



Northeast Ohio Regional Sewer District

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October 29, 1996

FOI/PA REQUEST

Case No:

96-470

Date Rec'd:

11/2/96

Action Off:

Post

Related Case:

USNRC
V-4
AM 9:09

Director, Division of Freedom of Information
and Publications Services
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Re: FOIA Request for Documents

Dear Director:

The Northeast Ohio Regional Sewer District (NEORS D) hereby requests copies of any and all sample collection, transport and testing protocols used in the collection and analysis of water samples collected at the 1020 London Road, Cleveland, Ohio facility of your licensee, Advanced Medical Systems, Inc.

The above request is made pursuant to the Freedom of Information Act and 10 CFR Sec. 9.15. The NEORS D has no commercial interest in the requested documents and requests a waiver of all fees pursuant to 10 CFR Sec. 9.41.

Please call me at (216) 881-6600, ext 826, if you have any questions about the foregoing. Thank you in advance for your assistance.

Very truly yours,

Lawrence K. English
Assistant General Counsel

9612160163 961212
PDR FOIA
ENGLISH96-470 PDR

FILTRATION TEST

Equipment needed: small vacuum pump, tubing, 1 liter flask, glass cylinder (open ends), stand, clamp, 0.45 micron filter, filter housing,

Set up the equipment as shown.

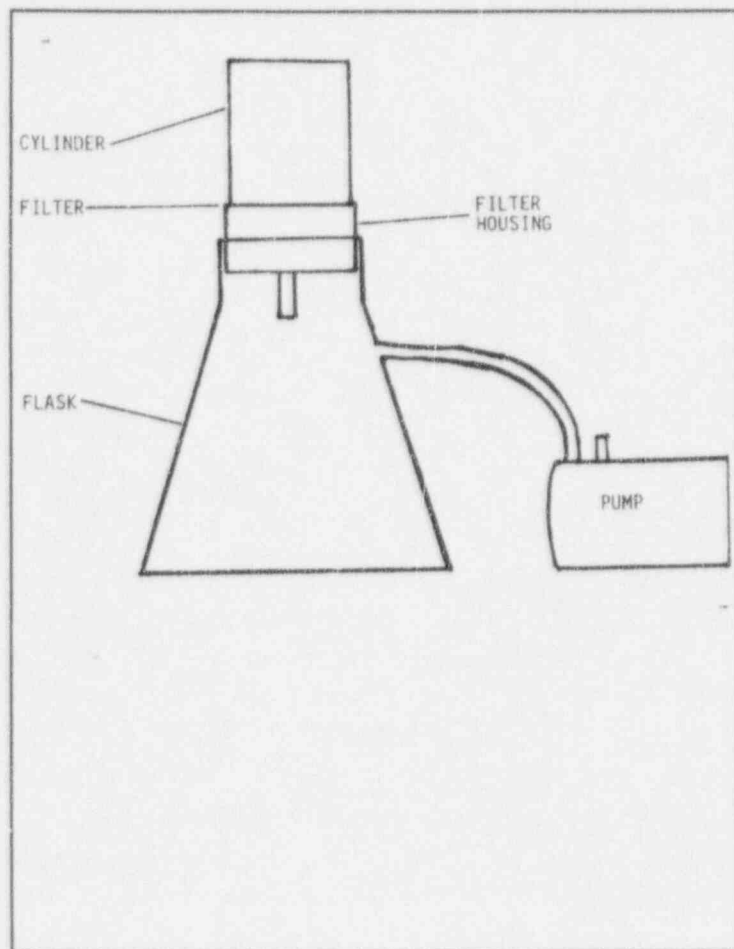
Turn on the vacuum pump.

Slowly pour the entire water sample into the glass cylinder.

Rinse the glass cylinder with a small amount of demineralized water.

Place the filter in a labelled petri dish.

Count the filter.



11/

100 SAMPLING PRINCIPLES

100.1 PURPOSE

To provide general guidance for sampling handling.

100.2 SCOPE

This procedure presents general sampling principles. This procedure is applicable in general and probably will be applicable in most specific cases. More specific information regarding sample collection is presented in Appendix B of this procedure.

