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UC-703

EVALUATION OF TECHNOLOGIES FOR VOLUME REDUCTION OF PLUTONIUM-CONTAMINATED SOILS FROM THE NEVADA TEST SITE

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Charalambos Papelis
Roger L. Jacobson
Forest L. Miller
Lynn K. Shaulis

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Nevada Operations Office
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ABSTRACT

Nuclear testing at and around the Nevada Test Site (NTS) resulted in plutonium (Pu) contamination of the soil over an area of several thousands of acres. The objective of this project was to evaluate the potential of five different processes to reduce the volume of Pu-contaminated soil from three different areas, namely Areas 11, 13, and 52. Volume reduction was to be accomplished by concentrating the Pu into a small but highly contaminated soil fraction, thereby greatly reducing the volume of soil requiring disposal. The processes tested were proposed by Paramag Corp. (PARAMAG), Advanced Processing Technologies Inc. (APT), Lockheed Environmental Systems and Technologies (LESAT), Nuclear Remediation Technologies (NRT), and Scientific Ecology Group (SEG). Because of time and budgetary restraints, the NRT and SEG processes were tested with soil from Area 11 only. These processes typically included a preliminary soil conditioning step (e.g., attrition scrubbing, wet sieving), followed by a more advanced process designed to separate Pu from the soil, based on physiochemical properties of Pu compounds (e.g., magnetic susceptibility, specific gravity). Analysis of the soil indicates that a substantial fraction of the total Pu contamination is typically confined in a relatively narrow and small particle size range. Processes which were able to separate this highly contaminated soil fraction (using physical methods, e.g., attrition scrubbing, wet sieving), from the rest of the soil achieved volume (mass) reductions on the order of 70%. The advanced, more complex processes tested did not enhance volume reduction. The primary reason why processes that rely on the dependence of settling velocity on density differences failed was the very fine grain size of the Pu-rich particles. The magnetic separation of Pu was most likely compromised by interferences from other magnetic or paramagnetic minerals in the soil. The small particle size of the Pu may have also contributed to poor separation by not generating strong enough forces to attract the Pu particles in the very short time of flow past the magnet. Flotation separation is highly dependent on using the correct reagent in the slurry, which would permit air bubbles to attach to Pu mineral grains. The best reagents may not have been identified to produce an optimal separation. Another problem which may have complicated all the tests is the inability to totally dislodge the Pu from the other soil particles.

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EXECUTIVE SUMMARY

During the period of nuclear weapon production and testing, the U.S. fired a number of "safety shots" at the Nevada Test Site (NTS) and on both the Tonopah Test Range and Nellis Air Force Range. A safety shot represents the attempt to detonate a nuclear device, using conventional explosives, to assess the possibility of an accidental nuclear explosion. The safety shots resulted in plutonium (Pu) contamination over an area of several thousands of acres. The level of contamination varies as a function of distance from the location of the explosion, or "ground zero," from about 50,000 pCi/g at ground zero to an average of between 100 and 1,000 pCi/g in most of the contaminated areas.

From an organizational point of view, this project was part of the Soil Media Operable Unit (SMOU) of the Environmental Restoration (ER) Division of the Department of Energy (DOE). The objective of the project was to evaluate the potential of five different processes to reduce the volume of Pu-contaminated soil from three different areas, namely Areas 11, 13, and 52. The soils from these areas differ both in terms of particle characteristics (particle size distribution) and Pu distribution among particle fractions. Volume reduction was to be accomplished by concentrating the Pu into a small but highly contaminated soil fraction, thereby greatly reducing the volume of soil requiring disposal. It should be noted, however, that there were essentially no established performance criteria for these processes. The individual vendors were instead asked to optimize their processes in order to maximize volume reduction and to minimize residual Pu contamination in the material considered clean. The processes tested were proposed by Paramag Corp. (PARAMAG), Advanced Processing Technologies Inc. (APT), Lockheed Environmental Systems and Technologies (LESAT), Nuclear Remediation Technologies (NRT), and Scientific Ecology Group (SEG).

These processes typically included a preliminary soil conditioning step (e.g., attrition scrubbing, wet sieving), followed by a more advanced process designed to separate Pu from the soil, based on physiochemical properties of Pu compounds. Specifically, two of the separation processes were based on the paramagnetic properties of Pu compounds (PARAMAG, NRT), the APT process was based on a modified flotation process, the LESAT process was based on a combination of processes, including separation based on specific gravity, and the SEG process was based on particle separation by specific gravity. All processes utilized some type of grain-size separation.

Testing of each process was accomplished in two phases. During the first phase, subcontractors were given the opportunity to optimize their processes. Optimization runs were performed either at the Treatability Test Facility (TTF) on the NTS, in which case NTS contaminated soil could be used, or at the subcontractor's facility, in which case a surrogate for Pu-contaminated soil was used. The second phase of the testing process included the actual or "record" runs. These were all performed at the TTF with Pu-contaminated soils from the three areas (11, 13, and 52). It should be noted, however, that because of time and budgetary constraints, the NRT and SEG tests were performed with soil from Area 11 only. This report summarizes the results from the record runs.

It was found, based on wet sieving of the contaminated soil and Pu determination in each size fraction, that in most cases (including soil from Areas 11 and 13 but *not* Area 52) most of the Pu contamination was associated with the smaller particles, typically smaller than approximately 40 mm. In soil from Area 52, however, a substantial fraction of total Pu activity (83%) was found in

the 75-250 mm size fraction. Processes which were able to separate this highly contaminated soil fraction (using physical methods, e.g., attrition scrubbing, wet sieving, separation by settling) from the rest of the soil achieved volume (mass) reductions on the order of 70%. None of the more advanced processes was consistently capable of increasing volume reduction, in addition to what was achieved by particle separation by size.

The magnetic separator of the PARAMAG process was not very effective in concentrating Pu in a small, highly contaminated soil fraction, although the concentrate had consistently higher Pu specific activity than the tailings. The air-sparged hydrocyclone of APT had very limited success in separating Pu from soil. The mineral jig of the LESAT process was not very effective in separating Pu from contaminated soil, nor was the Rare Earth Magnet of the NRT process. The major drawback of the NRT process was operation under dry conditions which precluded processing of the finer, highly contaminated soil fraction. The performance of the multigravity separator of SEG was variable and the results with some samples were encouraging. Because the masses of the process streams, however, were not reported in time for preparation of this report, the SEG process cannot be fully evaluated at this time. Individual components of the above processes, however, were very effective in breaking down soil agglomerates to individual particles and separating a slurry into particle size fractions.

Several reasons for poor performance identified during the tests included small volumes (mass) of soil being processed (on the order of a few kilograms). It is well known that the uncertainty of the results increases with decreasing sample size, making evaluation of the processes more difficult. Mass balances with large errors can be partially traced back to the small volumes. An additional source of uncertainty was the small sample size (1 g) used for Pu analytical determinations. Depending on sample uniformity, the Pu activities determined based on a 1 g aliquot may or may not be representative of an average value for the entire sample. This is especially true for samples with low specific activity and non-uniform particle size distributions. Based on the results from all processes tested, therefore, a relatively simple, cost-effective volume reduction process would include a careful determination of Pu specific activity as a function of particle size for the soil(s) of interest, attrition scrubbing to break down agglomerates to individual particles, and removal of the most heavily contaminated particle size fraction by physical methods.

Additional flaws may have contributed to the relatively poor performance of the advanced treatments tested. First, preliminary optimization of these processes and operational parameter estimation were frequently performed with surrogate materials as opposed to Pu-contaminated soils. Second, the performance of the same process appeared to vary between samples. Such a variation could be explained based on the specific physiochemical aspects of the process being tested and the physiochemical characteristics of the soil being treated. At this point, however, the relationship between soil physiochemical characteristics and individual process performance is not well understood. In addition, the physiochemical characterization of the contaminated soil is not detailed enough to allow further optimization of these processes. Additional characterization of the contaminated soil, including detailed studies of the contaminated mineral surfaces, possibly using surface-sensitive techniques, would be required to improve the performance of these advanced separation processes. Finally, the specific activities of the feed soils were very low in some cases, thereby making Pu separation from the soil increasingly difficult.

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INTRODUCTION

During the period of nuclear weapon production and testing, the U.S. fired a number of "safety shots" at the Nevada Test Site (NTS), and on both the Tonopah Test Range (TTR) and Nellis Air Force Range (NAFR). A safety shot represents the attempt to detonate a nuclear device, using conventional explosives, to assess the possibility of an accidental nuclear explosion. Such an explosion could be the result of an accidental crash of an airplane carrying nuclear devices or a terrorist act. In either case, nuclear safety dictates that a crash or conventional explosives would not set off a nuclear reaction, as well as that the device would be rendered unusable by the event.

The safety shots resulted in plutonium (Pu) contamination at the NTS over an area of several thousands of acres. It is believed that Pu, in the form of finely scattered particles, has only contaminated the top surface soil. The level of contamination varies as a function of distance from the location of the explosion, or "ground zero," from about 50,000 pCi/g at ground zero to an average of between 100 and 1,000 pCi/g in most of the contaminated area (Tamura, 1975, as cited in Peng, 1994).

From an organizational point of view, this project was part of the Soil Media Operable Unit (SMOU) of the Environmental Restoration (ER) Division of the U.S. Department of Energy (DOE). In the past it has been known as the Treatability Studies for Soil Media (TSSM) project of ER, as the Pu in Soils Integrated Demonstration (PuID) under the Office of Technology Development (OTD), and, initially, as the Land Surface Cleanup of Plutonium Project (LSCOPP) under the Nevada Operations Office of DOE.

In response to a request for proposals (RFP) issued by Reynolds Electrical and Engineering Company, Inc. (REECo), the DOE site contractor, several companies proposed different processes to separate Pu from the soil. The objective of all processes was to concentrate the Pu in a small, highly contaminated soil fraction, using physiochemical separation processes, thereby greatly reducing the volume of the soil requiring disposal. Several processes and configurations were considered and five were selected for final demonstration. There were essentially no established performance criteria for these processes. The five vendors were instead asked to optimize their processes in order to maximize volume reduction and to minimize residual Pu contamination in the material considered clean. The differences between the processes selected consisted of either differences in the physiochemical principles used for Pu separation from the soil, or differences in the specific process configurations employed. In general, these processes have been used in the past for mineral separations and it was hoped that this past knowledge could be used to separate Pu-rich particles from the desert soil. The five different separation processes are briefly outlined below.

Separation tests at the NTS were conducted by PARAMAG corporation, Advanced Process Technologies, Inc. (APT), Lockheed Environmental Systems and Technology (LESAT), Nuclear Remediation Technologies (NRT), and Scientific Ecology Group (SEG). Two of the separation processes were based on the paramagnetic properties of Pu compounds (PARAMAG, NRT). The APT process was based on a modified flotation process, the LESAT process was based on a

combination of processes, including separation by gravity, and the SEG process was based on particle separation by gravity.

Tests were conducted with contaminated soils from the NTS, NAFR, and TTR, namely Areas 11, 13, and 52. The soils from these areas differ both in terms of particle characteristics (particle size distribution) and Pu distribution among particle fractions. Specific characteristics of the individual soil samples used for each test are included in the discussion of individual processes. Testing of each process was accomplished in two phases. During the first phase, subcontractors were given the opportunity to optimize their processes. Optimization runs were performed either at the Treatability Test Facility (TTF) of the NTS, in which case NTS contaminated soil could be used, or at the subcontractor's facility, in which case a surrogate for Pu-contaminated soil was used. The results of these preliminary runs were analyzed by the individual subcontractors and were used to optimize process parameters. These preliminary results were included in individual reports to DOE (referenced in the discussion of individual processes) and will not be discussed further here.

The second phase of the testing process included the actual or "record" runs. These were all performed at the TTF using NTS Pu-contaminated soils from the three areas (11, 13, and 52). It should be noted, however, that because of time and budgetary constraints, the NRT and SEG tests were performed with soil from Area 11 only. This report summarizes the results from the record runs. It should be emphasized that the preliminary performance results, and therefore also process optimization, were based on approximate Pu concentrations, derived from measurements of ^{241}Am activity, from rapid g-spectroscopy, and an empirical ratio between ^{239}Pu and ^{241}Am activities, typically between 5 and 10 ($^{239}Pu/^{241}Am \approx 5\text{-}10$). The final results in this report, however, unless otherwise noted, are based on direct measurements of ^{239}Pu activity, as measured by a-spectroscopy, using ^{242}Pu as tracer. Additional details of analytical procedures are given in the discussion of the first process and apply to all subsequent processes as well.

This report is organized as follows. This introduction is followed by discussion of each separation process individually. For each process a brief introduction and a short process description outlining the principles behind the process and the adopted configuration are given, followed by discussion of the results and conclusions, based on analysis of the results. A summary of the results from all processes, conclusions, and recommendations follows the discussion of the individual processes. Detailed analytical data are included in the Appendices, by process.

CHAPTER 1
THE PARAMAG PROCESS

INTRODUCTION

The Paramag Corporation (PARAMAG) evaluated the feasibility of a process based on the Kolm™ separator (Kolm et al., 1975) to remediate the contaminated soil. The objective of the proposed process was the separation of Pu from contaminated soil, based on the paramagnetic properties of Pu. The results of the preliminary process optimization were reported in PARAMAG's final report (Peng, 1994). This chapter summarizes the results of the record runs, which were designed using parameters obtained from the preliminary optimization runs; all results reported here are based on ^{239}Pu activities measured using α-spectroscopy.

PROCESS DESCRIPTION

The PARAMAG process was described in detail in PARAMAG's final report (Peng, 1994). Only a brief summary of the process will be given here. The individual components of the system were an attrition scrubber, a hydraulic particle size separator (hydrosizer), a conventional screen, and a high intensity cylindrical magnet, which was the main component of the separation process. A simplified schematic representation of the system components is shown in Figure 1-1. The soil was initially fed to the attrition scrubber. Based on specific surface area vs. particle size considerations, it was believed that the highest Pu concentrations would be associated with materials of the highest surface area, and, consequently, smaller particle sizes. The attrition scrubber, designed by PARAMAG, was used to break down soil agglomerates into individual particles, thereby releasing Pu-rich particles from the soil matrix.

The slurry was then passed through the hydrosizer, to separate particles according to size. The coarse and medium size fractions were presumed to be free of contamination, and, therefore, were not subject to further treatment. The stream of smaller particles was passed through the magnet to be fractionated according to magnetic susceptibility. Plutonium compounds, being paramagnetic (Emsley, 1989; Weast, 1982), were expected to be concentrated primarily in intermediate magnetic susceptibility fractions. The hydrosizer upflow velocity was adjusted so that smaller particles, which were likely to be associated with higher Pu concentrations, would be carried over to the magnetic separator to be treated, whereas larger and medium size particles, associated with low Pu concentrations, would either settle or be recovered in different fractions and subsequently combined with the decontaminated soil. A conventional screen was used to recover the oversize particles from the tailings stream. The upflow velocity necessary to separate the small (fines) from medium size and larger, and therefore contaminated from non-contaminated particles, was determined by trial and error, based on preliminary practice runs.

The magnetic fractionation of the slurry was accomplished with a high intensity (6 tesla (6T)), cylindrical magnet. The device was described in more detail in the PARAMAG report (Peng, 1994). Additional information can be found in the original reference to the Kolm separator (Kolm et al., 1975); only a brief description is given here. A stainless steel, sponge-like core is enclosed in a PVC

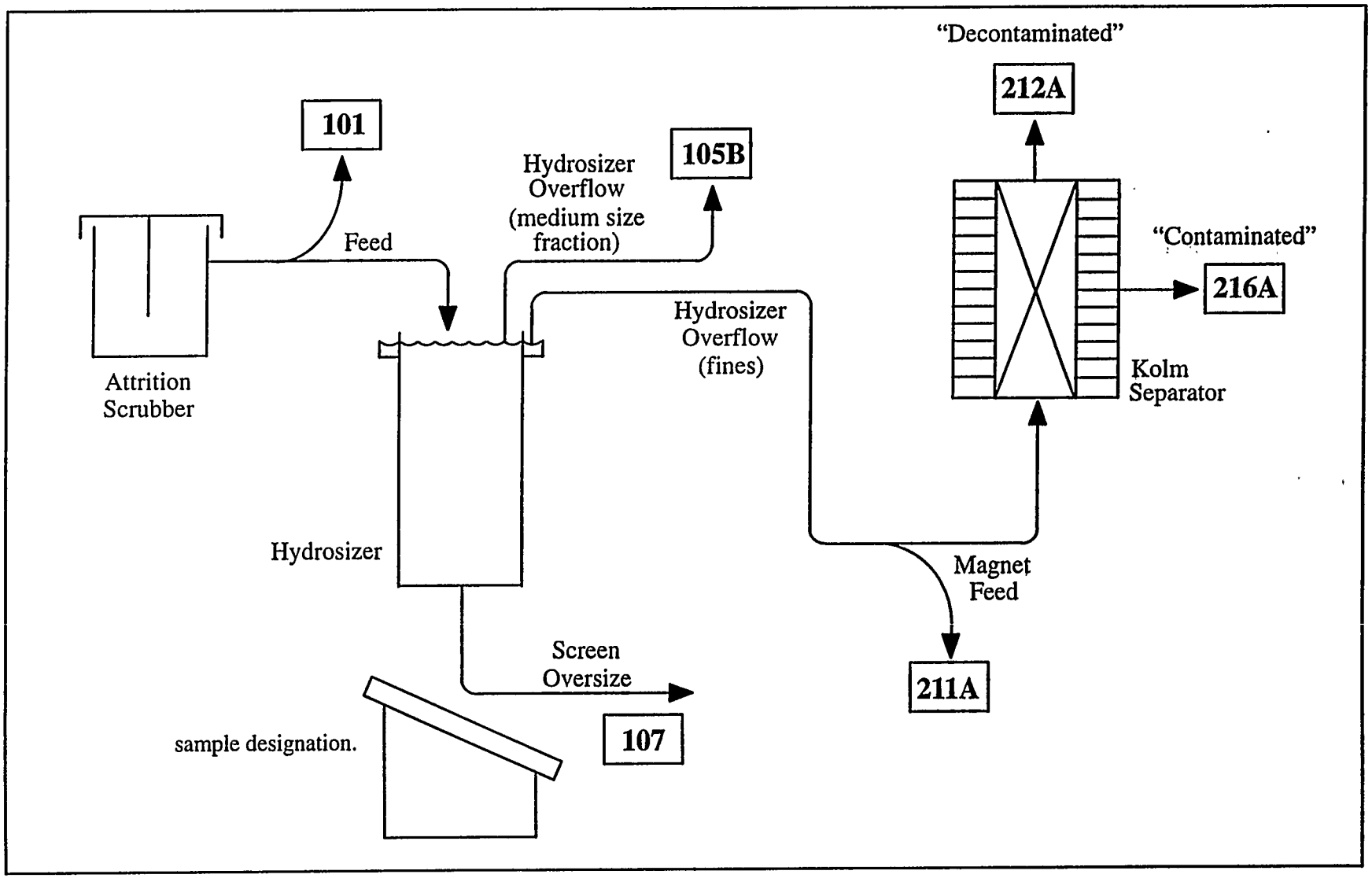

Figure 1–1. Simplified schematic representation of the PARAMAG process showing sampling locations and corresponding sample designation.

pipe through which the stream to be treated passes. The magnet is cooled with liquid helium to decrease the power requirements of the magnet.

The magnetic field can be varied from zero to the maximum field 6T, so that particles of different magnetic susceptibility are attracted to the stainless steel core. During normal operation, the field is set just high enough to remove particles associated with Pu. Highly magnetic particles, with low Pu concentration, can be removed during a preliminary run, by setting the magnetic field low enough to remove ferromagnetic particles but not paramagnetic (Pu-rich) particles. The particular cutoff necessary to achieve removal of Pu-contaminated particles was determined from preliminary trial-and-error runs. When the magnet core becomes saturated with particles, the operation is suspended and the magnet flushed. The output stream from the back-flushed magnet contains the concentrate.

RESULTS AND DISCUSSION

Samples were collected at different stages of the process. The sampling locations with the corresponding stream designations are shown in Figure 1-1. The results are summarized in Tables 1-1, 1-2, and 1-3 for Areas 11, 13, and 52, respectively. For each stream, the mass, the specific ^{239}Pu activity (pCi/g), an approximate particle size distribution, as a function of particle diameter, d, and the approximate size fraction where most of the Pu was concentrated are given. Corresponding percentages are given in parentheses next to the particle range. The particle size ranges in Tables 1-1 to 1-3 are provided as a reference and for discussion purposes only. The exact particle size distributions and Pu activity as a function of particle size, as determined by wet sieve analysis followed by Pu counting, are given in Appendix A for all areas and streams.

TABLE 1-1. PARAMAG PROCESS SUMMARY OF RESULTS: AREA 11.

Stream	Sample Size (g)	Activity ^{239}Pu (pCi/g)	Approx. Particle Size Dist. (μm) (% weight)	Approx. Pu Dist. In Particle Size Fraction (μm) (% Total Pu Activity)
101 Feed	1,758	139	all sizes	most Pu in <5
105B Hydrosizer Overflow	244	36	38<d<250(93%)	<75(90%)
107 Screen Oversize	1,753	1.1	d>250(96%)	
211A Magnet Feed	1,215	378	d<75(95%)	<38(96%)
216A "Contaminated"	548	691	5<d<75(88%)	<38(96%)
212A "Decontaminated"	1,564	240	d<75(96%)	<5(89%)

Total sample mass: 7,082 g
Activity input: 984,400 pCi
Activity output: 1,468,400 pCi; Difference: 49%
Concentrate mass and activity: 2,122 g 357 pCi/g
"Contaminated": "Decontaminated" Specific activity ratio: 2.9:1
"Contaminated":"Decontaminated" Mass ratio 1:2.9
Tailings mass and activity: 1,753 g 1.1 pCi/g
Mass reduction: 45% (49% if stream 105B is included in the tailings)
Remaining activity in tailings: 0.8%

TABLE 1-2. PARAMAG PROCESS SUMMARY OF RESULTS: AREA 13.

Stream	Sample Size (g)	Activity ^{239}Pu (pCi/g)	Approx. Particle Size Dist. (μm) (% weight)	Approx. Pu Dist. In Particle Size Fraction (μm) (% Total Pu Activity)
101 Feed	1,577	4.6	all sizes	Pu in smaller size fractions
105B Hydrosizer Overflow	791	2.0	75<d<250(87%)	75<d<125(78%)
107 Screen Oversize	2,028	0.14	d>125(96%)	
211A Magnet Feed	868	125	d<75(94%)	5<d<75(92%)
216A "Contaminated"	273	70	d<125(96%)	<38(98%)
212A "Decontaminated"	1,434	16	d<75(94%)	<38(97%)

Total sample mass: 6,971 g
Activity input: 32,070 pCi
Activity output: 159,600 pCi; Difference: 400%
Concentrate mass and activity: 1,707 g 25 pCi/g
"Contaminated": "Decontaminated" Specific activity ratio: 4.4:1
"Contaminated":"Decontaminated" Mass ratio 1:5.3
Tailings mass and activity: 2,028 g 0.1 pCi/g
Mass reduction: 54% (62% if stream 105B is included in the tailings)
Remaining activity in tailings: 3%

TABLE 1-3. PARAMAG PROCESS SUMMARY OF RESULTS: AREA 52.

Stream	Sample Size (g)	Activity ^{239}Pu (pCi/g)	Approx. Particle Size Dist. (μm) (% weight)	Approx. Pu Dist. In Particle Size Fraction (μm) (% Total Pu Activity)
101 Feed	1,351	298	all sizes	75<d<250(83%)
105B Hydrosizer Overflow	693	575	75<d<250(92%)	38<d<250(100%)
107 Screen Oversize	3,796	32	d>125(97%)	75<d<125(93%)
211A Magnet Feed	717	373	d<75(94%)	d<75(97%)
216A "Contaminated"	320	890	5<d<75(79%)	5<d<75(82%)
212A "Decontaminated"	982	207	d<38(83%)	<5(90%)

Total sample mass: 7,859 g
Activity input: 2,342,000 pCi
Activity output: 1,678,000 pCi; Difference: 28%
Concentrate mass and activity: 1,302 g 375 pCi/g
"Contaminated": "Decontaminated" Specific activity ratio: 4.3:1
"Contaminated":"Decontaminated" Mass ratio 1:3.1
Tailings mass and activity: 3,796 g 32 pCi/g
Mass reduction: 75% (66% if stream 105B is included in the concentrate)
Remaining activity in tailings: 11%

All Pu analyses were performed by REECo's Analytical Services Department. The analysis protocol included background and quality control samples. Analytical errors reported (two standard deviations) were a function of Pu specific activity, increasing with decreasing specific activity. Typical errors reported ranged from less than 10% at specific activities above 100 pCi/g, approximately 20-30% for specific activities below 100 pCi/g, and exceeded 100% on specific activities of 1 pCi/g and below.

Area 11 Soils

A summary of results from tests with Area 11 soil is given in Table 1-1. The total mass of the Area 11 soil was 7,082 g, an estimate obtained by adding the dry weights of all individual samples, because a total mass of processed soil could not be verified independently. Note that the total sample mass reported for Area 11 soils in Table 1-1, 7,082 g, (and for the other soils in Tables 1-2 and 1-3) includes the mass of the "Feed" (sample stream 101 (1,758 g) in Figure 1-1 and Table 1-1) which was only used for characterization purposes and was not processed further. The specific activity of the input soil was 139 pCi/g, based on analysis of the feed sample (stream 101). It should also be noted that this activity was substantially lower than the original estimate for Area 11 soil, which was 452 pCi/g. The expected Pu specific activity of the soils was determined based on the original measurements of ^{241}Am specific activity (using γ-spectroscopy) and an assumed ratio of 10 between ^{239}Pu and ^{241}Am specific activities. Based on the measured ^{241}Am specific activity (45.2 pCi/g, Peng, 1994) the expected Pu activity was 452 pCi/g. Although particles of all sizes were present, the majority of Pu activity was concentrated in the smaller particle fractions (Appendix A).

Stream 105B was composed of medium size particles (93% of the total mass distributed among particles between 38 and 250 μm, Table 1-1). The specific activity of this sample was 36 pCi/g, substantially lower than the activity of the bulk feed (139 pCi/g). This can be explained based on the particle size distributions of streams 101 and 105B and the observed high correlation between particle size and specific Pu activity in this soil. Most of the Pu activity in the feed (stream 101) was associated with particles smaller than 5 μm. Stream 105B, with 93% of the particles larger than 38 μm (Table 1-1), was therefore expected to have lower specific Pu activity. Within the medium size fraction overflow stream (105B), more than 54% of the total activity was associated with particles smaller than 38 μm (Appendix A), although these particles accounted for only 6.2% of the total mass.

By comparison, the magnet feed stream (211A) consisted of the finer particles (95% of the soil mass was associated with particles smaller than 75 μm, Table 1-1) and was, therefore, the stream with the highest specific activity (378 pCi/g). Again, most of the Pu activity was associated with the smaller particles within the stream (96% of the total activity in particles smaller than 38 μm). The specific activity of this concentrate stream was approximately three times higher than the average activity of Area 11 soil, indicating a successful concentration of Pu in this fraction.

The particle size distributions for the "decontaminated" and "contaminated" streams (212A and 216A, respectively) were in good agreement with the particle size distribution for the magnet feed. The distribution of Pu activity among size fractions and combined overall Pu activity for the

two streams were also in good agreement with the results for the input to the magnet (magnet feed, stream 211A). The distribution of Pu between the two streams, however, was not as good as it was hoped for. Although the "decontaminated" stream had lower specific activity than the "contaminated" stream (240 vs. 691 pCi/g, a ratio of 1:2.9) and accumulated the largest mass fraction of the magnet feed (mass ratio of 2.9:1 between "decontaminated" and "contaminated" fractions), the specific activity of the "decontaminated" stream is too high for the stream to be characterized as decontaminated and for release in the environment without further treatment. The designations "decontaminated" and "contaminated" will be used, therefore, only to refer to streams 212A and 216A, respectively, without any implication for the actual Pu activity. These results are shown schematically in Figure 1-2 which shows the mass and specific Pu activity of the magnet feed and the tailings ("decontaminated") and concentrate ("contaminated") process streams. Note, however, that the mass of the "Feed" in Figure 1-2 (as well as in Figures 1-4 and 1-6) represents the total mass of soil processed by the Kolm separator (i.e., the sum of the "contaminated" and "decontaminated" streams 216A and 212A, respectively) and not the mass of the stream labeled "Magnet Feed" (stream 211 A in Figure 1-1), which was used only for characterization and analytical purposes and was not processed further. The increased specific activity of the "decontaminated" stream compared to the average activity of Area 11 soil feed can be explained based on the different particle size distributions of the two streams and the observed strong correlation between particle size and specific Pu activity.

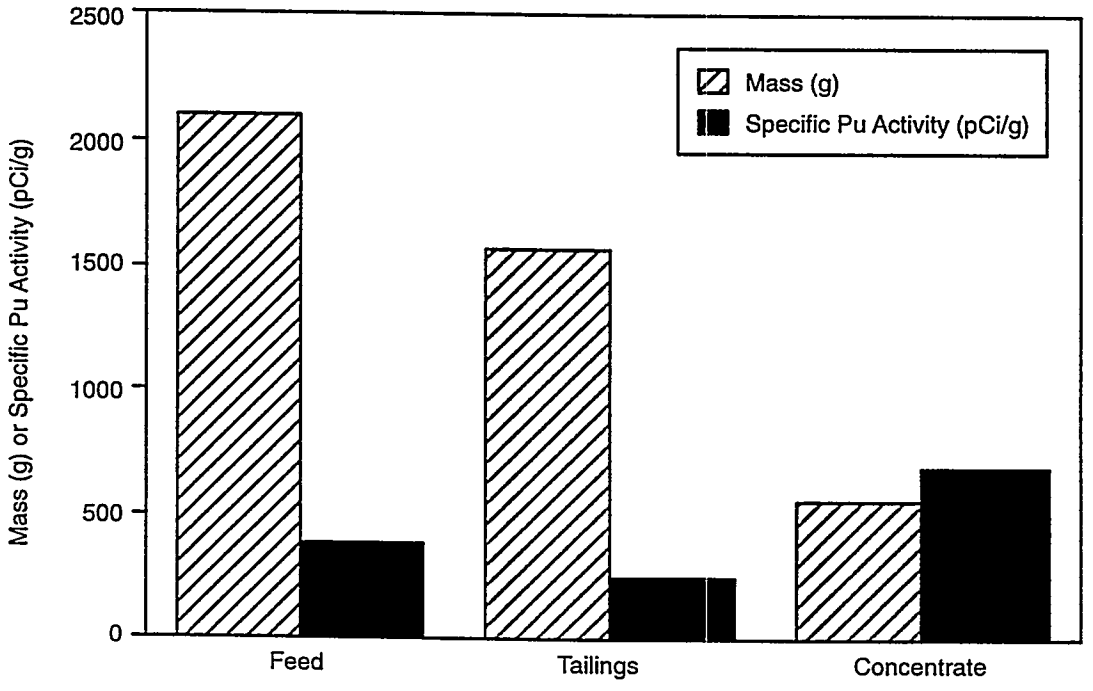

Figure 1-2. Results of particle distribution based on magnetic separation (PARAMAG process); Area 11 soil.

Realistically, only the screen oversize stream, with a specific activity two orders of magnitude lower than the soil feed, can be considered as being decontaminated. If this stream is considered as "tailings" and the combined "contaminated" and "decontaminated" streams are considered as the "concentrate" (with a resulting specific activity of 357 pCi/g, in good agreement with the magnet feed activity of 378 pCi/g), we can estimate the degree of decontamination of the process. Based on these assumptions, the mass reduction was 45% and the remaining specific activity in the tailings was only 0.8% of the specific activity of the feed soil (Table 1-1). It should be noted, however, that the achieved decontamination was entirely due to particle breakup and size reduction in the attrition scrubber followed by particle size separation. The medium size fraction (stream 105B), with specific activity of 36 pCi/g, was also relatively clean. If this stream is included in the tailings stream, the calculated mass reduction becomes 49%. These results are shown schematically in Figure 1-3, where the mass and specific activity of the tailings (including the hydrosizer overflow (105B) and screen oversize (107) streams with a combined specific activity of 5.4 pCi/g) are compared to the mass and specific activity of the magnet feed concentrate. Figure 1-3 clearly suggests that a separation by particle size can result in approximately 50% volume reduction of Area 11 contaminated soil.

It is difficult, without additional information, to suggest reasons for the non-optimal performance of the magnetic separator. Possible non-optimal parameters include magnetic intensity setting and flowrate. It is surprising that at the magnetic field chosen (2.3 T), a relatively large

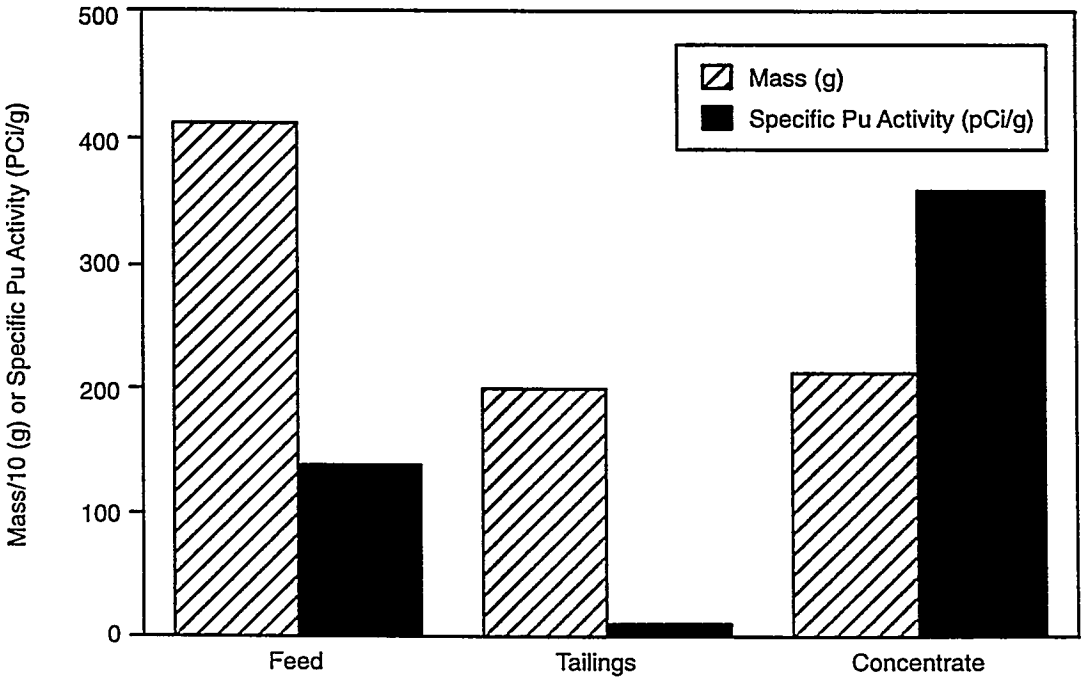

Figure 1-3. Volume reduction based on separation by particle size (PARAMAG process: attrition scrubber, hydrosizer, and screen); Area 11 soil.

fraction of the slurry would be retained by the magnet (26%). A plausible explanation for the relatively high percentage of soil retained by the magnet is that an initial deposit of magnetic material resulted in trapping of non-magnetic material. The frequency of shutdown and cleanup of the magnet is not known; too long intervals between cleanup could have resulted in excessive build up of retained material. In addition, the relatively high clay content of the soil could be responsible for "masking" the paramagnetic behavior of Pu particles (Peng, personal communication), resulting in poor separation. It should also be noted that the exact Pu distribution as a function of particle size was not known before the record runs and process optimization was based on preliminary Pu activity estimates from ^{241}Am spectroscopy measurements.

An attempt to complete a Pu activity balance suggests that sampling or analytical problems may have been present. There is a disagreement of approximately 49% between the total activity of Pu entering the process (assuming a total mass of 7,082 g with a specific activity of 139 pCi/g) and the sum of Pu activity in all streams leaving the system. Such a difference appears to be statistically significant, based on typical analysis errors, as discussed above, and the Pu activities involved. Budget constraints did not allow replicate sampling and analysis of replicates to assess sampling and analytical errors.

Area 13 Soils

The summary of results from tests with Area 13 soil are presented in Table 1-2. The total mass of soil recovered from the attrition scrubber for treatment was 6,971 g. The activity of the soil fed to the hydrosizer (stream 101) was only 4.6 pCi/g, even lower than the original estimate of 20.5 pCi/g for this area (Peng, 1994). The results reported here, therefore, have a substantial margin of error. Nevertheless, at least semi-quantitative conclusions can be drawn.

As in the case of Area 11, the soil sample included a wide range of particle sizes, but the majority of Pu was concentrated in the smaller particle sizes (see Appendix A for a complete Pu distribution as a function of particle size). Similar to results from Area 11, the medium-size-particle flow stream (105B) had a lower specific activity than the feed (stream 101), as expected, based on particle size vs. specific activity considerations. The activity differences between the two streams (4.6 and 2.0 pCi/g for streams 101 and 105B, respectively), however, are probably statistically insignificant, given the high margin of error at those low activities. The screen oversize fraction (stream 107) had a very low activity (0.14 pCi/g), as expected.

The Pu activity of the magnet feed (stream 211A) was almost two orders of magnitude higher than the specific activity of the feed (stream 101) or the medium-size-particle stream (105B). The differences in particle size distribution among these three streams can be used to explain the dramatic differences in specific activity. These results suggest that even in soils with very low average Pu specific activity, such as the soil of Area 13, specific activities in smaller size fractions may be orders of magnitude higher. Because the particles' health hazard potential increases with decreasing particle size, these results further suggest that even soils with very low average Pu activity may pose substantial health risks.

As in the case of Area 11 soil, the magnetic separation resulted in less than optimal distribution of Pu between the "contaminated" (concentrate) and "decontaminated" (tailings) soil fractions, although the "decontaminated" stream accumulated a substantially larger mass fraction with substantially lower specific activity than the "contaminated" stream (mass ratio 5.3:1 and specific activity ratio 1:4.4 for "decontaminated" : "contaminated" streams). These results are shown schematically in Figure 1-4. In terms of total activity, however, the two fractions were approximately equal (19,000 and 23,000 pCi for the "contaminated" and "decontaminated" fractions, respectively). Although both streams had relatively low specific activities (less than 100 pCi/g) and the activity of the "decontaminated" fraction was especially low (16 pCi/g), it would be hard to characterize either of them as being decontaminated, given that both had specific activities higher than the feed stream.

The combination of "decontaminated" and "contaminated" streams results in a concentrate stream of 1,707 g with specific activity of 25 pCi/g. Again, this represents a soil with very low Pu contamination. This activity is significantly lower than the activity of the magnet feed (125 pCi/g) and statistically, most likely, significant, given the relative errors involved. In addition, the disagreement between the total incoming Pu activity and the sum of activities in all subsamples was approximately 400%. The screen oversize tailings had a mass of 2,028 g and activity of 0.14 pCi/g. If this stream is compared to the concentrate stream, the resulting mass reduction was 54% and the remaining specific activity in the tailings was only 3% of the original specific activity of the soil. If the hydrosizer overflow stream (105B) is also included in the tailings stream, the resulting mass reduction becomes 62%. These results are shown schematically in Figure 1-5, where the tailings include the hydrosizer overflow (105B) and screen oversize (107) streams with a combined specific activity of 0.7 pCi/g. The relative specific activities of the tailings and concentrate streams in Figure 1-5 demonstrate the importance of particle separation by size for volume reduction. The size reduction and subsequent fractionation was solely responsible for the achieved decontamination. One must recognize, however, that the task of successful separation of Pu-contaminated particles from the soil matrix becomes increasingly difficult with decreasing specific activities and that, therefore, decontamination of soil with such low activity could be very difficult.

Area 52 Soils

The results of the tests with Area 52 soil are presented in Table 1-3. The total sample was 7,859 g and had a specific activity of 298 pCi/g, significantly higher than the original estimate of 53.5 pCi/g for this area (Peng, 1994). Essentially, all particle sizes were present; the distribution of Pu among different size fractions, however, was different from what was found in Areas 11 and 13 soils, with a substantial fraction of Pu associated with medium size particles. Of the total Pu activity, 83% was found in particles between 75 and 250 μm in size (Table 1-3). The reasons for these differences are not clear and would require further investigation. It is possible that the mineralogy of the area in combination with the specific history of Pu tests and nuclear devices used in Area 52 resulted in association of Pu with a coarser size fraction. It is believed that the safety shot in Area 52 was exploded in a bunker, whereas the shots in Areas 11 and 13 were aboveground detonations. It is,

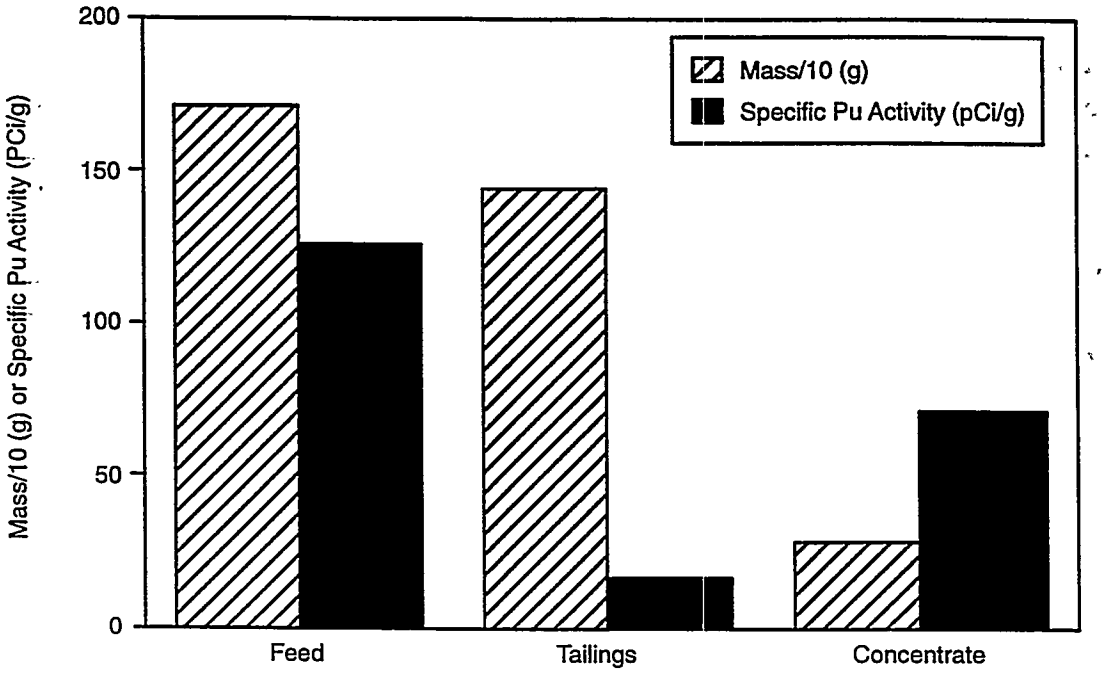

Figure 1-4. Results of particle distribution based on magnetic separation (PARAMAG process); Area 13 soil.

