73	19.7	9.0

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-045	Survey Subunit:	SS 2
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_I (Instrument Efficiency):	0.118
BKG Counts:	38	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	14

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
4.64	2.6	1	60	74	1.23	0.60	16.1	9.3

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-044	Survey Subunit:	SS4
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	47	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
0.92	33.00	31	60	59	0.98	0.20	5.4	9.0

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Table B-1-2
Survey Data Summary by Instrument and Date
Instrument No. 145483
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-047	Survey Subunit:	BKG
Instrument Serial #:	145483	Calibration Due Date:	12/27/02
Detector Serial #:	149068	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.118
BKG Counts:	62	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
		BKG	60	72	1.20	0.17	4.5	10.2
		BKG	60	74	1.23	0.20	5.4	10.2
		BKG	60	69	1.15	0.12	3.1	10.1

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Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040

Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-039	Survey Subunit:	SS9
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.14
BKG Counts:	40	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	12

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
32.76	16	19	60	52	0.87	0.20	4.5	7.1
26.52	16	18	60	48	0.80	0.13	3.0	6.9
26.52	5.2	5	60	38	0.63	-0.03	-0.8	6.5
23.4	10.6	10	60	50	0.83	0.17	3.8	7.0

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Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-037	Survey Subunit:	SS11
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_I (Instrument Efficiency):	0.14
BKG Counts:	40	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC (dpm/100cm^2):	12

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination (dpm/100cm^2)	95% CL Uncertainty (dpm/100cm^2)
East (E)	North (N)							
1	12.8	5	60	60	1.00	0.33	7.6	7.4
4.12	7.4	4	60	55	0.92	0.25	5.7	7.2

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Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040
January 30, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/30/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-038	Survey Subunit:	SS10
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.14
BKG Counts:	35	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	12

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
20	10	5	60	48	0.80	0.22	4.9	6.7
13.76	10	6	60	42	0.70	0.12	2.6	6.5
4.4	15.4	9	60	44	0.73	0.15	3.4	6.6
10.46	15.4	10	60	47	0.78	0.20	4.5	6.7

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Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040
January 31, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/31/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-040	Survey Subunit:	SS9
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.14
BKG Counts:	48	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	13

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
7.8	16	15	60	81	1.35	0.55	12.5	8.4
1.56	16	14	60	75	1.25	0.45	10.2	8.2
20.28	5.2	4	60	60	1.00	0.20	4.5	7.7
14.04	5.2	3	60	82	1.37	0.57	12.8	8.4
4.68	10.6	13	60	84	1.40	0.60	13.6	8.5

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Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040
January 31, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/31/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-041	Survey Subunit:	SS3
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.14
BKG Counts:	51	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
0.04	8.4	9	30	50	1.67	0.82	18.5	11.7
3.16	3	1	30	51	1.70	0.85	19.3	11.8
12.52	8.4	7	30	43	1.43	0.58	13.2	11.1
15.64	3	3	30	48	1.60	0.75	17.0	11.5
18.76	19.2	16	30	52	1.73	0.88	20.0	11.9
25	19.2	15	30	46	1.53	0.68	15.5	11.4
9.4	24.6	21	30	46	1.53	0.68	15	11.36
12.52	30	27	30	50	1.67	0.82	19	11.74
25	30	25	30	43	1.43	0.58	13	11.06
21.88	24.6	23	30	47	1.57	0.72	16	11.45
28.12	24.6	24	30	49	1.63	0.78	18	11.64

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Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040
January 31, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/31/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-042	Survey Subunit:	SS4
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.14
BKG Counts:	32	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	11

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
16.52	6	8	60	64	1.07	0.53	12.1	7.3
29	6	6	60	48	0.80	0.27	6.0	6.6
19.64	0.6	4	60	68	1.13	0.60	13.6	7.4

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Table B-1-3
Survey Data Summary by Intrument and Date
Instrument No. 168040
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-043	Survey Subunit:	SS1
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.14
BKG Counts:	55	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	14

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
18.24	12.00	13	60	81	1.35	0.43	9.8	8.6
15.12	17.40	17	60	66	1.10	0.18	4.2	8.1

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Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-044	Survey Subunit:	SS4
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.14
BKG Counts:	37	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	12

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
16.52	16.80	18	60	39	0.65	0.03	0.8	6.5
25.88	33.00	35	60	46	0.77	0.15	3.4	6.7

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Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-046	Survey Subunit:	SS 6
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.14
BKG Counts:	46	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	13

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
2.50	1.15	3	60	48	0.80	0.03	0.8	7.2