100.3 REFERENCES

- 100.3.1 HASL-300 EML Procedure Manual; Environmental Measurements Laboratory, U.S. Department of Energy, 376 Hudson St., New York, New York.
- 100.3.2 ASTM D3370; Standard Practices for Sampling Water, Annual Book of ASTM Standards, Part 31, 1978
- 100.3.3 EPA-600/7-77-088; Handbook for Analytical Quality Control in Radioanalytical Laboratories, 1977
- 100.3.4 Regulatory Guide 4.5; Measurements of Radionuclides in the Environment Sampling and Analysis of Plutonium in Soil, 1974
- 100.3.5 Procedure 713; Quality Control in Sampling
- 100.3.6 Appendix B of this procedure.

100.4 PRECAUTIONS

TO AVOID CONTAMINATION OF THE REGIONAL LABORATORY NEVER BRING KNOWN HOT SAMPLES INTO THE REGION III LABORATORY. PLACE THE SAMPLE, UNDER SURVEILLANCE, ON THE LOADING DOCK AND CONTACT THE LABORATORY PERSONNEL.

100.5 PROCEDURE

100.5.1 General Considerations

The collection of valid samples is equal in importance to accurate analysis in carrying out a program for evaluating contamination of man and his environment. It is not unusual to find very refined techniques of measurement applied to samples of dubious validity. Unfortunately, while it is possible to set down step by step procedures for chemical or radiometric analysis, such steps cannot be described for the general process of sampling. Once a particular sampling

program has been designed, it is possible to follow the actual operation.

The purpose of sampling and analysis is to obtain numerical data which can describe a particular situation and which can be interpreted as a basis for possible action. Naturally, the sample should be representative and the analyses should be accurate or the entire process is invalid. The requirement that the data be capable of interpretation also means that the sampling must be carried out with a clear purpose and with an understanding of the problem to be solved and the physical conditions that exist.

The sample collector must ensure that samples are collected properly and transmitted to the laboratory in a condition acceptable for producing meaningful results. Therefore, the sample collector must start with a clear understanding of the purpose of the program. The following items should be considered before sampling:

- 100.5.1.1 Type of analysis to be performed
- 100.5.1.2 Sensitivity required - this impacts sample size
- 100.5.1.3 Geometry for gamma spec analysis (refer to Appendix A)
- 100.5.1.4 Preservatives to inhibit sample degradation

100.5.2 Water Sampling

Before filling, rinse the plastic sample bottle out ~~two or three times~~ with water being collected. To avoid adsorption of elements on the sample bottle, add 2% v/v of conc.-HNO₃ or conc.-HCL. Carrier or complexing agent can also be added except for special analyses such as pH, conductivity, H-3, and C-14. For samples to be analyzed for H-3, collect in glass containers and do not add acid.

100.5.3 Soil and Sediment Sampling

No preservatives are required in soil sampling. Clean the sampling equipment before sampling to avoid cross contamination. Thorough mixing is required to ensure a homogenous sample.

100.5.4 Smear and Air Filters

Individual wrapping is essential. The sample should be handled with care when dust loading is observed because

particulate matter is easily removed from the filter, thus invalidating the analysis.

100.5.5 Labeling

Labeling requires the following items.

- 100.5.5.1 Name of facility
- 100.5.5.2 Docket and license number
- 100.5.5.3 Sample identification or location
- 100.5.5.4 Sampling time and date (including air flow and start and stop times for air samplers)
- 100.5.5.5 Sample collector's name
- 100.5.5.6 Insure sample container is sealed and no external contamination exists.

100.6 LIMITS OF DETECTION

N/A

100.7 SAMPLING PROCEDURES

Sampling procedures with more detail are provided in Appendix B. ~~The~~ Appendix B should be read and understood before Region III personnel collect samples to be analyzed by the Region III radiological lab.

APPENDIX A GEOMETRIES FOR GAMMA COUNTING

<u>DESCRIPTIONS</u>	<u>ALIQOT</u>
Charcoal Cartridge	Unlimited
Particulate Filter	Unlimited
Off-gas	14.7 ml
Marinelli	500 ml - minimum
Soil Cup	500 g - minimum
Upright Bottle	500 ml - minimum

Appendix B

GUIDELINES AND INSPECTION PROCEDURE
FOR ENVIRONMENTAL SAMPLE COLLECTION

1. OBJECTIVES

The purpose of this document is to set forth the practical, in-field methods (1) to be used by NRC Region III personnel to collect environmental samples, and (2) to determine if sample collection being performed in conjunction with licensed activities is carried out in a manner consistent with currently accepted practices. The aspects of environmental sampling covered in this document include; the purpose for sampling, sampling supplies, sampling techniques, appropriate containers, initial laboratory preparation, packaging for shipment, and documentation. To facilitate this effort, environmental sample collection and chain-of-custody (COC) forms are attached which should be used by Region III (See Attachments).