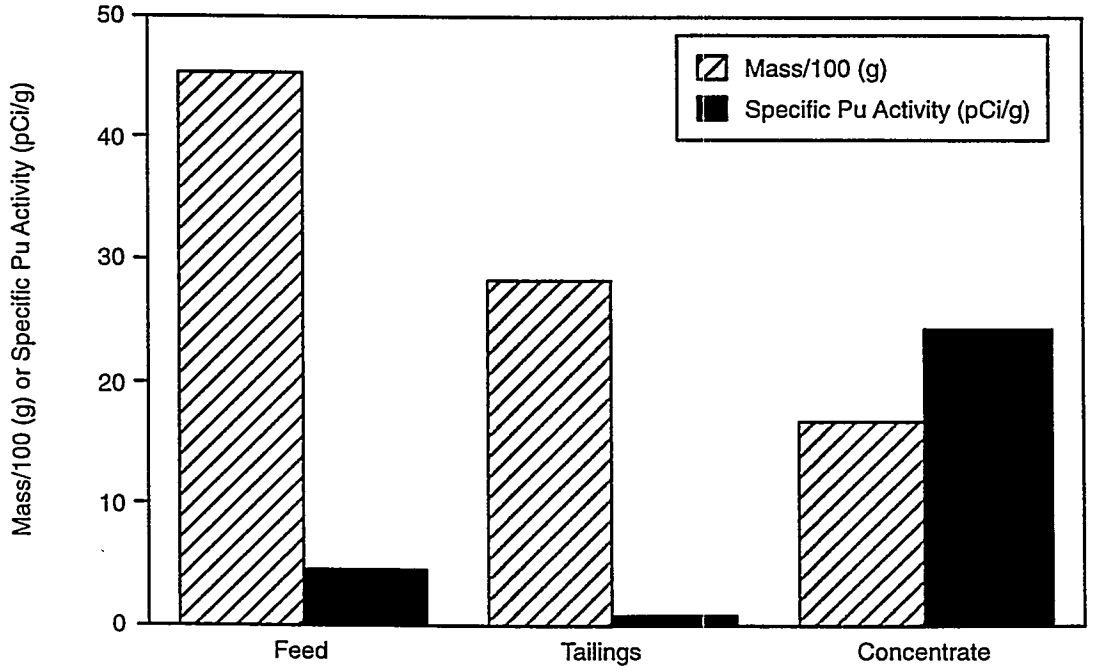

Figure 1-5. Volume reduction based on separation by particle size (PARAMAG process: attrition scrubber, hydrosizer, and screen); Area 13 soil.

therefore, possible that the Pu in Area 52 was deposited as a fused Pu-silicate, whereas in Areas 11 and 13 it was deposited as the Pu oxide (Tamura, 1995).

The Pu activity in the hydrosizer overflow (medium-size-fraction stream, 105B) was higher than the activity of the soil feed (575 vs. 298 pCi/g). This result is not surprising, given that a substantial fraction of Pu activity was associated with medium size particles in Area 52 (Table 1-3). The optimum settings for hydrosizer operation with Area 52 soil should have been different from the settings used with Area 11 and 13 soils to capture and further process the medium size, contaminated soil fraction. The screen oversize flowstream (107) contained the coarser particles (97% of the particles were larger than 125 μm) and had a specific activity of approximately 10% of the original feed (32 pCi/g). It is important to note, however, that even with this area soil, where a substantial fraction of Pu activity was found in the coarser particles, approximately 3% of the particles (by weight) in the screen oversize stream which were smaller than 125 μm accounted for 93% of the total Pu activity. The decreased activity in the magnet feed compared to the hydrosizer overflow (373 vs. 575 pCi/g) was consistent with the differences in particle size distribution and the fact that a substantial fraction of Pu was associated with medium size particles.

The magnetic separator was relatively successful in separating the slurry into high and low Pu concentration fractions. The "decontaminated" stream (212A) had a specific activity lower than the feed (207 pCi/g) and the "contaminated" stream had a specific activity higher than the feed (890 pCi/g). These results are also shown in Figure 1-6. The "decontaminated" fraction had a total activity of 0.285 μCi, whereas the "contaminated" fraction had a total activity of 0.2 μCi. The combined specific activity of the concentrate (combination of "decontaminated" and "contaminated" streams), 375 pCi/g, was in excellent agreement with the activity of the magnet feed (373 pCi/g). In addition, the Pu activity balance for the entire process showed the smallest disagreement from all areas, 28%. This difference could easily be explained by analytical errors. The fact that Pu activity could be better accounted for in this sample is consistent with the higher Pu activities measured (thereby decreasing measurement uncertainties) and possibly the distribution of Pu in coarser material.

Although the ratio of specific activities in the "contaminated" and "decontaminated" streams was larger than 4, and the specific activity of the "decontaminated" stream was lower than the specific activity of the feed (Table 1-3), the relatively high concentration (207 pCi/g) does not warrant the designation of this stream as truly decontaminated. The overall mass reduction, based on a separation of soil between tailings (screen oversize stream) and concentrate ("decontaminated" and "contaminated" streams combined) was 75% and the remaining specific activity in the tailings was 11% of the initial soil activity. For Area 52 soil, however, the hydrosizer overflow stream (105B) containing medium size, highly contaminated particles should also be included in the "concentrate," contaminated stream, resulting in mass reduction of 66%. These results (including the hydrosizer overflow (105B) stream as part of the concentrate) are shown in Figure 1-7. The activity of the tailings stream (32 pCi/g) is low enough for soil disposal and the relative specific activity difference between tailings and concentrate (based on particle size separation, Figure 1-7) exceeds a factor of 10. The higher percentage of remaining activity for Area 52 soil compared to Areas 11 and 13 soils was most likely caused by the different Pu distributions among particle size fractions in the test soils.

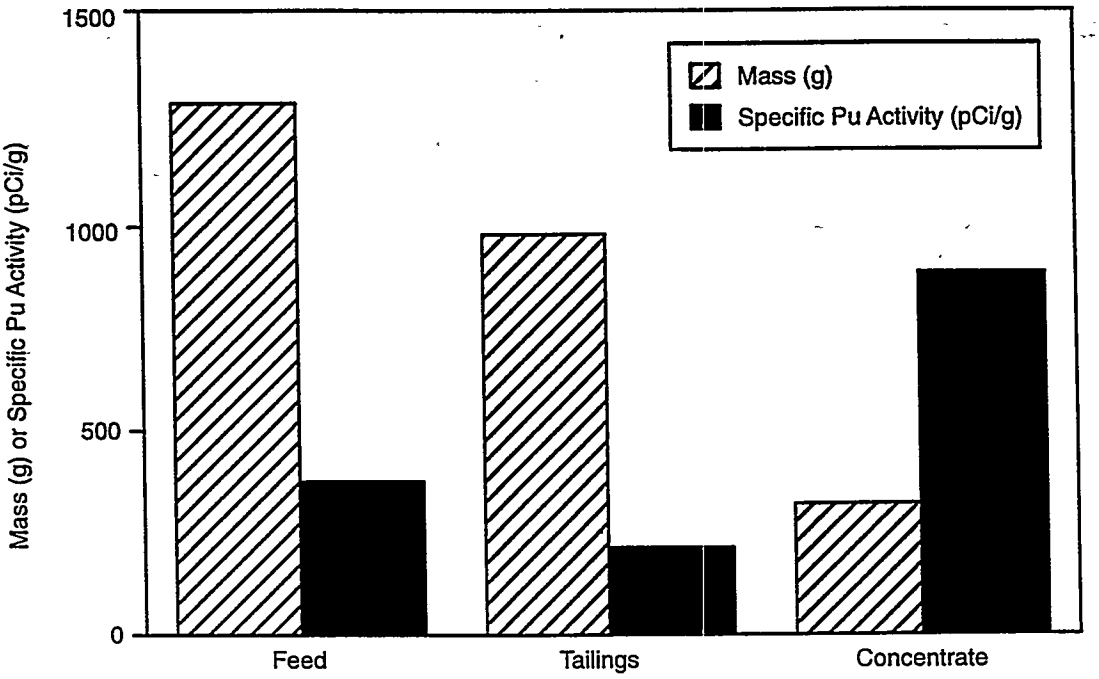

Figure 1-6. Results of particle distribution based on magnetic separation (PARAMAG process); Area 52 soil.

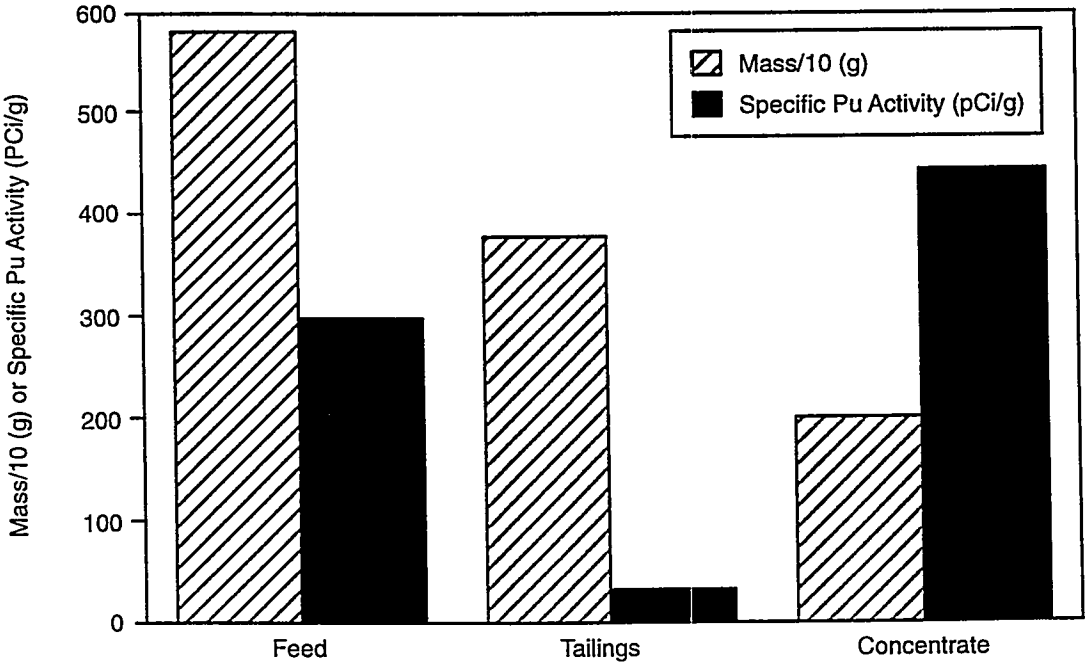

Figure 1-7. Volume reduction based on separation by particle size (PARAMAG process: attrition scrubber, hydrosizer, and screen); Area 52 soil.

CONCLUSIONS

Based on the results reported, the following conclusions can be drawn. Most of the Pu activity was associated with the smaller particle size fractions, especially for Areas 11 and 13 where most of the activity was in the smaller than 38 μm particle size range. In Area 52 soil, a substantial fraction of Pu activity was found in slightly larger size fractions (83% of the activity in the feed was found in the size range between 75 and 250 μm). An attempt to calculate a Pu activity balance, by comparing the total activity entering the process and the sum of the activities of all streams leaving the system was only successful with Area 52 soil, where the disagreement between input and output was only 28%. For the tests with soils from Areas 11 and 13, the disagreement was 49 and 400%, respectively, suggesting problems with sampling, record keeping, or Pu analysis.

The magnetic separator was moderately effective in concentrating Pu in a small, highly contaminated soil fraction. Although the "contaminated" streams (216A) had specific activities between approximately 2.9 and 4.4 times higher than the specific activities of the "decontaminated" streams (212A) and accumulated between 2.9 and 5.3 times less mass, the "decontaminated" soil had specific activity either too high for disposal (Areas 11 and 52) or higher than the specific activity of the original soil (Areas 11 and 13). The higher specific activity of the "decontaminated" stream, compared to the soil feed, can be explained based on the substantially different particle size distributions of these two streams and the highly preferential accumulation of Pu in smaller particles. Based on these results, it seems appropriate to consider the screen oversize tailings stream as the only truly decontaminated fraction for all three soils and everything else as the concentrate fraction, in which case the achieved mass reduction was 45, 54, and 75% for Areas 11, 13, and 52, respectively. If the medium size overflow stream (105B) of Areas 11 and 13 is included in the "tailings" stream, the overall mass reduction would be 49 and 62% for Areas 11 and 13, respectively. Similarly, if stream 105B is included in the "concentrate" stream in Area 52, the resulting mass reduction would be 66%. Based on these results, a cost-effective process would include the attrition scrubber and the hydrosizer, for particle attrition and size separation, but not the more expensive Kolm™ magnetic separator.

Several reasons could be responsible for the relatively poor performance of the magnetic separator. The most important appears to be possible interactions between non-magnetic, non-contaminated particles (the majority) and the fewer, smaller, contaminated particles. Clay particles may have an especially important effect in masking the paramagnetic behavior of Pu-contaminated particles. In addition, better performance of the overall process could be expected if a more accurate characterization of the soil material, including Pu distribution as a function of particle size, were available before the test. This is especially true for the test with Area 52 soil, where a substantial fraction of the total Pu activity was found in the medium size fraction. Operating the hydrosizer with settings different from the ones used for the soils of the other Areas (11 and 13) would, most likely, have resulted in isolating the highly contaminated medium size fraction for treatment, thereby improving the performance of the process.

CHAPTER 2
THE ADVANCED PROCESSING TECHNOLOGIES INC. (APT) PROCESS

INTRODUCTION

This chapter summarizes the test results of the air-sparged hydrocyclone process. While flotation technology has been used by many industries for material separation, air-sparged hydrocyclone technology is relatively new, and was invented by Advanced Processing Technologies, Inc. (APT) and the University of Utah. The original application of the air-sparged hydrocyclone (ASH) technology was in the mineral industries, particularly the coal and gold mining industries. One of the most recent applications of the ASH technology, however, has been in waste paper recycling. ASH technology produces strong centrifugal forces and infuses numerous small air bubbles, providing the capability to separate fine ink particles from paper fiber with greater efficiency than standard flotation equipment. It was this capability of separating fine particles, i.e., less than 10 μm, that motivated APT to test their design for Pu removal. The basic separation principle is that the air bubbles float particles with a certain surface chemistry.

PROCESS DESCRIPTION

Prior to discussing the test results, a brief description of the test methods will be presented. Detailed descriptions of the technology and methodology may be found in the APT final report (APT, 1994). The ASH injects numerous small air bubbles into a high velocity swirl flow of soil slurry to separate fine particles from the soil mass. Figure 2-1 page illustrates the equipment design and process flow. As stated by APT, the ASH "basically consists of a right-vertical porous tube, a conventional cyclone header with vortex finder, and a froth pedestal/underflow structure." A soil (or other material) slurry is pumped into the ASH near the top of the cylinder. It is immediately subjected to a high velocity swirl flow within the porous tube. Air is pumped through extremely fine pores under high pressure into the slurry. The centrifugal force of the slurry produces a shear force at the porous wall that results in the formation of numerous very small bubbles. As the bubbles move inward, radially across the slurry toward the center of the cylinder, a high amount of collision with particles occurs. This results in the attachment of particles to the bubbles. The particle-bubble aggregate moves to the center of the swirl and then travels upwards with other particle-bubble aggregates as froth, and exits via the overflow pipe. The froth or overflow stream in this case is the concentrate, i.e., Pu contaminated waste material, and the underflow exiting at the bottom of the cylinder is considered the clean or "tailings" material.

Test Procedures

Prior to conducting tests at the TTF with soils from Areas 11, 13, and 52, APT performed initial tests at their own facility. These tests used clean NTS soil spiked with cerium oxide, used as a surrogate for plutonium oxide, to determine optimum solids concentration, flotation times, flotation reagent types, and pH. The tests indicated that fatty acids, in particular lauric acid, myristic acid, and palmitic acid, performed well at alkaline pH (i.e., pH greater than 9.5). The specific reagents used for the activator, collector, promoter, and frother, were classified as proprietary and were not

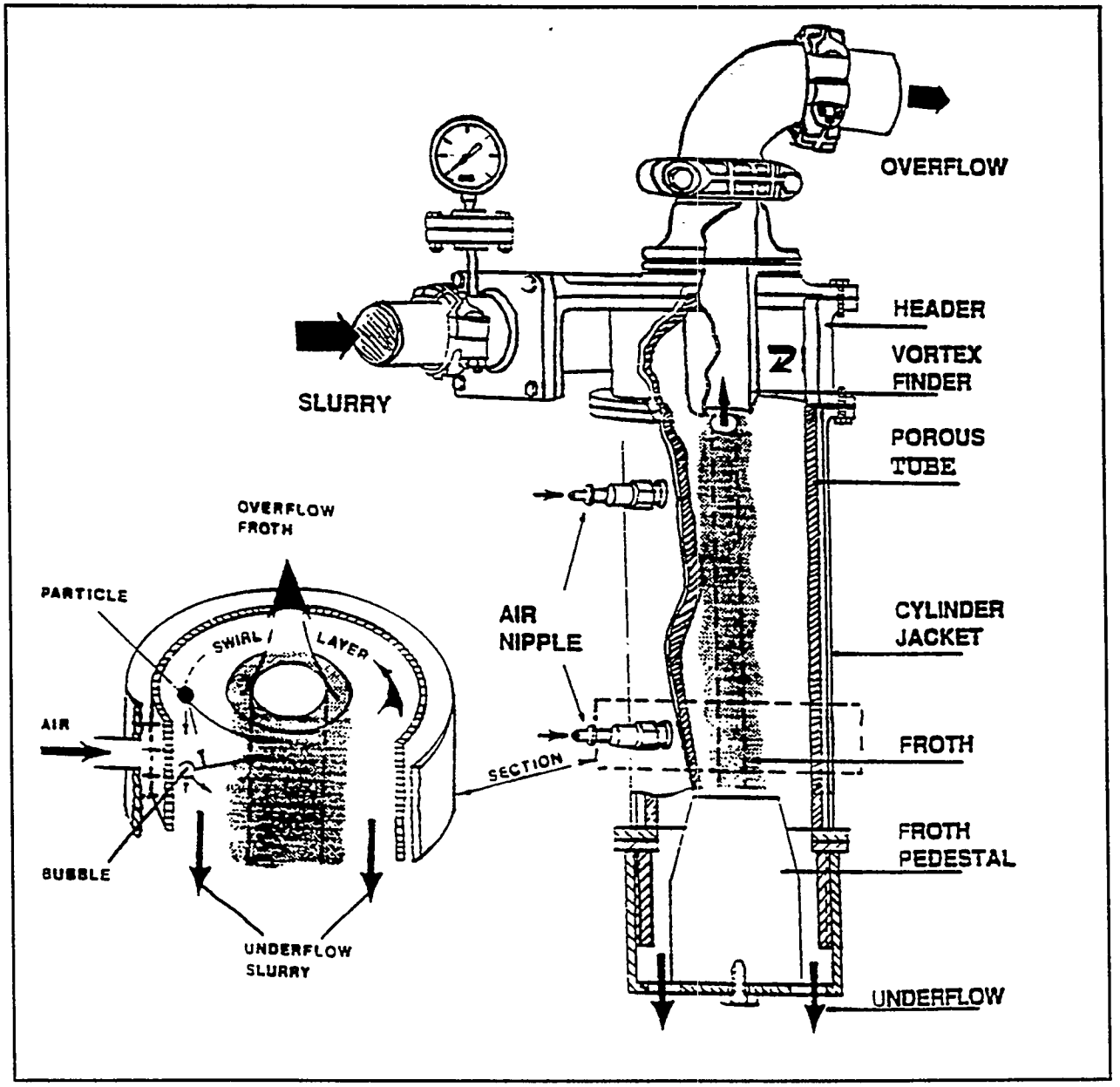

Figure 2-1. Diagram of the air-sparged hydrocyclone (from APT, 1994).

defined in the APT report. The following conditions were established for the tests run at the TTF: 15 psig slurry pressure; 400 L/min air flow rate; pedestal rotation 8 rpm; flotation pH 10.5-10.7; flotation time 5 or 10 minutes; and addition of 4.5 kg/t collector, 2 kg/t promoter, 0.1 kg/t frother, and 0.01 M activator reagents.

The equipment used at the TTF for the ASH soil separation tests was comprised of:

- ASH-2C air-sparged hydrocyclone; 2-inch diameter

- 140 gallon ASH feed sump and mixer
- 40 gallon auxiliary sump and mixer
- ASH 5 hp motor feed pump
- two air flowmeters scaled at 0-20 CFM
- two air pressure regulators and gauges to control inlet air pressure
- in-line air filters and moisture trap
- compressor with capability to deliver 100 CFM at 100 psig

The complete test procedures are outlined below in the order performed (APT, 1994).

1. The -100 mesh (d<149 μm) size fraction of the contaminated NTS soil was separated from the bulk sample via wet sieving. (Previous soil characterization studies had shown that almost all of the Pu was in the finer size fractions; 95% of the Pu is in the smaller than 125 μm size fraction APT, 1994.) Samples of both the +100 mesh and -100 mesh (larger and smaller than 149 μm) size fractions were analyzed for Pu. The smaller than 149 μm particle samples were collected after thorough agitation of the plastic drum holding all of the wet soil that would later be processed in the ASH. Duplicate samples for each of the test soils (Areas 11, 13, and 52) were used as a reference, i.e., feed, sample for comparison with the underflow and overflow materials.
2. An appropriate amount of -100 mesh (<149 μm) soil was combined with water to prepare the feed slurry.
3. The slurry was conditioned for approximately 2 minutes with an appropriate amount of activator (0.01 M).
4. 2 Kg/t of a promoter was added to the slurry and mixed for approximately 1 minute.
5. 2 kg/t of a frothing agent was added to the slurry and mixed for approximately 1 minute.
6. The ASH vortex finder diameter was set at 0.8 inches, and the underflow pedestal was set at either 7 or 8 rotations, i.e., overflow to underflow ratios of 0.79 and 0.74, respectively.
7. The air flow rate was set at 400 L/min.
8. The slurry was pumped into the ASH at 15 psig (approximately 80 L/min).
9. The ASH overflow stream was discharged into the small holding tank, and the underflow was discharged back into the feed holding tank.
10. After a period of operation (typically 5 or 10 flotation times), the feed pump was shut off. Duplicate samples were then collected from both the overflow and underflow

holding tanks. Both of these tanks were continuously agitated to help ensure representative sampling.

11. After sample collection, the tanks were drained and rinsed. The ASH was also rinsed and flushed with clean water for approximately 10 min. The system was then ready for the next test.

12. One each of the duplicate samples, i.e., feed, overflow and underflow, for each soil tested were wet sieved into various size fractions (125<d<250 μm, 75<d<125 μm, 38<d<75 μm, 5<d<38 μm, and d<5 μm) and analyzed for Pu via radiochemistry and α-spectroscopy. The other duplicate sample was submitted for Pu activity counting (by α-spectroscopy) as a bulk sample after drying and weighing.

It should be noted that APT chose not to add any pretreatment steps, such as particle breakup and attrition scrubbing. All three soils were processed in the same manner except for Area 11 soil. The Area 11 overflow, i.e., contaminated, stream was processed in the same manner as the feed in an attempt to further concentrate the contaminated stream. These two processing phases are listed as first stage and second stage in this report; first stage referring to the first pass of the feed through the ASH and the second stage referring to further processing of the overflow stream, using the same procedures as the first stage process.

RESULTS AND DISCUSSION

The results of the Pu analysis for each sample are presented in Tables 2-1 through 2-8. Tables 2-1 through 2-4 list the mass (kg), Pu specific activity (pCi/g) and total Pu activity (μCi) for the feed, overflow ("concentrate"), and underflow ("tailings") samples. Figures 2-2 through 2-5 present the same information graphically. The mass and specific Pu activity of the feed is compared to the mass and specific activity of the tailings (underflow) and concentrate (overflow). Tables 2-5 through 2-8 list the mass (kg), Pu specific activity (pCi/g), and total Pu activity (μCi) for each particle size fraction after wet sieving of the samples. While examining these results, it is important to recognize three factors that influenced the values measured.

First, the soil feed from Areas 13 and 52 had low Pu specific activities (31.6 and 110.1 pCi/g, respectively), rendering Pu separation more difficult, as discussed in Chapter 1. In fact, the original Pu concentration was so low for Area 13 soil, that the results for this soil carry little weight with respect to process evaluation, although tests with soils of such low activity are also useful because they test the efficiency of a process under extreme conditions.

Second, APT did not use an attrition scrubber to break down Pu-soil aggregates. This may be part of the reason why the underflow ("clean tailings") stream had high residual activities. Finally, the feed used by APT does not represent the total mass or Pu activity of the soils as they occur within the NTS. APT wet sieved the soils and the ASH processed only the smaller than 149 μm size fraction. Therefore, total mass and Pu reductions are probably larger than indicated by the sample analysis results.

TABLE 2-1. RESULTS OF THE APT FIRST STAGE SEPARATION OF NTS AREA 11 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu (μCi)
Feed	4.65	423.3	Feed		1.968
Underflow	3.19	277.8	Tailings	68.6	0.886
Overflow	1.46	712.4	Concentrate	31.4	1.040

TABLE 2-2. RESULTS OF THE APT SECOND STAGE SEPARATION OF NTS AREA 11 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu (μCi)
Feed	1.46	712.4	Feed		1.040
Underflow	1.12	531.3	Tailings	76.7	0.595
Overflow	0.35	1470.9	Concentrate	24.0	0.515

TABLE 2-3. RESULTS OF THE APT SEPARATION OF NTS AREA 13 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu (μCi)
Feed	4.49	31.6	Feed		0.142
Underflow	3.78	58.5	Tailings	84.2	0.221
Overflow	0.71	22.9	Concentrate	15.8	0.016

TABLE 2-4. RESULTS OF THE APT SEPARATION OF NTS AREA 52 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu (μCi)
Feed	4.45	110.1	Feed		0.490
Underflow	3.85	164.1	Tailings	86.4	0.631
Overflow	0.60	79.0	Concentrate	13.5	0.047

TABLE 2–5. NTS AREA 11 SOIL FIRST STAGE SEPARATION RESULTS BY PARTICLE SIZE FRACTION.

Size Fraction (μm)	Feed Weight (g)	Feed Pu Activity (pCi/g)	Feed Total Pu (μCi)	Underflow Weight (g)	Underflow Activity (pCi/g)	Underflow Total Pu (μCi)	Overflow Weight (g)	Overflow Activity (pCi/g)	Overflow Total Pu (μCi)
d>125	84.2	27.4	0.002	55.7	58.5	0.003	0.0	0.0	0.000
75<d<125	959.0	55.6	0.053	678.7	44.6	0.030	90.2	274.0	0.025
38<d<75	1763.6	37.6	0.066	1311.4	50.4	0.066	246.1	376.0	0.093
5<d<38	1506.3	1000.0	1.506	970.4	729.0	0.707	716.9	1070.0	0.767
d<5	336.8	1010.0	0.340	173.8	455.0	0.079	406.8	383.0	0.156

TABLE 2–6. NTS AREA 11 SOIL SECOND STAGE SEPARATION RESULTS BY PARTICLE SIZE FRACTION.

Size Fraction (μm)	Feed Weight (g)	Feed Pu Activity (pCi/g)	Feed Total Pu (μCi)	Underflow Weight (g)	Underflow Activity (pCi/g)	Underflow Total Pu (μCi)	Overflow Weight (g)	Overflow Activity (pCi/g)	Overflow Total Pu (μCi)
75<d<125	90.2	274.0	0.025	197.5	56.7	0.011	26.0	274.0	0.015
38<d<75	246.1	376.0	0.093	383.6	78.5	0.030	52.4	376.0	0.039
5<d<38	716.9	1070.0	0.767	359.7	1200.0	0.432	118.4	1070.0	0.347
d<5	406.8	383.0	0.156	179.3	681.0	0.122	752.0	383.0	0.115

TABLE 2–7. NTS AREA 13 SOIL SEPARATION RESULTS BY PARTICLE SIZE FRACTION.

Size Fraction (μm)	Feed Weight (g)	Feed Pu Activity (pCi/g)	Feed Total Pu (μCi)	Underflow Weight (g)	Underflow Activity (pCi/g)	Underflow Total Pu (μCi)	Overflow Weight (g)	Overflow Activity (pCi/g)	Overflow Total Pu (μCi)
75<d<125	938.4	9.9	0.009	579.5	2.4	0.001	10.4	6.2	0.000
38<d<75	1216.8	2.37	0.003	1074.5	8.6	0.009	30.5	8.1	0.000
5<d<38	1207.8	97.3	0.117	1093.7	181.0	0.198	116.6	30.1	0.004
d<5	1127.0	10.8	0.012	1032.3	12.1	0.012	552.6	22.5	0.012

TABLE 2–8. NTS AREA 52 SOIL SEPARATION RESULTS BY PARTICLE SIZE FRACTION.

Size Fraction (μm)	Feed Weight (g)	Feed Pu Activity (pCi/g)	Feed Total Pu (μCi)	Underflow Weight (g)	Underflow Activity (pCi/g)	Underflow Total Pu (μCi)	Overflow Weight (g)	Overflow Activity (pCi/g)	Overflow Total Pu (μCi)
d>125	104.4	75.9	0.008	82.4	52.5	0.004	0.0	0.0	0.000
75<d<125	1044.4	141.0	0.147	925.5	10.8	0.010	30.4	194.0	0.006
38<d<75	1103.4	71.1	0.078	1023.5	271.0	0.277	56.3	118.0	0.007
5<d<38	1103.4	146.0	0.161	1243.1	247.0	0.307	39.4	107.0	0.004
d<5	1094.3	87.0	0.095	572.5	56.8	0.033	473.9	64.7	0.031

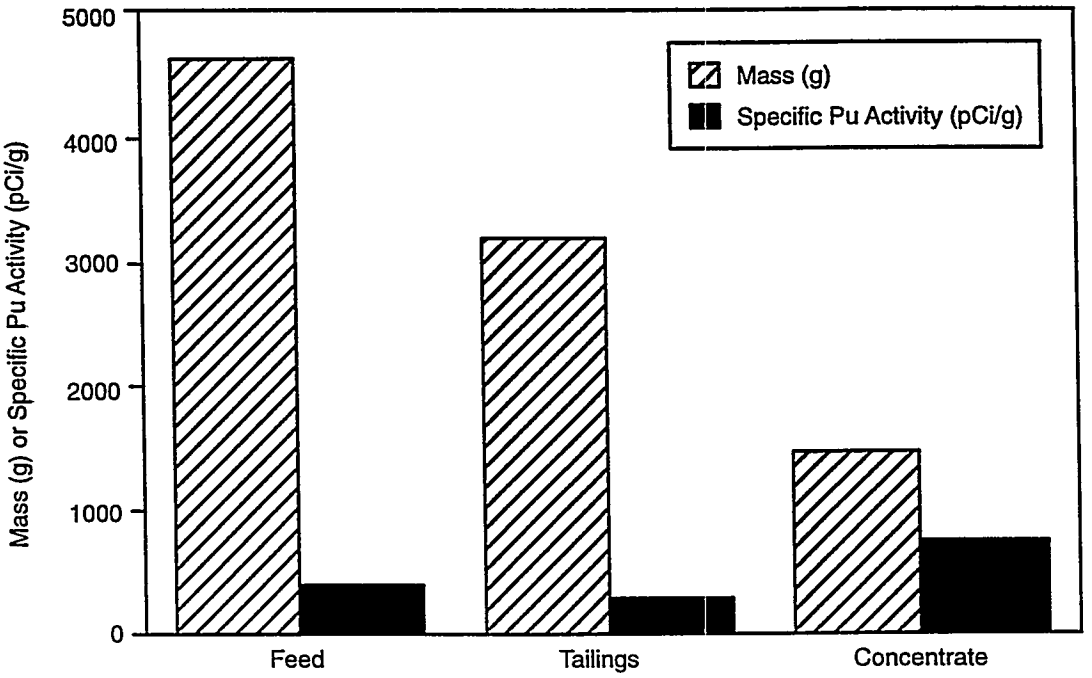

Figure 2-2. Results of particle separation by flotation (APT process); Area 11 soil - first stage.

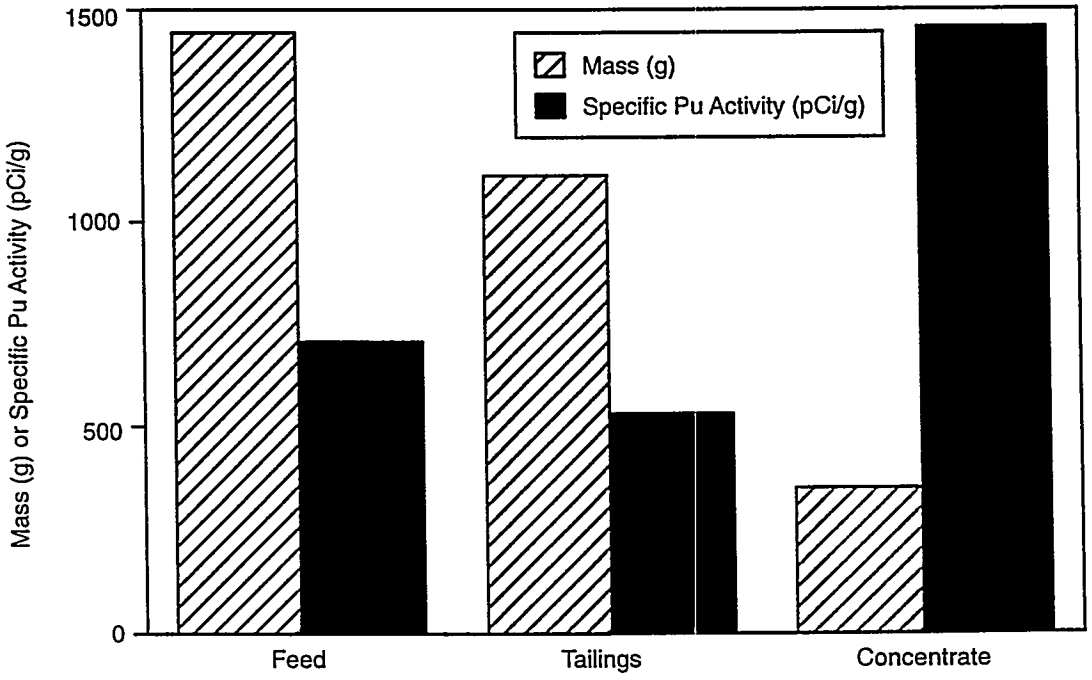

Figure 2-3. Results of particle separation by flotation (APT process); Area 11 soil - second stage.

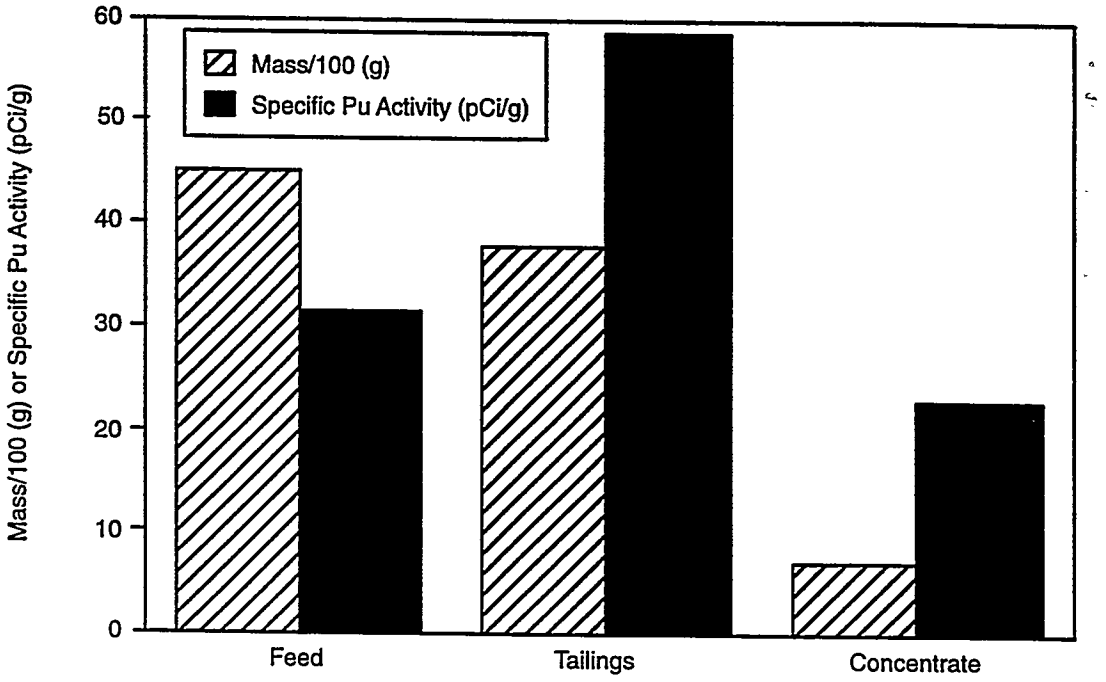

Figure 2-4. Results of particle separation by flotation (APT process); Area 13 soil.

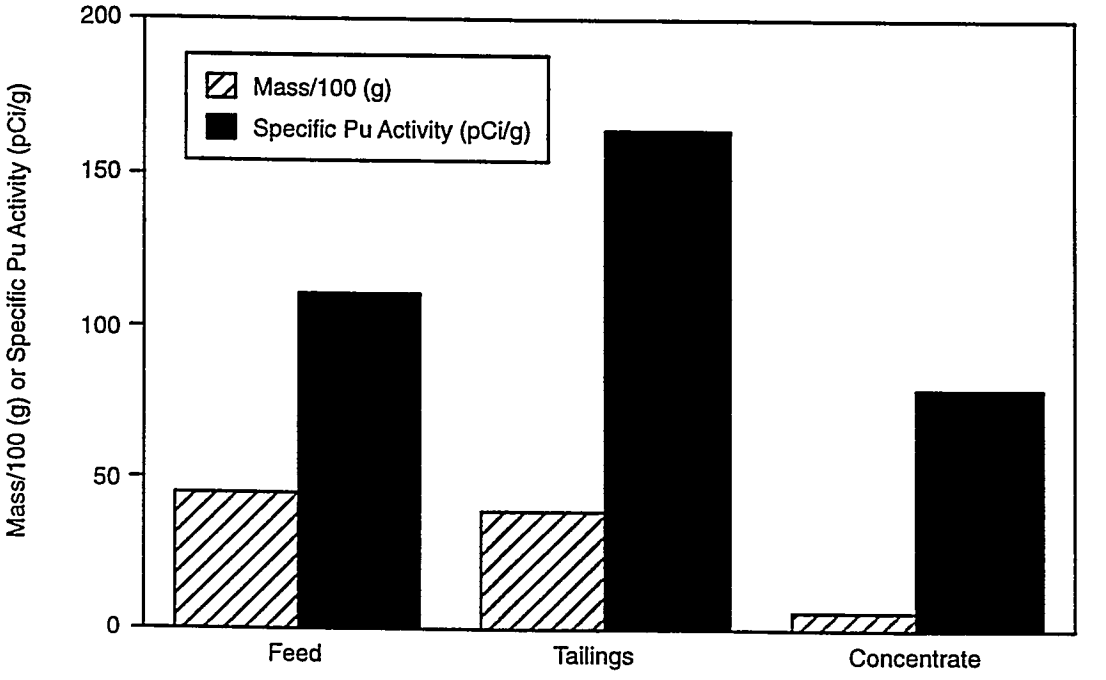

Figure 2-5. Results of particle separation by flotation (APT process); Area 52 soil.

As can be seen from Figures 2-2 through 2-5 (or Tables 2-1 through 2-4), the ASH tailings or clean materials do represent at least 70% of the feed mass. The ASH technology, however, was not successful in reducing Pu concentrations to acceptable levels. The ASH technology was only able to reduce the Pu concentration of the Area 11 soil to 277.8 pCi/g for the first stage and to 531.3 pCi/g for the second stage. Both of these values are too high for the soil to be considered as decontaminated. The Pu specific activity ratios (underflow/overflow) were 1:2.56 and 1:2.77 for the first and second stage separations of Area 11 soil (Tables 2-1 and 2-2 and Figures 2-2 and 2-3, respectively). These ratios, however, did not result in specific activities low enough in the "tailings" to be characterized as "decontaminated."

In addition, for both Area 13 and 52 soils, the overflow (concentrate) actually had less Pu than the supposedly clean underflow material, as shown in Figures 2-4 and 2-5. This indicates that the ASH process was not capable of separating the Pu from the bulk soil slurry for this soil. As shown in Tables 2-5 through 2-8, most of the Pu for all three NTS soils is found in the smaller than 38 μm size fractions. These results also show that the ASH process was not as successful in removing the fine (<38 μm) Pu particles as it was with the larger Pu particles.

CONCLUSIONS

The air-sparged hydrocyclone (ASH) process had very limited success in separating Pu from soil. The process produced a fair reduction of Pu in the first stage tailings of the Area 11 test soil only. The Area 11 first stage tailings had a Pu specific activity of 277.8 pCi/g. The results for the Area 13 soil showed a higher specific activity of Pu in the supposedly clean tailings than in the concentrate (overflow). Area 52 sample results showed the same trend, i.e., a higher activity of Pu in the tailings than in the concentrate.

There are four factors that may partially explain the poor results: 1) APT used a surrogate to determine the optimum reagents and other experimental variables; 2) APT did not use an attrition scrubber to break down Pu-soil particle aggregates; 3) low Pu specific activities in Area 13 and 52 soils; and 4) APT only used the smaller than 149 μm size fraction of the soil and therefore total mass and Pu reductions would be larger if the larger than 149 μm material were considered as part of the feed. Among all of the above factors, the first, i.e., selection of reagents based on surrogates as opposed to Pu-contaminated soil, appears to be the most important. It is highly likely that a flotation reagent that works well with cerium oxide will yield different results with Pu oxide. It should be acknowledged, however, that APT, and all other vendors, did not have any information on the physiochemical properties of the Pu-contaminated soil. This lack of specific information may have been detrimental for the selection of appropriate reagents.

CHAPTER 3
THE LOCKHEED ENVIRONMENTAL SYSTEMS AND TECHNOLOGIES (LESAT) PROCESS

INTRODUCTION

Lockheed Environmental Systems and Technologies (LESAT) was contracted to perform soil separation using their mineral jig system and to perform further tests with a shaker table. They also tested the output of the jig system using a centrifugal concentrator and hydroclone. This chapter summarizes the results of those tests.

PROCESS DESCRIPTION

The three soils used for evaluation of the separation process were presented to the vendor as gathered in the field, except that all particles larger than 0.5 in. (1.27 cm) had been screened off. The LESAT process used an attrition scrubber and a 4-mesh (4760 μm) wet vibrating screen to prepare the test soils for further processing. The coarse material removed during the screening is a tailings process stream.