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Table B-1-3
Survey Data Summary by Instrument and Date
Instrument No. 168040
February 1, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	2/1/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-047	Survey Subunit:	N/A
Instrument Serial #:	168040	Calibration Due Date:	1/15/03
Detector Serial #:	159005	Calibration Due Date:	1/15/03
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.14
BKG Counts:	76	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Concrete		BKG	60	90	1.50	0.23	5.3	9.5
Concrete		BKG	60	85	1.42	0.15	3.4	9.4
Concrete		BKG	60	96	1.60	0.33	7.6	9.7

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Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043

Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043
January 4, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/4/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-001	Survey Subunit:	SS4
Instrument Serial #:	168043	Calibration Due Date:	12/29/02
Detector Serial #:	126799	Calibration Due Date:	12/29/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.119
BKG Counts:	61	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	17

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
7.16	22.2	22	60	97	1.62	0.60	16.0	11.0
10.28	27.6	29	60	108	1.80	0.78	20.9	11.3

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Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-002/003	Survey Subunit:	SS4
Instrument Serial #:	168043	Calibration Due Date:	12/29/02
Detector Serial #:	126799	Calibration Due Date:	12/29/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.119
BKG Counts:	55	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	17

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
19.64	22.2	24	60	102	1.70	0.78	20.9	10.9

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Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-004	Survey Subunit:	SS1
Instrument Serial #:	168043	Calibration Due Date:	12/29/02
Detector Serial #:	126799	Calibration Due Date:	12/29/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.119
BKG Counts:	47	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
12	1.2	2	60	47	0.78	0.00	0.0	8.4
30.72	1.2	4	60	46	0.77	-0.02	-0.4	8.4

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Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043
January 6, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/6/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-006	Survey Subunit:	SS3
Instrument Serial #:	168043	Calibration Due Date:	12/29/02
Detector Serial #:	126799	Calibration Due Date:	12/29/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.119
BKG Counts:	51	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
9.4	3	2	60	89	1.48	0.63	16.9	10.3

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Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043
January 8, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/8/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-013	Survey Subunit:	SS5
Instrument Serial #:	168043	Calibration Due Date:	12/29/02
Detector Serial #:	126799	Calibration Due Date:	12/29/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.119
BKG Counts:	51	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
22.64	7.4	10	60	91	1.52	0.67	17.8	10.4
32	3	6	60	80	1.33	0.48	12.9	10.0

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Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043
January 9, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/9/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-017	Survey Subunit:	SS13
Instrument Serial #:	168043	Calibration Due Date:	12/29/02
Detector Serial #:	126799	Calibration Due Date:	12/29/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.119
BKG Counts:	51	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
13.36	6.6	8	60	90	1.50	0.65	17.3	10.3

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Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043
January 15, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/15/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-025	Survey Subunit:	SS8
Instrument Serial #:	168043	Calibration Due Date:	12/29/02
Detector Serial #:	126799	Calibration Due Date:	12/29/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.119
BKG Counts:	76	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	19

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
12.36	5.6	3	60	77	1.28	0.02	0.4	10.8
3	11	5	60	83	1.38	0.12	3.1	11.0
15.84	11	7	60	74	1.23	-0.03	-0.9	10.7
6.12	16.4	9	60	82	1.37	0.10	2.7	11.0

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Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043
January 16, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/16/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-027/029	Survey Subunit:	N/A
Instrument Serial #:	168043	Calibration Due Date:	12/29/02
Detector Serial #:	126799	Calibration Due Date:	12/29/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.119
BKG Counts:	37	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Tile #5-1		BKG	30	29	0.97	0.35	9.3	10.8
Tile #5-2		BKG	30	36	1.20	0.58	15.6	11.7
Tile #5-3		BKG	30	20	0.67	0.05	1.3	9.4
Tile #5-4		BKG	30	27	0.90	0.28	7.6	10.5
Tile #5-5		BKG	30	21	0.70	0.08	2.2	9.6
Carpet#5-1		BKG	30	21	0.70	0.08	2.2	9.6
Carpet#5-2		BKG	30	19	0.63	0.02	0.4	9.3
Carpet#5-3		BKG	30	12	0.40	-0.22	-5.8	8.0
Carpet#5-4		BKG	30	18	0.60	-0.02	-0.4	9.1
Carpet#5-5		BKG	30	14	0.47	-0.15	-4.0	8.4

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Table B-1-4
Survey Data Summary by Instrument and Date
Instrument No. 168043
January 17, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/17/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-031/032	Survey Subunit:	N/A
Instrument Serial #:	168043	Calibration Due Date:	12/29/02
Detector Serial #:	126799	Calibration Due Date:	12/29/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.119
BKG Counts:	44	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Concrete#5-1		BKG	60	64	1.07	0.33	8.9	9.1
Concrete#5-2		BKG	60	70	1.17	0.43	11.6	9.3
Concrete#5-3		BKG	60	34	0.57	-0.17	-4.4	7.7
Concrete#5-4		BKG	60	68	1.13	0.40	10.7	9.2
Concrete#5-5		BKG	60	56	0.93	0.20	5.3	8.7