2. REQUIREMENTS

Review of sample collection activities performed by licensees should be conducted primarily by direct observation of work activity, interviews with workers, and demonstration of how a task is performed. The following elements should be reviewed in sufficient depth to ensure that satisfactory collection protocols have been developed and are being followed. Every organization collecting environmental samples should possess a manual that describes the procedures to be followed in obtaining representative environmental samples. Ideally, the sampling procedures used should be based on methodology developed and published by the Oak Ridge National Laboratories, the Radiological and Environmental Sciences Laboratory, the Environmental Protection Agency, the Environmental Measurements Laboratory, and/or the American Society for Testing and Materials.

A. Purpose for Sample Collection

Collecting environmental samples for subsequent radiological analysis is generally part of an Environmental Monitoring Program designed to assess the impact of human activities involving radioactive materials on the surrounding environs. The analytical results are used for the following; (1) to verify compliance with laws, regulations, permits, and licenses; (2) to detect any radiological trends that may develop; (3) to determine the potential dose to the public; and (4) to verify that sites may be released for unrestricted use. In keeping with the overall purpose, an environmental sampling program is designed, implemented, and continued until all the objectives have been achieved.

The objective of a sampling effort is to remove from a defined bulk source of environmental material a small portion that is representative of the whole. By definition a representative sample is one that, when analyzed for a particular constituent, will yield a value that is true of the bulk source as a whole. Although it is important to remember that a totally representative sample may not always be possible, the need to obtain as representative a sample as possible is critical. Analytical results from a sample of dubious validity may lead to false conclusions and inappropriate actions, thereby constituting a waste of time and resources.

The steps to be considered in a sampling program are as follows:

- (1) Clearly determine the problem to be solved or the type of information that is most pertinent;
- (2) Determine the best method for obtaining a truly representative sample. Due to the nature of environmental sampling, this process cannot be as detailed or as stringent as laboratory analysis procedures; therefore much will depend on the experience, common sense, and judgement of the individual collector;
- (3) Collection of representative samples, taking into consideration the following aspects;
 - (a) point(s) of sampling;
 - (b) type(s) of samples; i.e. grab or continuous, integrated or composite, etc.;
 - (c) time of sampling;
 - (d) frequency of sampling - sufficient to accomplish objectives, yet not overburdening the laboratory;
 - (e) volume to be collected - small enough to be easily transported, but large enough to be representative and meet detection limits and adequate for the counting geometry;
 - (f) method for maintaining the integrity of the sample prior to analysis - preservation and packaging for shipment to safeguard against deterioration of the sample, sealing and;
 - (g) if possible, collecting the types of samples that require little or no preparation, since analysis after

2 half-lives is suspect and analysis after 6 half-lives is considered invalid.

- (4) Maintaining accurate records of the sampled locations for any future follow-up sampling.

B. Guidelines for Air Sample Collection

- (1) Particulate and Ambient Air Sampling Supplies: The predominant type of air sample is a continuous sample which is collected by an automatic sampling apparatus. The air samplers to be utilized by RIII staff are low-volume samplers which have flow rates ranging from 1 - 5 cu.ft./min. The connections and tubing from the sample head to the vacuum pump should be of minimum length and contain no sharp bends, as these may impede air flow through the system. To prevent any leakage, all hoses are to be secured with hose clamps and all threaded junctions are to contain Teflon tape. Ideally, the samplers should be equipped with integrated flow meters which measure the actual volume of air sampled. However, a unit equipped with a calibrated flow meter, an elapsed time meter (ETM), and a flow regulator would be adequate.

The choice of filter media depends on the information desired. For most analyses glass fiber filters are sufficient; possessing excellent retention of particulates, durability, and are readily dissolved for radiochemical analysis. The disadvantages for glass fiber filters are the higher background for natural nuclides and that the collected activity becomes imbedded in the filter causing an unknown amount of self-absorption. If the required analysis consists of only counting for gross α and β , a membrane filter would be more appropriate as all the activity will be deposited on the surface of the filter. Also, shorter collection times which will result in less filter loading may be necessary to quantify the α -emitters, as they are particularly susceptible to self-absorption. Membrane filters are also easily dissolved for radiological analysis by organic solvents.