The main component of the LESAT separation process is a two-cell mineral jig. This is a single gravity device, using pulses of water from below to raise steel balls and allow dense material (Pu particles) to fall through the bed of steel balls to be recovered. The slurry of lighter material flows over the jig surfaces and is further processed. The slurry passing over the mineral jig is then processed through a spiral classifier. As the soil is augered up, the classifier water flowing down removes the smaller soil particles. The larger particles exit the top of the spiral classifier, known in the mineral processing industry as the underflow, and are considered a tailings process stream. The fines exiting from the bottom of the spiral classifier, known as the overflow, will be processed further. The concentrate processing streams removed from the bottom of the mineral jig hutches were concentrated further by passing them across a shaking table. The concentrate from each hutch thus produced both a concentrate and a tailings stream using the shaking table.

The overflow from the spiral concentrator, the largest output stream, was sampled and the sample was used as input to a centrifugal concentrator. The tailings from this multiple gravity separation device were reprocessed through the device three times. The tailings from the last run through the centrifugal concentrator were processed in a hydrocyclone. The combined concentrates of the centrifugal concentrator runs, the concentrate from the hydrocyclone, and the tailings from the hydrocyclone were the output streams from this part of the process. The reasoning behind this configuration of equipment was explained in a paragraph of the LESAT final report quoted below (Williams et al., 1994).

"The larger gravels (larger than 0.5 in.) were initially removed from the soil by dry screening. The soil fraction smaller than 0.5 in. was scrubbed in an attrition scrubber to free contaminants from the surfaces. The scrubbed soil was then passed through a 4-mesh (4.76 mm) vibrating screen. The scrubbed slurry passing the screen was then passed through a mineral jig to remove any liberated

particulate Pu from the soil. The concentrates from the mineral jig were further concentrated on a Wilfley table to further reduce the volume of the concentrate stream. The tail from the mineral jig was processed through a spiral classifier to separate the fines and water from the sand and the gravels. The spiral classifier overflow containing fine particles was collected in a thickener. The overflow water from the thickener was passed through a centrifugal gravity concentrator to remove any heavy particles. The tailings from the centrifugal concentrator were finally passed through a hydrocyclone at two or three different pressure settings for each test to evaluate size separating techniques as a concentrating method."

Both clean and contaminated samples of three types of contaminated Nevada soil were carefully mixed and provided to LESAT personnel to allow them to optimize their separation process. Record runs were then performed with sufficient quantities of contaminated soil to provide between 30 minutes and one hour of soil processing. This provided sufficient material in each of the major output streams for adequate analysis.

The soils came from Area 11 on the Nevada Test Site, Area 13 on the Nellis Air Force Range, and Area 52 on the Tonopah Test Range. These soils were chosen to span the range of soil characteristics in the Nevada contaminated areas.

RESULTS AND DISCUSSION

The major experimental objectives were to calculate the volume reduction obtained and to determine the activity of the clean soil material. An additional objective was to determine if the technology was able to remove Pu more effectively from large, medium, or small soil particles.

The technology evaluated produced multiple output streams of soil that need to either be classified as concentrate (higher activity material) or tailings (low activity/clean material). In this chapter, as in the rest of this report, the classical definitions were used, where the concentrate has an activity/concentration higher than the feed material and the tailings are, therefore, lower than the feed.

Separation Technology

The technology tested is shown schematically in Figure 3-1. The components are designed to remove the large particles (larger than 1.25 cm), physically detach the Pu particles from the soil particles, remove the larger particles (larger than 4 mesh, 4.76 mm), remove the Pu by gravity separation, and separate the particles larger than 75 μm. The details of this test are described in a final report by Williams et al. (1994) on how the experiments were conducted. Some material was taken from the gravity separation process (mineral jig 1) and run through a second gravity separation process (Wilfley shaking table). An additional technology (Falcon concentrator) was tested using the material smaller than 75 μm, which also used separation based on grain-size differences. The Falcon concentrator concentrate was passed through a hydrocyclone to evaluate the potential for further Pu concentration.

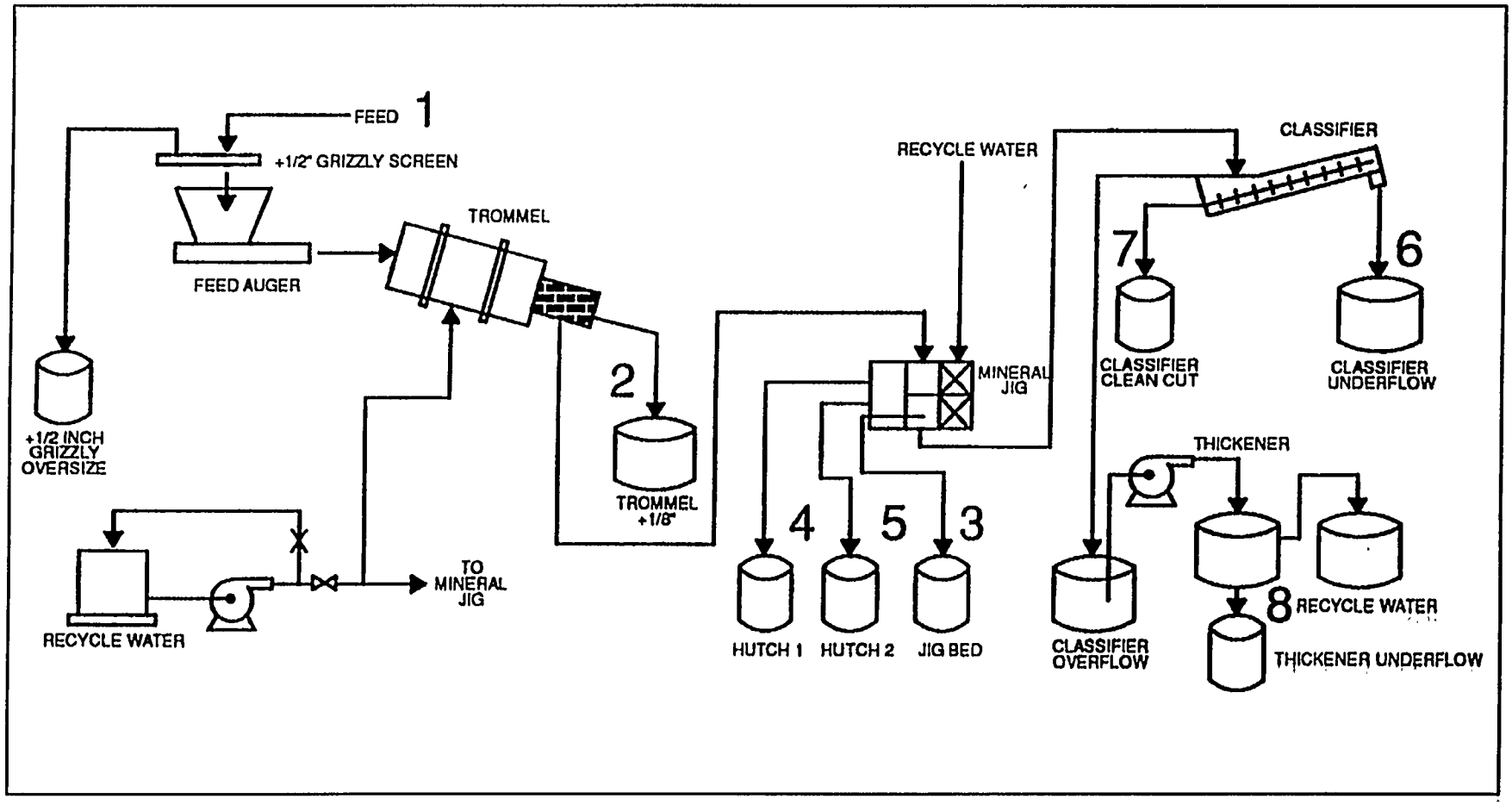

Figure 3–1. Schematic representation of the LESAT process (from Williams et al., 1994).

Area 11 Soil Tests

The results of the tests performed on the soils from Area 11 are summarized in Tables 3-1 through 3-4 and Figures 3-2 and 3-3. The input material had a Pu activity of 190 pCi/g, which should have been increased by the mineral jig concentrating the Pu. However, the exact opposite was observed with activities of 28 and 33 pCi/g in the material passing through hutch 1 and 2, respectively. This can be clearly seen in Figure 3-2, where the activity and mass of the feed are compared to the activity and mass of the overflow ("tailings") and the combined activities and masses of the material passing through the hutches. This result is consistent with very small Pu particles which do not settle rapidly enough in water to pass downward through a conventional mineral jig. The particles instead move across the top of the mineral jig with the water stream.

TABLE 3-1. RESULTS OF PARTICLE SEPARATION WITH A MINERAL JIG AND A SPIRAL CLASSIFIER; LESAT PROCESS, AREA 11 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu Activity (μCi)
Feed	157	190	Feed		29.9
Hutch 1	25.1	28	Tailings	16	0.7
Hutch 2	3.8	33	Tailings	2.4	0.1
Classifier Underflow	26.9	6	Tailings	17.1	0.2
Classifier Cleanout Sump	1.8	220	Conc.	1.1	0.4
Thickener Underflow	67.4	530	Conc.	42.9	35.7
Spillage at Misc.*	32	-	-	20.4	

*Grizzly Oversize	3.8	Tailings
Scrubber Heel	19.5	Feed
>4 Mesh	3.3	Tailings
Hutch Beds	0.7	Tailings
Class	1.6	Tailings
Spillage	3.3	Feed

TABLE 3-2. RESULTS OF PARTICLE SEPARATION WITH A WILFLEY SHAKING TABLE; LESAT PROCESS, AREA 11 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu Activity (μCi)
Feed (Hutch 1)	25.2	28	Feed		0.7
Concentrate	2.3	118	Conc.	9	0.3
Tailings	22.9	16	Tailings	91	0.4
Feed (Hutch 2)	3.22(2.97)	33			0.1
Concentrate	0.27(0.35)	14	Tailings		0
Tailings	2.95(3.6)	15	Tailings		0.04

TABLE 3-3. RESULTS OF PARTICLE SEPARATION WITH THE FALCON CONCENTRATOR; LESAT PROCESS, AREA 11 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Total Pu Activity (μCi)
		Falcon Concentrator	
Feed (Thickener Underflow)	4.01	530	2.12
Concentrate	0.32	745	0.24
Tailings	3.68	209	0.77
		Falcon Concentrator (Sonification)	
Feed (Thickener Underflow)	3.76	530	2
Concentrate	0.37	706	0.26
Tailings	3.39	302	1.02

TABLE 3-4. RESULTS OF PARTICLE SEPARATION WITH A HYDROCYCLONE; LESAT PROCESS, AREA 11 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)
	15 psi	
Feed (Thickener Underflow)	0.17	530
Concentrate	0.03	520
Tailings	0.14	270
	30 psi	
Feed (Thickener Underflow)	0.16	530
Concentrate	0.02	550
Tailings	0.14	510

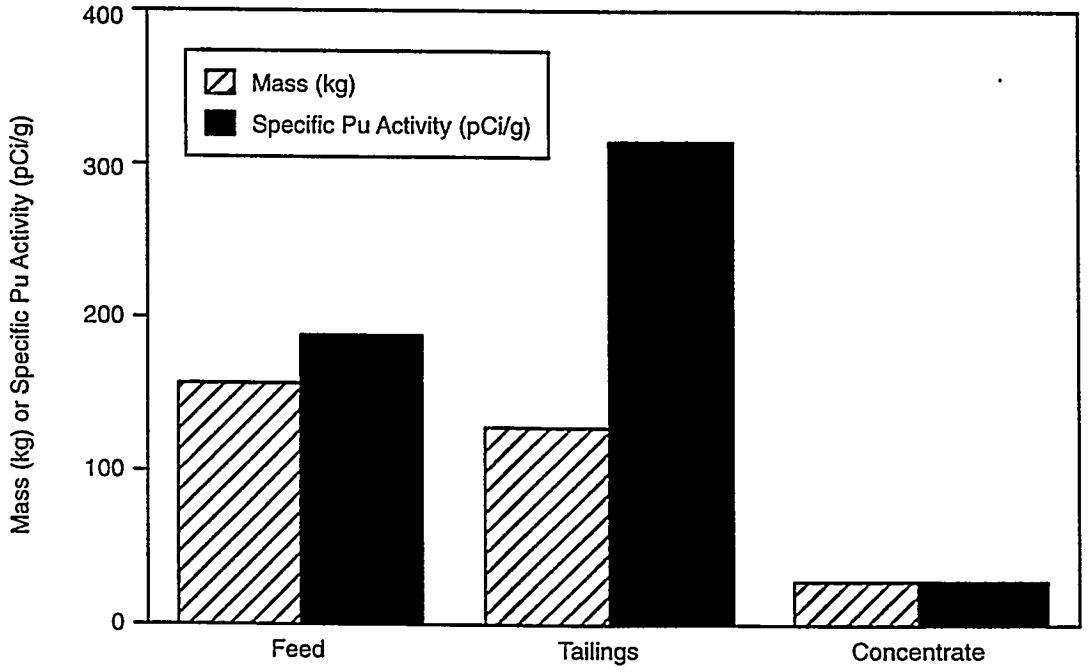

Figure 3-2. Results of particle separation by gravity (LESAT process: mineral jig); Area 11 soil.

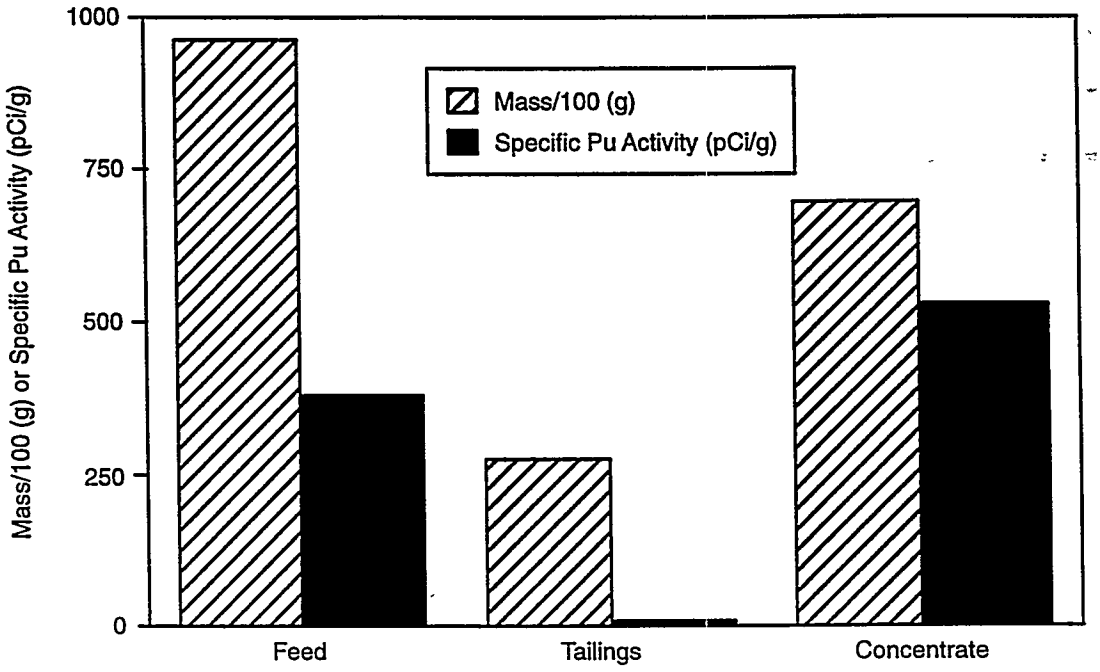

Figure 3-3. Volume reduction based on separation by particle size (LESAT process: spiral classifier); Area 11 soil.

The next device tested was grain-size separation using a spiral classifier. This process was set to produce two particle streams with a cut-off diameter of 75 μm and did achieve an impressive separation (6 pCi/g tailings vs. 530 pCi/g concentrate), as can be clearly seen in Figure 3-3. This yields a volume reduction of approximately 29% (26.9 kg/94.3 kg x100). The theoretical volume reduction if perfect grain-size separation could be achieved, at the 75 μm size, would be approximately 60% (Table 3-5). A series of spiral classifiers separating at progressively smaller sizes could theoretically achieve greater than an 80% volume reduction with the clean material from Area 11 having less than 40 pCi/g activity (Table 3-5).

TABLE 3-5. NTS AREA 11 SOIL-GRAIN SIZE FROM THE SPIRAL CLASSIFIER.

	Feed		Tailings		Concentrate	
Size (μm)	Weight %	Pu Activity (pCi/g)	Weight %	Pu Activity (pCi/g)	Weight %	Pu Activity (pCi/g)
+2000	22.88	1.21	53.5	0.5	0.0	-
+250	16.04	23.2	27.5	6.2	0.0	-
+125	10.72	56.6	2.6	34.5	2.20	680.0
+75	11.64	29.8	7.6	13.2	39.05	45.0
+38	20.72	28.8	7.6	13.2	39.05	45.0
+5	15.64	913.0	0.0	-	44.54	997.0
<5	2.24	940.0	0.0	-	9.32	580.0
TOTAL	99.88	186	99.5	6	100.00	549.0

The results from the Wilfley shaking table are displayed in Table 3-2 and indicate mixed results. The feed from hutch 1 and 2, with activities of 28 and 33 pCi/g, respectively, are both so low that this would normally be considered tailings. Therefore, attempting to separate the Pu would probably not be considered. In spite of this, the feed from hutch 1 was effectively separated with a volume reduction of 94% and a relatively low activity (16 pCi/g) for the tailings. However, the result was not reproduced with feed from hutch 2. The numbers shown in parentheses in Table 3-2 were obtained by independent sample mass estimates and are compared here to the sample mass reported in Williams et al. (1994). The concentrate and tailings had approximately the same activity (14 vs. 15 pCi/g) and a relatively poor total Pu balance. A large part of this problem is the relatively small volume of feed from hutch 2 which was not large enough to obtain representative results. It is suggested, based on these and other experiments, that a minimum volume of feed be at least 25 kg to obtain representative results from material with a relatively low concentration of Pu particles (hot particle effect). The results from the Wilfley shaking table are encouraging. The total Pu balance for hutch 1 was excellent with concentrate plus tailings equal to 0.7 μCi and the feed material equal to 0.7 μCi. The balance from hutch 2 was not good, but the sample size was so small that this is not surprising.

The Falcon concentrator is a centrifugal concentrator which obtained feed from the thickener underflow. The feed was supplied directly to the Falcon concentrator and also passed through an ultrasonic system before being concentrated (Table 3-3). The Falcon concentrator achieved approximately 66% volume reduction, which is a reasonable performance. However, because the sample was so small (less than 3 kg), the results may not be very representative. The tailings (clean material) had a relatively high activity with values ranging from 200-300 pCi/g. This is a modest improvement from the feed material of 530 pCi/g, but in all probability is not clean enough to return to the site for revegetation. The total Pu balance for both experiments (Table 3-3) had a reasonable error and the results are acceptable considering the relatively small sample sizes.

The results from the hydrocyclone (Table 3-4) are almost totally comprised of very small sample sizes (0.17 kg and 0.16 kg). This was not an adequate evaluation of the potential separation capabilities of the hydrocyclone; much larger samples should have been used.

It is clear why the spiral classifier is a good separation device (Table 3-5). The classifier was set at approximately 75 μm and was efficient at selectively separating particles. If a second or third classifier were set at progressively smaller size separations, then there could be even improved efficiency because the larger than 75 and 38 μm particles with relatively low activities would be separated.

Area 13 Soil Tests

The results of all the tests on Area 13 soil are inconclusive because the feed material had an activity of only 21 pCi/g, which may be considered clean soil. Numerous requests to increase the activity of the feed material by blending with higher activity soils were denied by DOE. Quantitative results were not possible because of the low activity. The data from these tests are shown in Tables 3-6 and 3-7 and in Figures 3-4 and 3-5. The results are conclusive for both tests. The pair of hutches

did not remove Pu as indicated by the lack of any activity in the material removed. This is clearly shown in Figure 3-4 where the combined Pu specific activity of the two hutches is essentially zero and the Pu specific activity in the "tailings" is higher than in the feed. The spiral classifier appears to separate Pu by grain size with tailings decreasing to 5 pCi/g (feed:tailings = 4:1) and the concentrate increasing to 75 pCi/g (feed:concentrate = 1:3) (Figure 3-5). This is promising; however, with such low activities it is not possible to determine how well volume reduction will perform on Pu activities one or two orders of magnitude higher. The spiral classifier effectively separates particles that are greater than 75 μm from particles that are less than 125 μm with an overlap in the 75 to 125 μm particles (Table 3-8).

TABLE 3-6. RESULTS OF PARTICLE SEPARATION WITH A MINERAL JIG AND A SPIRAL CLASSIFIER; LESAT PROCESS, AREA 13 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu Activity (μCi)
Feed	107.1	21	Feed		2.25
Hutch 1	29.4	**	Tailings	27.4	
Hutch 2	7.6	**	Tailings	7.1	
Classifier Underflow	13.6	5	Tailings	12.7	0.07
Classifier Cleanout Sump	7.2	**	Tailings	6.7	
Thickener Underflow	32	75	Conc.	29.9	2.4
Spillage at Misc. *	17.4	-		16.2	
Total	107.2				2.47

*Grizzly Oversize 1.1
Scrubber Heel 14.3
>4 Mesh 1.3
Hutch Beds 0.7

**Not Detected

TABLE 3-7. RESULTS OF PARTICLE SEPARATION WITH THE FALCON CONCENTRATOR; LESAT PROCESS, AREA 13 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu Activity (μCi)
Feed (Thickener Underflow)	1.5	75(111)	Feed		0.11(0.17)
Concentrate	0.4	150	Conc.	26.7	0.06
Tailings	1.1	0(50)	Conc.	73.3	0.055

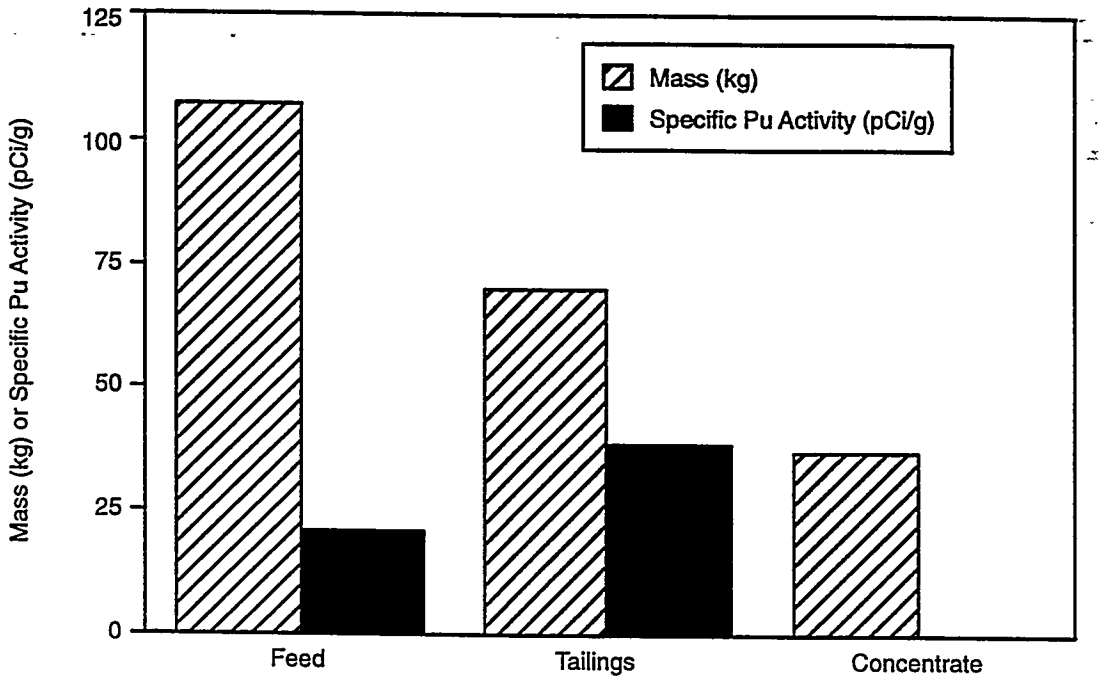

Figure 3-4. Results of particle separation by gravity (LESAT process: mineral jig); Area 13 soil.

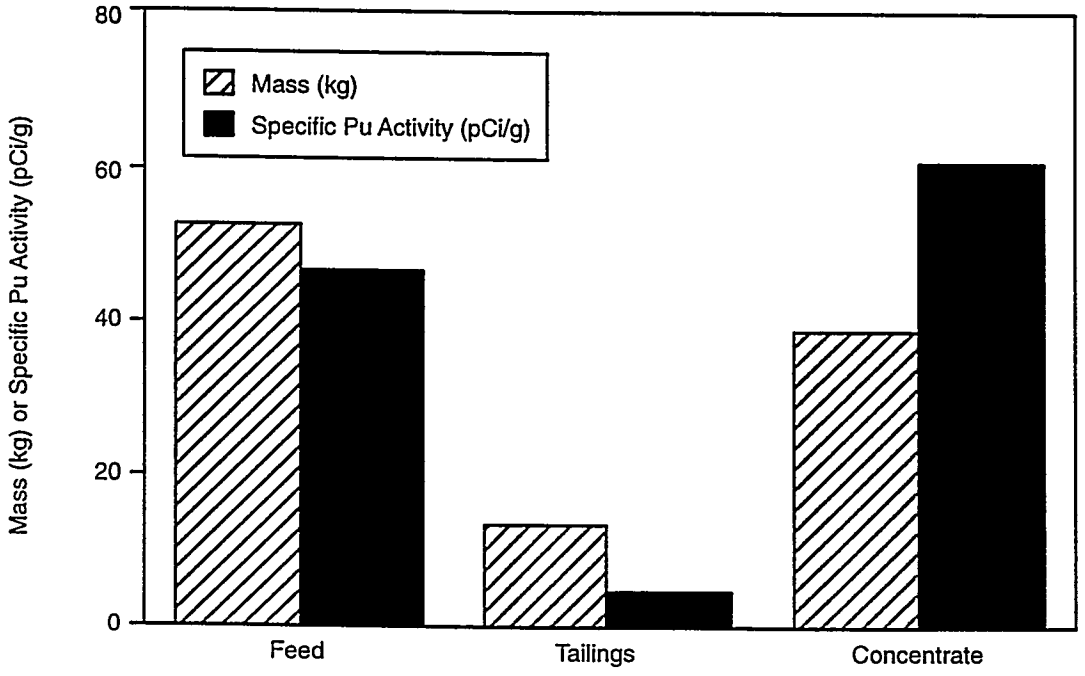

Figure 3-5. Volume reduction based on separation by particle size (LESAT process: spiral classifier); Area 13 soil.

TABLE 3-8. NTS AREA 13 SOIL-GRAIN SIZE FROM THE SPIRAL CLASSIFIER.

	Feed		Tailings		Concentrate	
Size (μm)	Weight %	Pu Activity (pCi/g)	Weight %	Pu Activity (pCi/g)	Weight %	Pu Activity (pCi/g)
+2000	14.3	0.6	16.2	1.8	0.0	0
+250	17.2	2.1	67.5	6.9	0.0	0
+125	15.6	2.1	7.9	0.6	3.4	1.5
+75	16.0	3.6	8.8	0.9	24.5	65.5
+38	17.3	44.8	0.0	0	33.9	6.9
+5	11.7	91.9	0.0	0	33.8	137.0
<5	7.4	11.1	0.0	0	3.7	250.0
TOTAL		20.8		5.1		74.5

The Falcon concentrator was used with feed material (1.5 kg) obtained from the thickener underflow of the spiral classifier. The separation of Pu from this material shows some promise with feed to tailings activity ratio 2:1 and tailings to concentrate activity ratio 1:3 (Table 3-7). Again, the numbers given in parentheses correspond to independent determination of sample specific activities and are compared to the values reported in Williams et al. (1994). The volume reduction was approximately 70%, but the overall result is questionable because of the small volumes processed (1.5 kg) and the relatively low Pu activity (75 pCi/g) of the feed material.

Area 52 Soil Tests

The soils from Area 52 have a coarser texture for the Pu and the soil particles and as a result the mineral jigs removed more of the Pu and soil. Hutch 1 removed approximately 30% of the total soil material, however, it removed the Pu in about the same ratio as the feed material (90 vs. 68 pCi/g) and, therefore, there was no concentration of Pu as expected (Table 3-9). Hutch 2 increased the Pu activity from 90 to 133 pCi/g, which is a modest but probably not significant increase. The overall enrichment factor obtained by comparing the feed to the concentrate (feed: concentrate = 1:1.5) for hutch 2 is very low. The poor overall performance of the mineral jigs, even for Area 52 soil, can be determined by inspection of Figure 3-6 where the masses and Pu specific activities of the feed, the "tailings" and the combined "concentrate" (both hutches) are compared. Although the "concentrate" had a higher specific activity than the "tailings" (the reverse was true for both Area 11 and 13 soils), the overall enrichment factor is most likely statistically insignificant.

TABLE 3-9. RESULTS OF PARTICLE SEPARATION WITH A MINERAL JIG AND A SPIRAL CLASSIFIER; LESAT PROCESS, AREA 52 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu Activity (μCi)
Feed	145.6	90	Feed		13.1
Hutch 1	43.6	68	Tailings	30	2.96
Hutch 2	10.8	133	Conc.	7.4	1.44
Classifier Underflow	28	6	Tailings	19.2	0.17
Classifier Cleanout Sump	2.6	1090	Conc.	1.8	2.83
Thickener Underflow	29.7	117	Conc.	20.4	3.47
Spillage at Misc. *	30.9	**		21.2	-
Total	145.6				10.87

*Scrubber Heel 14.9 **Not Detected
Hutch Beds 2.4

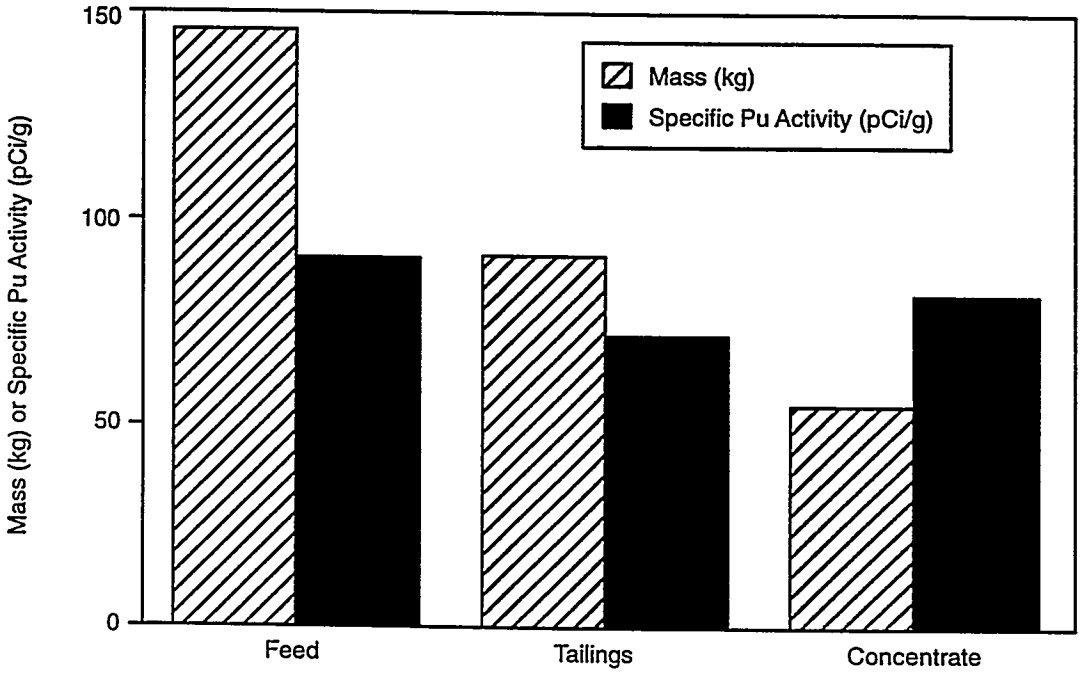

Figure 3-6. Results of particle separation by gravity (LESAT process: mineral jig); Area 52 soil.

The spiral classifier was again an efficient device in producing relatively clean soil (6 pCi/g) from the classifier underflow, however, this clean fraction only represented 19.2 percent of the soil material. The more concentrated output from the classifier (thickener underflow) increased the Pu activity of the feed material from 90 to 117 pCi/g, which is an enrichment factor of 1.3. The

promising performance of the spiral classifier is easily confirmed by inspection of Figure 3-7, where the masses and specific activities of the feed, tailings, and concentrate are compared. Combining the results from both mineral jigs (hutch 1 and 2) and the spiral classifier yields a mass reduction of 62% (tailings/(tailings+concentrate)) with "clean soil" producing an activity of 44 pCi/g vs. the feed with an activity of 90 pCi/g. This reduction by a factor of 2 is not very impressive, however, and it is questionable because of the relatively low activity of the feed soil. The devices might have worked much better if the soils had a higher and more representative Pu activity.

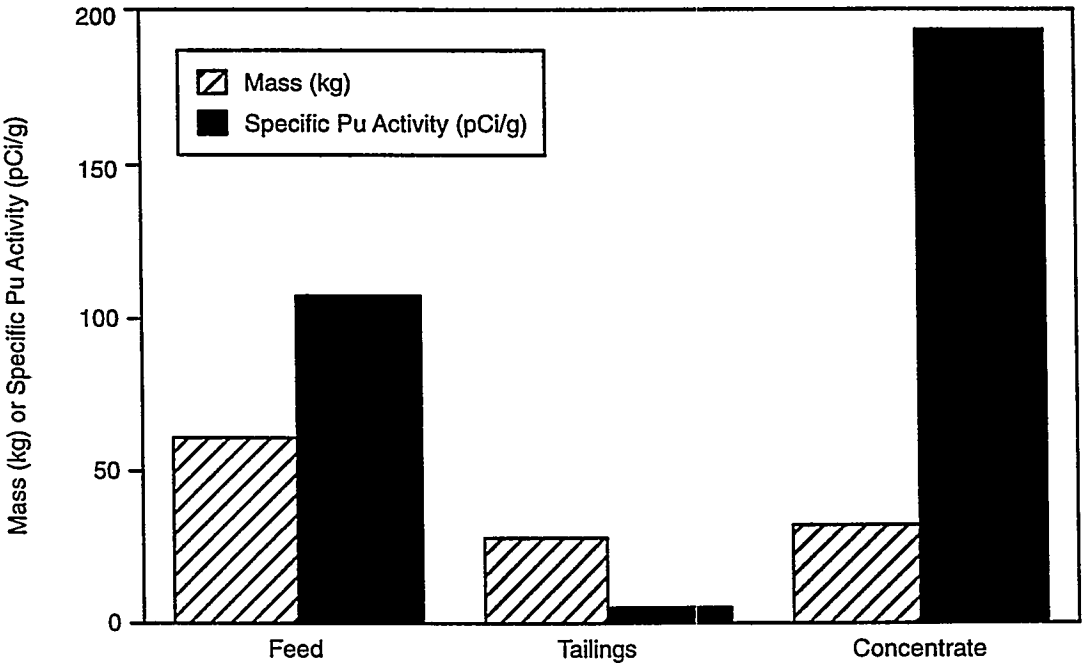

Figure 3-7. Volume reduction based on separation by particle size (LESAT process: spiral classifier); Area 52 soil.

The Wilfley shaking table (Williams et al., 1994) was used to process soil from hutch 1 and 2 in an attempt to further concentrate the Pu. The first experiment with material from hutch 1 was inconclusive because the material that was supposed to be clean with an activity less than the feed material was actually higher (68 vs. 112 pCi/g) and also had a poor material balance (Table 3-10). The material balance was obtained by comparing the total Pu activity in the feed material vs. the activity in the tailings plus concentrate (Table 3-10). It is certainly possible that there was an error in the Pu values because a 1-g sample was used to determine the activity and in a heterogenous matrix a much larger sample (30 g) is recommended. The second test utilizing material from hutch 2 appeared to be more internally consistent with respect to the material balance and Pu activities (Table 3-10). The theoretical volume reduction is 94%, but the clean material activity only decreased from 133 to 80 pCi/g, a factor of 0.6.

TABLE 3-10. RESULTS OF PARTICLE SEPARATION WITH A WILFLEY SHAKING TABLE; LESAT PROCESS, AREA 52 SOIL.

Stream	Weight (kg)	Pu Activity (pCi/g)	Classification	Percent of Total Mass	Total Pu Activity (μCi)
Feed (Hutch1)	43.6	68	Feed		2.96
Concentrate	2	830	Conc.	4.6	1.66
Tailings	41.6	112	Conc.	95.4	4.66
Feed (Hutch2)	10.8	133	Feed		1.44
Concentrate	0.7	373	Conc.	6.5	0.26
Tailings	10.1	80	Tailings	93.5	0.81

The data in Table 3-11 demonstrate that the classifier separated the soil at the correct size range. This is because the larger than 75 μm material had the highest activity. The activity in this soil is generally in coarser grain sizes and, therefore, the overall volume reduction using grain size will be lower.

TABLE 3-11. NTS AREA 52 SOIL-GRAIN SIZE FROM THE SPIRAL CLASSIFIER.

	Feed		Tailings		Concentrate	
Size (μm)	Weight %	Pu Activity (pCi/g)	Weight %	Pu Activity (pCi/g)	Weight %	Pu Activity (pCi/g)
+2000	7.8	5.7	14.1	2.1	0.0	-
+250	38.7	5.2	83.5	3.1	8.9	5.1
+125	17.8	163	2.4	118	6.8	177
+75	13.1	130	0.0	-	20.2	99.5
+38	9.8	256	0.0	-	28.4	86.6
+5	8.1	146	0.0	-	28.3	181
<5	2.6	99.5	0.0	-	6.7	119
TOTAL		89.8		5.7		117

The conclusion on processing Area 52 soils is that it may be possible to make some modest volume reductions but the results are not very encouraging and there are major uncertainties caused by the small volumes used in the process, low Pu activities, and the use of 1-g samples for the Pu analyses.

CONCLUSIONS

The LESAT system used a variety of technologies in an attempt to separate Pu from contaminated soil, including an attrition scrubber, a mineral jig, a spiral classifier, a Wilfley shaking table, a Falcon concentrator, and a hydrocyclone. These separation technologies are based on

different principles and the results of the tests performed can be summarized as follows. The only effective Pu separation technique appears to be separation by particle size, using the spiral classifier. This was not surprising, based on the observed strong correlation of high Pu specific activity with small particles. The spiral classifier was able to separate particles by size, effectively, and achieve impressive Pu specific activity separation between concentrate and tailings streams. As an example, the Pu specific activity ratio between concentrate and tailings streams for Area 11 soil was approximately 90 with a remaining specific activity in the tailings 6 pCi/g. Under ideal conditions, volume reduction on the order of 60-80% could be expected based on separation by particle size.

Other processes which are based on particle separation by density (mineral jig and Wilfley shaking table) were not successful in separating effectively the soil between contaminated and decontaminated streams. The mineral jig results of tests performed with Area 11 soil were particularly disappointing. The "tailings" had a Pu specific activity almost 10 times higher than the "concentrate." Results from tests with the Wilfley shaking table were not particularly encouraging either. The failure of technologies which are based on separation by density was caused by the association of Pu contamination almost exclusively with fine particles. Because of their small size, the settling velocity of the fines was very low, despite their higher density.

The results of the tests performed with the centrifugal Falcon concentrator and the hydrocyclone were inconclusive. The Falcon concentrator resulted in modestly higher Pu specific activities in the concentrate compared to the tailings; the concentrate in the tailings, however, was typically too high to characterize these soils as decontaminated. The results of tests with the hydrocyclone were inconclusive because of the small quantities of material tested (160-170 g). The main problem when such small quantities are used is the potential for non-representative samples which, obviously, cannot be used for a reliable process evaluation.

CHAPTER 4

THE NUCLEAR REMEDIATION TECHNOLOGIES (NRT) PROCESS

INTRODUCTION

Nuclear Remediation Technologies (NRT), a subsidiary of General Atomics, proposed a process which uses a 21,000 G segmented, permanent rare earth magnet, developed by the Eriez Magnetics Co., to separate Pu particles from dry soil at the end of a moving conveyor belt. Because of time constraints and funding priorities, the NRT process was evaluated using soil from Area 11 only rather than the three soils used previously (soils from Areas 11, 13, and 52). The preliminary process optimization results were reported in the NRT final report (General Atomics, 1994). This chapter summarizes the results of the record runs.

PROCESS DESCRIPTION

The NRT process has been previously described in detail (General Atomics, 1994). Only a brief overview will be given here. A schematic representation of the process is shown in Figure 4-1 (after General Atomics, 1994). The main component of the process is the Rare Earth Roll (RER), which consists of a stack of rare earth permanent magnets, which form one of the rolls at the end of a continuous conveyor belt. The entire process consists of particle sizing, low-intensity magnetic separation and high-intensity magnetic separation. The particle sizing is accomplished with a set of screens and a vibrating mechanism. Both the low-intensity separation and the high-intensity separation are accomplished with the same piece of equipment, changing only the roller at the end of the conveyor belt. The soil is poured into a vibratory feed hopper and released onto the moving belt to form a layer of soil of the desired thickness (Figure 4-1). Both the speed of the conveyor belt and the amount of soil released from the hopper per unit time can be varied to optimize the process.

A number of catch bins are positioned at or under the end of the conveyor belt to segregate the material being processed. Separation of Pu from the soil was attempted based on the following concept. Because of varying magnetic susceptibility of the soil components processed, and, therefore, variable attraction to the magnetic roll, it was expected that the non-magnetic (diamagnetic) fraction would accumulate in the bins further away (ahead of) from the roll, the material with intermediate susceptibility (paramagnetic fraction) would accumulate in an intermediate position, and the fraction with highest susceptibility (ferromagnetic fraction) would accumulate the furthest back underneath the RER (Figure 4-1).

Because this was a dry process, the pieces of process equipment and their associated motors and controllers were enclosed in negative air pressure containers, with the air drawn off through HEPA filters, to protect the personnel in the test bay during evaluation runs and to prevent test bay contamination.