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047

Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-002	Survey Subunit:	SS4
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	57	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	20

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
29	27.6	26	60	96	1.60	0.65	20.2	12.6
22.76	27.6	27	60	66	1.10	0.15	4.7	11.3
22.76	6	7	60	73	1.22	0.27	8.3	11.6

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-005	Survey Subunit:	SS2
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	34	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
10.88	2.6	2	60	68	1.13	0.57	17.6	10.3

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 5, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/5/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-004	Survey Subunit:	SS1
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	20	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
21.36	17.4	16	30	23	0.77	0.43	13.5	10.8
27.6	17.4	15	30	30	1.00	0.67	20.7	12.0
30.72	1.2	5	30	20	0.67	0.33	10.4	10.2
21.36	6.6	7	60	48	0.80	0.47	14.5	8.4

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 6, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/6/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-006	Survey Subunit:	SS3
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	36	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
21.88	3	4	60	61	1.02	0.42	13.0	10.0
21.88	13.8	13	60	62	1.03	0.43	13.5	10.1

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 7, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/7/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-012	Survey Subunit:	SS5
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	31	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	15

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
32	12.8	19	60	72	1.20	0.68	21.3	10.3
32	2	9	60	55	0.92	0.40	12.4	9.4
38.24	2	7	60	55	0.92	0.40	12.4	9.4

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 9, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/9/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-019	Survey Subunit:	SS10
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	30	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	19

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
4.4	4.6	4	30	24	0.80	0.30	9.3	11.4

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 10, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/10/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-023	Survey Subunit:	SS7
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	39	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	17

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
15.12	11.6	7	60	33	0.55	-0.10	-3.1	8.6
12.17	17	8	60	55	0.92	0.27	8.3	9.9

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 16, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/16/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-027/029	Survey Subunit:	N/A
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	36	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Tile #1-1		BKG	60	64	1.07	0.47	14.5	10.2
Tile #1-2		BKG	60	25	0.42	-0.18	-5.7	7.9
Tile #1-3		BKG	60	25	0.42	-0.18	-5.7	7.9
Tile #1-4		BKG	60	29	0.48	-0.12	-3.6	8.2
Tile #1-5		BKG	60	30	0.50	-0.10	-3.1	8.3
Carpet #1-1		BKG	60	41	0.68	0.08	2.6	8.9
Carpet #1-2		BKG	60	31	0.50	-0.10	-3.1	8.3

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 17, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/17/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-030	Survey Subunit:	N/A
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	38	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	16

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Concrete#1-1		BKG	60	57	0.95	0.32	9.9	9.9
Concrete#1-2		BKG	60	46	0.77	0.13	4.1	9.3
Concrete#1-3		BKG	60	62	1.03	0.40	12.4	10.2
Concrete#1-4		BKG	60	42	0.70	0.07	2.1	9.1
Concrete#1-5		BKG	60	52	0.87	0.23	7.3	9.6
Wood #1-1		BKG	60	18	0.30	-0.33	-10.4	7.6
Wood #1-2		BKG	60	24	0.40	-0.23	-7.3	8.0
Wood #1-3		BKG	60	32	0.53	-0.10	-3.1	8.5
Wood #1-4		BKG	60	20	0.33	-0.30	-9.3	7.7
Wood #1-5		BKG	60	38	0.63	0.00	0.0	8.9

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Table B-1-5
Survey Data Summary by Instrument and Date
Instrument No. 168047
January 17, 2002
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Date of Survey:	1/17/02	Type of Radiation:	Alpha
Survey Serial Number:	KT-031/032	Survey Subunit:	N/A
Instrument Serial #:	168047	Calibration Due Date:	12/27/02
Detector Serial #:	126794	Calibration Due Date:	12/27/02
E_s (Surface Efficiency):	0.25	E_i (Instrument Efficiency):	0.102
BKG Counts:	25	BKG Count Time (min):	60
Active Area of Detector Probe (cm^2):	126	MDC ($dpm/100cm^2$):	18

Grid Coordinates		Survey Point Number	Survey Point Count Time (min)	Gross Counts (cts)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Contamination ($dpm/100cm^2$)	95% CL Uncertainty ($dpm/100cm^2$)
East (E)	North (N)							
Carpet#1-3		BKG	30	15	0.50	0.08	2.6	9.4
Carpet#1-4		BKG	30	16	0.53	0.12	3.6	9.6
Carpet#1-5		BKG	30	13	0.43	0.02	0.5	8.9

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