The air sampling apparatus must be protected from the weather and tampering. This can be accomplished by placing it inside a housing or under a roof, which also protects the filter from direct rainfall and excessive dust loading. The sample head should be at least 10 cm below any ceiling in order to minimize the sheltering effect of the roof on particulate dust collection.

- (2) Selecting Sampling Sites: In general, a few separate sampling sites will be necessary to obtain the needed information.
- (a) The primary site should be placed in the area believed to have the highest concentration of nuclides. This site(s) would be close to the source and in the direction of the prevailing wind.
 - (b) Another important site(s) would be positioned between the source and the area(s) of greatest population density, with the placement of the samplers at the periphery of the populated area(s).
 - (c) A control air sample should be collected at a considerable distance upwind from the source. This sample would constitute the normal background for the area.
 - (d) Topography may influence the validity of an air sample. Sites should not be located in valleys (persistent wind, temperature inversions, etc), next to large bodies of water, or in close proximity to mountains or plateaus which block normal air flow. Precautions should also be taken when placing an air sampler in an industrial area. Air samplers should be elevated to the highest practical height, usually two meters above the ground. The angle from the sample head and the tops of the nearest buildings should be 30° or less, if possible. If this cannot be achieved, set the sampling apparatus at least 2m from the nearest building. The site should also be positioned at least 15 meters from heavy traffic.
- (3) Procedure for Air Sample Collection: After the appropriate supplies have been obtained, select a sampling site by taking into consideration the previously mentioned variables and access to power. Place the filter into the sample head with tweezers, connect the sample head to the pump, turn on the power, and adjust the flow. Check for in-leakage in the sample train. At this time record on the sample collection form the following information: name of sample site, exact location of sampling, sample number, flow rate, date, time, any unusual conditions, and the name of the collector. (See attached form)

At the end of the sampling period (generally one week), the collector will record on the collection form the date, time, and the elapsed time, flow rate and his name. The collector then disconnects the sample head from the vacuum pump and

removes the filter with tweezers. The collector should then examine the filter for any defects or holes and for foreign matter, such as insects or small debris. A hole, defect, or excessive foreign matter may invalidate the sample, while a few insects or small amount of debris may be removed with tweezers. The removal of foreign matter should be noted on the sample collection form.

At this time the collector should survey the filter using a portable detector equipped with a pancake probe to ensure that the level of activity would not constitute a health or contamination hazard during shipment and handling. The filter is then placed in a labelled container (glassine, or paper envelope; or petri dish) and secured. Splitting particulate air filters should be avoided due to the problems of inexact counting geometry and uneven dust loading on the filter. For confirmatory analysis, transfer the filters after counting to another laboratory with the appropriate COC documentation.

After the collector has returned to the laboratory, a sample analysis request form is prepared with the sample location, date and time of collection, flow rate and elapsed time (or volume from the integrated flow meter), and the analyses requested. Individual air samples may be kept after the initial analysis for subsequent compositing with other filters and re-analysis. If there is no interest in the level of radon daughters, the filters should be stored for three days before counting to allow decay of these natural nuclides.

In the event that radio-iodine is the nuclide of interest, commercially available canisters containing charcoal activated with TEDA or Silver Zeolite can be mounted in the sample head and then counted by gamma spectrometry.

*** Note** - If it is not necessary to quantify the activity but simply make comparisons, or if the location is remote and away from any power source, an alternate method may be employed. This method involves placing double-sided masking tape into stainless steel planchets and mounting these planchets at various sampling sites. Airborne radioactivity has been found to generally be associated with larger dust particles. Any particles that become attached to the tape will not be removed by wind or handling, and these samples may be packaged, shipped and analyzed as stated above.

C. Guidelines for Manual Water Sample Collection

This procedure encompasses the various types of water samples that may be collected, the conditions that influence which type of sample is most applicable, and the practical steps to achieve a representative water sample.

(1) General:

There are four types of water samples that are applicable to environmental monitoring; grab samples, integrated samples, composite samples and split samples.