RESULTS AND DISCUSSION

Preliminary process optimization tests were performed at Eriez Magnetics Technical Center, Erie, PA, with a surrogate contaminant (copper sulfate) instead of Pu. The record tests, described

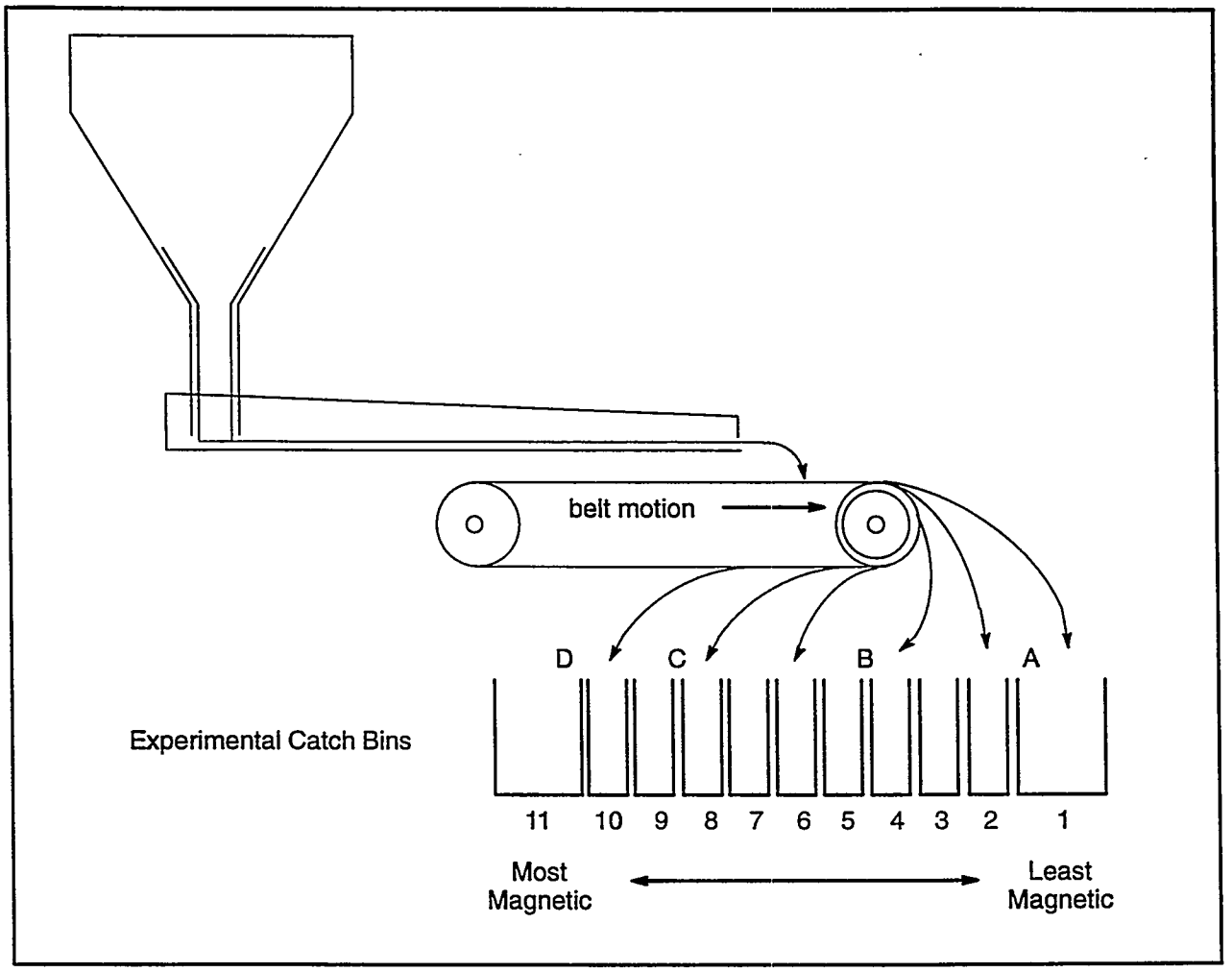

Figure 4-1. Schematic representation of the NRT process (after General Atomics, 1994).

and analyzed in this chapter, were performed with Pu-contaminated soil at the TTF on the NTS. Copper sulfate has a magnetic susceptibility a little less than twice the susceptibility of Pu oxide.

During the Pu separation tests, clean soil was first processed to uncover potential problems and to provide baseline data for comparison purposes. Plutonium-contaminated soil was then processed identically to evaluate the ability of the system to separate radioactive material from the soil matrix. The record run of the separation process included three steps. The first step was a particle size fractionation using a 24-inch SWECO vibratory screener. This screener uses Market Grade (MG) and Tensile Bolting Cloth (TBC) sieves instead of Standard U.S. sieves. The particle size cut-off diameters corresponding to the SWECO sieves are given in Table 4-1. Soil screening through the SWECO vibratory screener, therefore, resulted in eight particle size fractions to be treated later.

TABLE 4-1. SIEVE SIZES USED IN THE EVALUATION OF THE NRT PROCESS.

Sieve Designation	Sieve Opening (μm)
4 Market Grade	5150
10 Market Grade	1885
20 Market Grade	865
35 Market Grade	447
60 Market Grade	234
120 Tensile Bolting Cloth	147
200 Market Grade	73

A sample of Area 11 contaminated soil weighing 33,841 g was provided for NRT use. The particle size distribution and specific activity of individual size fractions, resulting from screening using the SWECO screener described above, are given in Table 4-2 and schematically shown in Figure 4-2. A given particle size fraction was initially run through a low-intensity magnetic separation using a splitter to remove magnetic materials. It was then processed by the same piece of equipment after replacing the ordinary magnetic end roller by a rare earth ceramic magnet for a high-intensity magnetic separation pass, with a series of 11 bins positioned in front of and below the end of the conveyor belt (Figure 4-1). The particle size fraction greater than 4 Market Grade (5150 μm) was not processed because it could damage the separation equipment. In addition, the particle size fraction smaller than 200 Market Grade (73 μm) was not processed either, because smaller particles became charged and airborne when processed through the separation equipment.

TABLE 4-2. PARTICLE SIZE DISTRIBUTION AND ^{241}Am SPECIFIC ACTIVITY OF NRT FEED SOIL: AREA 11.

Particle Size (μm)	Gross Weight (g)	Sample Size (g)	Processed Weight (g)	Specific Activity (pCi/g)
d>5150	2934	316	2618	12
1885<d<5150	3375	318	3057	11
865<d<1885	2721	290	2431	22
447<d<865	2229	328	1901	21
234<d<447	3728	328	3400	49
147<d<234	2421	324	2097	31
73<d<147	5761	312	5449	29
d<73	10672	289	10383	91
Total	33841			

After the feed soil was split into the eight particle size fractions indicated in Table 4-2, a sample of each fraction was taken for characterization. The column labeled "Sample Size" represents the amount of soil taken for further soil characterization (specific activity as a function of particle size), while the column labeled "Processed Weight" represents the material available for further

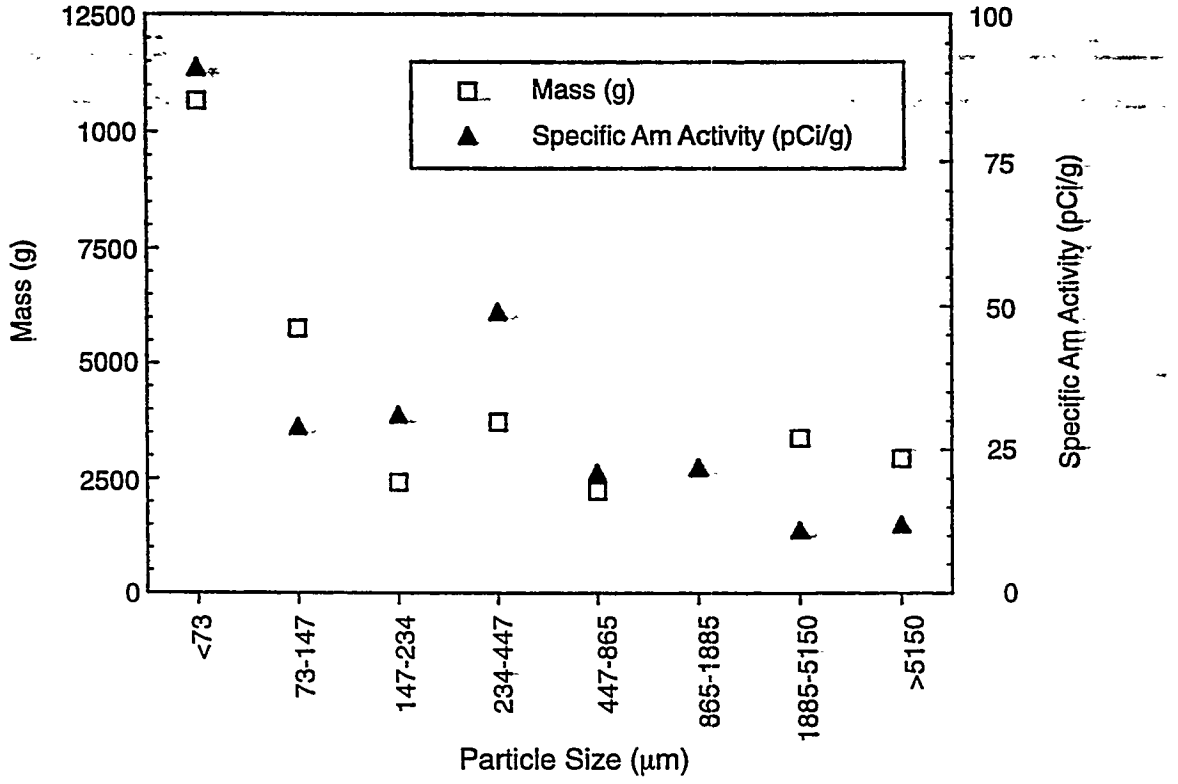

Figure 4-2. Specific ^{241}Am activity as a function of particle size (NRT process: separation by SWECO screens); Area 11 soil.

processing. The samples were counted and the specific activity of each fraction (pCi/g of ^{241}Am) is listed in the last column. It can be seen from Table 4-2 and Figure 4-2 that most of the total Pu activity was associated with the smaller size fractions. With the exception of an intermediate size fraction (234<d<447 μm) with slightly higher specific activity (49 pCi/g) than adjacent size fractions, the highest specific activity (91 pCi/g) was concentrated in the smallest size fraction (smaller than 73 μm). Note also that this size fraction accounted for approximately one third of the total soil mass, indicating that most of the Pu contamination was concentrated in this fraction, in agreement with previous results of Area 11 soil characterization. It is, therefore, disappointing that this particular fraction was not treated further (see above). It was hoped, however, that the ability of the process to separate Pu from soil could be evaluated based on the remaining size fractions.

It is also worth noting that, with the exception of the finest size fraction, all other size fractions had approximately the same specific activity (Figure 4-2). These results are consistent with dry screen separation which results in substantial quantities of fines being present in all size fractions, and thereby creating size fractions with a more uniform specific activity distribution. This hypothesis has significant implications for the interpretation of the results presented and will be discussed further in the following section.

To establish the relationship between particle size fractions (and specific Pu activities) as determined by the dry SWECO screener and the wet sieving procedure (using Standard U.S. sieves)

adopted for other process, feed soil samples were further analyzed by drawing 100-g aliquots and wet sieving using Standard U.S. 8-inch sieves, conforming to ASTM E-11. The particle size distribution and ^{241}Am specific activity for the resulting size fractions are given in Table 4-3. Table 4-3 lists the mass (g) and ^{241}Am specific activity (pCi/g) retained by Standard U.S. sieves (rows) of the size fractions generated by the SWECO screens (columns).

It can be seen by inspection of Table 4-3 that although there is a good correlation between the dry (SWECO) and the wet (Standard U.S.) sieve-generated size cuts, and that a substantial fraction of expected mass (based on the dry screening) falls in the right range, it is also obvious that a substantial fraction of fines (particles smaller than 38 μm) are also present in the SWECO (dry) cuts. It should also be noted that, as already pointed out, most of the Pu was concentrated in the smaller size fractions, which as can also be seen from Table 4-3, could have specific activities one order of magnitude higher than the particles in the nominal size cut of the SWECO screen. In all cases, the fines contributed at least a considerable fraction to the total activity. In some cases the majority of Pu contamination was attributed to the "out-of-nominal-size-range" fines. The implication of such a Pu distribution is that the SWECO size cuts produced more uniform Pu distributions among particle sizes due to the inclusion of fines in each size cut. This hypothesis is supported by the Pu distribution shown in Table 4-2 (as mentioned in the discussion of Figure 4-2), where, apart from the smallest particle size fraction (smaller than 73 μm), all other particle size fractions had relatively uniform specific activities.

Each of the six particle size fractions was processed separately with the output streams from the rare earth magnet runs being partitioned into 11 bins. These bins were combined differently for different size fractions. In Figure 4-3, the specific activity (pCi/g ^{241}Am) accumulated in each of the 11 bins is shown as a function of the six particle size fractions. The actual results used to construct Figure 4-3 are reported in tabular form in Appendix D.

Ideally, one would expect strong accumulation of the Pu contaminated soil in as few bins as possible, the optimum scenario being accumulation in one bin only, even though the bins showing preferential Pu accumulation could vary as a function of particle size. Inspection of Figure 4-3, however, reveals that this was not the case. Although there was a slight dependence of Am (and therefore Pu) activity as a function of bin, there was no systematic trend for the distribution of Pu among the 11 bins. No particular cutoff could be selected which would produce an acceptable split between "tailings" or decontaminated soil and "concentrate" or highly contaminated soil. The results were so discouraging that no Pu activity determinations (using α-spectroscopy) were performed.

There are several reasons which may have led to the failure of the NRT process. First, the optimization of the process was performed with a surrogate (copper sulfate) instead of the target Pu compounds. Differences in magnetic susceptibility between the two compounds could be important in optimal parameter selection. Second, as the wet sieving analysis suggested, dry sieving was not entirely successful, resulting in a considerable fraction of fines entrapped with coarser particles, thereby producing a feed of mixed particle sizes. Since Pu is preferentially distributed among finer

TABLE 4–3. PARTICLE SIZE DISTRIBUTION AND ^{241}AM SPECIFIC ACTIVITY OF NRT FEED SOIL: AREA 11 (STANDARD SIEVE SIZES).

	<200MG <73 μm		200MG<d<120TB 73< d<147μm		120TBC<d<60MG 147<d<234μm		60MG<d<35MG 234<d<447μm		35MG<d<20MG 447<d<865μm		20MG<d<10MG 865<d<1885μm		10MG<d<4MG 1885<d<5150μm	
Particle Size (μm)	Mass (g)	Activity (pCi/g)	Mass (g)	Activity (pCi/g)	Mass (g)	Activity (pCi/g)	Mass (g)	Activity (pCi/g)	Mass (g)	Activity (pCi/g)	Mass (g)	Activity (pCi/g)	Mass (g)	Activity (pCi/g)
0–5	9.40	177.94	–	–	–	–	–	–	–	–	–	–	–	–
5–38	53.00	210.73	7.90	323.50	7.30	340.26	14.10	263.02	17.50	164.24	23.00	55.93	–	–
38–75	36.10	48.53	27.30	23.82	2.10	17.11	5.00	16.81	8.20	70.12	9.20	1.78	–	–
75–125	–	–	64.5	14.75	8.80	0.83	4.60	3.92	5.10	0.00	8.80	1.89	19.60	37.31
125–250	–	–	0.00	0.00	81.00	46.51	40.60	20.11	7.30	0.00	7.40	19.77	4.10	0.00
250–2000	–	–	–	–	–	–	35.50	12.23	63.80	11.45	52.90	6.18	15.90	0.00
>2000	–	–	–	–	–	–	–	–	–	–	–	–	59.20	6.23

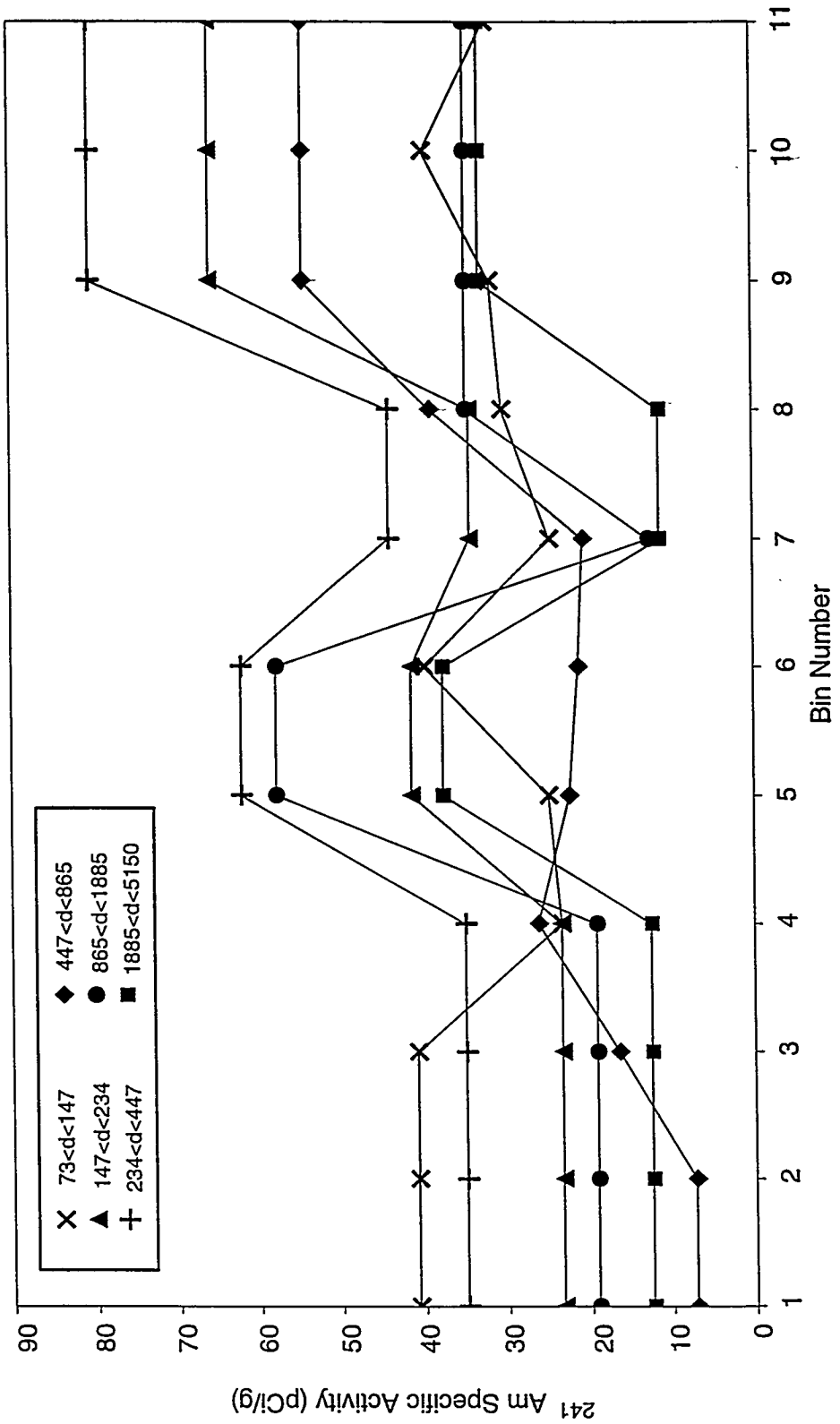

Figure 4-3. Distributuion of ^{241}Am specific activity (pCi/g) in the 11 bins of the NRT processes as a function of particle size fractions (Area 11 soil).

particles, entrapped fines would result in approximately uniform distributions of Pu. In other words, it is possible that the paramagnetic character of Pu particles was masked by the presence of larger diamagnetic or ferromagnetic particles.

Although the NRT process in the adopted configuration was not successful, it is worth noting that wet sieve analysis confirmed that Pu contamination is strongly associated with the smaller particles and that, therefore, removal of these particles would result in substantial volume reduction of the soil requiring disposal. This finding is particularly important, because the NRT process did not include any attrition scrubbing. It is possible that the vibratory action of the SWECO screener was a somewhat effective substitute for attrition scrubbing.

CONCLUSIONS

The NRT process was not successful in separating Pu from contaminated soil. In none of the bins, or a combination of a small number of bins, was Pu successfully concentrated. These results were based on ^{241}Am specific activities measured with γ-spectroscopy; because of the poor performance of the system, ^{239}Pu specific activities were not determined using α-spectroscopy. Note also that the NRT process was tested with Area 11 soil only.

Dry sieving, using a 24-inch SWECO vibratory screener, was not entirely successful in separating contaminated Area 11 soil into monodisperse particle size fractions. Wet sieving of the individual size fractions revealed the presence of a substantial percentage of fines (particles smaller than 38 μm) in all size cuts produced by the SWECO screener. The non-uniform particle size distributions produced by the SWECO screener could partly explain the poor performance of the system. Another possible reason for the poor performance of the NRT process is non-optimal operational parameters, determined by using a surrogate (copper sulfate) instead of Pu-contaminated soil.

The main drawback of the NRT configuration was that because the NRT process was a dry process, fine particles (smaller than 73 μm) could not be processed because of excessive dust generation. As a result, this system essentially fails to address the entire Pu-contamination problem, since most of the Pu is consistently found in the smaller size fractions, i.e., exactly the particle sizes that are not treated by the NRT process. Plutonium specific activities become consistently and increasingly lower with increasing particle size (except for Area 52 soil, see Chapter 1), which makes the task of efficient Pu separation from soil increasingly difficult. Even in the particle size fractions treated, frequently most of the total Pu activity was accounted for by particles outside the nominal particle size range of the fraction considered.

It is important to note, however, that the relationship between particle size and Pu activity for Area 11 soil was confirmed once more, although no elaborate particle scrubbing equipment was used. It is possible that the vibratory action of the SWECO screener was a partially effective substitute for attrition scrubbing. Based on the above, an adequate Pu separation system would be limited to efficient particle sizing and separation by size. Dry screening, however, appears to be inefficient as well as involving unnecessarily high health and safety risks from dust generation.

CHAPTER 5

THE SCIENTIFIC ECOLOGY GROUP (SEG) PROCESS

INTRODUCTION

The Scientific Ecology Group (SEG), a wholly owned subsidiary of Westinghouse, proposed a process which uses a combination of an attrition scrubber, a mineral jig, vibrating screens, and a multigravity separator to remove Pu from contaminated soil of the NTS. This chapter summarizes the results of the record runs received in time for incorporation into this report. The final SEG report (SEG,1995) was not available at the time this report was written; the conclusions of this report, however, are not affected by the additional data reported in the SEG final report. The results reported here, unless otherwise noted, are based on ^{239}Pu activities, as determined by radiochemistry and α-spectroscopy. It should also be noted that, because of time constraints and funding priorities, only tests with Area 11 soil were conducted and are reported here.

PROCESS DESCRIPTION

This section briefly describes the SEG process. Additional process details can be found in the final SEG report (SEG, 1995). A schematic representation of the overall process is shown in Figure 5-1. The SEG separation process first conditioned the soil and then processed the soil slurry through the multigravity separator. SEG received soil which was pre-screened to remove particles larger than 0.25 in. (6,300 μm). The screened soil was moved from a hopper with a screw auger and combined with water to form a dense slurry, processed in an attrition scrubber and then further processed with a one-cell mineral jig. The mineral jig was not used as a density separation device but in a countercurrent flow mode as a particle size segregation device to remove the large particles through the bed. The fines passing over the mineral jig were collected in a tank. They were then mixed and passed through a 100 mesh (149 μm) vibrating screen and then a 200 mesh (74 μm) vibrating screen to accomplish a preliminary particle size screening.

The -200 mesh (smaller than 74 μm) soil fraction was processed through the multigravity separator (MGS), which resulted in two streams, the tailings (presumably decontaminated material) and the concentrate (presumably contaminated material). The concentrate from the first MGS run was then passed through a 325 mesh (44 μm) vibrating screen and both output streams ($d<44$ and $44<d<74$ μm) were then processed separately through the multigravity separator, thereby producing two more sets of tailings and concentrates. Increased passes through the MGS would presumably result in a better separation. For example, the tailings from the first MGS separation ($d<74$ μm) could be used as input to another MGS separation, as was done during the record runs for this study.

RESULTS AND DISCUSSION

After testing the system in Pittsburgh, PA, the SEG soil separation system was brought to the NTS where fine tuning and test runs with contaminated soil were performed before the record runs.

The record run through the soil conditioning part of the process was initiated with 101,045 g of soil passing the 0.25-inch screen. The jig bottom removed 10,408 g of soil (oversize) and 33,446

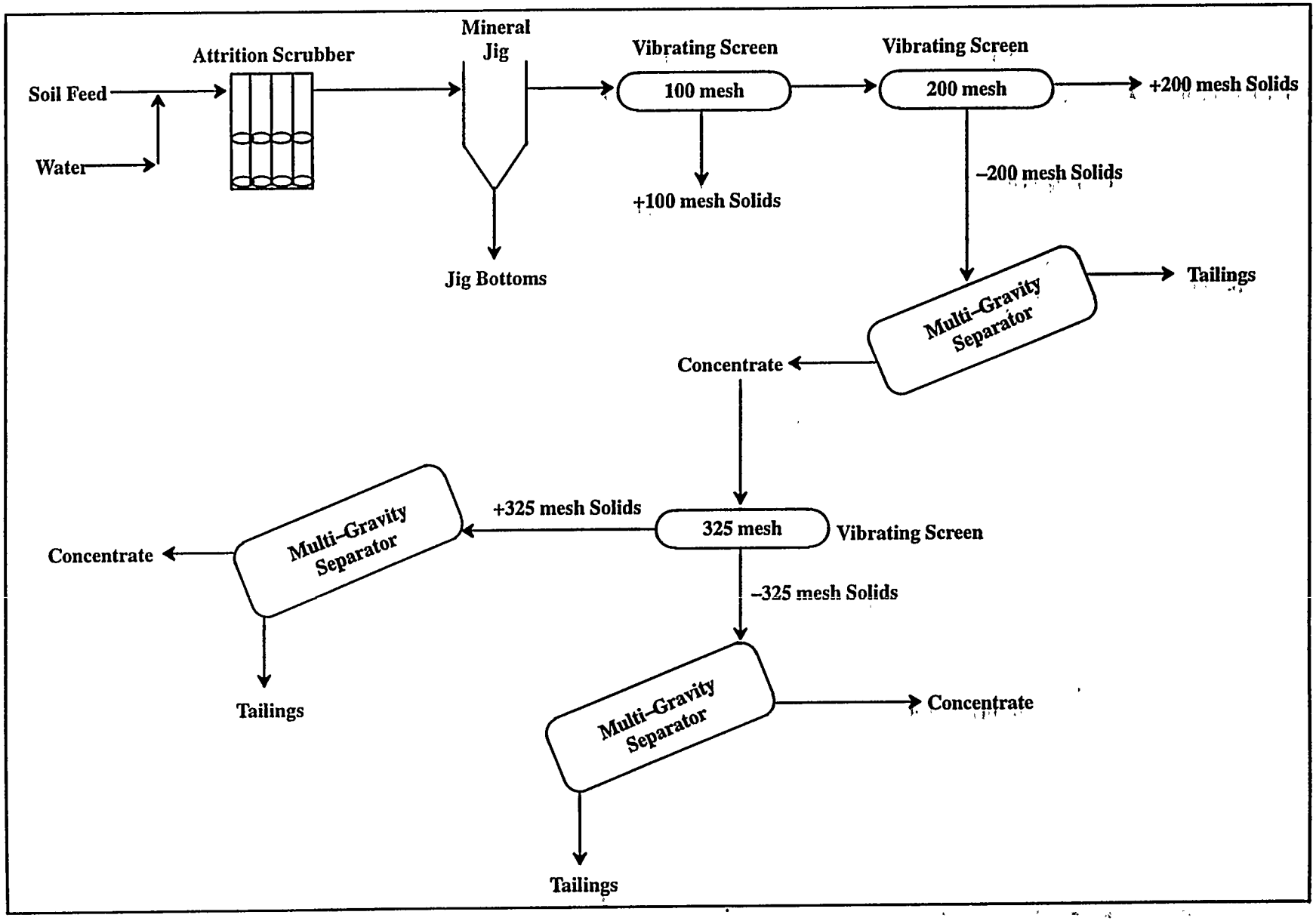

Figure 5–1. Schematic representation of the SEG process (after SEG, 1995).

g of material did not pass through the 100 mesh (149 μm) screen. This left 57,293 g of smaller than 149 μm material for further processing. Aliquots of that material were used in the multigravity separator runs.

It should be emphasized, that from this point on, no weights of material processed had been obtained at the time this report was written. Only weight percents had been provided. Dry weights of the individual streams are included in the final SEG report (SEG, 1995) but these data were received too late to be incorporated in this report. The mass of the individual streams was on the order of 100-200 g. It should be cautioned, however, that although the reported Pu specific activities and relative distributions of mass between concentrate and tailings reported here and in the final SEG report are in very good agreement, there are substantial discrepancies between these relative distributions of mass and the actual corresponding stream masses reported in the final SEG report (dry weight). The efficiencies reported here, therefore, were computed based on the originally reported relative distributions between concentrate and tailings and an assumed input stream weight of 1,000 g. In addition, in the absence of absolute weight information, it was impossible to check any mass balances between different stages of the process, nor was it possible to evaluate the potential of the process for contaminated soil volume reduction, which was exactly the objective of the tests performed.

Some of the smaller than 149 μm material was passed through a 200 mesh (74 μm) screen. This material formed the basis for further processing. Using 1,000 g of smaller than 74 μm soil as feed for the MGS, 624 g of concentrate was produced and 376 g of tailings. This particular run will be referred to as MGS1 and the results are summarized in Table 5-1 and schematically shown in Figure 5-2. The performance of the MGS, based on these results, was not very encouraging, as can be inferred by inspection of Figure 5-2. The ratio of concentrate to tailings Pu specific activity was 1.5:1, indicating an inefficient concentration of Pu into a small, highly contaminated fraction, which was the objective of the process. In addition, the absolute Pu specific activity of the tailings (504 pCi/g) would be too high for release in the environment, and is actually higher than the specific activity of the feed (483 pCi/g). This paradox is also manifested in the comparison between total Pu activity entering the process as feed (483,000 pCi) and leaving the system as concentrate and tailings (663,120 pCi). The discrepancy is 37% and suggests the presence of analytical or sampling errors. Pu activity determination errors alone cannot explain these differences. These errors are expected to be substantially lower at those high Pu specific activities (see Chapter 1 for details on analytical uncertainties as a function of specific activity). The discrepancy could be due to non-representative sampling, however.

The concentrate from run MGS1 was split into two fractions using a 325 mesh (44 μm) screen. Both of these fractions became feed streams for further multigravity separation processes, and for discussion purposes they are labeled MGS2 (for material smaller than 44 μm) and MGS3 (for material between 44 and 74 μm). The results of run MGS2, shown in Table 5-2 and schematically in Figure 5-3, will be discussed first. From a process point of view, this run appears to be extremely successful, based on the ratio between concentrate and tailings specific activities (16.3:1), indicating

a remarkable ability to concentrate Pu into a relatively small mass with very high specific activity compared to the feed material. This can be easily confirmed by inspection of Figure 5-3.

TABLE 5-1. MULTIGRAVITY SEPARATOR PERFORMANCE RESULTS (d<74μm) - MGS1 (SEG PROCESS).

Process Stream	Mass (g)	Specific ^{239}Pu Activity (pCi/g)	Total ^{239}Pu Activity (pCi)
Feed	1,000	483	483,000
Concentrate	624	759	473,616
Tailings	376	504	189,504

Activity Input (Feed):	483,000
Activity output (Conc. + Tailings):	663,120 Difference 37%
Concentrate - Tailings Specific Activity Ratio:	1.5:1
Concentrate - Tailings Mass Ratio	1.7:1

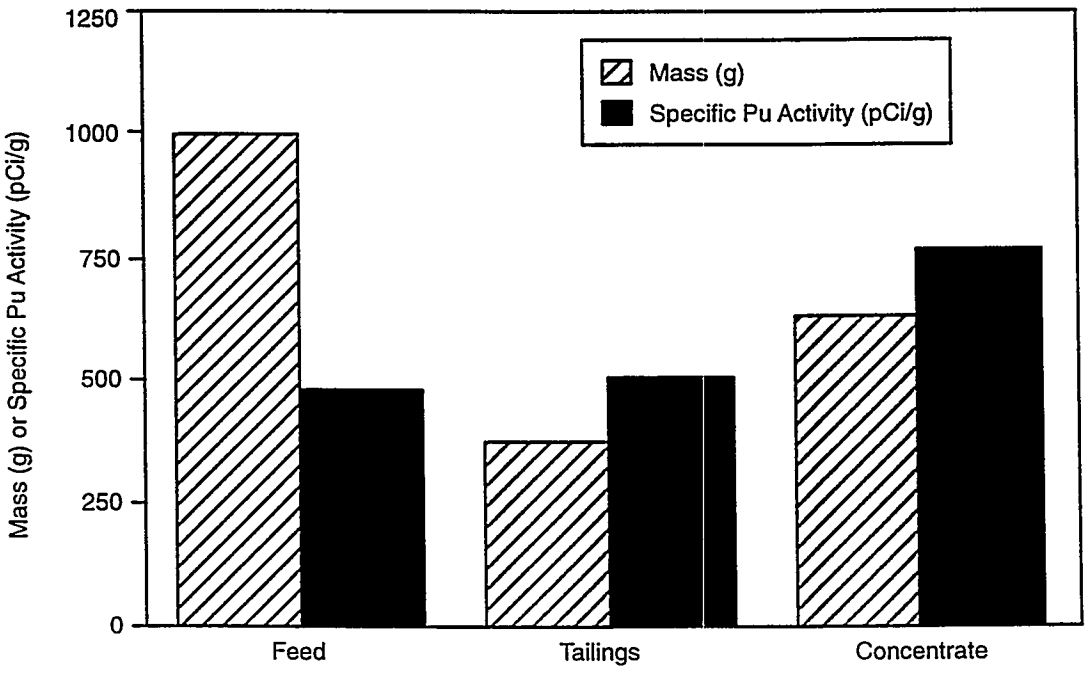

Figure 5-2. Results of particle separation by gravity (SEG process: multigravity separator); Area 11 soil, d<74 μm.

TABLE 5-2. MULTIGRAVITY SEPARATOR PERFORMANCE RESULTS CONCENTRATE OF MGS1 (d<44μm) AS INPUT (SEG PROCESS).

Process Stream	Mass (g)	Specific ^{239}Pu Activity (pCi/g)	Total ^{239}Pu Activity (pCi)
Feed	1,000	742	742,000
Concentrate	51	3,590	183,090
Tailings	939	220	206,580

Activity Input (Feed):	742,000
Activity output (Conc. + Tailings):	389,670 Difference 90%
Concentrate - Tailings Specific Activity Ratio:	16.3:1
	1:18.4

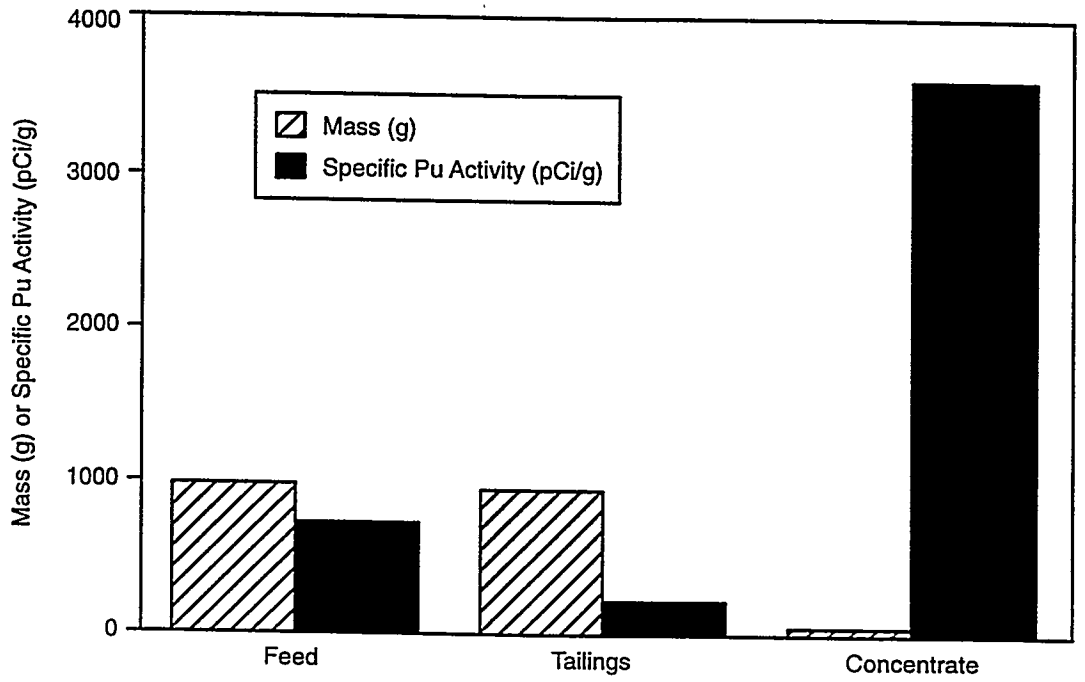

Figure 5-3. Results of particle separation by gravity (SEG process: multigravity separator); Area 11 soil, d<44 μm.

The specific activity in the tailings, although not low enough for return of the soil to the environment, was substantially lower than the feed activity. The difference between total input and output activities (approximately 90%), however, is considered excessive and casts some doubts on system performance results. Possible reasons for the observed uncertainties were discussed above and include non-representative sampling, although this is less likely with the particle sizes involved during this run (smaller than 44 μm).

The feed material for run MGS3 consisted of the concentrate of run MGS1, and, specifically, the 44-74 μm size fraction. The results are summarized in Table 5-3 page and are also shown in Figure 5-4. Several observations can be made by inspection of Table 5-3 and Figure 5-4. The specific

activity ratio between concentrate and tailings was 4.6:1, an intermediate value compared to runs MGS1 and MGS2. The corresponding mass ratio had also an intermediate value. It is also interesting to note that a correlation appears to exist between system performance and particle size involved. The initial run (MGS1) involving all particle sizes (d<74 μm) showed the lowest potential for concentrating Pu, the run with the larger size fraction but limited particle size range (44<d<74) showed intermediate potential, and the run with the smallest size fraction (d<44) showed the highest potential for concentrating Pu. These results could imply that the design of the MGS enables increased separation efficiency with increasingly uniform particle size distributions and with decreasing particle size.

TABLE 5-3. MULTIGRAVITY SEPARATOR PERFORMANCE RESULTS CONCENTRATE OF MGS1 (44<d<74 μm) AS INPUT (SEG PROCESS).

Process Stream	Mass (g)	Specific ^{239}Pu Activity (pCi/g)	Total ^{239}Pu Activity (pCi)
Feed	1,000	36	36,000
Concentrate	140	110	15,400
Tailings	860	24	20,640

Activity Input (Feed):	36,000
Activity output (Conc. + Tailings):	36,040 Difference 0%
Concentrate - Tailings Specific Activity Ratio:	4.6:1
Concentrate - Tailings Mass Ratio	1:6.1

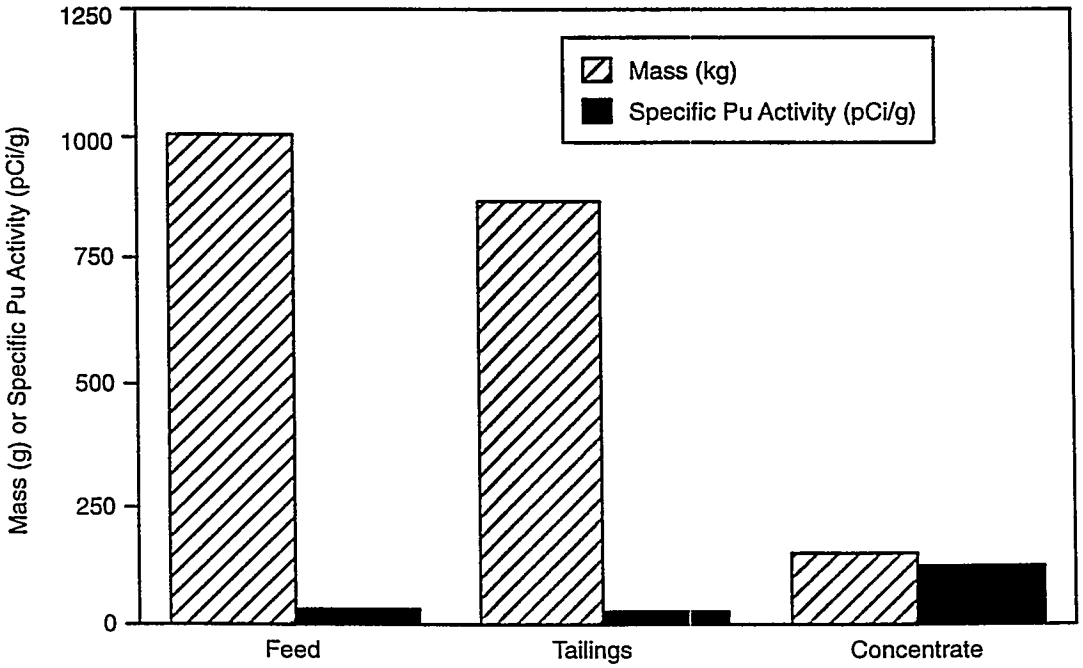

Figure 5-4. Results of particle separation by gravity (SEG process: multigravity separator); Area 11 soil, 44<d<74 μm.

The agreement between input and output total activities for run MGS3 was excellent. The specific activity reported for the input stream (feed), however, is puzzling and requires comment. It is difficult to understand why this stream had such a low specific activity (36 pCi/g). It should be remembered that the feed to this run was the 44-74 μm size fraction of the concentrate from run MGS1. This stream had a specific activity of 759 pCi/g (Table 5-1). The finer size fraction (d<44 μm) of this stream, which was the feed to run MGS2, had a very similar specific activity (742 pCi/g, Table 5-2). Although not impossible, the values reported suggest that essentially the entire Pu activity was concentrated in the smaller than 44 μm fraction with very little activity in the 44-74 μm size fraction. Verification of this hypothesis, however, would require a Pu activity balance between the concentrate of run MGS1 and the feed streams to runs MGS2 and MGS3. Such an activity balance cannot be performed without the mass for each stream which, as already mentioned, was not reported.

To enhance volume reduction, the tailings stream from run MGS1, which had a relatively high specific activity (504 pCi/g, Table 5-1), was reprocessed. The results of this run (MGS4) are shown in Table 5-4 and in Figure 5-5. The specific activity of this stream, 553 pCi/g, was in fair agreement with the activity of the tailings stream of run MGS1 (504 pCi/g). The agreement between total activity input and output was good (16% difference, Table 5-4). The ratio between specific activities of concentrate and tailings, however, was not much better than the original ratio during run MGS1 (2.0:1 vs. 1.5:1), which can also be inferred by inspection of Figures 5-2 and 5-5. In addition, the specific activity was still high enough to prevent release of the tailings to the environment. The mass ratio between concentrate and tailings was substantially higher for this run compared to the original (MGS1) run (1:7.5 vs. 1.7:1).

TABLE 5-4. MULTIGRAVITY SEPARATOR PERFORMANCE RESULTS (d<74μm) REPROCESSING OF TAILINGS STREAM OF MGS1 (SEG PROCESS).

Process Stream	Mass (g)	Specific ^{239}Pu Activity (pCi/g)	Total ^{239}Pu Activity (pCi)
Feed	1,000	553	553,000
Concentrate	118	865	102,070
Tailings	882	425	374,850
Activity Input (Feed):		553,000	
Activity Output (Conc. + Tailings):Concentrate - Tailings		476,920 Difference 16%	
Specific Activity Ratio:		2.0:1	
Concentrate - Tailings Mass Ratio		1:7.5	

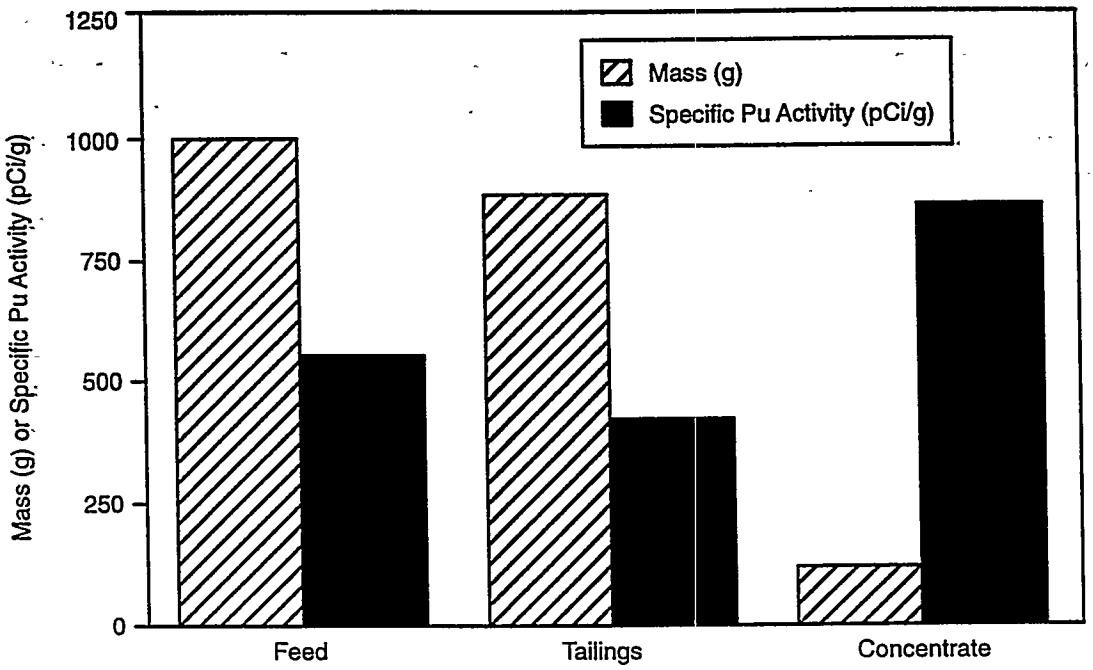

Figure 5-5. Results of particle separation by gravity (SEG process: multigravity separator); Area 11 soil, reprocessing of d<74 μm tailings stream.

CONCLUSIONS

The performance of the SEG process was variable. The efficiency of the process appeared to depend on particle size and particle size uniformity of the feed. The potential for concentrating Pu, as quantified by the ratio between specific activities of concentrate and tailings, varied between a low of 1.5:1 and a high of 16.3:1. The latter ratio is encouraging and could imply that the process could be potentially useful, if such efficiency could be consistently maintained. The potential for volume reduction, however, can be evaluated only if the individual masses of all streams are known. These masses were not reported in time to be incorporated in this report and, therefore, the SEG process cannot be fully evaluated at this time.

CHAPTER 6

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The objective of this project was to evaluate the potential of five different processes to reduce the volume of Pu-contaminated soil from three different areas of the Nevada Test Site (NTS). These areas were selected because they represent soils with different characteristics and different levels of Pu contamination. The processes tested were proposed by Paramag Corp. (PARAMAG), Advanced Processing Technologies Inc. (APT), Lockheed Environmental Systems and Technologies (LESAT), Nuclear Remediation Technologies (NRT), and Scientific Ecology Group (SEG). A summary of the results, conclusions based on all processes, as well as recommendations for the design of a larger-scale process are given in this section of the report.

The general conclusion, based on experience from all processes tested, as will be shown by the summary of results below, is that the most reliable and predictable method for contaminated soil volume reduction is to separate the soil by particle size. This will be demonstrated below by comparing Pu separation efficiencies based on two of the more advanced techniques (magnetic separation and separation by gravity) and separation based on particle size, as well as by summary plots including all processes tested. It was found, based on wet sieving of the contaminated soil and Pu determination in each size fraction, that in most cases (including soil from Areas 11 and 13 but *not* Area 52), most of the Pu contamination was associated with the smaller particles, typically smaller than approximately 40 μm. As expected, the stages of any process that resulted in efficient removal of these finer particles resulted in volume (mass) reduction on the order of 60-70%. The maximum (theoretical) volume reduction, assuming 100% efficiency in removing particles below a certain size, could be even higher, approaching 80-85%, depending on soil characteristics. A short summary of the results from each process is given below.

The magnetic separator of the PARAMAG process was not very effective in concentrating Pu in a small, highly contaminated soil fraction, although the concentrate had consistently higher Pu specific activity than the tailings by a factor of between 2.9 and 4.4. The attrition scrubber, however, was effective in breaking down particle agglomerates to individual particles and the hydrosizer produced fairly uniform particle size fractions. At the current level of performance of the magnetic separator, the additional operating cost for this device does not appear to be warranted.

This recommendation is supported by a comparison of Figures 6-1 and 6-2. The data used for Figures 6-1 and 6-2 are listed in Table 6-1, which shows the masses and specific Pu activities for the feed, tailings, and concentrate for both the magnetic separation and separation by particle size using an attrition scrubber, a hydrosizer, and a screen. Figure 6-1 schematically represents the efficiency of the magnetic process in concentrating Pu from Area 11 of the NTS. It can be seen that although the tailings stream had lower specific activity than the feed stream and that the concentrate had higher specific activity than the feed stream, the difference between the activities of the two streams was not impressive. In addition, the remaining specific activity in the tailings was too high for the soil to be returned to the environment without further treatment. By comparison, particle separation by size yielded tailings that had very low specific activity, almost two orders of magnitude

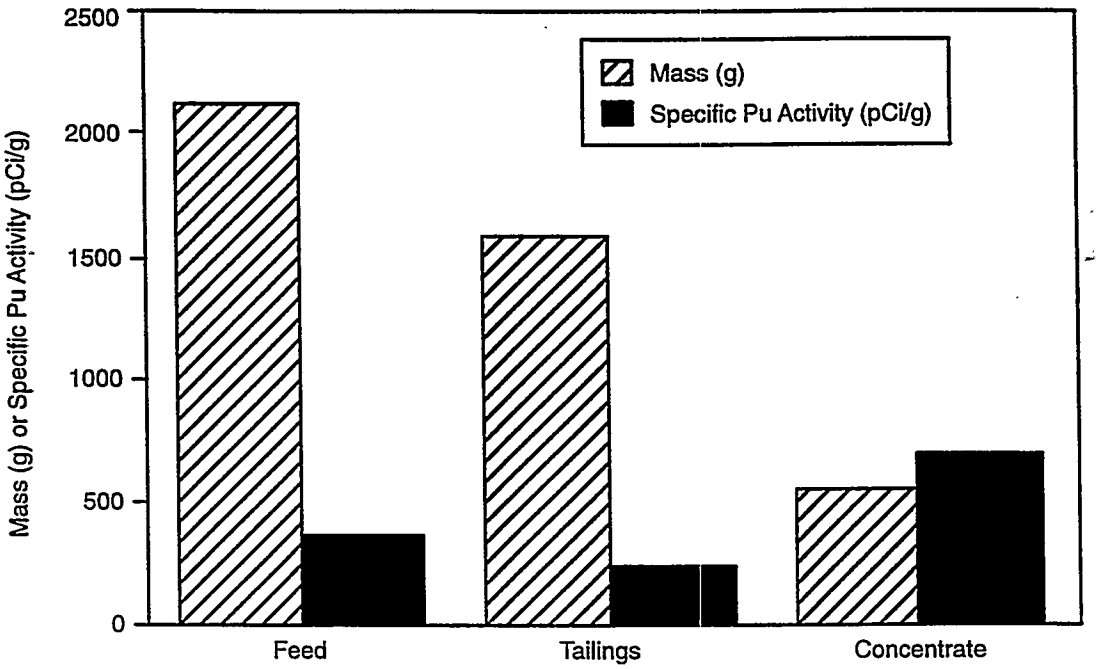

Figure 6-1. Results of particle distribution based on magnetic separation (PARAMAG process); Area 11 soil.

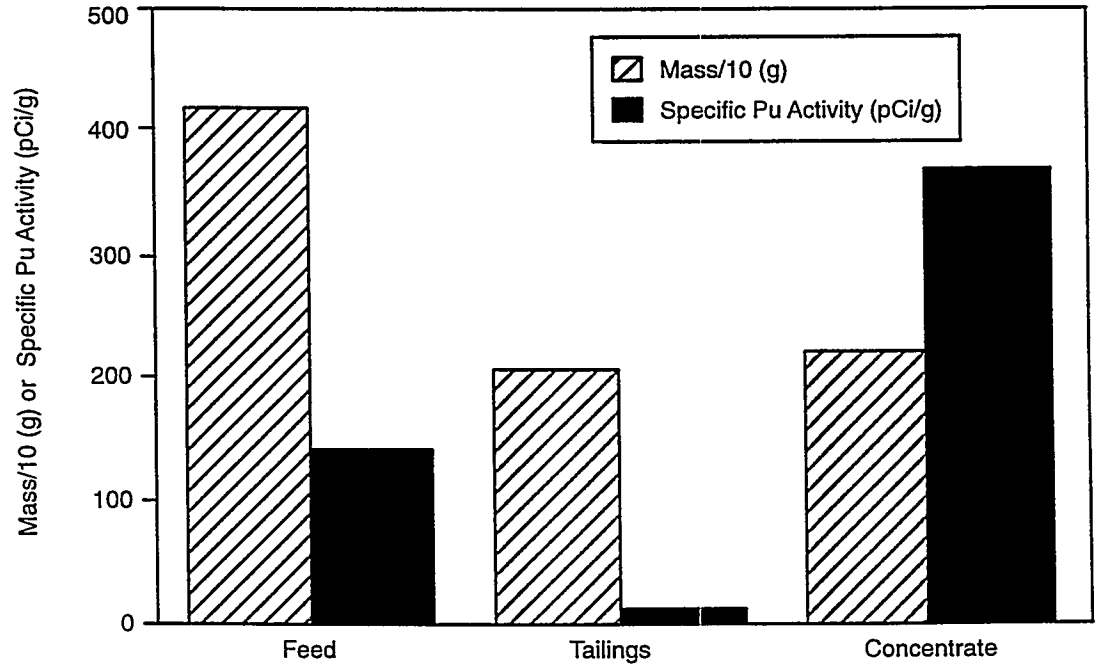

Figure 6-2. Volume reduction based on separation by particle size (PARAMAG process: attrition scrubber, hydrosizer, and screen); Area 11 soil.

lower than the specific activity of the concentrate, producing soil that could be returned to the site without further treatment. Based on these results, a volume reduction of 50% could be achieved easily (Figure 6-2). By comparison, the volume reduction calculated based on the magnetic process is only a nominal value (73.9%, Table 6-1) because material with Pu activity of 240 pCi/g cannot be considered decontaminated.

TABLE 6-1. SUMMARY OF VOLUME REDUCTION RESULTS: PARAMAG PROCESS.

Test Type	Soil	Stream	Percent Mass	Specific Pu Activity (pCi/g)	Percent Mass Reduction	Specific Activity Ratio Conc./Tailings
Hydrosizer and Screens	NTS Area 11	Feed	100	139	49	71.3
		Tailings	48.6	5.3		
		Concentrate	51.4	378		
Magnetic Separation	NTS Area 11	Feed	100	378	73.9*	2.9
		Tailings	73.9	240		
		Concentrate	26.1	690		

*Nominal mass reduction because of high specific activity of the tailings; see text for details.

The air-sparged hydrocyclone of APT had very limited success in separating Pu from soil. The summary of the results of the APT process with Area 11 soil is presented in Table 6-2. It can be seen that for both stages the activity of the tailings was too high for release of the soil to the environment. The reported volume reduction represents, therefore, only a nominal volume reduction (Table 6-2). In addition, with the soils from Areas 13 and 52, the supposedly clean tailings had higher specific activity than the concentrate. Furthermore, APT did not take advantage of the preferential accumulation of Pu in the smaller particle size fraction and, therefore, little volume reduction could be demonstrated, even for the soil with the highest Pu activity. At this point, therefore, no aspect of this process could be recommended.

TABLE 6-2. SUMMARY OF VOLUME REDUCTION RESULTS: APT PROCESS.

Test Type	Soil	Stream	Percent Mass	Specific Pu Activity (pCi/g)	Percent Mass Reduction	Specific Activity Ratio Conc./Tailings
Flotation Separation First Stage	Pretreated NTS Area 11	Feed	100	423	68.6*	2.6
		Tailings	68.6	278		
		Concentrate	31.4	712		
Flotation Separation Second Stage	Pretreated NTS Area 11	Feed	100	712	76*	2.8
		Tailings	76.0	531		
		Concentrate	24.0	1,471		

*Nominal mass reduction because of high specific activity of the tailings; see text for details.

The summary of process performance results for the LESAT process is shown in Table 6-3, which includes the mass distribution and Pu specific activity for the feed, tailings, and concentrate for both separation by gravity (mineral jig) and separation by particle size (spiral classifier). The mineral jig of the LESAT process was not very effective in separating Pu from contaminated soil. Because most of the Pu is associated with small particles with very low settling velocities, these particles are not removed by the mineral jig, even though the specific gravity of plutonium compounds is much higher than the specific gravity of the mineral matrix of the soil. This can easily be seen by inspection of Figure 6-3, which shows the masses and specific activities of the feed and tailings and concentrate produced by the mineral jig using Area 11 soil. This separation process performed even worse than the magnetic separation for the reasons mentioned above, and actually produced a "concentrate" with substantially lower specific activity than the "tailings" (Figure 6-3).

TABLE 6-3. SUMMARY OF VOLUME REDUCTION RESULTS: LESAT PROCESS.

Test Type	Soil	Stream	Percent Mass	Specific Pu Activity (pCi/g)	Percent Mass Reduction	Specific Activity Ratio Conc./Tailings
Spiral Classifier	NTS Area 11	Feed	100	320	28	88
		Tailings	28	6		
		Concentrate	72	530		
Separation By Gravity (Mineral Jig)	NTS Area 11	Feed	100	190	*	0.1
		Tailings	81.6	320		
		Concentrate	18.4	29		

*Not defined because the tailings had higher specific activity than the concentrate.

The spiral classifier, however, was very effective in separating particles by size and, therefore, with the soil having the highest specific activity (Area 11), impressive specific activity ratios between tailings and concentrate were achieved. Inspection of Figure 6-4 clearly demonstrates the dramatic difference in specific activity between tailings and concentrate, as well as the absolute low value of specific activity of the tailings. These results are consistent with the PARAMAG process results, strongly suggesting that separation by particle size is definitely a more cost-effective method for Pu-contaminated soil volume reduction. The overall volume reduction was limited by the percentage of soil processed through the spiral classifier. An optimum configuration, based on the components of this process, would, therefore, include the attrition scrubber, the trommel(s), and the spiral classifier.

The Rare Earth Magnet of the NRT process was not effective in separating Pu from contaminated soil. There was essentially no substantial preferential accumulation of Pu in any one of the 11 bins. The major drawback of this process was operation under dry conditions, which precluded processing of the finer, highly contaminated soil fraction. In addition, dry screening appears to be producing less uniform size fractions compared to wet sieving with higher percentages

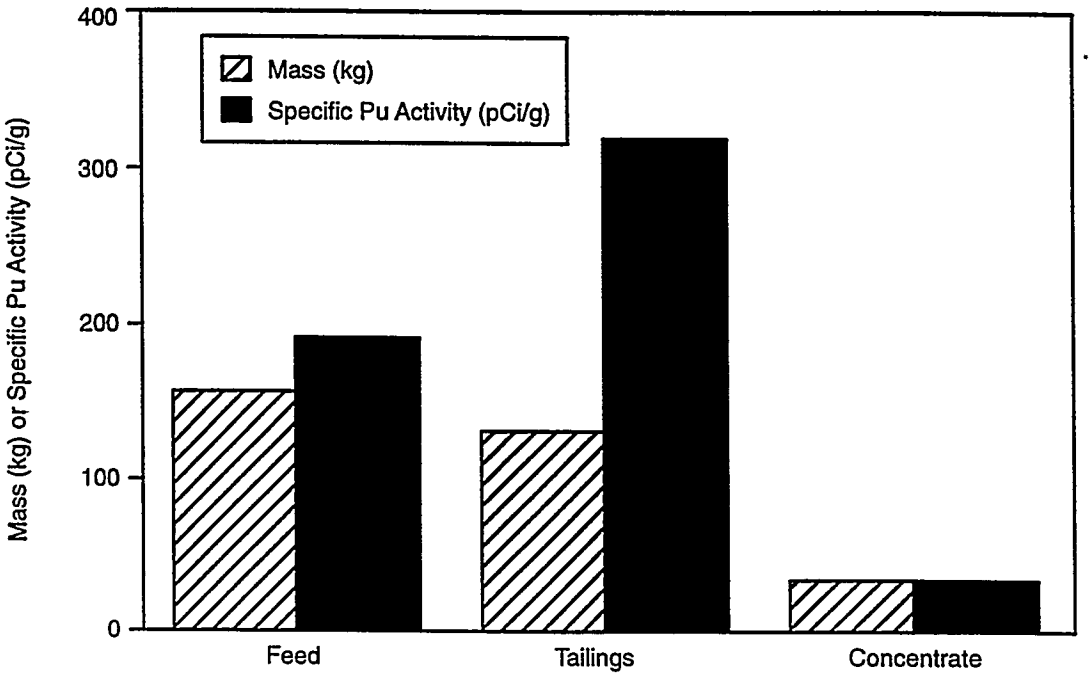

Figure 6-3. Results of particle separation by gravity (LESAT process: mineral jig); Area 11 soil.

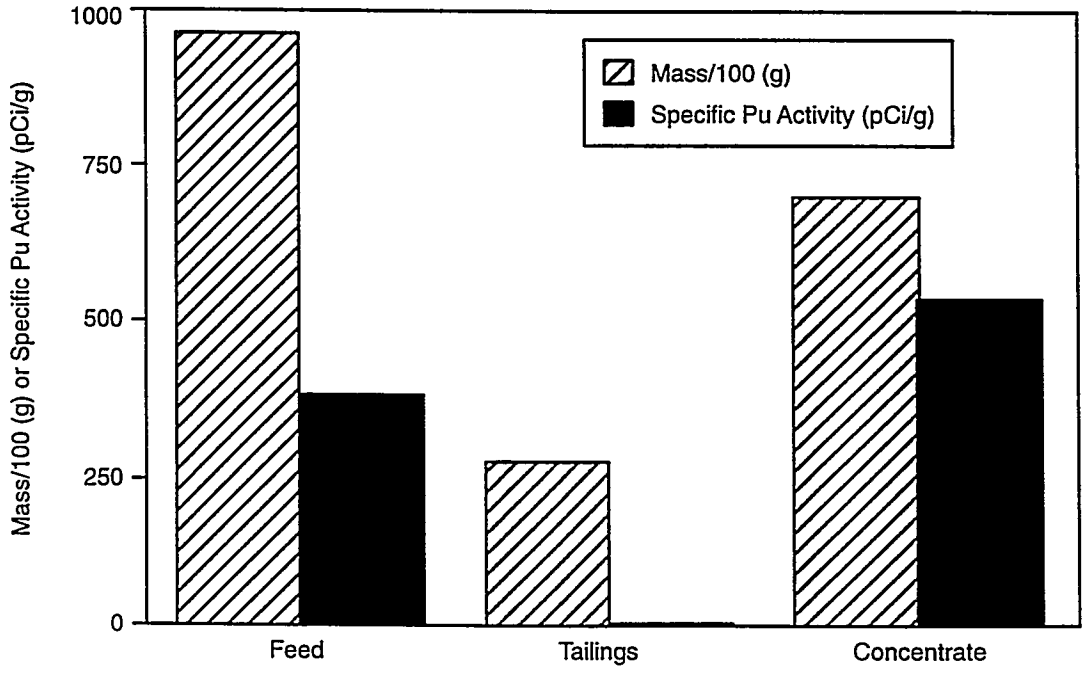

Figure 6-4. Volume reduction based on separation by particle size (LESAT process: spiral classifier); Area 11 soil.

of fines and, therefore, higher Pu specific activities in each size fraction. Based on these results, no component of this system could be recommended.

The performance of the multigravity separator of SEG was variable. The efficiency of the process appeared to depend on particle size and particle size uniformity. Although the ratio of concentrate-to-tailings specific activities reached an encouraging 16.3:1 for the finer particles, this ratio was not consistently maintained, suggesting that the overall process performance depends on parameters which are not well understood. With particles of less uniform size (all particles smaller than 75 μm), the results were less encouraging, as can be seen from Table 6-4. Again, the specific Pu activity in the tailings (504 pCi/g) was too high for release of the soil to the environment and therefore the volume reduction reported in Table 6-4 represents only a calculated nominal figure. In addition, the exact potential for volume reduction can only be evaluated if the individual masses of all process streams are known, not just mass and activity ratios between streams. These masses were not reported in time for this report and, therefore, the SEG process cannot be fully evaluated at this time.

TABLE 6-4. SUMMARY OF VOLUME REDUCTION RESULTS: SEG PROCESS.

Test Type	Soil	Stream	Percent Mass	Specific Pu Activity (pCi/g)	Percent Mass Reduction	Specific Activity Ratio Conc./Tailings
Screening 75 μm	NTS Area 11	Feed	100	200*	57.2	20.2
		Tailings	57.2	18*		
		Concentrate	42.8	363*		
Separation by Gravity (Multi-Gravity Separator)	Pretreated NTS Area 11	Feed	100	483	37.6	1.5
		Tailings	37.6	504	**	
		Concentrate	62.4	759		

*Approximate ^{239}Pu specific activities based on ^{241}Am activities and an assumed $^{239}Pu/^{241}Am$ activity ratio of 5.
^{239}Pu specific activities were not available in time for incorporation into this report.
**Nominal mass reduction because of high specific activity of the tailings; see text for details.

The results discussed above are summarized in Figures 6-5 and 6-6. These figures help demonstrate the point made earlier that separation by size appears to be the most reliable method for volume reduction of Pu-contaminated soils. Both figures are based on experiments with Area 11 soils using data reported in Tables 6-1 through 6-4. Figure 6-5 shows the Pu specific activity in the tailings for all advanced separation processes (magnetic, flotation, and gravity), as well as separation by particle size for comparison purposes. Multiple columns for the same type of process correspond to experiments performed by different vendors. As can be seen from Figure 6-5, only separation by particle size results in low enough activities in the tailings to characterize the soil as clean. For the advanced separation technologies the remaining activity in the tailings varies from 200 to 504 pCi/g and the soil can certainly not be characterized as decontaminated.

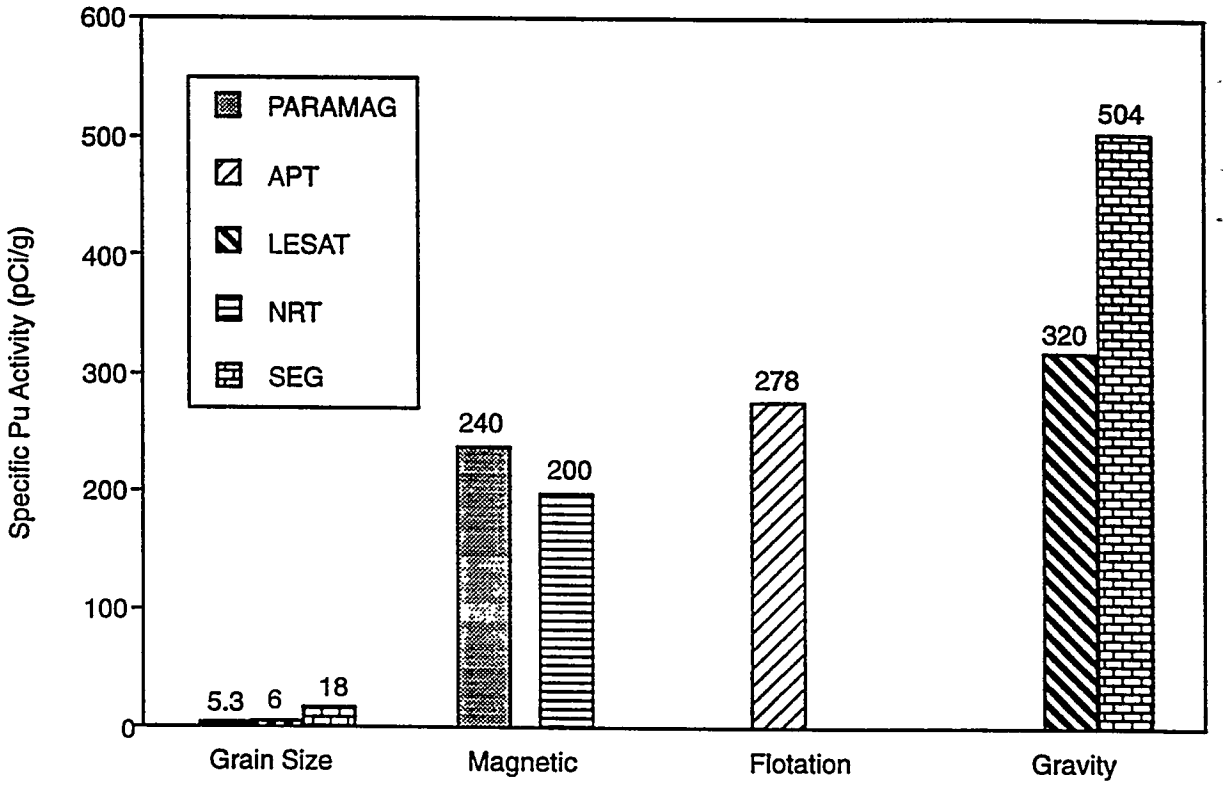

Figure 6-5. Specific Pu activity of the tailings from advanced processes and from separation by particle size; Area 11 soil.

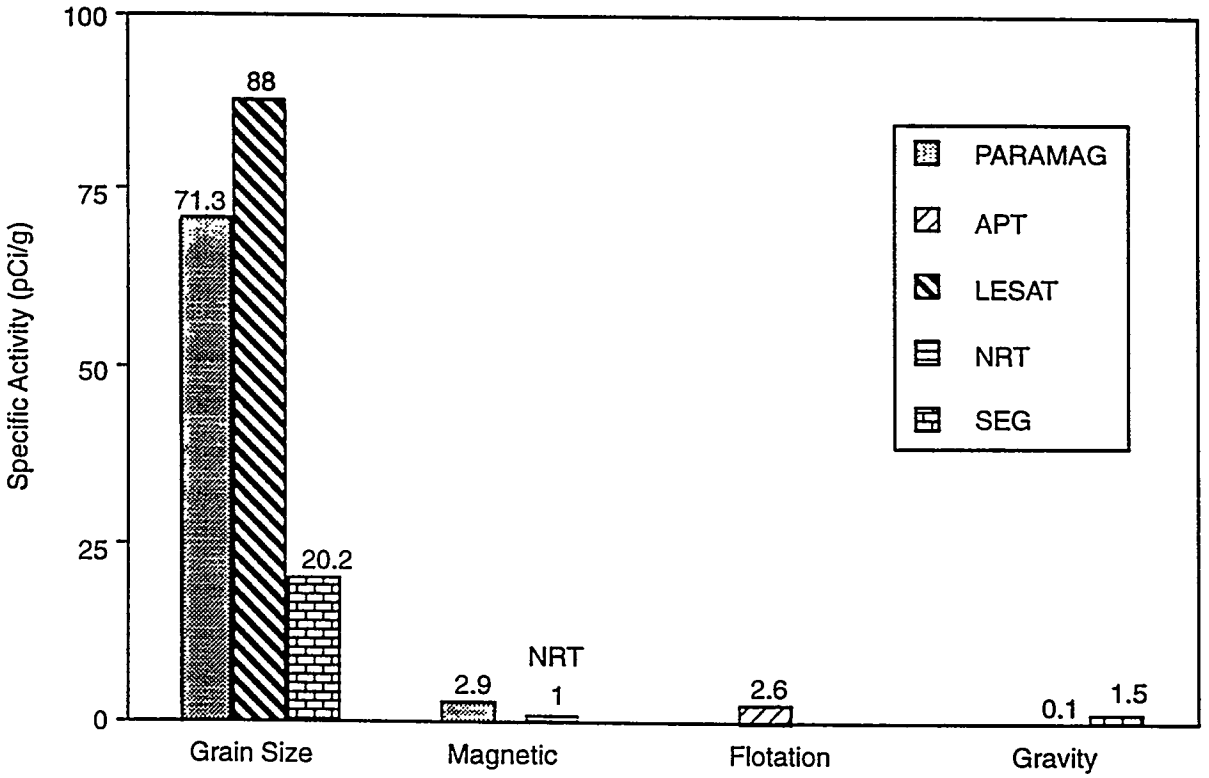

Figure 6-6. Concentrate-to-tailings specific activity ratios for all separation processes; Area 11 soil.

Based on these results, it is obvious that separation by particle size is the only reliable method for volume reduction under these conditions. The efficiency of a separation technology can also be evaluated based on the potential for concentration of the total activity in the smallest possible volume, as expressed by the activity ratio between concentrate and tailings. This ratio is shown for every separation process, including separation by particle size, in Figure 6-6. All results refer to experiments with Area 11 soils and the data were obtained from Tables 6-1 through 6-4. It is again obvious that only separation by grain size could successfully concentrate Pu in a small, highly contaminated fraction. The most successful processes were the LESAT particle size separation using a spiral classifier and the PARAMAG separation using a hydrosizer with concentrate-to-tailings activity ratios 88 and 71.3, respectively. The combination of attrition scrubber, mineral jig, and the two vibrating screens (100 and 200 mesh) used by the SEG process was able to concentrate Pu in the concentrate by a factor of 20 (Figure 6-6 and Table 6-4). Note that the concentrate-to-tailings specific activity ratio reported in Table 6-4 and shown in Figure 6-6 was calculated based on the measured ^{241}Am specific activity of individual streams and an assumed $^{239}Pu/^{241}Am$ activity ratio of 5. The ^{239}Pu specific activities were not available at the time this report was written. These results, however, can still be used to arrive at conclusions, although the exact numbers may be inaccurate. All other advanced processes were only able to achieve a maximum concentration ratio of 2.9 (magnetic separation), while in one separation by gravity, the concentrate was actually more dilute than the tailings. Based on these results, it is obvious that separation by particle size is the only reliable method for volume reduction under these conditions.

The potential for volume reduction of the contaminated soil, based on a separation by particle size, can be easily demonstrated using Figure 6-7. This figure shows the specific Pu activity and cumulative mass distribution (as a percent of total mass), according to size fraction, for Area 11 soil. It is obvious by inspection of Figure 6-7 that only the two smaller size fractions, corresponding to particles smaller than 38 μm, are associated with high specific Pu activities, approximately 1200 and 450 pCi/g. All other, larger size fractions have very low specific activities, below 50 pCi/g. The two smaller size fractions, however, account for only approximately 20% of the total soil mass (Figure 6-7), which suggests that removal of these two smaller size fractions will theoretically yield a volume reduction of approximately 80% for this soil.

It should be noted, however, that this theoretical volume reduction estimate could only be achieved if a process's particle separation efficiency can match that of wet sieving, which was used to determine particle size and specific activity distributions. A multiple step size separation process may be required to achieve these theoretical volume reduction efficiencies. In addition, the actual volume reduction will be a function of Pu distribution among different size fractions. Different soils may have different characteristics which would require disposal of a different size fraction. This was actually the case with Area 52 soil, as can be seen in Figure 6-8. The size fractions associated with the highest specific activities include particles between 75 and 250 μm, substantially larger than the most radioactive particles of Area 11 soil. The overall volume reduction, however, would be similar for both areas if the most radioactive size fractions were removed. A careful particle characterization is, therefore, important before any site remediation attempt.

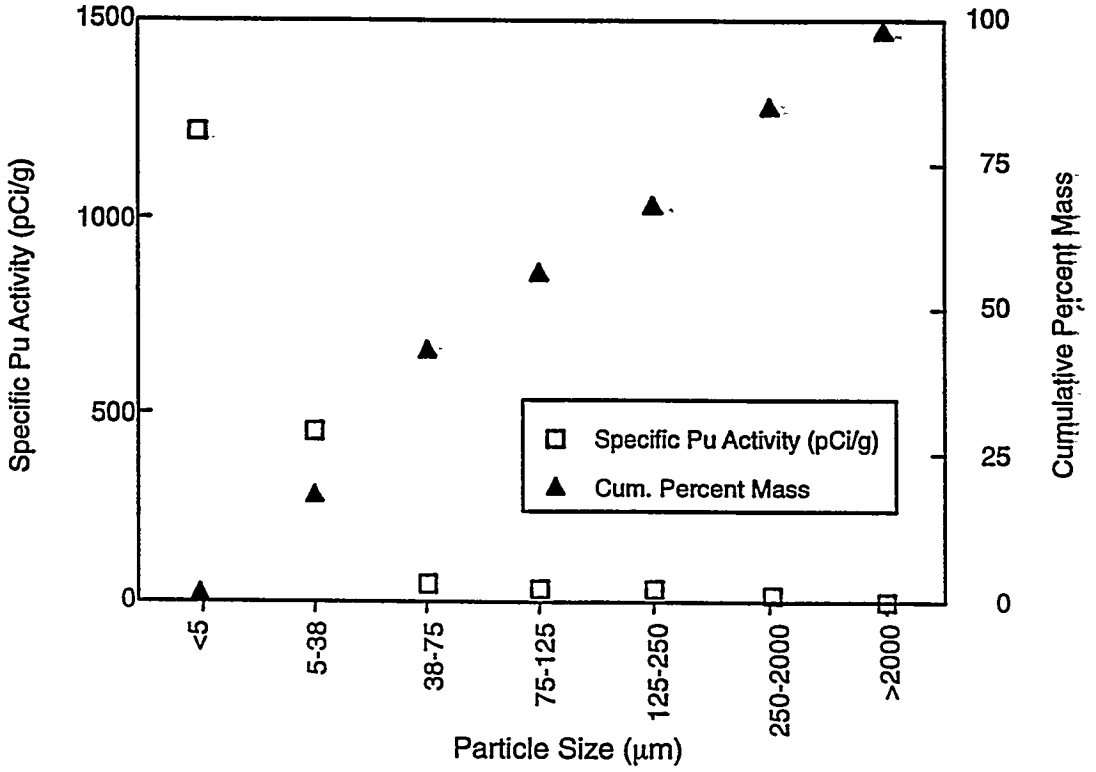

Figure 6-7. Specific Pu activity and cumulative percent mass as a function of particle size; Area 11 soil.

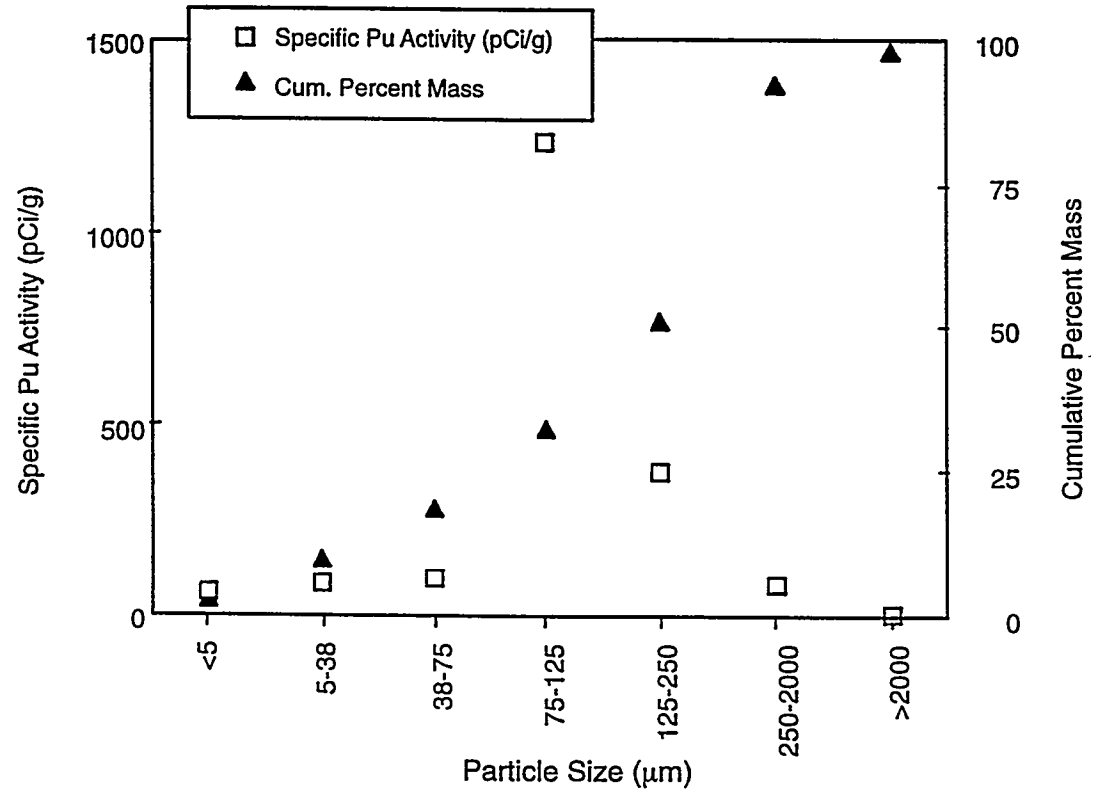

Figure 6-8. Specific Pu activity and cumulative percent mass as a function of particle size; Area 52 soil.

Based on these studies, the use of advanced technologies for Pu separation from contaminated soil does not appear to be warranted, because even in cases where some improvement in Pu separation was observed, the additional cost could probably not be justified. A cost-effective system would, therefore, include a particle size separation process only. As stated above, a careful characterization of the soil to be remediated would be required before any remediation so that Pu contamination as a function of particle size is known. A proposed system might then include the following components, shown schematically in Figure 6-9. The most desirable features of any component of a proposed system would include the ability to process the maximum amount of material per unit time and minimum attention requirements. In addition, small changes in flowstream characteristics should not affect the efficiency of the system excessively. Based on these requirements, the components of the system shown in Figure 6-9 were selected. Initial size separation would be accomplished with one or possibly two trommels to screen the larger size material in a two-step process. The selection of trommels instead of screens is based on the higher capacity of the former and minimum attention requirements during operation. An attrition scrubber following the gross particle separation would promote particle breakup and separation of Pu particles from the soil matrix. Following the attrition scrubber, the first particle separation process could be a spiral classifier, which was proven to be a reliable device for particle separation down to about 75 μm. Finally, fine tuning of the particle size separation from the spiral classifier overflow (concentrate) could be accomplished with a hydrosizer.

Several reasons may have contributed to the relatively poor performance of the advanced treatments tested. First, preliminary optimization of these processes and operational parameter estimation was frequently performed with surrogate materials as opposed to Pu-contaminated soils. The transferability of parameters determined using one compound to another is always questionable and is bound to have, sometimes, unpredictable results. Second, the performance of the same process appeared to vary between samples. Such a variation can be explained based on the specific physiochemical aspects of the process being tested and the physiochemical characteristics of the soil being treated. At this point, the relationship between soil physiochemical characteristics and individual process performance is not well understood. In addition, the physiochemical characterization of the contaminated soil is not detailed enough to allow further optimization of these processes. Additional characterization of the contaminated soil, including detailed studies of the contaminated mineral surfaces using surface-sensitive techniques, would be required to improve the performance of these advanced separation processes.

Third, certain aspects of the soil characterization were not available to the subcontractors before the record runs. One such example was the fact that Pu contamination was associated with a coarser size fraction in Area 52 soil compared to soils from Areas 11 and 13 (compare Figures 6-7 and 6-8). Finally, the specific activities of the feed soils were very low in some cases, thereby making Pu separation from the soil increasingly difficult. These tests with the lower levels of Pu contamination, however, are still valuable because they help identify the maximum capabilities of the processes tested.

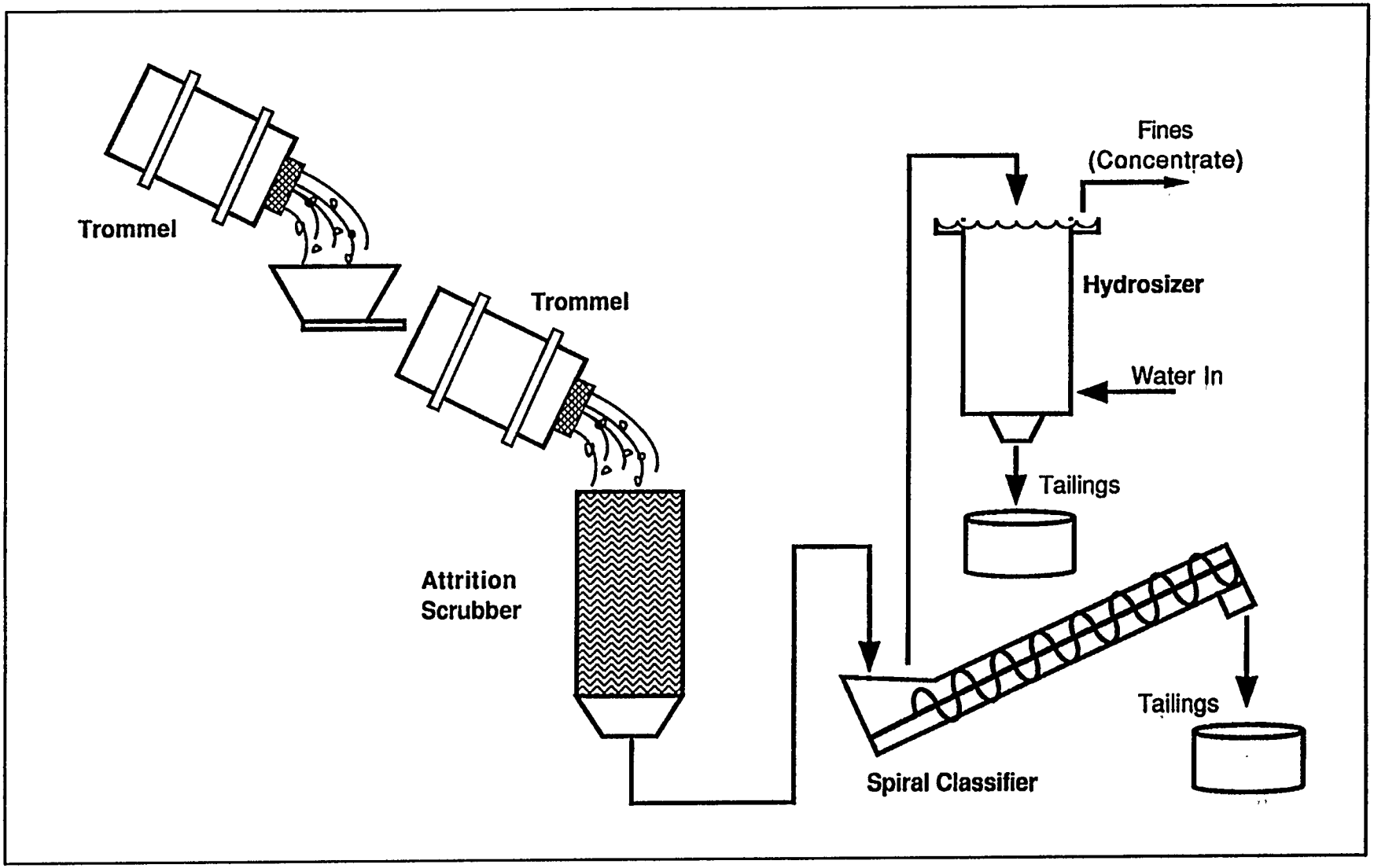

Figure 6–9. Schematic representation of a proposed volume reduction process.