- (a) A grab sample consists of a sample collected at an instantaneous point in time and at a specified place. As such, the analytical results will describe the conditions existing only at that specific place and time. Grab samples are usually adequate for streams, ponds, spigots, wells, small reservoirs, processing vats and holding tanks.
- (b) An integrated sample is generated by combining several grab samples, each of which was taken from a separate point around a body of water at approximately the same time. This sample is applicable to large bodies of water such as lakes, reservoirs, and rivers where concentration gradients may exist. The results would indicate the average activity in the entire body of water.
- (c) A composite sample is formed by combining several separate grab samples that have been collected at the same location over a stated interval of time. For instance; aliquots from four individual weekly samples are combined to form one monthly composite sample, or aliquots from thirteen weekly samples may be combined to generate a quarterly composite sample. Since the analytical results reflect the average concentration over time, composite samples are applicable to all the water sources previously mentioned.
- (d) Verification of analytical results is often achieved by submitting split samples for analysis to separate laboratories. Split water samples may be generated in either of two ways; (1) collecting the water in a large bucket and alternately pouring the contents into two or more separate containers, or (2) pouring the sample from the bucket into a large (2.5 gal) cubitainer, adding the preservative, and then splitting the sample into smaller subsamples after

returning to the laboratory. The samples are then packaged as described below and shipped with the analysis request and the COC forms.

D. Containers, Labelling, and Recording Collection Data

The kind of container used for collection will depend on the type of sample desired and the radiological analyses to be performed. For most samples and analyses a one gallon polyethylene cubitainer is adequate. Plastic is preferred over glass because the cationic nature of many radionuclides renders them susceptible to adsorption to glass. The cubitainer should be filled to within 100ml of capacity. As soon as possible after collection, add 25ml of concentrated HCL to the container and shake to prevent plating out, hydrolysis, or precipitation of radionuclides (NOTE: Many laboratories prefer not to acidify samples to be assayed for radio-iodine, therefore check with the analyzing laboratory for guidance). Samples collected for subsequent tritium analysis are to be placed in glass containers and filled to capacity. In this instance, glass is chosen because tritium atoms in the sample will exchange with hydrogen atoms in the plastic container wall, thereby decreasing the true tritium concentration. Also, no acid is used to preserve the tritium samples as the hydrogens atoms of the acid would dilute the tritium. The caps of the containers should to screwed on tightly and sealed with electrical tape to ensure the security of the sample.

All samples shipped to analytical laboratories must be accompanied by a copy of the sample collection form and the necessary COC documentation. Water samples suspected of containing significant radioactivity should be checked by field detectors equipped with pancake probes to ensure that the levels of activity do not constitute a safety or contamination hazard during handling and shipment.

Information to be recorded on a sample collection form and labelled on the sample containers includes; (1) name and number of sample, (2) specific sampling point such as tank number, north shore, west bank, etc., (3) date and time, (4) type of preservative used, (5) analyses requested, (6) name of the collector, and (7) any information regarding whether this sample is to be composited with others. Containers must be labelled with permanent black markers.

E. Procedures for the Collection of Water Samples

(a) Residential and Industrial Spigots

When sampling from a spigot, it is critical to first flush the system for at least two minutes at high flow in order to

discharge any material that may have accumulated since the last use. The valve is then adjusted to a steady flow and the cubitainer is placed under the flow to collect the water sample. Do not collect the sample from a hose; always disconnect the hose and sample directly from the spigot. Cap and seal the container and record the pertinent information.

(b) Streams and Rivers

Select a safe sampling point (a safe sampling site consists of an area that poses no threat of physical harm to the collection personnel) away from sharp bends or coves, as these areas may have a different composition than the body of water as a whole. Rinse the collection bucket with the sample media. Cast the rinsed, tethered plastic bucket into an area immediately downstream of significant or even turbulent flow. Retrieve the bucket and pour the contents into the cubitainer(s). Repeat as necessary to obtain a sufficient volume for analysis. Cap and seal the container(s) and record all pertinent information on the sample collection form, especially the exact sampling point.

If the sampling and subsequent analysis are being conducted to monitor the impact of discharges into a stream or river, then a minimum of three samples should be taken; one at the point of discharge for a "worst case scenario" sample, another approximately 100 meters upstream as the control, and another a few hundred meters downstream to assess dilution. Again, care must be exercised in choosing safe sampling points and in recording exact locations for sampling.

(c) Processing Vats, Holding Tanks and Retention Basins

These types of systems are amenable for grab sampling. Cast a rinsed, tethered plastic bucket into the water, retrieve, and pour the contents into the container(s). Care should be taken not to disturb the bottom of such systems, as sludge may accumulate over time. Cap and seal the container(s) and record the pertinent information as described above.