Additional flaws identified during the tests included small volumes (mass) of soil samples being processed (on the order of a few kg). It is well known that the uncertainty of the results increases with decreasing sample size, making evaluation of the processes more difficult. Mass balances with large errors can be partially traced back to the small sample sizes used. An additional source of uncertainty was the small sample size (1 g) used for Pu analytical determinations. Depending on sample uniformity, the Pu activities determined from a 1-g aliquot may or may not be representative of an average value for the entire sample. This is especially true for samples with low specific activity and nonuniform particle size distributions.

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APPENDIX A

PLUTONIUM ANALYTICAL DATA AS A FUNCTION OF PROCESS STREAM AND PARTICLE SIZE: PARAMAG PROCESS

PARAMAG

SCREEN ANALYSIS DATA

Sample Name: **P-11-30-101**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
554	+2000 microns	13.10	13.10	13.10	86.90	1.800	23.58	0.17	0.17	99.83
57	+250 microns	16.70	16.70	29.80	70.20	21.000	350.70	2.57	2.75	97.25
555	+125 microns	11.40	11.40	41.20	58.80	39.500	450.30	3.31	6.05	93.95
556	+75 microns	13.30	13.30	54.50	45.50	43.000	571.90	4.20	10.25	89.75
529	+38 microns	24.30	24.30	78.80	21.20	57.600	1399.68	10.28	20.53	79.47
553	+5 microns	16.50	16.50	95.30	4.70	449.000	7408.50	54.39	74.92	25.08
536	<5 microns	2.80	2.80	98.10	1.90	1220.000	3416.00	25.08	100.00	0.00
TOTAL		98.10				138.845	13620.66			

SAMPLE wt. g.	% LOSS
100.00	1.90

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
554	+2000 microns	13.10	13.10	13.10	86.90	1.80	23.58	0.17	0.17	99.83
57	+250 microns	16.70	16.70	29.80	70.20	21.00	350.70	2.57	2.75	97.25
555	+125 microns	11.40	11.40	41.20	58.80	39.50	450.30	3.31	6.05	93.95
556	+75 microns	13.30	13.30	54.50	45.50	43.00	571.90	4.20	10.25	89.75
529	+38 microns	24.30	24.30	78.80	21.20	57.60	1399.68	10.28	20.53	79.47
553	+5 microns	16.50	16.50	95.30	4.70	449.00	7408.50	54.39	74.92	25.08
536	<5 microns	2.80	2.80	98.10	1.90	1220.00	3416.00	25.08	100.00	0.00
TOTAL		98.10				138.84	13620.66			

PARAMAG

SCREEN ANALYSIS DATA

Sample Name: **P-11-30-107**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
500	+2000 microns	72.00	72.00	72.00	28.00	0.298	21.46	25.10	25.10	74.90
497	+250 microns	24.10	24.10	96.10	3.90	2.250	54.23	63.43	88.53	11.47
498	+125 microns	3.80	3.80	99.90	0.10	2.580	9.80	11.47	100.00	0.00
	+75 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	+38 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	+5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
TOTAL		99.90				0.856	85.49			

SAMPLE wt. g.	% LOSS
100.00	0.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
500	+2000 microns	1263.50	72.00	72.00	28.00	0.299	377.79	25.16	25.16	74.84
497	+250 microns	422.92	24.10	96.10	3.90	2.250	951.57	63.38	88.54	11.46
498	+125 microns	66.68	3.80	99.90	0.10	2.580	172.03	11.46	100.00	0.00
	+75 microns	0.00	0.00	99.90	0.10		0.00	0.00	100.00	0.00
	+38 microns	0.00	0.00	99.90	0.10		0.00	0.00	100.00	0.00
	+5 microns	0.00	0.00	99.90	0.10		0.00	0.00	100.00	0.00
	<5 microns	0.00	0.00	99.90	0.10		0.00	0.00	100.00	0.00
TOTAL		1753.10				0.856	1501.39			

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SCREEN ANALYSIS DATA

Sample Name: **P-11-30-105B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
517	+125 microns	4.80	4.80	4.80	95.20	8.610	41.33	1.18	1.18	98.82
522	+75 microns	47.90	47.90	52.70	47.30	6.780	324.76	9.24	10.42	89.58
516	+38 microns	40.00	40.00	92.70	7.30	31.100	1244.00	35.41	45.83	54.17
520	+5 microns	6.20	6.20	98.90	1.10	307.000	1903.40	54.17	100.00	0.00
	<5 microns		0.00	98.90	1.10		0.00	0.00	100.00	0.00
TOTAL		98.90				35.526	3513.49			

SAMPLE wt. g.	% LOSS
100.00	1.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
517	+125 microns	11.84	4.80	4.80	95.20		0.00	0.00	0.00	100.00
522	+75 microns	118.13	47.90	52.70	47.30	6.780	800.92	9.35	9.35	90.65
516	+38 microns	98.65	40.00	92.70	7.30	31.100	3068.02	35.83	45.18	54.82
520	+5 microns	15.29	6.20	98.90	1.10	307.000	4694.03	54.82	100.00	0.00
	<5 microns		0.00	98.90	1.10		0.00	0.00	100.00	0.00
TOTAL		243.91				35.107	8562.97			

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SCREEN ANALYSIS DATA

Sample Name: **P-11-31-212A-2.3**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
524	+75 microns	6.20	6.20	6.20	93.80	18.700	115.94	0.17	0.17	99.83
528	+38 microns	35.60	35.60	41.80	58.20	78.200	2783.92	4.10	4.27	95.73
530	+5 microns	52.40	52.40	94.20	5.80	1180.000	61832.00	91.07	95.34	4.66
531	<5 microns	4.10	4.10	98.30	1.70	772.000	3165.20	4.66	100.00	0.00
TOTAL		98.30				690.713	67897.06			

SAMPLE wt. g.	% LOSS
100.00	1.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
524	+75 microns	34.54	6.20	6.20	93.80	18.700	645.90	0.17	0.17	99.83
528	+38 microns	198.35	35.60	41.80	58.20	78.200	15510.97	4.10	4.27	95.73
530	+5 microns	291.96	52.40	94.20	5.80	1180.000	344512.80	91.07	95.34	4.66
531	<5 microns	22.84	4.10	98.30	1.70	772.000	17632.48	4.66	100.00	0.00
TOTAL		547.69				690.723	378302.15			

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SCREEN ANALYSIS DATA

Sample Name: P-11-31-211A-2.3

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
523	+75 microns	3.50	3.50	3.50	96.50	9.930	34.76	0.09	0.09	99.91
527	+38 microns	23.10	23.10	26.60	73.40	56.900	1314.39	3.55	3.64	96.36
525	+5 microns	27.70	27.70	54.30	45.70	540.000	14958.00	40.36	44.00	56.00
526	<5 microns	43.70	43.70	98.00	2.00	475.000	20757.50	56.00	100.00	0.00
TOTAL		98.00				378.211	37064.65			

SAMPLE wt. g.	% LOSS
100.00	2.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
523	+75 microns	43.40	3.50	3.50	96.50	9.930	430.96	0.09	0.09	99.91
527	+38 microns	286.46	23.10	26.60	73.40	56.900	16299.57	3.55	3.64	96.36
525	+5 microns	343.51	27.70	54.30	45.70	540.000	185495.40	40.36	44.00	56.00
526	<5 microns	541.92	43.70	98.00	2.00	475.000	257412.00	56.00	100.00	0.00
TOTAL		1215.29				378.213	459637.94			

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SCREEN ANALYSIS DATA

Sample Name: **P-11-31-216A-2.3**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
533	+75 microns	2.00	2.00	2.00	98.00	11.900	23.80	0.10	0.10	99.90
535	+38 microns	16.20	16.20	18.20	81.80	47.500	769.50	3.26	3.36	96.64
532	+5 microns	9.60	9.60	27.80	72.20	184.000	1766.40	7.47	10.83	89.17
534	<5 microns	70.50	70.50	98.30	1.70	299.000	21079.50	89.17	100.00	0.00
TOTAL		98.30				240.480	23639.20			

SAMPLE wt. g.	% LOSS
100.00	1.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
533	+75 microns	31.82	2.00	2.00	98.00	11.900	378.66	0.10	0.10	99.90
535	+38 microns	257.72	16.20	18.20	81.80	47.500	12241.70	3.26	3.36	96.64
532	+5 microns	152.72	9.60	27.80	72.20	184.000	28100.48	7.47	10.83	89.17
534	<5 microns	1121.55	70.50	98.30	1.70	299.000	335343.45	89.17	100.00	-0.00
TOTAL		1563.81				240.480	376064.29			

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SCREEN ANALYSIS DATA

Sample Name: **P-13-20-101**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
512	+2000 microns	6.60	6.60	6.60	93.40	0.170	1.12	0.24	0.24	99.76
513	+250 microns	22.30	22.30	28.90	71.10	0.317	7.07	1.53	1.77	98.23
514	+125 microns	17.80	17.80	46.70	53.30	2.040	36.31	7.85	9.62	90.38
510	+75 microns	16.70	16.70	63.40	36.60	3.910	65.30	14.11	23.73	76.27
511	+38 microns	15.80	15.80	79.20	20.80	4.830	76.31	16.49	40.22	59.78
515	+5 microns	14.40	14.40	93.60	6.40	12.500	180.00	38.90	79.12	20.88
509	<5 microns	6.40	6.40	100.00	0.00	15.100	96.64	20.88	100.00	0.00
TOTAL		100.00				4.628	462.75			

SAMPLE wt. g.	% LOSS
100.00	0.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
512	+2000 microns	6.60	6.60	6.60	93.40	0.170	1.12	0.24	0.24	99.76
513	+250 microns	22.30	22.30	28.90	71.10	0.317	7.07	1.53	1.77	98.23
514	+125 microns	17.80	17.80	46.70	53.30	2.040	36.31	7.85	9.62	90.38
510	+75 microns	16.70	16.70	63.40	36.60	3.910	65.30	14.11	23.73	76.27
511	+38 microns	15.80	15.80	79.20	20.80	4.830	76.31	16.49	40.22	59.78
515	+5 microns	14.40	14.40	93.60	6.40	12.500	180.00	38.90	79.12	20.88
509	<5 microns	6.40	6.40	100.00	0.00	15.100	96.64	20.88	100.00	0.00
TOTAL		100.00				4.628	462.75			

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SCREEN ANALYSIS DATA

Sample Name: **P-13-20-107**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
501	+2000 microns	20.60	20.60	20.60	79.40	0.166	3.42	24.35	24.35	75.65
495	+250 microns	39.60	39.60	60.20	39.80	0.106	4.20	29.89	54.25	45.75
499	+125 microns	35.60	35.60	95.80	4.20	0.117	4.17	29.66	83.91	16.09
496	+75 microns	4.20	4.20	100.00	0.00	0.538	2.26	16.09	100.00	0.00
	+38 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
	+5 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
	<5 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
TOTAL		100.00				0.140	14.04			

SAMPLE wt. g.	% LOSS
100.00	0.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
501	+2000 microns	417.79	20.60	20.60	79.40	0.166	69.35	24.35	24.35	75.65
495	+250 microns	803.13	39.60	60.20	39.80	0.106	85.13	29.89	54.25	45.75
499	+125 microns	722.00	35.60	95.80	4.20	0.117	84.47	29.66	83.91	16.09
496	+75 microns	85.18	4.20	100.00	0.00	0.538	45.83	16.09	100.00	0.00
	+38 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
	+5 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
	<5 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
TOTAL		2028.10				0.140	284.79			

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SCREEN ANALYSIS DATA

Sample Name: **P-13-20-105B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
506	+125 microns	23.60	23.60	23.60	76.40	0.595	14.04	7.25	7.25	92.75
507	+75 microns	63.30	63.30	86.90	13.10	2.400	151.92	78.49	85.74	14.26
508	+38 microns	12.60	12.60	99.50	0.50	2.190	27.59	14.26	100.00	-0.00
	+5 microns		0.00	99.50	0.50		0.00	0.00	100.00	-0.00
	<5 microns		0.00	99.50	0.50		0.00	0.00	100.00	-0.00
TOTAL		99.50				1.945	193.56			

SAMPLE wt. g.	% LOSS
100.00	0.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
506	+125 microns	187.59	23.60	23.60	76.40	0.595	111.62	7.25	7.25	92.75
507	+75 microns	503.16	63.30	86.90	13.10	2.400	1207.58	78.49	85.74	14.26
508	+38 microns	100.15	12.60	99.50	0.50	2.190	219.33	14.26	100.00	0.00
	+5 microns		0.00	99.50	0.50		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.50	0.50		0.00	0.00	100.00	0.00
TOTAL		790.90				1.945	1538.53			

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SCREEN ANALYSIS DATA

Sample Name: **P-13-31-211A-1.0**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
571	+75 microns	4.20	4.20	4.20	95.80	4.100	17.22	0.14	0.14	99.86
569	+38 microns	17.00	17.00	21.20	78.80	169.000	2873.00	23.32	23.46	76.54
570	+5 microns	23.80	23.80	45.00	55.00	357.000	8496.60	68.98	92.44	7.56
568	<5 microns	53.20	53.20	98.20	1.80	17.500	931.00	7.56	100.00	0.00
TOTAL		98.20				125.436	12317.82			

SAMPLE wt. g.	% LOSS
100.00	1.80

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
571	+75 microns	37.14	4.20	4.20	95.80	4.100	152.27	0.14	0.14	99.86
569	+38 microns	150.32	17.00	21.20	78.80	169.000	25404.08	23.32	23.46	76.54
570	+5 microns	210.44	23.80	45.00	55.00	357.000	75127.08	68.98	92.44	7.56
568	<5 microns	470.40	53.20	98.20	1.80	17.500	8232.00	7.56	100.00	0.00
TOTAL		868.30				125.435	108915.43			

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SCREEN ANALYSIS DATA

Sample Name: **P-13-31-212A-1.0**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
519	+75 microns	12.30	12.30	12.30	87.70	2.750	33.83	0.50	0.50	99.50
521	+38 microns	39.20	39.20	51.50	48.50	1.820	71.34	1.05	1.55	98.45
518	+5 microns	44.90	44.90	96.40	3.60	147.000	6600.30	97.55	99.10	0.90
572	<5 microns	0.70	0.70	97.10	2.90	86.800	60.76	0.90	100.00	-0.00
TOTAL		97.10				69.683	6766.23			

SAMPLE wt. g.	% LOSS
100.00	2.90

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
519	+75 microns	34.56	12.30	12.30	87.70	2.750	95.04	0.50	0.50	99.50
521	+38 microns	110.13	39.20	51.50	48.50	1.820	200.44	1.05	1.55	98.45
518	+5 microns	126.15	44.90	96.40	3.60	147.000	18544.05	97.55	99.10	0.90
572	<5 microns	1.97	0.70	97.10	2.90	86.800	171.00	0.90	100.00	0.00
TOTAL		272.81				69.684	19010.52			

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SCREEN ANALYSIS DATA

Sample Name: **P-13-31-216A-1.0**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
589	+75 microns	4.80	4.80	4.80	95.20	2.430	11.66	0.74	0.74	99.26
582	+38 microns	17.20	17.20	22.00	78.00	1.720	29.58	1.88	2.62	97.38
551	+5 microns	24.10	24.10	46.10	53.90	34.400	829.04	52.72	55.35	44.65
558	<5 microns	52.40	52.40	98.50	1.50	13.400	702.16	44.65	100.00	0.00
TOTAL		98.50				15.964	1572.45			

SAMPLE wt. g.	% LOSS
100.00	1.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
589	+75 microns	69.89	4.80	4.80	95.20	2.430	169.83	0.74	0.74	99.26
582	+38 microns	250.42	17.20	22.00	78.00	1.720	430.72	1.88	2.62	97.38
551	+5 microns	350.88	24.10	46.10	53.90	34.400	12070.27	52.72	55.35	44.65
558	<5 microns	762.91	52.40	98.50	1.50	13.400	10222.99	44.65	100.00	0.00
TOTAL		1434.10				15.964	22893.82			

PARAMAG

SCREEN ANALYSIS DATA

Sample Name: **P-52-30-101**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
539	+2000 microns	5.70	5.70	5.70	94.30	4.000	22.80	0.08	0.08	99.92
540	+250 microns	41.10	41.10	46.80	53.20	82.300	3382.53	11.53	11.61	88.39
542	+125 microns	18.80	18.80	65.60	34.40	379.000	7125.20	24.29	35.90	64.10
537	+75 microns	13.80	13.80	79.40	20.60	1240.000	17112.00	58.33	94.23	5.77
538	+38 microns	8.90	8.90	88.30	11.70	99.900	889.11	3.03	97.26	2.74
543	+5 microns	7.00	7.00	95.30	4.70	87.500	612.50	2.09	99.34	0.66
541	<5 microns	3.00	3.00	98.30	1.70	64.100	192.30	0.66	100.00	0.00
TOTAL		98.30				298.438	29336.44			

SAMPLE wt. g.	% LOSS
100.00	1.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
539	+2000 microns	5.70	5.70	5.70	94.30	4.000	22.80	0.08	0.08	99.92
540	+250 microns	41.10	41.10	46.80	53.20	82.300	3382.53	11.53	11.61	88.39
542	+125 microns	18.80	18.80	65.60	34.40	379.000	7125.20	24.29	35.90	64.10
537	+75 microns	13.80	13.80	79.40	20.60	1240.000	17112.00	58.33	94.23	5.77
538	+38 microns	8.90	8.90	88.30	11.70	99.900	889.11	3.03	97.26	2.74
543	+5 microns	7.00	7.00	95.30	4.70	87.500	612.50	2.09	99.34	0.66
541	<5 microns	3.00	3.00	98.30	1.70	64.100	192.30	0.66	100.00	0.00
TOTAL		98.30				298.438	29336.44			

PARAMAG

SCREEN ANALYSIS DATA

Sample Name: P-52-30-105B

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
548	+125 microns	27.00	27.00	27.00	73.00	672.000	18144.00	31.59	31.59	68.41
550	+75 microns	64.70	64.70	91.70	8.30	312.000	20186.40	35.15	66.74	33.26
549	+38 microns	8.20	8.20	99.90	0.10	2330.000	19106.00	33.26	100.00	0.00
	+5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
TOTAL		99.90				574.939	57436.40			

SAMPLE wt. g.	% LOSS
100.00	0.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
548	+125 microns	187.22	27.00	27.00	73.00	572.000	107089.84	28.25	28.25	71.75
550	+75 microns	448.53	64.70	91.70	8.30	312.000	139941.36	36.92	65.17	34.83
549	+38 microns	56.66	8.20	99.90	0.10	2330.000	132017.80	34.83	100.00	0.00
	+5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
TOTAL		692.41				547.434	379049.00			

PARAMAG

SCREEN ANALYSIS DATA

Sample Name: **P-52-30-107**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
505	+2000 microns	8.30	8.30	8.30	91.70	1.950	16.19	0.50	0.50	99.50
503	+250 microns	59.70	59.70	68.00	32.00	2.620	156.41	4.85	5.35	94.65
502	+125 microns	29.30	29.30	97.30	2.70	1.770	51.86	1.61	6.96	93.04
504	+75 microns	2.50	2.50	99.80	0.20	1200.000	3000.00	93.04	100.00	0.00
	+38 microns		0.00	99.80	0.20		0.00	0.00	100.00	0.00
	+5 microns		0.00	99.80	0.20		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.80	0.20		0.00	0.00	100.00	0.00
TOTAL		99.80				32.309	3224.46			

SAMPLE wt. g.	% LOSS
100.00	0.20

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
505	+2000 microns	315.73	8.30	8.30	91.70	1.950	615.67	0.50	0.50	99.50
503	+250 microns	2270.99	59.70	68.00	32.00	2.620	5949.99	4.85	5.35	94.65
502	+125 microns	1114.57	29.30	97.30	2.70	1.770	1972.79	1.61	6.96	93.04
504	+75 microns	95.10	2.50	99.80	0.20	1200.000	114120.00	93.04	100.00	0.00
	+38 microns		0.00	99.80	0.20		0.00	0.00	100.00	0.00
	+5 microns		0.00	99.80	0.20		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.80	0.20		0.00	0.00	100.00	0.00
TOTAL		3796.39				32.309	122658.46			

PARAMAG

SCREEN ANALYSIS DATA

Sample Name: **P-52-31-211A-1.8**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
561	+75 microns	3.70	3.70	3.70	96.30	318.000	1176.60	3.25	3.25	96.75
562	+38 microns	21.30	21.30	25.00	75.00	599.000	12758.70	35.19	38.44	61.56
563	+5 microns	12.70	12.70	37.70	62.30	617.000	7835.90	21.61	60.05	39.95
560	<5 microns	59.60	59.60	97.30	2.70	243.000	14482.80	39.95	100.00	0.00
TOTAL		97.30				372.600	36254.00			

SAMPLE wt. g.	% LOSS
100.00	2.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
561	+75 microns	27.29	3.70	3.70	96.30	318.000	8678.22	3.25	3.25	96.75
562	+38 microns	157.09	21.30	25.00	75.00	599.000	94096.91	35.19	38.44	61.56
563	+5 microns	93.66	12.70	37.70	62.30	617.000	57788.22	21.61	60.05	39.95
560	<5 microns	439.56	59.60	97.30	2.70	243.000	106813.08	39.95	100.00	0.00
TOTAL		717.60				372.598	267376.43			

PARAMAG

SCREEN ANALYSIS DATA

Sample Name: **P-52-31-212A-1.8**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
546	+75 microns	10.80	10.80	10.80	89.20	974.000	10519.20	12.24	12.24	87.76
547	+38 microns	41.70	41.70	52.50	47.50	606.000	25270.20	29.41	41.65	58.35
545	+5 microns	37.30	37.30	89.80	10.20	1220.000	45506.00	52.96	94.61	5.39
544	<5 microns	6.70	6.70	96.50	3.50	691.000	4629.70	5.39	100.00	0.00
TOTAL		96.50				890.416	85925.10			

SAMPLE wt. g.	% LOSS
100.00	3.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
546	+75 microns	35.86	10.80	10.80	89.20	974.000	34927.64	12.24	12.24	87.76
547	+38 microns	138.45	41.70	52.50	47.50	606.000	83900.70	29.41	41.65	58.35
545	+5 microns	123.84	37.30	89.80	10.20	1220.000	151084.80	52.96	94.61	5.39
544	<5 microns	22.25	6.70	96.50	3.50	691.000	15374.75	5.39	100.00	0.00
TOTAL		320.40				890.412	285287.89			

PARAMAG

SCREEN ANALYSIS DATA

Sample Name: **P-52-31-216A-1.8**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
567	+75 microns	1.90	1.90	1.90	98.10	3.280	6.23	0.03	0.03	99.97
566	+38 microns	13.30	13.30	15.20	84.80	16.000	212.80	1.05	1.08	98.92
565	+5 microns	14.10	14.10	29.30	70.70	122.000	1720.20	8.49	9.57	90.43
564	<5 microns	68.40	68.40	97.70	2.30	268.000	18331.20	90.43	100.00	0.00
TOTAL		97.70				207.476	20270.43			

SAMPLE wt. g.	% LOSS
100.00	2.30

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
567	+75 microns	19.10	1.90	1.90	98.10	3.280	62.65	0.03	0.03	99.97
566	+38 microns	133.67	13.30	15.20	84.80	16.000	2138.72	1.05	1.08	98.92
565	+5 microns	141.71	14.10	29.30	70.70	122.000	17288.62	8.49	9.57	90.43
564	<5 microns	687.43	68.40	97.70	2.30	268.000	184231.24	90.43	100.00	0.00
TOTAL		981.91				207.474	203721.23			

APPENDIX B

PLUTONIUM ANALYTICAL DATA AS A FUNCTION OF PROCESS STREAM AND PARTICLE SIZE: APT PROCESS

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A13-100 MESH FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
617	+75 microns	20.90	20.90	20.90	79.10	9.870	206.28	6.53	6.53	93.47
616	+38 microns	27.10	27.10	48.00	52.00	2.370	64.23	2.03	8.56	91.44
619	+5 microns	26.90	26.90	74.90	25.10	97.300	2617.37	82.86	91.42	8.58
620	<5 microns	25.10	25.10	100.00	0.00	10.800	271.08	8.58	100.00	0.00
TOTAL		100.00				31.590	3158.96			

SAMPLE wt. g.	% LOSS
100.00	0.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
617	+75 microns	938.41	20.90	20.90	79.10	9.870	9262.11	6.53	6.53	93.47
616	+38 microns	1216.79	27.10	48.00	52.00	2.370	2883.79	2.03	8.56	91.44
619	+5 microns	1207.81	26.90	74.90	25.10	97.300	117519.91	82.86	91.42	8.58
620	<5 microns	1126.99	25.10	100.00	0.00	10.800	12171.49	8.58	100.00	0.00
TOTAL		4450.00				31.874	141837.30			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940222-A13-01-UF**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
622	+75 microns	15.10	15.10	15.10	84.90	2.380	35.94	0.62	0.62	99.38
623	+38 microns	28.00	28.00	43.10	56.90	8.570	239.96	4.17	4.79	95.21
624	+5 microns	28.50	28.50	71.60	28.40	181.000	5158.50	89.56	94.35	5.65
621	<5 microns	26.90	26.90	98.50	1.50	12.100	325.49	5.65	100.00	0.00
TOTAL		98.50				58.476	5759.89			

SAMPLE wt. g.	% LOSS
100.00	1.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
622	+75 microns	0.00	15.10	15.10	84.90	2.380	0.00	ERR	ERR	ERR
623	+38 microns	0.00	28.00	43.10	56.90	8.570	0.00	ERR	ERR	ERR
624	+5 microns	0.00	28.50	71.60	28.40	181.000	0.00	ERR	ERR	ERR
621	<5 microns	0.00	26.90	98.50	1.50	12.100	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940222-A13-01-0F**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
627	+75 microns	1.40	1.40	1.40	98.60	6.190	8.67	0.40	0.40	99.60
614	+38 microns	4.10	4.10	5.50	94.50	8.110	33.25	1.52	1.92	98.08
626	+5 microns	15.70	15.70	21.20	78.80	30.100	472.57	21.59	23.51	76.49
625	<5 microns	74.40	74.40	95.60	4.40	22.500	1674.00	76.49	100.00	0.00
TOTAL		95.60				22.892	2188.49			

SAMPLE wt. g.	% LOSS
100.00	4.40

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
627	+75 microns	0.00	1.40	1.40	98.60	6.190	0.00	ERR	ERR	ERR
614	+38 microns	0.00	4.10	5.50	94.50	8.110	0.00	ERR	ERR	ERR
626	+5 microns	0.00	15.70	21.20	78.80	30.100	0.00	ERR	ERR	ERR
625	<5 microns	0.00	74.40	95.60	4.40	22.500	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A52-100 MESH HEAD**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
589	+125 microns	1.40	1.40	1.40	98.60	9.410	13.17	0.10	0.10	99.90
587	+75 microns	18.00	18.00	19.40	80.60	36.500	657.00	5.21	5.31	94.69
586	+38 microns	21.50	21.50	40.90	59.10	224.000	4816.00	38.17	43.49	56.51
588	+5 microns	27.30	27.30	68.20	31.80	158.000	4313.40	34.19	77.67	22.33
585	<5 microns	29.90	29.90	98.10	1.90	94.200	2816.58	22.33	100.00	0.00
TOTAL		98.10				128.605	12616.15			

SAMPLE wt. g.	% LOSS
100.00	1.90

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
589	+125 microns	0.00	1.40	1.40	98.60	9.410	0.00	ERR	ERR	ERR
587	+75 microns	0.00	18.00	19.40	80.60	36.500	0.00	ERR	ERR	ERR
586	+38 microns	0.00	21.50	40.90	59.10	224.000	0.00	ERR	ERR	ERR
588	+5 microns	0.00	27.30	68.20	31.80	158.000	0.00	ERR	ERR	ERR
585	<5 microns	0.00	29.90	98.10	1.90	94.200	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A52-100 MESH FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
581	+125 microns	2.30	2.30	2.30	97.70	75.900	174.57	1.62	1.62	98.38
582	+75 microns	23.00	23.00	25.30	74.70	141.000	3243.00	30.06	31.67	68.33
584	+38 microns	24.30	24.30	49.60	50.40	71.100	1727.73	16.01	47.69	52.31
582	+5 microns	24.30	24.30	73.90	26.10	146.000	3547.80	32.88	80.57	19.43
590	<5 microns	24.10	24.10	98.00	2.00	87.000	2096.70	19.43	100.00	0.00
TOTAL		98.00				110.100	10789.80			

SAMPLE wt. g.	% LOSS
100.00	2.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
581	+125 microns	0.00	2.30	2.30	97.70	75.900	0.00	ERR	ERR	ERR
582	+75 microns	0.00	23.00	25.30	74.70	141.000	0.00	ERR	ERR	ERR
584	+38 microns	0.00	24.30	49.60	50.40	71.100	0.00	ERR	ERR	ERR
582	+5 microns	0.00	24.30	73.90	26.10	146.000	0.00	ERR	ERR	ERR
590	<5 microns	0.00	24.10	98.00	2.00	87.000	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940223-A52-01-UF**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
577	+125 microns	2.10	2.10	2.10	97.90	52.500	110.25	0.68	0.68	99.32
579	+75 microns	23.60	23.60	25.70	74.30	10.800	254.88	1.58	2.27	97.73
593	+38 microns	26.10	26.10	51.80	48.20	271.000	7073.10	43.94	46.21	53.79
578	+5 microns	31.70	31.70	83.50	16.50	247.000	7829.90	48.64	94.85	5.15
605	<5 microns	14.60	14.60	98.10	1.90	56.800	829.28	5.15	100.00	0.00
TOTAL		98.10				164.092	16097.41			

SAMPLE wt. g.	% LOSS
100.00	1.90

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
577	+125 microns	82.35	2.10	2.10	97.90	52.500	4323.38	0.68	0.68	99.32
579	+75 microns	925.48	23.60	25.70	74.30	10.800	9995.18	1.58	2.27	97.73
593	+38 microns	1023.51	26.10	51.80	48.20	271.000	277371.21	43.94	46.21	53.79
578	+5 microns	1243.12	31.70	83.50	16.50	247.000	307050.64	48.64	94.85	5.15
605	<5 microns	572.54	14.60	98.10	1.90	56.800	32520.27	5.15	100.00	-0.00
TOTAL		3847.00				164.092	631260.68			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A11-100 MESH FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
654	+125 microns	1.80	1.80	1.80	98.20	27.400	49.32	0.12	0.12	99.88
672	+75 microns	20.50	20.50	22.30	77.70	55.600	1139.80	2.71	2.83	97.17
655	+38 microns	37.70	37.70	60.00	40.00	37.600	1417.52	3.37	6.19	93.81
652	+5 microns	32.20	32.20	92.20	7.80	1000.000	32200.00	76.52	82.72	17.28
653	<5 microns	7.20	7.20	99.40	0.60	1010.000	7272.00	17.28	100.00	0.00
TOTAL		99.40				423.326	42078.64			

SAMPLE wt. g.	% LOSS
100.00	0.60

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
654	+125 microns	84.21	1.80	1.80	98.20	27.400	2307.35	0.12	0.12	99.88
672	+75 microns	959.00	20.50	22.30	77.70	55.600	53320.40	2.71	2.83	97.17
655	+38 microns	1763.63	37.70	60.00	40.00	37.600	66312.49	3.37	6.19	93.81
652	+5 microns	1506.34	32.20	92.20	7.80	1000.000	1506340.00	76.52	82.72	17.28
653	<5 microns	336.82	7.20	99.40	0.60	1010.000	340188.20	17.28	100.00	0.00
TOTAL		4650.00				423.327	1968468.44			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940210-A11-03-MED 1**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
648	+75 microns	5.50	14.07	14.07	85.93	274.000	1507.00	2.38	2.38	97.62
641	+38 microns	15.00	38.36	52.43	47.57	376.000	5640.00	8.90	11.27	88.73
650	+5 microns	43.70	111.76	164.19	-64.19	1070.000	46759.00	73.75	85.02	14.98
651	<5 microns	24.80	63.43	227.62	-127.62	383.000	9498.40	14.98	100.00	0.00
TOTAL		89.00				712.409	63404.40			

SAMPLE wt. g.	% LOSS
39.10	-127.62

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
648	+75 microns	90.22	14.07	14.07	85.93	274.000	24720.28	2.38	2.38	97.62
641	+38 microns	246.07	38.36	52.43	47.57	376.000	92522.32	8.90	11.27	88.73
650	+5 microns	716.88	111.76	164.19	-64.19	1070.000	767061.60	73.75	85.02	14.98
651	<5 microns	406.83	63.43	227.62	-127.62	383.000	155815.89	14.98	100.00	-0.00
TOTAL		1460.00				712.411	1040120.09			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940210-A11-03-UF**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
644	+125 microns	1.70	1.70	1.70	98.30	58.500	99.45	0.37	0.37	99.63
647	+75 microns	20.70	20.70	22.40	77.60	44.600	923.22	3.42	3.78	96.22
645	+38 microns	40.00	40.00	62.40	37.60	50.400	2016.00	7.46	11.24	88.76
642	+5 microns	29.60	29.60	92.00	8.00	729.000	21578.40	79.84	91.08	8.92
643	<5 microns	5.30	5.30	97.30	2.70	455.000	2411.50	8.92	100.00	0.00
TOTAL		97.30				277.786	27028.57			

SAMPLE wt. g.	% LOSS
100.00	2.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
644	+125 microns	55.73	1.70	1.70	98.30	58.500	3260.21	0.37	0.37	99.63
647	+75 microns	678.65	20.70	22.40	77.60	44.600	30267.79	3.42	3.78	96.22
645	+38 microns	1311.41	40.00	62.40	37.60	50.400	66095.06	7.46	11.24	88.76
642	+5 microns	970.44	29.60	92.00	8.00	729.000	707450.76	79.84	91.08	8.92
643	<5 microns	173.76	5.30	97.30	2.70	455.000	79060.80	8.92	100.00	-0.00
TOTAL		3190.00				277.785	886134.62			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940210-A11-03-0F**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
636	+75 microns	6.70	7.27	7.27	92.73	576.000	3859.20	2.91	2.91	97.09
638	+38 microns	13.50	14.64	21.91	78.09	722.000	9747.00	7.35	10.26	89.74
635	+5 microns	30.50	33.08	54.99	45.01	2930.000	89365.00	67.36	77.61	22.39
637	<5 microns	39.50	42.84	97.83	2.17	752.000	29704.00	22.39	100.00	0.00
TOTAL		90.20				1470.900	132675.20			

SAMPLE wt. g.	% LOSS
92.20	2.17

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
636	+75 microns	26.00	7.27	7.27	92.73	576.000	14976.00	2.91	2.91	97.09
638	+38 microns	52.38	14.64	21.91	78.09	722.000	37818.36	7.35	10.26	89.74
635	+5 microns	118.35	33.08	54.99	45.01	2930.000	346765.50	67.38	77.63	22.37
637	<5 microns	153.07	42.84	97.83	2.17	752.000	115108.64	22.37	100.00	-0.00
TOTAL		350.00				1470.481	514668.50			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940210-A11-03-MED-2**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
649	+75 microns	17.40	17.40	17.40	82.60	56.700	986.58	1.88	1.88	98.12
640	+38 microns	33.80	33.80	51.20	48.80	78.500	2653.30	5.06	6.94	93.06
639	+5 microns	31.70	31.70	82.90	17.10	1200.000	38040.00	72.54	79.48	20.52
646	<5 microns	15.80	15.80	98.70	1.30	681.000	10759.80	20.52	100.00	0.00
TOTAL		98.70				531.304	52439.68			

SAMPLE wt. g.	% LOSS
100.00	1.30

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
649	+75 microns	197.45	17.40	17.40	82.60	56.700	11195.42	1.88	1.88	98.12
640	+38 microns	383.55	33.80	51.20	48.80	78.500	30108.68	5.06	6.94	93.06
639	+5 microns	359.72	31.70	82.90	17.10	1200.000	431664.00	72.54	79.48	20.52
646	<5 microns	179.29	15.80	98.70	1.30	681.000	122096.49	20.52	100.00	0.00
TOTAL		1120.00				531.308	595064.58			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A11-1/2"FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
663	+2000 microns	8.70	8.70	8.70	91.30	73.300	637.71	2.41	2.41	97.59
664	+250 microns	16.80	16.80	25.50	74.50	66.900	1123.92	4.25	6.66	93.34
665	+125 microns	12.50	12.50	38.00	62.00	72.900	911.25	3.44	10.10	89.90
666	+75 microns	15.30	15.30	53.30	46.70	40.900	625.77	2.37	12.47	87.53
668	+38 microns	24.50	24.50	77.80	22.20	54.400	1332.80	5.04	17.51	82.49
667	+5 microns	19.00	19.00	96.80	3.20	1050.000	19950.00	75.42	92.93	7.07
669	<5 microns	2.50	2.50	99.30	0.70	748.000	1870.00	7.07	100.00	0.00
TOTAL		99.30				266.379	26451.45			

SAMPLE wt. g.	% LOSS
100.00	0.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
663	+2000 microns	0.00	8.70	8.70	91.30	73.300	0.00	ERR	ERR	ERR
664	+250 microns	0.00	16.80	25.50	74.50	66.900	0.00	ERR	ERR	ERR
665	+125 microns	0.00	12.50	38.00	62.00	72.900	0.00	ERR	ERR	ERR
666	+75 microns	0.00	15.30	53.30	46.70	40.900	0.00	ERR	ERR	ERR
668	+38 microns	0.00	24.50	77.80	22.20	54.400	0.00	ERR	ERR	ERR
667	+5 microns	0.00	19.00	96.80	3.20	1050.000	0.00	ERR	ERR	ERR
669	<5 microns	0.00	2.50	99.30	0.70	748.000	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A11+100MESHHEAD**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
670	+2000 microns	32.40	32.40	32.40	67.60	9.230	299.05	8.89	8.89	91.11
661	+250 microns	40.00	40.00	72.40	27.60	32.400	1296.00	38.51	47.39	52.61
659	+125 microns	21.40	21.40	93.80	6.20	59.500	1273.30	37.83	85.23	14.77
662	+75 microns	6.20	6.20	100.00	0.00	80.200	497.24	14.77	100.00	0.00
	+38 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
	+5 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
	<5 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
TOTAL		100.00				33.656	3365.59			

SAMPLE wt. g.	% LOSS
100.00	0.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
670	+2000 microns	0.00	32.40	32.40	67.60	9.230	0.00	ERR	ERR	ERR
661	+250 microns	0.00	40.00	72.40	27.60	32.400	0.00	ERR	ERR	ERR
659	+125 microns	0.00	21.40	93.80	6.20	59.500	0.00	ERR	ERR	ERR
662	+75 microns	0.00	6.20	100.00	0.00	80.200	0.00	ERR	ERR	ERR
0	+38 microns	0.00	0.00	100.00	0.00	0.000	0.00	ERR	ERR	ERR
	+5 microns	0.00	0.00	100.00	0.00		0.00	ERR	ERR	ERR
	<5 microns	0.00	0.00	100.00	0.00		0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A11-100MESHHEAD**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
658	+125 microns	1.50	1.50	1.50	98.50	101.000	151.50	0.36	0.36	99.64
57	+75 microns	19.20	19.20	20.70	79.30	44.100	846.72	2.02	2.38	97.62
671	+38 microns	36.60	36.60	57.30	42.70	55.100	2016.66	4.80	7.18	92.82
660	+5 microns	33.20	33.20	90.50	9.50	961.000	31905.20	75.98	83.16	16.84
656	<5 microns	7.20	7.20	97.70	2.30	982.000	7070.40	16.84	100.00	-0.00
TOTAL		97.70				429.790	41990.48			

SAMPLE wt. g.	% LOSS
100.00	2.30

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
658	+125 microns	0.00	1.50	1.50	98.50	101.000	0.00	ERR	ERR	ERR
57	+75 microns	0.00	19.20	20.70	79.30	44.100	0.00	ERR	ERR	ERR
671	+38 microns	0.00	36.60	57.30	42.70	55.100	0.00	ERR	ERR	ERR
660	+5 microns	0.00	33.20	90.50	9.50	961.000	0.00	ERR	ERR	ERR
656	<5 microns	0.00	7.20	97.70	2.30	982.000	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A11-100MESH FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
654	+125 microns	1.80	1.80	1.80	98.20	27.400	49.32	0.12	0.12	99.88
672	+75 microns	20.50	20.50	22.30	77.70	55.600	1139.80	2.71	2.83	97.17
655	+38 microns	37.70	37.70	60.00	40.00	37.600	1417.52	3.37	6.19	93.81
652	+5 microns	32.20	32.20	92.20	7.80	1000.000	32200.00	76.52	82.72	17.28
653	<5 microns	7.20	7.20	99.40	0.60	1010.000	7272.00	17.28	100.00	0.00
TOTAL		99.40				423.326	42078.64			

SAMPLE wt. g.	% LOSS
100.00	0.60

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
654	+125 microns	0.00	1.80	1.80	98.20	27.400	0.00	ERR	ERR	ERR
672	+75 microns	0.00	20.50	22.30	77.70	55.600	0.00	ERR	ERR	ERR
655	+38 microns	0.00	37.70	60.00	40.00	37.600	0.00	ERR	ERR	ERR
652	+5 microns	0.00	32.20	92.20	7.80	1000.000	0.00	ERR	ERR	ERR
653	<5 microns	0.00	7.20	99.40	0.60	1010.000	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940210-A11-03-MED1**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
648	+75 microns	5.50	6.17	6.17	93.83	274.000	1507.00	2.38	2.38	97.62
641	+38 microns	15.00	16.84	23.01	76.99	376.000	5640.00	8.90	11.27	88.73
650	+5 microns	43.70	49.05	72.05	27.95	1070.000	46759.00	73.75	85.02	14.98
651	<5 microns	24.80	27.83	99.89	0.11	383.000	9498.40	14.98	100.00	0.00
TOTAL		89.00				712.409	63404.40			

SAMPLE wt. g.	% LOSS
89.10	0.11

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
648	+75 microns	0.00	6.17	6.17	93.83	274.000	0.00	ERR	ERR	ERR
641	+38 microns	0.00	16.84	23.01	76.99	376.000	0.00	ERR	ERR	ERR
650	+5 microns	0.00	49.05	72.05	27.95	1070.000	0.00	ERR	ERR	ERR
651	<5 microns	0.00	27.83	99.89	0.11	383.000	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940210-A11-03-MED2**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
649	+75 microns	17.40	17.40	17.40	82.60	56.700	986.58	1.88	1.88	98.12
640	+38 microns	33.80	33.80	51.20	48.80	78.500	2653.30	5.06	6.94	93.06
639	+5 microns	31.70	31.70	82.90	17.10	1200.000	38040.00	72.54	79.48	20.52
646	<5 microns	15.80	15.80	98.70	1.30	681.000	10759.80	20.52	100.00	0.00
TOTAL		98.70				531.304	52439.68			

SAMPLE wt. g.	% LOSS
100.00	1.30

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
649	+75 microns	0.00	17.40	17.40	82.60	56.700	0.00	ERR	ERR	ERR
640	+38 microns	0.00	33.80	51.20	48.80	78.500	0.00	ERR	ERR	ERR
639	+5 microns	0.00	31.70	82.90	17.10	1200.000	0.00	ERR	ERR	ERR
646	<5 microns	0.00	15.80	98.70	1.30	681.000	0.00	ERR	ERR	ERR
TOTAL		24.60				0.000	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940210-A11-03-0F**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
636	+75 microns	6.70	7.27	7.27	92.73	567.000	3798.90	2.86	2.86	97.14
638	+38 microns	13.50	14.64	21.91	78.09	722.000	9747.00	7.35	10.21	89.79
635	+5 microns	30.50	33.08	54.99	45.01	2930.000	89365.00	67.39	77.60	22.40
637	<5 microns	39.50	42.84	97.83	2.17	752.000	29704.00	22.40	100.00	0.00
TOTAL		90.20				1470.232	132614.90			

SAMPLE wt. g.	% LOSS
92.20	2.17

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
636	+75 microns	0.00	7.27	7.27	92.73	567.000	0.00	ERR	ERR	ERR
638	+38 microns	0.00	14.64	21.91	78.09	722.000	0.00	ERR	ERR	ERR
635	+5 microns	0.00	33.08	54.99	45.01	2930.000	0.00	ERR	ERR	ERR
637	<5 microns	0.00	42.84	97.83	2.17	752.000	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940210-A11-03-UF**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
644	+125 microns	1.70	1.70	1.70	98.30	58.500	99.45	0.37	0.37	99.63
647	+75 microns	20.70	20.70	22.40	77.60	44.600	923.22	3.42	3.78	96.22
645	+38 microns	40.00	40.00	62.40	37.60	50.400	2016.00	7.46	11.24	88.76
642	+5 microns	29.60	29.60	92.00	8.00	729.000	21578.40	79.84	91.08	8.92
643	<5 microns	5.30	5.30	97.30	2.70	455.000	2411.50	8.92	100.00	0.00
TOTAL		97.30				277.786	27028.57			

SAMPLE wt. g.	% LOSS
100.00	2.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
644	+125 microns	0.00	1.70	1.70	98.30	58.500	0.00	ERR	ERR	ERR
647	+75 microns	0.00	20.70	22.40	77.60	44.600	0.00	ERR	ERR	ERR
645	+38 microns	0.00	40.00	62.40	37.60	50.400	0.00	ERR	ERR	ERR
642	+5 microns	0.00	29.60	92.00	8.00	729.000	0.00	ERR	ERR	ERR
643	<5 microns	0.00	5.30	97.30	2.70	455.000	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A13-1/2"FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
628	+2000 microns	5.90	5.90	5.90	94.10	0.252	1.49	0.19	0.19	99.81
629	+250 microns	22.80	22.80	28.70	71.30	0.434	9.90	1.25	1.44	98.56
630	+125 microns	18.60	18.60	47.30	52.70	0.460	8.56	1.08	2.52	97.48
634	+75 microns	19.80	19.80	67.10	32.90	20.400	403.92	51.04	53.56	46.44
633	+38 microns	15.30	15.30	82.40	17.60	7.490	114.60	14.48	68.04	31.96
632	+5 microns	12.60	12.60	95.00	5.00	16.000	201.60	25.48	93.52	6.48
631	<5 microns	4.50	4.50	99.50	0.50	11.400	51.30	6.48	100.00	-0.00
TOTAL		99.50				7.953	791.36			

SAMPLE wt. g.	% LOSS
100.00	0.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
628	+2000 microns	0.00	5.90	5.90	94.10	0.252	0.00	ERR	ERR	ERR
629	+250 microns	0.00	22.80	28.70	71.30	0.434	0.00	ERR	ERR	ERR
630	+125 microns	0.00	18.60	47.30	52.70	0.460	0.00	ERR	ERR	ERR
634	+75 microns	0.00	19.80	67.10	32.90	20.400	0.00	ERR	ERR	ERR
633	+38 microns	0.00	15.30	82.40	17.60	7.490	0.00	ERR	ERR	ERR
632	+5 microns	0.00	12.60	95.00	5.00	16.000	0.00	ERR	ERR	ERR
631	<5 microns	0.00	4.50	99.50	0.50	11.400	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A13+100 MESH HEAD**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
612	+2000 microns	11.60	11.60	11.60	88.40	0.282	3.27	0.07	0.07	99.93
609	+250 microns	43.70	43.70	55.30	44.70	9.970	435.69	9.73	9.80	90.20
608	+125 microns	25.60	25.60	80.90	19.10	1.210	30.98	0.69	10.49	89.51
618	+75 microns	19.00	19.00	99.90	0.10	211.000	4009.00	89.51	100.00	0.00
	+38 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	+5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
TOTAL		99.90				44.834	4478.94			

SAMPLE wt. g.	% LOSS
100.00	0.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
612	+2000 microns	0.00	11.60	11.60	88.40	0.282	0.00	ERR	ERR	ERR
609	+250 microns	0.00	43.70	55.30	44.70	9.970	0.00	ERR	ERR	ERR
608	+125 microns	0.00	25.60	80.90	19.10	1.210	0.00	ERR	ERR	ERR
618	+75 microns	0.00	19.00	99.90	0.10	211.000	0.00	ERR	ERR	ERR
0	+38 microns	0.00	0.00	99.90	0.10	0.000	0.00	ERR	ERR	ERR
	+5 microns	0.00	0.00	99.90	0.10		0.00	ERR	ERR	ERR
	<5 microns	0.00	0.00	99.90	0.10		0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A13-100 MESH HEAD**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
613	+125 microns	1.30	1.30	1.30	98.70	1.830	2.38	0.02	0.02	99.98
615	+75 microns	22.70	22.70	24.00	76.00	9.520	216.10	1.93	1.95	98.05
610	+38 microns	26.10	26.10	50.10	49.90	3.120	81.43	0.73	2.68	97.32
611	+5 microns	24.90	24.90	75.00	25.00	425.000	10582.50	94.55	97.23	2.77
607	<5 microns	24.00	24.00	99.00	1.00	12.900	309.60	2.77	100.00	0.00
TOTAL		99.00				113.051	11192.02			

SAMPLE wt. g.	% LOSS
100.00	1.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
613	+125 microns	0.00	1.30	1.30	98.70	1.830	0.00	ERR	ERR	ERR
615	+75 microns	0.00	22.70	24.00	76.00	9.520	0.00	ERR	ERR	ERR
610	+38 microns	0.00	26.10	50.10	49.90	3.120	0.00	ERR	ERR	ERR
611	+5 microns	0.00	24.90	75.00	25.00	425.000	0.00	ERR	ERR	ERR
607	<5 microns	0.00	24.00	99.00	1.00	12.900	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A13-100 MESH FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
617	+75 microns	20.90	20.90	20.90	79.10	9.870	206.28	6.53	6.53	93.47
616	+38 microns	27.10	27.10	48.00	52.00	2.370	64.23	2.03	8.56	91.44
619	+5 microns	26.90	26.90	74.90	25.10	97.300	2617.37	82.86	91.42	8.58
620	<5 microns	25.10	25.10	100.00	0.00	10.800	271.08	8.58	100.00	0.00
TOTAL		100.00				31.590	3158.96			

SAMPLE wt. g.	% LOSS
100.00	0.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
617	+75 microns	0.00	20.90	20.90	79.10	9.870	0.00	ERR	ERR	ERR
616	+38 microns	0.00	27.10	48.00	52.00	2.370	0.00	ERR	ERR	ERR
619	+5 microns	0.00	26.90	74.90	25.10	97.300	0.00	ERR	ERR	ERR
620	<5 microns	0.00	25.10	100.00	0.00	10.800	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940222-A-13-01-0F**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
627	+75 microns	1.40	1.40	1.40	98.60	6.190	8.67	0.40	0.40	99.60
614	+38 microns	4.10	4.10	5.50	94.50	8.110	33.25	1.52	1.92	98.08
626	+5 microns	15.70	15.70	21.20	78.80	30.100	472.57	21.59	23.51	76.49
625	<5 microns	74.40	74.40	95.60	4.40	22.500	1674.00	76.49	100.00	0.00
TOTAL		95.60				22.892	2188.49			

SAMPLE wt. g.	% LOSS
100.00	4.40

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
627	+75 microns	10.40	1.40	1.40	98.60	6.190	64.38	0.40	0.40	99.60
614	+38 microns	30.45	4.10	5.50	94.50	8.110	246.95	1.52	1.92	98.08
626	+5 microns	116.60	15.70	21.20	78.80	30.100	3509.66	21.59	23.51	76.49
625	<5 microns	552.55	74.40	95.60	4.40	22.500	12432.38	76.49	100.00	0.00
TOTAL		710.00				22.892	16253.36			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940222-A13-01-UF**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
622	+75 microns	15.10	15.10	15.10	84.90	2.380	35.94	0.62	0.62	99.38
623	+38 microns	28.00	28.00	43.10	56.90	8.570	239.96	4.17	4.79	95.21
624	+5 microns	28.50	28.50	71.60	28.40	181.000	5158.50	89.56	94.35	5.65
621	<5 microns	26.90	26.90	98.50	1.50	12.100	325.49	5.65	100.00	0.00
TOTAL		98.50				58.476	5759.89			

SAMPLE wt. g.	% LOSS
100.00	1.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
622	+75 microns	579.47	15.10	15.10	84.90	2.380	1379.14	0.62	0.62	99.38
623	+38 microns	1074.52	28.00	43.10	56.90	8.570	9208.64	4.17	4.79	95.21
624	+5 microns	1093.71	28.50	71.60	28.40	181.000	197961.51	89.56	94.35	5.65
621	<5 microns	1032.30	26.90	98.50	1.50	12.100	12490.83	5.65	100.00	0.00
TOTAL		3780.00				58.476	221040.12			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A52-1.2"FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
602	+2000 microns	4.30	4.30	4.30	95.70	6.090	26.19	0.28	0.28	99.72
600	+250 microns	42.70	42.70	47.00	53.00	11.600	495.32	5.27	5.55	94.45
603	+125 microns	19.00	19.00	66.00	34.00	19.100	362.90	3.86	9.41	90.59
604	+75 microns	14.50	14.50	80.50	19.50	104.000	1508.00	16.05	25.47	74.53
599	+38 microns	9.40	9.40	89.90	10.10	617.000	5799.80	61.74	87.21	12.79
601	+5 microns	6.60	6.60	96.50	3.50	113.000	745.80	7.94	95.15	4.85
596	<5 microns	2.40	2.40	98.90	1.10	190.000	456.00	4.85	100.00	0.00
TOTAL		98.90				94.985	9394.01			

SAMPLE wt. g.	% LOSS
100.00	1.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
602	+2000 microns	0.00	4.30	4.30	95.70	6.090	0.00	ERR	ERR	ERR
600	+250 microns	0.00	42.70	47.00	53.00	11.600	0.00	ERR	ERR	ERR
603	+125 microns	0.00	19.00	66.00	34.00	19.100	0.00	ERR	ERR	ERR
604	+75 microns	0.00	14.50	80.50	19.50	104.000	0.00	ERR	ERR	ERR
599	+38 microns	0.00	9.40	89.90	10.10	617.000	0.00	ERR	ERR	ERR
601	+5 microns	0.00	6.60	96.50	3.50	113.000	0.00	ERR	ERR	ERR
596	<5 microns	0.00	2.40	98.90	1.10	190.000	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A52+100 MESH HEAD**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
595	+2000 microns	9.20	9.20	9.20	90.80	2.240	20.61	0.49	0.49	99.51
590	+250 microns	57.90	57.90	67.10	32.90	8.790	508.94	12.12	12.61	87.39
591	+125 microns	26.40	26.40	93.50	6.50	108.000	2851.20	67.89	80.50	19.50
596	+75 microns	6.30	6.30	99.80	0.20	130.000	819.00	19.50	100.00	-0.00
	+38 microns		0.00	99.80	0.20		0.00	0.00	100.00	-0.00
	+5 microns		0.00	99.80	0.20		0.00	0.00	100.00	-0.00
	<5 microns		0.00	99.80	0.20		0.00	0.00	100.00	-0.00
TOTAL		99.80				42.082	4199.75			

SAMPLE wt. g.	% LOSS
100.00	0.20

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
595	+2000 microns	0.00	9.20	9.20	90.80	2.240	0.00	ERR	ERR	ERR
590	+250 microns	0.00	57.90	67.10	32.90	8.790	0.00	ERR	ERR	ERR
591	+125 microns	0.00	26.40	93.50	6.50	108.000	0.00	ERR	ERR	ERR
596	+75 microns	0.00	6.30	99.80	0.20	130.000	0.00	ERR	ERR	ERR
0	+38 microns	0.00	0.00	99.80	0.20	0.000	0.00	ERR	ERR	ERR
	+5 microns	0.00	0.00	99.80	0.20		0.00	ERR	ERR	ERR
	<5 microns	0.00	0.00	99.80	0.20		0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-A52-100 MESH FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
581	+125 microns	2.30	2.30	2.30	97.70	75.900	174.57	1.62	1.62	98.38
592	+75 microns	23.00	23.00	25.30	74.70	141.000	3243.00	30.06	31.67	68.33
594	+38 microns	24.30	24.30	49.60	50.40	71.100	1727.73	16.01	47.69	52.31
582	+5 microns	24.30	24.30	73.90	26.10	146.000	3547.80	32.88	80.57	19.43
580	<5 microns	24.10	24.10	98.00	2.00	87.000	2096.70	19.43	100.00	0.00
TOTAL		98.00				110.100	10789.80			

SAMPLE wt. g.	% LOSS
100.00	2.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
581	+125 microns	104.44	2.30	2.30	97.70	75.900	7927.00	1.62	1.62	98.38
592	+75 microns	1044.39	23.00	25.30	74.70	141.000	147258.99	30.06	31.67	68.33
594	+38 microns	1103.42	24.30	49.60	50.40	71.100	78453.16	16.01	47.69	52.31
582	+5 microns	1103.42	24.30	73.90	26.10	146.000	161099.32	32.88	80.57	19.43
580	<5 microns	1094.34	24.10	98.00	2.00	87.000	95207.58	19.43	100.00	0.00
TOTAL		4450.00				110.100	489946.05			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940223-A52-01-0F**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
583	+75 microns	4.70	4.70	4.70	95.30	194.000	911.80	12.43	12.43	87.57
606	+38 microns	8.70	8.70	13.40	86.60	118.000	1026.60	14.00	26.43	73.57
584	+5 microns	6.10	6.10	19.50	80.50	107.000	652.70	8.90	35.33	64.67
597	<5 microns	73.30	73.30	92.80	7.20	64.700	4742.51	64.67	100.00	0.00
TOTAL		92.80				79.026	7333.61			

SAMPLE wt. g.	% LOSS
100.00	7.20

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	0.00	0.00	100.00
583	+75 microns	30.39	4.70	4.70	95.30	194.000	5895.66	12.43	12.43	87.57
606	+38 microns	56.25	8.70	13.40	86.60	118.000	6637.50	14.00	26.43	73.57
584	+5 microns	39.44	6.10	19.50	80.50	107.000	4220.08	8.90	35.33	64.67
597	<5 microns	473.92	73.30	92.80	7.20	64.700	30662.62	64.67	100.00	-0.00
TOTAL		600.00				79.026	47415.86			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940223-A52-01-OF**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
583	+75 microns	4.70	4.70	4.70	95.30	194.000	911.80	12.43	12.43	87.57
606	+38 microns	8.70	8.70	13.40	86.60	118.000	1026.60	14.00	26.43	73.57
584	+5 microns	6.10	6.10	19.50	80.50	107.000	652.70	8.90	35.33	64.67
597	<5 microns	73.30	73.30	92.80	7.20	64.700	4742.51	64.67	100.00	0.00
TOTAL		92.80				79.026	7333.61			

SAMPLE wt. g.	% LOSS
100.00	7.20

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
583	+75 microns	0.00	4.70	4.70	95.30	194.000	0.00	ERR	ERR	ERR
606	+38 microns	0.00	8.70	13.40	86.60	118.000	0.00	ERR	ERR	ERR
584	+5 microns	0.00	6.10	19.50	80.50	107.000	0.00	ERR	ERR	ERR
597	<5 microns	0.00	73.30	92.80	7.20	64.700	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APT

SCREEN ANALYSIS DATA

Sample Name: **APT-940223-A52-01-UF**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
577	+125 microns	2.10	2.10	2.10	97.90	52.500	110.25	0.68	0.68	99.32
579	+75 microns	23.60	23.60	25.70	74.30	10.800	254.88	1.58	2.27	97.73
593	+38 microns	26.10	26.10	51.80	48.20	271.000	7073.10	43.94	46.21	53.79
576	+5 microns	31.70	31.70	83.50	16.50	247.000	7829.90	48.64	94.85	5.15
805	<5 microns	14.60	14.60	98.10	1.90	56.800	829.28	5.15	100.00	0.00
TOTAL		98.10				164.092	16097.41			

SAMPLE wt. g.	% LOSS
100.00	1.90

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.000	0.00	ERR	ERR	ERR
577	+125 microns	0.00	2.10	2.10	97.90	52.500	0.00	ERR	ERR	ERR
579	+75 microns	0.00	23.60	25.70	74.30	10.800	0.00	ERR	ERR	ERR
593	+38 microns	0.00	26.10	51.80	48.20	271.000	0.00	ERR	ERR	ERR
576	+5 microns	0.00	31.70	83.50	16.50	247.000	0.00	ERR	ERR	ERR
805	<5 microns	0.00	14.60	98.10	1.90	56.800	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

APPENDIX C

PLUTONIUM ANALYTICAL DATA AS A FUNCTION OF PROCESS STREAM AND PARTICLE SIZE: LESAT PROCESS

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 FEED MATERIAL**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
353	+2000 microns	57.20	22.88	22.88	77.12	12.10	692.12	1.49	1.49	98.51
349	+250 microns	40.10	16.04	38.92	61.08	23.20	930.32	2.00	3.49	96.51
348	+125 microns	26.80	10.72	49.64	50.36	56.60	1516.88	3.26	6.76	93.24
352	+75 microns	29.10	11.64	61.28	38.72	29.80	867.18	1.87	8.62	91.38
351	+38 microns	51.80	20.72	82.00	18.00	28.80	1491.84	3.21	11.83	88.17
350	+5 microns	39.10	15.64	97.64	2.36	913.00	35698.30	76.84	88.67	11.33
347	<5 microns	5.60	2.24	99.88	0.12	940.00	5264.00	11.33	100.00	0.00
TOTAL		249.70				186.07	46460.64			

SAMPLE wt. g.	% LOSS
250.00	0.12

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
353	+2000 microns	33781.90	22.88	22.88	77.12	12.10	408761.03	1.49	1.49	98.51
349	+250 microns	23682.77	16.04	38.92	61.08	23.20	549440.21	2.00	3.49	96.51
348	+125 microns	15827.88	10.72	49.64	50.36	56.60	895858.27	3.26	6.76	93.24
352	+75 microns	17186.25	11.64	61.28	38.72	29.80	512150.19	1.87	8.62	91.38
351	+38 microns	30592.70	20.72	82.00	18.00	28.80	881069.83	3.21	11.83	88.17
350	+5 microns	23092.18	15.64	97.64	2.36	913.00	21083155.78	76.84	88.67	11.33
347	<5 microns	3307.32	2.24	99.88	0.12	940.00	3108880.03	11.33	100.00	0.00
TOTAL		147471.00				186.07	27439315.34			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 HUTCH 1 TABLE FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
390	+250 microns	26.70	26.70	26.70	73.30	3.89	103.86	5.76	5.76	94.24
391	+125 microns	30.10	30.10	56.80	43.20	14.30	430.43	23.87	29.63	70.37
409	+75 microns	29.70	29.70	86.50	13.50	11.40	338.58	18.78	48.41	51.59
398	+38 microns	11.00	11.00	97.50	2.50	26.40	290.40	16.11	64.52	35.48
394	+5 microns	1.40	1.40	98.90	1.10	457.00	639.80	35.48	100.00	-0.00
	<5 microns		0.00	98.90	1.10		0.00	0.00	100.00	-0.00
TOTAL		98.90				18.23	1803.07			

SAMPLE wt. g.	% LOSS
100.00	1.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
390	+250 microns	7593.25	26.70	26.70	73.30	3.89	29537.73	5.76	5.76	94.24
391	+125 microns	8560.18	30.10	56.80	43.20	14.30	122410.55	23.87	29.63	70.37
409	+75 microns	8446.42	29.70	86.50	13.50	11.40	96289.21	18.78	48.41	51.59
398	+38 microns	3128.30	11.00	97.50	2.50	26.40	82587.23	16.11	64.52	35.48
394	+5 microns	398.15	1.40	98.90	1.10	457.00	181953.56	35.48	100.00	0.00
0	<5 microns	0.00	0.00	98.90	1.10	0.00	0.00	0.00	100.00	0.00
TOTAL		28126.30				18.23	512778.28			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 HUTCH 1 TABLE CONCENTRATE**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
369	+250 microns	16.10	16.10	16.10	83.90	3.53	56.83	0.48	0.48	99.52
399	+125 microns	30.20	30.20	46.30	53.70	11.80	356.36	3.01	3.50	96.50
368	+75 microns	37.70	37.70	84.00	16.00	16.30	614.51	5.20	8.69	91.31
392	+38 microns	15.20	15.20	99.20	0.80	507.00	7706.40	65.19	73.89	26.11
367	+5 microns	0.70	0.70	99.90	0.10	4410.00	3087.00	26.11	100.00	0.00
	<5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
TOTAL		99.90				118.33	11821.10			

SAMPLE wt. g.	% LOSS
100.00	0.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
369	+250 microns	365.51	16.10	16.10	83.90	3.53	1290.26	0.48	0.48	99.52
399	+125 microns	685.62	30.20	46.30	53.70	11.80	8090.34	3.01	3.50	96.50
368	+75 microns	855.89	37.70	84.00	16.00	16.30	13951.04	5.20	8.69	91.31
392	+38 microns	345.08	15.20	99.20	0.80	507.00	174956.11	65.19	73.89	26.11
367	+5 microns	15.89	0.70	99.90	0.10	4410.00	70083.24	26.11	100.00	0.00
0	<5 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
TOTAL		2268.00				118.33	268370.99			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 HUTCH 1 TABLE TAILS**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
393	+250 microns	25.30	25.30	25.30	74.70	15.80	399.74	25.50	25.50	74.50
397	+125 microns	33.20	33.20	58.50	41.50	20.20	670.64	42.78	68.29	31.71
396	+75 microns	29.80	29.80	88.30	11.70	12.40	369.52	23.57	91.86	8.14
395	+38 microns	11.00	11.00	99.30	0.70	11.60	127.60	8.14	100.00	0.00
	+5 microns		0.00	99.30	0.70		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.30	0.70		0.00	0.00	100.00	0.00
TOTAL		99.30				15.79	1567.50			

SAMPLE wt. g.	% LOSS
100.00	0.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
393	+250 microns	5835.05	25.30	25.30	74.70	15.80	92193.81	25.50	25.50	74.50
397	+125 microns	7657.06	33.20	58.50	41.50	20.20	154672.68	42.78	68.29	31.71
396	+75 microns	6872.91	29.80	88.30	11.70	12.40	85224.04	23.57	91.86	8.14
395	+38 microns	2536.98	11.00	99.30	0.70	11.60	29428.95	8.14	100.00	0.00
0	+5 microns	0.00	0.00	99.30	0.70	0.00	0.00	0.00	100.00	0.00
0	<5 microns	0.00	0.00	99.30	0.70	0.00	0.00	0.00	100.00	0.00
TOTAL		22902.00				15.79	361519.49			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 HUTCH 2 TABLE FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
410	+250 microns	20.90	20.90	20.90	79.10	13.70	286.33	8.61	8.61	91.39
405	+125 microns	24.10	24.10	45.00	55.00	16.50	397.65	11.96	20.57	79.43
404	+75 microns	34.30	34.30	79.30	20.70	13.70	469.91	14.13	34.70	65.30
411	+38 microns	15.90	15.90	95.20	4.80	13.70	217.83	6.55	41.25	58.75
472	+5 microns	4.40	4.40	99.60	0.40	444.00	1953.60	58.75	100.00	0.00
	<5 microns		0.00	99.60	0.40		0.00	0.00	100.00	0.00
TOTAL		99.60				33.39	3325.32			

SAMPLE wt. g.	% LOSS
100.00	0.40

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
410	+250 microns	980.26	20.90	20.90	79.10	13.70	13429.62	8.61	8.61	91.39
405	+125 microns	1130.35	24.10	45.00	55.00	16.50	18650.82	11.96	20.57	79.43
404	+75 microns	1608.76	34.30	79.30	20.70	13.70	22040.01	14.13	34.70	65.30
411	+38 microns	745.75	15.90	95.20	4.80	13.70	10216.80	6.55	41.25	58.75
472	+5 microns	206.37	4.40	99.60	0.40	444.00	91628.94	58.75	100.00	0.00
0	<5 microns	0.00	0.00	99.60	0.40	0.00	0.00	0.00	100.00	0.00
TOTAL		4671.50				33.39	155966.19			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 N27 HUTCH 2 TABLE CONCENTRATE**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
389	+250 microns	40.10	40.10	40.10	59.90	7.16	287.12	19.91	19.91	80.09
388	+125 microns	20.50	20.50	60.60	39.40	21.50	440.75	30.56	50.47	49.53
386	+75 microns	27.10	27.10	87.70	12.30	12.90	349.59	24.24	74.71	25.29
385	+38 microns	11.40	11.40	99.10	0.90	16.40	186.96	12.96	87.67	12.33
387	+5 microns	0.70	0.70	99.80	0.20	254.00	177.80	12.33	100.00	0.00
	<5 microns		0.00	99.80	0.20		0.00	0.00	100.00	0.00
TOTAL		99.80				14.45	1442.22			

SAMPLE wt. g.	% LOSS
100.00	0.20

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
389	+250 microns	109.29	40.10	40.10	59.90	7.16	782.52	19.91	19.91	80.09
388	+125 microns	55.87	20.50	60.60	39.40	21.50	1201.24	30.56	50.47	49.53
386	+75 microns	73.86	27.10	87.70	12.30	12.90	952.79	24.24	74.71	25.29
385	+38 microns	31.07	11.40	99.10	0.90	16.40	509.55	12.96	87.67	12.33
387	+5 microns	1.91	0.70	99.80	0.20	254.00	484.59	12.33	100.00	0.00
0	<5 microns	0.00	0.00	99.80	0.20	0.00	0.00	0.00	100.00	0.00
TOTAL		272.00				14.45	3930.69			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 HUTCH 2 TABLE TAILS**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
402	+250 microns	18.40	18.40	18.40	81.60	8.78	161.55	11.02	11.02	88.98
403	+125 microns	27.80	27.80	46.20	53.80	19.40	539.32	36.79	47.81	52.19
401	+75 microns	36.10	36.10	82.30	17.70	15.70	566.77	38.66	86.47	13.53
400	+38 microns	16.00	16.00	98.30	1.70	12.40	198.40	13.53	100.00	0.00
	+5 microns		0.00	98.30	1.70		0.00	0.00	100.00	0.00
	<5 microns		0.00	98.30	1.70		0.00	0.00	100.00	0.00
TOTAL		98.30				14.91	1466.04			

SAMPLE wt. g.	% LOSS
100.00	1.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
402	+250 microns	551.81	18.40	18.40	81.60	8.78	4844.92	11.02	11.02	88.98
403	+125 microns	833.72	27.80	46.20	53.80	19.40	16174.11	36.79	47.81	52.19
401	+75 microns	1082.63	36.10	82.30	17.70	15.70	16997.33	38.66	86.47	13.53
400	+38 microns	479.84	16.00	98.30	1.70	12.40	5949.98	13.53	100.00	-0.00
0	+5 microns	0.00	0.00	98.30	1.70	0.00	0.00	0.00	100.00	-0.00
0	<5 microns	0.00	0.00	98.30	1.70	0.00	0.00	0.00	100.00	-0.00
TOTAL		2948.00				14.91	43966.35			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 CLASSIFIER UNDERFLOW**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
433	+2000 microns	53.50	53.50	53.50	46.50	0.46	24.61	4.50	4.50	95.50
436	+250 microns	27.50	27.50	81.00	19.00	6.20	170.50	31.17	35.67	64.33
432	+125 microns	2.60	2.60	83.60	16.40	34.50	89.70	16.40	52.07	47.93
435	+75 microns	8.30	8.30	91.90	8.10	19.50	161.85	29.59	81.66	18.34
434	+38 microns	7.60	7.60	99.50	0.50	13.20	100.32	18.34	100.00	-0.00
	+5 microns		0.00	99.50	0.50		0.00	0.00	100.00	-0.00
	<5 microns		0.00	99.50	0.50		0.00	0.00	100.00	-0.00
TOTAL		99.50				5.50	546.98			

SAMPLE wt. g.	% LOSS
100.00	0.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
433	+2000 microns	15138.89	53.50	53.50	46.50	0.46	6963.89	4.50	4.50	95.50
436	+250 microns	7781.67	27.50	81.00	19.00	6.20	48246.36	31.17	35.67	64.33
432	+125 microns	735.72	2.60	83.60	16.40	34.50	25382.40	16.40	52.07	47.93
435	+75 microns	2348.65	8.30	91.90	8.10	19.50	45798.67	29.59	81.66	18.34
434	+38 microns	2150.57	7.60	99.50	0.50	13.20	28387.54	18.34	100.00	0.00
0	+5 microns	0.00	0.00	99.50	0.50	0.00	0.00	0.00	100.00	0.00
0	<5 microns	0.00	0.00	99.50	0.50	0.00	0.00	0.00	100.00	0.00
TOTAL		28155.50				5.50	154778.85			

LESAT

SCREEN ANALYSIS DATA

Sample Name: A-11 CLASSIFIER OVERFLOW/THICKENER UNDERFLOW

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
354	+125 microns	5.40	2.16	2.16	97.84	680.00	3672.00	2.77	2.77	97.23
358	+75 microns	12.00	4.80	6.96	93.04	165.00	1980.00	1.50	4.27	95.73
355	+38 microns	95.90	38.36	45.32	54.68	45.40	4353.86	3.29	7.56	92.44
356	+5 microns	109.40	43.76	89.08	10.92	997.00	109071.80	82.41	89.97	10.03
357	<5 microns	22.90	9.16	98.24	1.76	580.00	13282.00	10.03	100.00	-0.00
TOTAL		245.60				538.92	132359.66			

SAMPLE wt. g.	% LOSS
250.00	1.76

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
354	+125 microns	1586.76	2.16	2.16	97.84	680.00	1078993.88	2.77	2.77	97.23
358	+75 microns	3526.12	4.80	6.96	93.04	165.00	581810.42	1.50	4.27	95.73
355	+38 microns	28179.61	38.36	45.32	54.68	45.40	1279354.11	3.29	7.56	92.44
356	+5 microns	32146.50	43.76	89.08	10.92	997.00	32050055.63	82.41	89.97	10.03
357	<5 microns	6729.02	9.16	98.24	1.76	580.00	3902831.34	10.03	100.00	0.00
TOTAL		72168.00				538.92	38893045.37			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 CLASSIFIER CLEANOUT (SUMP)**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
414	+2000 microns	20.70	8.28	8.28	91.72	0.35	7.25	0.01	0.01	99.99
413	+250 microns	22.20	8.88	17.16	82.84	12.10	268.62	0.50	0.51	99.49
407	+125 microns	9.30	3.72	20.88	79.12	42.90	398.97	0.74	1.25	98.75
406	+75 microns	46.80	18.72	39.60	60.40	20.70	968.76	1.79	3.04	96.96
408	+38 microns	85.80	34.32	73.92	26.08	24.20	2076.36	3.84	6.88	93.12
437	+5 microns	49.00	19.60	93.52	6.48	860.00	42140.00	77.92	84.80	15.20
431	<5 microns	12.40	4.96	98.48	1.52	663.00	8221.20	15.20	100.00	0.00
TOTAL		246.20				219.66	54081.16			

SAMPLE wt. g.	% LOSS
250.00	1.52

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
414	+2000 microns	189.38	8.28	8.28	91.72	0.35	66.28	0.01	0.01	99.99
413	+250 microns	203.10	8.88	17.16	82.84	12.10	2457.51	0.50	0.51	99.49
407	+125 microns	85.08	3.72	20.88	79.12	42.90	3650.04	0.74	1.25	98.75
406	+75 microns	428.16	18.72	39.60	60.40	20.70	8862.86	1.79	3.04	96.96
408	+38 microns	784.95	34.32	73.92	26.08	24.20	18995.91	3.84	6.88	93.12
437	+5 microns	448.28	19.60	93.52	6.48	860.00	385524.52	77.92	84.80	15.20
431	<5 microns	113.44	4.96	98.48	1.52	663.00	75212.96	15.20	100.00	0.00
TOTAL		2252.40				219.66	494770.08			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 N-34 FALCON CONCENTRATOR CONCENTRATE**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
360	+75 microns	3.10	3.10	3.10	96.90	47.30	146.63	0.20	0.20	99.80
361	+38 microns	30.20	30.20	33.30	66.70	47.20	1425.44	1.96	2.16	97.84
359	+5 microns	54.70	54.70	88.00	12.00	1170.00	63999.00	87.95	90.11	9.89
364	<5 microns	9.60	9.60	97.60	2.40	750.00	7200.00	9.89	100.00	0.00
TOTAL		97.60				745.61	72771.07			

SAMPLE wt. g.	% LOSS
100.00	2.40

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
360	+75 microns	10.32	3.10	3.10	96.90	47.30	487.97	0.20	0.20	99.80
361	+38 microns	100.50	30.20	33.30	66.70	47.20	4743.68	1.96	2.16	97.84
359	+5 microns	182.03	54.70	88.00	12.00	1170.00	212980.28	87.95	90.11	9.89
364	<5 microns	31.95	9.60	97.60	2.40	750.00	23960.66	9.89	100.00	0.00
TOTAL		324.80				745.61	242172.58			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 N-34 FALCON CONCENTRATOR TAILS**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
362	+75 microns	3.30	4.24	4.24	95.76	106.00	349.80	2.22	2.22	97.78
363	+38 microns	24.80	31.88	36.12	63.88	36.00	892.80	5.66	7.88	92.12
365	+5 microns	30.50	39.20	75.32	24.68	197.00	6008.50	38.10	45.98	54.02
366	<5 microns	16.80	21.59	96.92	3.08	507.00	8517.60	54.02	100.00	0.00
TOTAL		75.40				209.13	15768.70			

SAMPLE wt. g.	% LOSS
77.80	3.08

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
362	+75 microns	161.19	4.24	4.24	95.76	106.00	17086.38	2.22	2.22	97.78
363	+38 microns	1211.38	31.88	36.12	63.88	36.00	43609.85	5.66	7.88	92.12
365	+5 microns	1489.81	39.20	75.32	24.68	197.00	293492.12	38.10	45.98	54.02
366	<5 microns	820.62	21.59	96.92	3.08	507.00	416052.00	54.02	100.00	0.00
TOTAL		3683.00				209.13	770240.35			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 N-35 FALCON CONCENTRATOR CONCENTRATE**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
462	+75 microns	2.30	2.30	2.30	97.70	217.00	499.10	0.73	0.73	99.27
463	+38 microns	28.80	28.80	31.10	68.90	29.20	840.96	1.22	1.95	98.05
468	+5 microns	52.60	52.60	83.70	16.30	1070.00	56282.00	81.80	83.75	16.25
469	<5 microns	13.70	13.70	97.40	2.60	816.00	11179.20	16.25	100.00	0.00
TOTAL		97.40				706.38	68801.26			

SAMPLE wt. g.	% LOSS
100.00	2.60

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
462	+75 microns	8.74	2.30	2.30	97.70	217.00	1897.50	0.73	0.73	99.27
463	+38 microns	109.49	28.80	31.10	68.90	29.20	3197.20	1.22	1.95	98.05
468	+5 microns	199.98	52.60	83.70	16.30	1070.00	213975.61	81.80	83.75	16.25
469	<5 microns	52.09	13.70	97.40	2.60	816.00	42501.62	16.25	100.00	0.00
TOTAL		370.30				706.38	261571.94			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 N-35 FALCON CONCENTRATOR TAILS**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
470	+75 microns	1.70	3.01	3.01	96.99	45.30	77.01	0.46	0.46	99.54
481	+38 microns	18.20	32.27	35.28	64.72	261.00	4750.20	28.41	28.87	71.13
480	+5 microns	20.20	35.82	71.10	28.90	436.00	8807.20	52.67	81.55	18.45
479	<5 microns	15.20	26.95	98.05	1.95	203.00	3085.60	18.45	100.00	0.00
TOTAL		55.30				302.35	16720.01			

SAMPLE wt. g.	% LOSS
56.40	1.95

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
470	+75 microns	104.26	3.01	3.01	96.99	45.30	4722.96	0.46	0.46	99.54
481	+38 microns	1116.19	32.27	35.28	64.72	261.00	291325.56	28.41	28.87	71.13
480	+5 microns	1238.85	35.82	71.10	28.90	436.00	540137.77	52.67	81.55	18.45
479	<5 microns	932.20	26.95	98.05	1.95	203.00	189237.11	18.45	100.00	0.00
TOTAL		3391.50				302.35	1025423.40			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 N-35 CYCLONE UNDERFLOW 15 psi**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
473	+75 microns	3.10	3.10	3.10	96.90	105.00	325.50	1.21	1.21	98.79
474	+38 microns	35.00	35.00	38.10	61.90	43.40	1519.00	5.67	6.88	93.12
476	+5 microns	46.90	46.90	85.00	15.00	532.00	24950.80	93.11	100.00	0.00
475	<5 microns	13.40	13.40	98.40	1.60	0.08	1.11	0.00	100.00	0.00
TOTAL		98.40				272.32	26796.41			

SAMPLE wt. g.	% LOSS
100.00	1.60

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
473	+75 microns	4.30	3.10	3.10	96.90	105.00	451.53	1.21	1.21	98.79
474	+38 microns	48.55	35.00	38.10	61.90	43.40	2107.15	5.67	6.88	93.12
476	+5 microns	65.06	46.90	85.00	15.00	532.00	34611.63	93.11	100.00	0.00
475	<5 microns	18.59	13.40	98.40	1.60	0.08	1.54	0.00	100.00	-0.00
TOTAL		136.50				272.32	37171.85			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 N-35 CYCLONE OVERFLOW 15 psi**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+75 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+38 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
343	+5 microns	11.40	43.02	43.02	56.98	498.00	5677.20	42.02	42.02	57.98
344	<5 microns	14.40	54.34	97.36	2.64	544.00	7833.60	57.98	100.00	-0.00
TOTAL		25.80				523.67	13510.80			

SAMPLE wt. g.	% LOSS
26.50	2.64

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+38 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
343	+5 microns	11.71	43.02	43.02	56.98	498.00	5831.23	42.02	42.02	57.98
344	<5 microns	14.79	54.34	97.36	2.64	544.00	8046.14	57.98	100.00	0.00
TOTAL		26.50				523.67	13877.37			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 N-35 CYCLONE UNDERFLOW 30 psi**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
471	+75 microns	3.40	3.40	3.40	96.60	115.00	391.00	0.78	0.78	99.22
472	+38 microns	33.60	33.60	37.00	63.00	611.00	20529.60	40.81	41.59	58.41
477	+5 microns	48.40	48.40	85.40	14.60	548.00	26523.20	52.72	94.31	5.69
478	<5 microns	12.50	12.50	97.90	2.10	229.00	2862.50	5.69	100.00	0.00
TOTAL		97.90				513.85	50306.30			

SAMPLE wt. g.	% LOSS
100.00	2.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
471	+75 microns	4.82	3.40	3.40	96.60	115.00	554.75	0.78	0.78	99.22
472	+38 microns	47.67	33.60	37.00	63.00	611.00	29127.29	40.81	41.59	58.41
477	+5 microns	68.67	48.40	85.40	14.60	548.00	37630.98	52.72	94.31	5.69
478	<5 microns	17.73	12.50	97.90	2.10	229.00	4061.30	5.69	100.00	0.00
TOTAL		138.90				513.85	71374.31			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-11 N-35 CYCLONE OVERFLOW 30 psi**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+75 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+38 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
345	+5 microns	8.70	35.37	35.37	64.63	679.00	5907.30	45.89	45.89	54.11
346	<5 microns	14.60	59.35	94.72	5.28	477.00	6964.20	54.11	100.00	0.00
TOTAL		23.30				552.42	12871.50			

SAMPLE wt. g.	% LOSS
24.60	5.28

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+38 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
345	+5 microns	9.19	35.37	35.37	64.63	679.00	6236.89	45.89	45.89	54.11
346	<5 microns	15.41	59.35	94.72	5.28	477.00	7352.76	54.11	100.00	0.00
TOTAL		24.60				552.42	13589.65			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-13 FEED MATERIAL**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
460	+2000 microns	14.30	14.30	14.30	85.70	0.62	8.87	0.43	0.43	99.57
459	+250 microns	17.20	17.20	31.50	68.50	2.11	36.29	1.76	2.18	97.82
454	+125 microns	15.60	15.60	47.10	52.90	2.10	32.76	1.58	3.77	96.23
458	+75 microns	16.00	16.00	63.10	36.90	3.57	57.12	2.76	6.53	93.47
455	+38 microns	17.30	17.30	80.40	19.60	44.80	775.04	37.49	44.02	55.98
457	+5 microns	11.70	11.70	92.10	7.90	91.90	1075.23	52.01	96.03	3.97
456	<5 microns	7.40	7.40	99.50	0.50	11.10	82.14	3.97	100.00	0.00
TOTAL		99.50				20.78	2067.45			

SAMPLE wt. g.	% LOSS
100.00	0.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
460	+2000 microns	17879.96	14.30	14.30	85.70	0.62	11085.57	0.43	0.43	99.57
459	+250 microns	21505.96	17.20	31.50	68.50	2.11	45377.58	1.76	2.18	97.82
454	+125 microns	19505.41	15.60	47.10	52.90	2.10	40961.36	1.58	3.77	96.23
458	+75 microns	20005.55	16.00	63.10	36.90	3.57	71419.81	2.76	6.53	93.47
455	+38 microns	21631.00	17.30	80.40	19.60	44.80	969068.73	37.49	44.02	55.98
457	+5 microns	14629.06	11.70	92.10	7.90	91.90	1344410.32	52.01	96.03	3.97
456	<5 microns	9252.57	7.40	99.50	0.50	11.10	102703.48	3.97	100.00	0.00
TOTAL		124409.50				20.78	2585026.85			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-13 N-37 THICKENER UNDERFLOW**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
486	+125 microns	3.40	3.40	3.40	96.60	1.52	5.17	0.01	0.01	99.99
485	+75 microns	24.50	24.50	27.90	72.10	65.50	1604.75	3.27	3.28	96.72
487	+38 microns	33.90	33.90	61.80	38.20	6.98	236.62	0.48	3.76	96.24
492	+5 microns	33.80	33.80	95.60	4.40	1370.00	46306.00	94.35	98.12	1.88
491	<5 microns	3.70	3.70	99.30	0.70	250.00	925.00	1.88	100.00	-0.00
TOTAL		99.30				494.24	49077.54			

SAMPLE wt. g.	% LOSS
100.00	0.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
486	+125 microns	1135.02	3.40	3.40	96.60	1.52	1725.23	0.01	0.01	99.99
485	+75 microns	8178.83	24.50	27.90	72.10	65.50	535713.39	3.27	3.28	96.72
487	+38 microns	11316.83	33.90	61.80	38.20	6.98	78991.48	0.48	3.76	96.24
492	+5 microns	11283.45	33.80	95.60	4.40	1370.00	15458323.12	94.35	98.12	1.88
491	<5 microns	1235.17	3.70	99.30	0.70	250.00	308792.57	1.88	100.00	0.00
TOTAL		33149.30				494.24	16383545.79			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-13 N-37 CLASSIFIER UNDERFLOW**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
443	+2000 microns	16.20	16.20	16.20	83.80	1.85	29.97	5.90	5.90	94.10
445	+250 microns	67.50	67.50	83.70	16.30	6.90	465.75	91.64	97.54	2.46
444	+125 microns	7.90	7.90	91.60	8.40	0.59	4.66	0.92	98.46	1.54
446	+75 microns	8.80	8.80	100.40	-0.40	0.89	7.83	1.54	100.00	-0.00
	+38 microns		0.00	100.40	-0.40		0.00	0.00	100.00	-0.00
	+5 microns		0.00	100.40	-0.40		0.00	0.00	100.00	-0.00
	<5 microns		0.00	100.40	-0.40		0.00	0.00	100.00	-0.00
TOTAL		100.40				5.06	508.21			

SAMPLE wt. g.	% LOSS
100.00	-0.40

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
443	+2000 microns	2049.06	16.20	16.20	83.80	1.85	3790.76	5.90	5.90	94.10
445	+250 microns	8537.74	67.50	83.70	16.30	6.90	58910.42	91.64	97.54	2.46
444	+125 microns	999.23	7.90	91.60	8.40	0.59	589.55	0.92	98.46	1.54
446	+75 microns	1113.07	8.80	100.40	-0.40	0.89	990.63	1.54	100.00	-0.00
0	+38 microns	0.00	0.00	100.40	-0.40	0.00	0.00	0.00	100.00	-0.00
0	+5 microns	0.00	0.00	100.40	-0.40	0.00	0.00	0.00	100.00	-0.00
0	<5 microns	0.00	0.00	100.40	-0.40	0.00	0.00	0.00	100.00	-0.00
TOTAL		12699.10				5.06	64281.35			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-13 N-40 FALCON CONCENTRATOR CONCENTRATE**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
482	+75 microns	16.60	16.60	16.60	83.40	45.30	751.98	0.33	0.33	99.67
483	+38 microns	36.30	36.30	52.90	47.10	4.47	162.26	0.07	0.41	99.59
489	+5 microns	40.50	40.50	93.40	6.60	5490.00	222345.00	98.83	99.24	0.76
494	<5 microns	4.90	4.90	98.30	1.70	350.00	1715.00	0.76	100.00	0.00
TOTAL		98.30				2288.65	224974.24			

SAMPLE wt. g.	% LOSS
100.00	1.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
482	+75 microns	64.78	16.60	16.60	83.40	45.30	2934.48	0.33	0.33	99.67
483	+38 microns	141.65	36.30	52.90	47.10	4.47	633.20	0.07	0.41	99.59
489	+5 microns	158.04	40.50	93.40	6.60	5490.00	867665.74	98.83	99.24	0.76
494	<5 microns	19.12	4.90	98.30	1.70	350.00	6692.51	0.76	100.00	0.00
TOTAL		383.60				2288.65	877925.93			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-13 N-40 FALCON CONCENTRATOR TAILS**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
484	+75 microns	1.20	4.82	4.82	95.18	0.91	1.09	0.00	0.00	100.00
485	+38 microns	8.40	33.73	38.55	61.45	2.77	23.27	0.08	0.08	99.92
490	+5 microns	12.10	48.59	87.15	12.85	2380.00	28798.00	97.92	98.00	2.00
493	<5 microns	2.50	10.04	97.19	2.81	235.00	587.50	2.00	100.00	0.00
TOTAL		24.20				1215.28	29409.86			

SAMPLE wt. g.	% LOSS
24.90	2.81

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
484	+75 microns	55.36	4.82	4.82	95.18	0.91	50.38	0.00	0.00	100.00
485	+38 microns	387.51	33.73	38.55	61.45	2.77	1073.40	0.08	0.08	99.92
490	+5 microns	558.20	48.59	87.15	12.85	2380.00	1328516.00	97.92	98.00	2.00
493	<5 microns	115.33	10.04	97.19	2.81	235.00	27102.69	2.00	100.00	0.00
TOTAL		1116.40				1215.28	1356742.47			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-52 N-41 FEED MATERIAL**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
372	+2000 microns	19.50	7.80	7.80	92.20	5.72	111.54	0.51	0.51	99.49
373	+250 microns	96.70	38.68	46.48	53.52	5.17	499.94	2.28	2.78	97.22
371	+125 microns	44.40	17.76	64.24	35.76	163.00	7237.20	32.96	35.74	64.26
375	+75 microns	32.80	13.12	77.36	22.64	130.00	4264.00	19.42	55.16	44.84
378	+38 microns	24.40	9.76	87.12	12.88	256.00	6246.40	28.44	83.60	16.40
382	+5 microns	20.30	8.12	95.24	4.76	146.00	2963.80	13.50	97.10	2.90
370	<5 microns	6.40	2.56	97.80	2.20	99.50	636.80	2.90	100.00	0.00
TOTAL		244.50				89.81	21959.68			

SAMPLE wt. g.	% LOSS
250.00	2.20

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
372	+2000 microns	11613.25	7.80	7.80	92.20	5.72	66427.80	0.51	0.51	99.49
373	+250 microns	57589.81	38.68	46.48	53.52	5.17	297739.34	2.28	2.78	97.22
371	+125 microns	26442.48	17.76	64.24	35.76	163.00	4310124.08	32.96	35.74	64.26
375	+75 microns	19534.08	13.12	77.36	22.64	130.00	2539430.87	19.42	55.16	44.84
378	+38 microns	14531.45	9.76	87.12	12.88	256.00	3720051.82	28.44	83.60	16.40
382	+5 microns	12089.69	8.12	95.24	4.76	146.00	1765095.03	13.50	97.10	2.90
370	<5 microns	3811.53	2.56	97.80	2.20	99.50	379247.09	2.90	100.00	-0.00
TOTAL		145612.30				89.81	13078116.02			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-52 N-41 THICKENER UNDERFLOW**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
381	+250 microns	8.90	8.90	8.90	91.10	5.06	45.03	0.39	0.39	99.61
380	+125 microns	6.80	6.80	15.70	84.30	177.00	1203.60	10.34	10.73	89.27
383	+75 microns	20.20	20.20	35.90	64.10	99.50	2009.90	17.27	28.00	72.00
384	+38 microns	28.40	28.40	64.30	35.70	86.60	2459.44	21.13	49.13	50.87
377	+5 microns	28.30	28.30	92.60	7.40	181.00	5122.30	44.02	93.15	6.85
418	<5 microns	6.70	6.70	99.30	0.70	119.00	797.30	6.85	100.00	0.00
TOTAL		99.30				117.20	11637.57			

SAMPLE wt. g.	% LOSS
100.00	0.70

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
381	+250 microns	2728.87	8.90	8.90	91.10	5.06	13808.07	0.39	0.39	99.61
380	+125 microns	2084.98	6.80	15.70	84.30	177.00	369040.97	10.34	10.73	89.27
383	+75 microns	6193.61	20.20	35.90	64.10	99.50	616264.08	17.27	28.00	72.00
384	+38 microns	8707.85	28.40	64.30	35.70	86.60	754099.47	21.13	49.13	50.87
377	+5 microns	8677.18	28.30	92.60	7.40	181.00	1570570.43	44.02	93.15	6.85
418	<5 microns	2054.32	6.70	99.30	0.70	119.00	244463.58	6.85	100.00	-0.00
TOTAL		30446.80				117.20	3568246.61			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-52 N-41 CLASSIFIER UNDERFLOW**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
379	+2000 microns	14.30	14.13	14.13	85.87	2.14	30.60	5.35	5.35	94.65
374	+250 microns	84.50	83.50	97.63	2.37	3.05	257.73	45.09	50.45	49.55
376	+125 microns	2.40	2.37	100.00	0.00	118.00	283.20	49.55	100.00	0.00
	+75 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
	+38 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
	+5 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
	<5 microns		0.00	100.00	0.00		0.00	0.00	100.00	0.00
TOTAL		101.20				5.65	571.53			

SAMPLE wt. g.	% LOSS
101.20	-0.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
379	+2000 microns	3041.75	14.13	14.13	85.87	2.14	6509.34	5.35	5.35	94.65
374	+250 microns	17973.95	83.50	97.63	2.37	3.05	54820.55	45.09	50.45	49.55
376	+125 microns	510.50	2.37	100.00	0.00	118.00	60239.33	49.55	100.00	0.00
0	+75 microns	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00	0.00
0	+38 microns	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00	0.00
0	+5 microns	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00	0.00
0	<5 microns	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00	0.00
TOTAL		21526.20				5.65	121569.21			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-52 N-41 CLASSIFIER CLEANOUT (SUMP)**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
449	+2000 microns	6.60	6.60	6.60	93.40	3.15	20.79	0.02	0.02	99.98
448	+250 microns	22.20	22.20	28.80	71.20	4660.00	103452.00	95.01	95.03	4.97
447	+125 microns	15.10	15.10	43.90	56.10	16.80	253.68	0.23	95.26	4.74
450	+75 microns	24.20	24.20	68.10	31.90	59.00	1427.80	1.31	96.58	3.42
451	+38 microns	22.40	22.40	90.50	9.50	44.70	1001.28	0.92	97.50	2.50
452	+5 microns	7.90	7.90	98.40	1.60	312.00	2464.80	2.26	99.76	0.24
464	<5 microns	1.50	1.50	99.90	0.10	175.00	262.50	0.24	100.00	0.00
TOTAL		99.90				1089.92	108882.85			

SAMPLE wt. g.	% LOSS
100.00	0.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
449	+2000 microns	174.77	6.60	6.60	93.40	3.15	550.53	0.02	0.02	99.98
448	+250 microns	587.87	22.20	28.80	71.20	4660.00	2739458.67	95.01	95.03	4.97
447	+125 microns	399.86	15.10	43.90	56.10	16.80	6717.57	0.23	95.26	4.74
450	+75 microns	640.83	24.20	68.10	31.90	59.00	37808.83	1.31	96.58	3.42
451	+38 microns	593.16	22.40	90.50	9.50	44.70	26514.38	0.92	97.50	2.50
452	+5 microns	209.20	7.90	98.40	1.60	312.00	65269.09	2.26	99.76	0.24
464	<5 microns	39.72	1.50	99.90	0.10	175.00	6951.13	0.24	100.00	0.00
TOTAL		2645.40				1089.92	2883270.18			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-52 N-41 HUTCH 1 TABLE FEED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
420	+250 microns	48.90	48.90	48.90	51.10	5.54	270.91	4.02	4.02	95.98
419	+125 microns	31.40	31.40	80.30	19.70	51.40	1613.96	23.96	27.98	72.02
415	+75 microns	14.60	14.60	94.90	5.10	229.00	3343.40	49.63	77.60	22.40
438	+38 microns	4.60	4.60	99.50	0.50	328.00	1508.80	22.40	100.00	0.00
	+5 microns		0.00	99.50	0.50		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.50	0.50		0.00	0.00	100.00	0.00
TOTAL		99.50				67.71	6737.07			

SAMPLE wt. g.	% LOSS
100.00	0.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
420	+250 microns	19588.06	48.90	48.90	51.10	5.54	108517.86	4.02	4.02	95.98
419	+125 microns	12578.02	31.40	80.30	19.70	51.40	646510.20	23.96	27.98	72.02
415	+75 microns	5848.38	14.60	94.90	5.10	229.00	1339278.67	49.63	77.60	22.40
438	+38 microns	1842.64	4.60	99.50	0.50	328.00	604385.85	22.40	100.00	0.00
0	+5 microns	0.00	0.00	99.50	0.50	0.00	0.00	0.00	100.00	0.00
0	<5 microns	0.00	0.00	99.50	0.50	0.00	0.00	0.00	100.00	0.00
TOTAL		39857.10				67.71	2698692.60			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-52 N-42 HUTCH 1 TABLE CONCENTRATES**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
426	+250 microns	16.10	16.10	16.10	83.90	2.27	36.55	0.04	0.04	99.96
425	+125 microns	40.20	40.20	56.30	43.70	13.00	522.60	0.63	0.68	99.32
424	+75 microns	33.80	33.80	90.10	9.90	2000.00	67600.00	81.69	82.37	17.63
423	+38 microns	9.60	9.60	99.70	0.30	1520.00	14592.00	17.63	100.00	0.00
	+5 microns		0.00	99.70	0.30		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.70	0.30		0.00	0.00	100.00	0.00
TOTAL		99.70				830.00	82751.15			

SAMPLE wt. g.	% LOSS
100.00	0.30

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
426	+250 microns	582.31	16.10	16.10	83.90	2.27	1321.85	0.04	0.04	99.96
425	+125 microns	1453.97	40.20	56.30	43.70	13.00	18901.66	0.63	0.68	99.32
424	+75 microns	1222.50	33.80	90.10	9.90	2000.00	2444990.97	81.69	82.37	17.63
423	+38 microns	347.22	9.60	99.70	0.30	1520.00	527770.83	17.63	100.00	-0.00
0	+5 microns	0.00	0.00	99.70	0.30	0.00	0.00	0.00	100.00	-0.00
0	<5 microns	0.00	0.00	99.70	0.30	0.00	0.00	0.00	100.00	-0.00
TOTAL		3606.00				830.00	2992985.32			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-52 N-42 HUTCH 1 TABLE TAILS**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
422	+250 microns	48.30	48.30	48.30	51.70	6.62	319.75	2.88	2.88	97.12
421	+125 microns	34.20	34.20	82.50	17.50	205.00	7011.00	63.15	66.03	33.97
417	+75 microns	14.30	14.30	96.80	3.20	168.00	2402.40	21.64	87.67	12.33
416	+38 microns	2.70	2.70	99.50	0.50	507.00	1368.90	12.33	100.00	0.00
	+5 microns		0.00	99.50	0.50		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.50	0.50		0.00	0.00	100.00	0.00
TOTAL		99.50				111.58	11102.05			

SAMPLE wt. g.	% LOSS
100.00	0.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
422	+250 microns	17597.27	48.30	48.30	51.70	6.62	116493.91	2.88	2.88	97.12
421	+125 microns	12460.18	34.20	82.50	17.50	205.00	2554336.30	63.15	66.03	33.97
417	+75 microns	5209.96	14.30	96.80	3.20	168.00	875272.79	21.64	87.67	12.33
416	+38 microns	983.70	2.70	99.50	0.50	507.00	498734.98	12.33	100.00	0.00
0	+5 microns	0.00	0.00	99.50	0.50	0.00	0.00	0.00	100.00	0.00
0	<5 microns	0.00	0.00	99.50	0.50	0.00	0.00	0.00	100.00	0.00
TOTAL		36251.10				111.58	4044837.99			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-52 N-43 HUTCH 2 TABLE CONCENTRATES**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
427	+250 microns	21.20	21.20	21.20	78.80	2.70	57.24	0.15	0.15	99.85
430	+125 microns	35.80	35.80	57.00	43.00	3.63	129.95	0.35	0.50	99.50
429	+75 microns	34.20	34.20	91.20	8.80	164.00	5608.80	15.04	15.54	84.46
428	+38 microns	8.70	8.70	99.90	0.10	3620.00	31494.00	84.46	100.00	0.00
	+5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
TOTAL		99.90				373.27	37289.99			

SAMPLE wt. g.	% LOSS
100.00	0.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
427	+250 microns	146.00	21.20	21.20	78.80	2.70	394.21	0.15	0.15	99.85
430	+125 microns	246.55	35.80	57.00	43.00	3.63	894.98	0.35	0.50	99.50
429	+75 microns	235.53	34.20	91.20	8.80	164.00	38627.17	15.04	15.54	84.46
428	+38 microns	59.92	8.70	99.90	0.10	3620.00	216895.62	84.46	100.00	0.00
0	+5 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
0	<5 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
TOTAL		688.00				373.27	256811.97			

LESAT

SCREEN ANALYSIS DATA

Sample Name: **A-52 N-43 HUTCH 2 TABLE TAILS**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
465	+250 microns	43.50	43.50	43.50	56.50	4.60	200.10	2.53	2.53	97.47
466	+125 microns	38.10	38.10	81.60	18.40	85.40	3253.74	41.21	43.75	56.25
467	+75 microns	14.90	14.90	96.50	3.50	230.00	3427.00	43.41	87.15	12.85
453	+38 microns	2.30	2.30	98.80	1.20	441.00	1014.30	12.85	100.00	0.00
	+5 microns		0.00	98.80	1.20		0.00	0.00	100.00	0.00
	<5 microns		0.00	98.80	1.20		0.00	0.00	100.00	0.00
TOTAL		98.80				79.91	7895.14			

SAMPLE wt. g.	% LOSS
100.00	1.20

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
465	+250 microns	4633.72	43.50	43.50	56.50	4.60	21315.11	2.53	2.53	97.47
466	+125 microns	4058.50	38.10	81.60	18.40	85.40	346595.76	41.21	43.75	56.25
467	+75 microns	1587.18	14.90	96.50	3.50	230.00	365051.81	43.41	87.15	12.85
453	+38 microns	245.00	2.30	98.80	1.20	441.00	108045.54	12.85	100.00	0.00
0	+5 microns	0.00	0.00	98.80	1.20	0.00	0.00	0.00	100.00	0.00
0	<5 microns	0.00	0.00	98.80	1.20	0.00	0.00	0.00	100.00	0.00
TOTAL		10524.40				79.91	841008.21			

APPENDIX D

PLUTONIUM ANALYTICAL DATA AS A FUNCTION OF PROCESS STREAM AND PARTICLE SIZE: NRT PROCESS

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT UNPROCESSED**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns	45.00	18.00	18.00	82.00	29.29	1318.05	6.78	6.78	93.22
	+250 microns	32.40	12.96	30.96	69.04	0.07	2.14	0.01	6.79	93.21
	+125 microns	26.90	10.76	41.72	58.28	25.87	695.90	3.58	10.36	89.64
	+75 microns	30.90	12.36	54.08	45.92	17.64	545.08	2.80	13.17	86.83
	+38 microns	51.30	20.52	74.60	25.40	15.81	811.05	4.17	17.34	82.66
	+5 microns	47.70	19.08	93.68	6.32	265.37	12658.15	65.07	82.41	17.59
	<5 microns	16.20	6.48	100.16	-0.16	211.26	3422.41	17.59	100.00	0.00
TOTAL		250.40				77.69	19452.78			

SAMPLE wt. g.	% LOSS
250.00	-0.16

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	6081.81	18.00	18.00	82.00	29.29	178136.25	6.78	6.78	93.22
0	+250 microns	4378.90	12.96	30.96	69.04	0.07	289.01	0.01	6.79	93.21
0	+125 microns	3635.57	10.76	41.72	58.28	25.87	94052.24	3.58	10.36	89.64
0	+75 microns	4176.18	12.36	54.08	45.92	17.64	73667.76	2.80	13.17	86.83
0	+38 microns	6933.26	20.52	74.60	25.40	15.81	109614.91	4.17	17.34	82.66
0	+5 microns	6446.72	19.08	93.68	6.32	265.37	1710766.02	65.07	82.41	17.59
0	<5 microns	2189.45	6.48	100.16	-0.16	211.26	462543.63	17.59	100.00	0.00
TOTAL		33841.90				77.69	2629069.82			

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT +4 MESH**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns	99.90	99.90	99.90	0.10	68.85	6878.12	100.00	100.00	0.00
	+250 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	+125 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	+75 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	+38 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	+5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
	<5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
TOTAL		99.90				68.85	6878.12			

SAMPLE wt. g.	% LOSS
100.00	0.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	2933.90	99.90	99.90	0.10	68.85	201999.02	100.00	100.00	0.00
0	+250 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
0	+125 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
0	+75 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
0	+38 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
0	+5 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
0	<5 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
TOTAL		2933.90				68.85	201999.02			

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT 4 TO 10 MESH**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns	59.20	59.20	59.20	40.80	6.23	368.82	33.53	33.53	66.47
	+250 microns	15.90	15.90	75.10	24.90	0.00	0.00	0.00	33.53	66.47
	+125 microns	4.10	4.10	79.20	20.80	0.00	0.00	0.00	33.53	66.47
	+75 microns	19.60	19.60	98.80	1.20	37.31	731.28	66.47	100.00	0.00
	+38 microns		0.00	98.80	1.20		0.00	0.00	100.00	0.00
	+5 microns		0.00	98.80	1.20		0.00	0.00	100.00	0.00
	<5 microns		0.00	98.80	1.20		0.00	0.00	100.00	0.00
TOTAL		98.80				11.13	1100.09			

SAMPLE wt. g.	% LOSS
100.00	1.20

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	2022.39	59.20	59.20	40.80	6.23	12599.47	33.53	33.53	66.47
0	+250 microns	543.17	15.90	75.10	24.90	0.00	0.00	0.00	33.53	66.47
0	+125 microns	140.06	4.10	79.20	20.80	0.00	0.00	0.00	33.53	66.47
0	+75 microns	669.57	19.60	98.80	1.20	37.31	24981.81	66.47	100.00	-0.00
0	+38 microns	0.00	0.00	98.80	1.20	0.00	0.00	0.00	100.00	-0.00
0	+5 microns	0.00	0.00	98.80	1.20	0.00	0.00	0.00	100.00	-0.00
0	<5 microns	0.00	0.00	98.80	1.20	0.00	0.00	0.00	100.00	-0.00
TOTAL		3375.20				11.13	37581.28			

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT 10 TO 20 MESH**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns	52.90	52.90	52.90	47.10	6.18	326.92	18.24	18.24	81.76
	+125 microns	7.40	7.40	60.30	39.70	19.77	146.30	8.16	26.40	73.60
	+75 microns	8.60	8.60	68.90	31.10	1.89	16.25	0.91	27.31	72.69
	+38 microns	9.20	9.20	78.10	21.90	1.78	16.38	0.91	28.22	71.78
	+5 microns	23.00	23.00	101.10	-1.10	55.93	1286.39	71.78	100.00	0.00
	<5 microns		0.00	101.10	-1.10		0.00	0.00	100.00	0.00
TOTAL		101.10				17.73	1792.24			

SAMPLE wt. g.	% LOSS
100.00	-1.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	142.37	52.90	52.90	47.10	6.18	879.88	18.24	18.24	81.76
0	+125 microns	19.92	7.40	60.30	39.70	19.77	393.75	8.16	26.40	73.60
0	+75 microns	23.15	8.60	68.90	31.10	1.89	43.75	0.91	27.31	72.69
0	+38 microns	24.76	9.20	78.10	21.90	1.78	44.07	0.91	28.22	71.78
0	+5 microns	61.90	23.00	101.10	-1.10	55.93	3462.18	71.78	100.00	0.00
0	<5 microns	0.00	0.00	101.10	-1.10	0.00	0.00	0.00	100.00	0.00
TOTAL		272.10				17.73	4823.63			

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT 20 TO 35 MESH**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns	63.80	63.80	63.80	36.20	11.45	730.51	18.08	18.08	81.92
	+125 microns	7.30	7.30	71.10	28.90	0.00	0.00	0.00	18.08	81.92
	+75 microns	5.10	5.10	76.20	23.80	0.00	0.00	0.00	18.08	81.92
	+38 microns	6.20	6.20	82.40	17.60	70.12	434.74	10.76	28.85	71.15
	+5 microns	17.50	17.50	99.90	0.10	164.24	2874.20	71.15	100.00	0.00
	<5 microns		0.00	99.90	0.10		0.00	0.00	100.00	0.00
TOTAL		99.90				40.43	4039.45			

SAMPLE wt. g.	% LOSS
100.00	0.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	1423.72	63.80	63.80	36.20	11.45	16301.56	18.08	18.08	81.92
0	+125 microns	162.90	7.30	71.10	28.90	0.00	0.00	0.00	18.08	81.92
0	+75 microns	113.81	5.10	76.20	23.80	0.00	0.00	0.00	18.08	81.92
0	+38 microns	138.35	6.20	82.40	17.60	70.12	9701.45	10.76	28.85	71.15
0	+5 microns	390.52	17.50	99.90	0.10	164.24	64138.68	71.15	100.00	0.00
0	<5 microns	0.00	0.00	99.90	0.10	0.00	0.00	0.00	100.00	0.00
TOTAL		2229.30				40.43	90141.69			

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT 35 TO 60 MESH**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns	35.50	35.50	35.50	64.50	12.23	434.17	8.58	8.58	91.42
	+125 microns	40.60	40.60	76.10	23.90	20.11	816.47	16.13	24.71	75.29
	+75 microns	4.60	4.60	80.70	19.30	3.92	18.03	0.36	25.07	74.93
	+38 microns	5.00	5.00	85.70	14.30	16.81	84.05	1.66	26.73	73.27
	+5 microns	14.10	14.10	99.80	0.20	263.02	3708.58	73.27	100.00	0.00
	<5 microns		0.00	99.80	0.20		0.00	0.00	100.00	0.00
TOTAL		99.80				50.71	5061.30			

SAMPLE wt. g.	% LOSS
100.00	0.20

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	1326.16	35.50	35.50	64.50	12.23	16218.98	8.58	8.58	91.42
0	+125 microns	1516.68	40.60	76.10	23.90	20.11	30500.49	16.13	24.71	75.29
0	+75 microns	171.84	4.60	80.70	19.30	3.92	673.62	0.36	25.07	74.93
0	+38 microns	186.78	5.00	85.70	14.30	16.81	3139.83	1.66	26.73	73.27
0	+5 microns	526.73	14.10	99.80	0.20	263.02	138540.43	73.27	100.00	0.00
0	<5 microns	0.00	0.00	99.80	0.20	0.00	0.00	0.00	100.00	0.00
TOTAL		3728.20				50.71	189073.35			

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT 60 TO 120 MESH**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns	81.00	81.00	81.00	19.00	46.51	3767.31	59.85	59.85	40.15
	+75 microns	8.80	8.80	89.80	10.20	0.83	7.33	0.12	59.97	40.03
	+38 microns	2.10	2.10	91.90	8.10	17.11	35.93	0.57	60.54	39.46
	+5 microns	7.30	7.30	99.20	0.80	340.26	2483.90	39.46	100.00	0.00
	<5 microns		0.00	99.20	0.80		0.00	0.00	100.00	0.00
TOTAL		99.20				63.45	6294.47			

SAMPLE wt. g.	% LOSS
100.00	0.80

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	1976.66	81.00	81.00	19.00	46.51	91934.52	59.85	59.85	40.15
0	+75 microns	214.75	8.80	89.80	10.20	0.83	178.89	0.12	59.97	40.03
0	+38 microns	51.25	2.10	91.90	8.10	17.11	876.83	0.57	60.54	39.46
0	+5 microns	178.14	7.30	99.20	0.80	340.26	60615.12	39.46	100.00	0.00
0	<5 microns	0.00	0.00	99.20	0.80	0.00	0.00	0.00	100.00	0.00
TOTAL		2420.80				63.45	153605.36			

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT 120 TO 200 MESH**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+75 microns	64.50	64.50	64.50	35.50	14.75	951.38	22.88	22.88	77.12
	+38 microns	27.30	27.30	91.80	8.20	23.82	650.29	15.64	38.53	61.47
	+5 microns	7.90	7.90	99.70	0.30	323.50	2555.65	61.47	100.00	0.00
	<5 microns		0.00	99.70	0.30		0.00	0.00	100.00	0.00
TOTAL		99.70				41.70	4157.31			

SAMPLE wt. g.	% LOSS
100.00	0.30

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+75 microns	3726.96	64.50	64.50	35.50	14.75	54972.68	22.88	22.88	77.12
0	+38 microns	1577.46	27.30	91.80	8.20	23.82	37575.05	15.64	38.53	61.47
0	+5 microns	456.48	7.90	99.70	0.30	323.50	147671.46	61.47	100.00	0.00
0	<5 microns	0.00	0.00	99.70	0.30	0.00	0.00	0.00	100.00	0.00
TOTAL		5760.90				41.70	240219.19			

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT -200 MESH TEST 2**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+75 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+38 microns	36.10	36.10	36.10	63.90	48.53	1751.93	12.01	12.01	87.99
	+5 microns	53.00	53.00	89.10	10.90	210.73	11168.69	76.53	88.54	11.46
	<5 microns	9.40	9.40	98.50	1.50	177.94	1672.64	11.46	100.00	0.00
TOTAL		98.50				148.15	14593.26			

SAMPLE wt. g.	% LOSS
100.00	1.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+38 microns	3911.44	36.10	36.10	63.90	48.53	189822.39	12.01	12.01	87.99
0	+5 microns	5742.56	53.00	89.10	10.90	210.73	1210130.40	76.53	88.54	11.46
0	<5 microns	1018.49	9.40	98.50	1.50	177.94	181230.54	11.46	100.00	-0.00
TOTAL		10672.50				148.15	1581183.32			

NRT

SCREEN ANALYSIS DATA

Sample Name: **NRT -200 MESH TEST 1**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+250 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+125 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+75 microns		0.00	0.00	100.00		0.00	0.00	0.00	100.00
	+38 microns	36.20	36.20	36.20	63.80	14.80	535.76	4.25	4.25	95.75
	+5 microns	55.40	55.40	91.60	8.40	185.07	10252.88	81.39	85.65	14.35
	<5 microns	10.80	10.80	102.40	-2.40	167.42	1808.14	14.35	100.00	0.00
TOTAL		102.40				123.02	12596.77			

SAMPLE wt. g.	% LOSS
100.00	-2.40

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
0	+38 microns	3772.90	36.20	36.20	63.80	14.80	55838.85	4.25	4.25	95.75
0	+5 microns	5773.99	55.40	91.60	8.40	185.07	1068592.19	81.39	85.65	14.35
0	<5 microns	1125.62	10.80	102.40	-2.40	167.42	188450.50	14.35	100.00	0.00
TOTAL		10672.50				123.02	1312881.55			

APPENDIX E

PLUTONIUM ANALYTICAL DATA AS A FUNCTION OF PROCESS STREAM AND PARTICLE SIZE: SEG PROCESS

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG NTS-R1 Screen Underflow B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	41.70	41.70	41.70	58.30		0.00	ERR	ERR	ERR
	+5 microns	30.70	30.70	72.40	27.60		0.00	ERR	ERR	ERR
	<5 microns	25.00	25.00	97.40	2.60		0.00	ERR	ERR	ERR
TOTAL		97.40				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	2.60

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	41.70	41.70	58.30	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	30.70	72.40	27.60	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	25.00	97.40	2.60	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R1 Feed B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	27.20	27.20	27.20	72.80		0.00	ERR	ERR	ERR
	+5 microns	42.50	42.50	69.70	30.30		0.00	ERR	ERR	ERR
	<5 microns	28.80	28.80	98.50	1.50		0.00	ERR	ERR	ERR
TOTAL		98.50				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	1.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	27.20	27.20	72.80	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	42.50	69.70	30.30	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	28.80	98.50	1.50	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R1 Concentrate B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	45.70	45.70	45.70	54.30		0.00	ERR	ERR	ERR
	+5 microns	51.60	51.60	97.30	2.70		0.00	ERR	ERR	ERR
	<5 microns	1.40	1.40	98.70	1.30		0.00	ERR	ERR	ERR
TOTAL		98.70				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	1.30

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	45.70	45.70	54.30	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	51.60	97.30	2.70	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	1.40	98.70	1.30	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R1 Tails B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+5 microns	11.50	11.50	11.50	88.50		0.00	ERR	ERR	ERR
	<5 microns	83.20	83.20	94.70	5.30		0.00	ERR	ERR	ERR
TOTAL		94.70				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	5.30

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	11.50	11.50	88.50	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	83.20	94.70	5.30	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R2 Feed B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	7.90	7.90	7.90	92.10		0.00	ERR	ERR	ERR
	+5 microns	87.30	87.30	95.20	4.80		0.00	ERR	ERR	ERR
	<5 microns	3.30	3.30	98.50	1.50		0.00	ERR	ERR	ERR
TOTAL		98.50				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	1.50

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	7.90	7.90	92.10	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	87.30	95.20	4.80	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	3.30	98.50	1.50	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R3 Feed B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	14.50	14.50	14.50	85.50		0.00	ERR	ERR	ERR
	+5 microns	81.00	81.00	95.50	4.50		0.00	ERR	ERR	ERR
	<5 microns	2.40	2.40	97.90	2.10		0.00	ERR	ERR	ERR
TOTAL		97.90				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	2.10

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	14.50	14.50	85.50	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	81.00	95.50	4.50	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	2.40	97.90	2.10	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R2 Concentrate B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	1.40	3.18	3.18	96.82		0.00	ERR	ERR	ERR
	+5 microns	42.20	95.91	99.09	0.91		0.00	ERR	ERR	ERR
	<5 microns		0.00	99.09	0.91		0.00	ERR	ERR	ERR
TOTAL		43.60				0.00	0.00			

SAMPLE wt. g.	% LOSS
44.00	0.91

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	3.18	3.18	96.82	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	95.91	99.09	0.91	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	0.00	99.09	0.91	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R2 Tails B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	9.40	9.40	9.40	90.60		0.00	ERR	ERR	ERR
	+5 microns	84.10	84.10	93.50	6.50		0.00	ERR	ERR	ERR
	<5 microns	5.70	5.70	99.20	0.80		0.00	ERR	ERR	ERR
TOTAL		99.20				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	0.80

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	9.40	9.40	90.60	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	84.10	93.50	6.50	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	5.70	99.20	0.80	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R3 Concentrate B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00			ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00			ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	3.60	3.60	3.60	96.40		0.00	ERR	ERR	ERR
	+5 microns	95.40	95.40	99.00	1.00		0.00	ERR	ERR	ERR
	<5 microns		0.00	99.00	1.00		0.00	ERR	ERR	ERR
TOTAL		99.00				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	1.00

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	3.60	3.60	96.40	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	95.40	99.00	1.00	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	0.00	99.00	1.00	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R3 Tails B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	24.80	24.80	24.80	75.20		0.00	ERR	ERR	ERR
	+5 microns	70.80	70.80	95.60	4.40		0.00	ERR	ERR	ERR
	<5 microns	1.60	1.60	97.20	2.80		0.00	ERR	ERR	ERR
TOTAL		97.20				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	2.80

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	24.80	24.80	75.20	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	70.80	95.60	4.40	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	1.60	97.20	2.80	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R5 Feed B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	80.00	80.00	80.00	20.00		0.00	ERR	ERR	ERR
	+5 microns	18.60	18.60	98.60	1.40		0.00	ERR	ERR	ERR
	<5 microns		0.00	98.60	1.40		0.00	ERR	ERR	ERR
TOTAL		98.60				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	1.40

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	80.00	80.00	20.00	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	18.60	98.60	1.40	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	0.00	98.60	1.40	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R5 Concentrate B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	23.50	24.79	24.79	75.21		0.00	ERR	ERR	ERR
	+5 microns	68.70	72.47	97.26	2.74		0.00	ERR	ERR	ERR
	<5 microns		0.00	97.26	2.74		0.00	ERR	ERR	ERR
TOTAL		92.20				0.00	0.00			

SAMPLE wt. g.	% LOSS
94.80	2.74

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	24.79	24.79	75.21	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	72.47	97.26	2.74	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	0.00	97.26	2.74	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R5 Tail B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	91.50	91.50	91.50	8.50		0.00	ERR	ERR	ERR
	+5 microns	6.90	6.90	98.40	1.60		0.00	ERR	ERR	ERR
	<5 microns		0.00	98.40	1.60		0.00	ERR	ERR	ERR
TOTAL		98.40				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	1.60

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	91.50	91.50	8.50	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	6.90	98.40	1.60	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	0.00	98.40	1.60	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R6 Feed B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+5 microns	10.50	13.17	13.17	86.83		0.00	ERR	ERR	ERR
	<5 microns	65.90	82.69	95.86	4.14		0.00	ERR	ERR	ERR
TOTAL		76.40				0.00	0.00			

SAMPLE wt. g.	% LOSS
79.70	4.14

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	13.17	13.17	86.83	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	82.69	95.86	4.14	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R6 Concentrate B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns	1.80	4.13	4.13	95.87		0.00	ERR	ERR	ERR
	+5 microns	24.50	56.19	60.32	39.68		0.00	ERR	ERR	ERR
	<5 microns	15.90	36.47	96.79	3.21		0.00	ERR	ERR	ERR
TOTAL		42.20				0.00	0.00			

SAMPLE wt. g.	% LOSS
43.60	3.21

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	4.13	4.13	95.87	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	56.19	60.32	39.68	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	36.47	96.79	3.21	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

SEG

SCREEN ANALYSIS DATA

Sample Name: **SEG MGS-R6 Tails B**

SAMPLE ID	SIZE	WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
	+2000 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+250 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+125 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+75 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+38 microns		0.00	0.00	100.00		0.00	ERR	ERR	ERR
	+5 microns	10.40	10.40	10.40	89.60		0.00	ERR	ERR	ERR
	<5 microns	86.00	86.00	96.40	3.60		0.00	ERR	ERR	ERR
TOTAL		96.40				0.00	0.00			

SAMPLE wt. g.	% LOSS
100.00	3.60

SAMPLE ID	SIZE	STREAM WEIGHT g	% RET.	CUM. % RET	CUM. % PASSING	Pu ACTIVITY pCi/g	UNITS pCi	RET. DIST. %	CUM. RET. DIST %	CUM. PASS. DIST. %
0	+2000 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+250 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+125 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+75 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+38 microns	0.00	0.00	0.00	100.00	0.00	0.00	ERR	ERR	ERR
0	+5 microns	0.00	10.40	10.40	89.60	0.00	0.00	ERR	ERR	ERR
0	<5 microns	0.00	86.00	96.40	3.60	0.00	0.00	ERR	ERR	ERR
TOTAL		0.00				ERR	0.00			

DISTRIBUTION

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David Bedsun
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P.O. Box 208
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Wayne Bliss
Bechtel Nevada Corporation
P.O. Box 98521
Las Vegas, NV 89193-8521

Joanne M. Bradbery, Director
Contracts Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Mary Lou Brown
International Technology Corporation
4330 S. Valley View
Suite 114
Las Vegas, NV 89103

Lee Davisson
Nuclear Chemistry Division
Lawrence Livermore National Laboratory
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L–237
Livermore, CA 94550

Martha DeMarre
Chief, Document Research Section
Health Protection Dept.
Bechtel Nevada Corporation
P.O. Box 98521
Las Vegas, NV 89193-8521

Frank Di Sanza, Director
Project Control and Technology
Development Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Dave Dobson
1451 Harbor Bay Parkway
Alameda, CA 94502

Brian Dozier
Bechtel Nevada Corporation
P.O. Box 98521
Las Vegas, NV 89193-8521

Doug Duncan
Hydrology Program Manager
Office of Environmental Restoration
and Waste Management
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Donald Elle, Director
Environmental Protection Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Dennis Farmer
Radiation Sciences Laboratory
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
P.O. Box 98517, M/S 513
Las Vegas, NV 89193–8517

Joseph N. Fiore, Acting Deputy Manager
Office of the Manager
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Clyde W. Frank
Assistant Secretary for Technology
U.S. Department of Energy
5B–014/FORS
Forresthall Bldg.
1000 Independence Avenue, SW
Washington, D.C. 20585

Larry Franks
Nevada State Health Department
Radiological Health Section
620 Belrose Avenue
Las Vegas, NV 89158

General Atomics – Nuclear Remediation Technologies
P.O. Box 85608
San Diego, CA 92186–9784

Joseph M. Ginanni
Waste Management Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193–8518

Virginia Glanzman
U.S. Geological Survey
Box 2506, MS 913
Denver Federal Center
Denver, CO 80225

Roger Jacobson
Desert Research Institute
Water Resources Center
P.O. Box 19040
Las Vegas, NV 89132-0040

Marjory Jones
Desert Research Institute
Water Resources Center
P.O. Box 60220
Reno, NV 89506-0220

Jim Kinnard
Bechtel Nevada Corporation
P.O. Box 98521
Las Vegas, NV 89193-8521

Randy Laczniak
U.S. Geological Survey
Water Resources Division
6770 S. Paradise Rd.
Las Vegas, NV 89119

Steve Lawrence
Environmental Restoration Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

John Ledbetter
Contracts Division
Nevada Operations Office
U.S. Department of Energy
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Las Vegas, NV 89193-8518

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Test Operations Division
Nevada Operations Office
U.S. Department of Energy
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Las Vegas, NV 89193-8518

S. John Mather
Assistant Secretary for Environment, Demonstration, Testing and Evaluation
U.S. Department of Energy
472/TREV, Trevion Bldg.
1000 Independence Avenue, SW
Washington, D.C. 20585

Charles E. McWilliam, Director
Operations Management Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Steve Mellington, Director
Environmental Restoration Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Dr. Manoranjan Misra
Department of Chemical/Metallurgical
Engineering
MS 170
University of Nevada, Reno
Reno, Nevada 89557

Beth Moore
Waste Management Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193–8518

Paul Orkild
U.S. Geological Survey
Box 2506, MS 913
Denver Federal Center
Denver, CO 80225

James Owendoff
Assistant Secretary for Environmental Restoration
U.S. Department of Energy
5B–050/FORS
Forresthall Bldg.
1000 Independence Avenue, SW
Washington, D.C. 20585

Paramag Corp.
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Lakeland, FL 33807–5108

Richard Pearl
Environmental Protection Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Stuart E. Rawlinson
ERWM
Bechtel Nevada Corporation
P.O. Box 95487, M/S 580
Las Vegas, NV 89193–5487

Ken Ryfeld
Geotrans, c/o IT
4330 Valley View
Suite 112, MS-439
Las Vegas, NV 89103

Monica Salazar-Sanchez
Environmental Restoration Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Scientific Ecology Group, Inc.
P.O. Box 2530
1560 Bear Creek Rd.
Oak Ridge, TN 37831–2530

Ralph Smiecinski
Project Control and Technology
Development Division
Nevada Operations Office
U.S. Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

David K. Smith
Isotopes Sciences Division
Lawrence Livermore National Laboratory
P.O. Box 808, M/S L231
Livermore, CA 94550

Dr. Tsuneo Tamura
8117 River Drive
Oak Ridge, TN 37830

Joe Thompson
Los Alamos National Laboratory
INC-11, MS J514
P.O. Box 1663
Los Alamos, NM 87545

Doug Trudeau
U.S. Geological Survey
Water Resources Division
6770 S. Paradise Rd.
Las Vegas, NV 89119

Janet Wiley
International Technology Corporation
4330 S. Valley View
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Las Vegas, NV 89193–8518

Librarian
Water Resources Center Archives
410 O'Brien Hall
University of California
Berkeley, CA 94720-1718