(d) Large Lakes and Reservoirs

Concentration gradients or stratification may exist in a large body of water that is not subject to sufficient mixing action. Subsamples from several places around these bodies may be analyzed individually and/or as a combined integrated sample. Choose several safe sampling points around the entire body of water and collect subsamples as described

above. For integrated samples, determine the amount of water to be taken at each point to form a correctly integrated sample (for a one gallon sample integrated from four separate points, collect a one liter sample from each point and combine). Cast a clean, tethered plastic bucket into the water and retrieve, taking care not to disturb the sediment. Pour the contents into the cubitainer(s), cap and seal, and record the pertinent information as previously described.

(e) Composite Samples

Composite samples may be generated from all of the previously mentioned sampling locations. Individual grab samples may be analyzed as collected, with aliquots set aside for later compositing. After the month or quarter has elapsed, equal volume aliquots from each grab sample are combined to form one composite sample. Cap and seal the cubitainer, and record all pertinent information on the container and collection form. Composite samples have a unique aspect that must be addressed; the date and time of sample collection. The time of sampling should always be designated as 12:00 noon. For the date of sampling, two options are applicable; the middle of the sampling period or the end of the period. If the nuclide of interest is short-lived, the sampling date should be the middle of the period in order to account for the decay that would occur. For long-lived nuclides, the end of the sampling period may be used. Once again, analyses conducted after two half-lives should be considered suspect and analyses after six half-lives should be considered invalid.

F. Guidelines for the Collection of Vegetation Samples

Vegetation may be sampled and analyzed to assess the impacts of topical deposition and/or systemic uptake. In general, edible portions of root crops, leafy vegetables, fruits, vegetables and berries may be collected. The growing portions (leaves, roots) of inedible plants may also be sampled. Sampling should occur twice during the growing season and personnel involved in field collection should wear disposable latex gloves to guard against cross contamination, pesticide exposure, or allergic reactions. Vegetation samples are preserved by thorough drying and refrigeration.

(1) Root Crops

For root crops such as carrots, beets, or potatoes, extract the edible portion from the ground with a spade. Wipe off any dirt or moisture, cut off the leafy parts and discard.

Collect approximately 1 Kg dry weight of the edible portion, place in a heavy-duty clear plastic bag and secure closure of the bag with either tape, twist-tie, or tie off the bag. Record the pertinent information on the bag and on the collection form, making sure to state the nature of the sample - carrots, beets, etc.

(2) Leafy Vegetation

Broadleaf vegetables such as lettuce and cabbage, as well as swiss chard and turnip greens are suitable to assess deposition. Cut the plants off close to the surface, shake off any dirt or moisture, and place 1 Kg of dry weight of sample into a clear heavy-duty plastic bag. Seal the bag and record the pertinent information on the bag and the collection form.

(3) Fruits, Vegetables and Berries

Harvest 1 kg dry weight of the edible portions from the tree, vine, or plant and place in a clear heavy-duty plastic bag. Seal the bag and record the information as prescribed above.

After transporting the samples to the laboratory, preparation for on-site analysis or shipment to other laboratories should be performed. The individual samples should be cut into small fragments, mixed thoroughly and oven dried at 110°C. Appropriate sample collection and COC documentation is to accompany any shipments to off-site facilities.

G. Guidelines for Soil and Sediment Collection

In addition to being excellent mediums for determining the accumulation of long-lived nuclides, soil and sediment also present several pathways of radiation dose to the public. Airborne deposition, rainfall, flooding of burial sites, and careless disposal of radioactive materials may create situations of soil contamination. In turn, the radioactivity in soil and sediment may lead to radiation exposure via several pathways; direct gamma radiation, runoff to surface water, uptake by plants and fish, migration to groundwater, ingestion by children, and resuspension into the air.

The depth of soil samples to be taken is somewhat dictated by the type of contamination that is suspected. Recent airborne deposition usually results in a homogeneous distribution within the top few centimeters and may be assessed by topsoil or surface soil collection and analysis, while migration from rainfall and

flooding usually results in a heterogeneous distribution and requires sampling and analysis of subsurface soil. The migration from burial of radioactive material usually requires that bore samples be taken; this technique is not described in this document. As previously stated, the type, number, location, and depth of the samples collected are dependent upon the experience and judgement of the individual collector.

The choice of a soil sampling site follows many of the same principles set forth under air sampling. Soils to be sampled are those downwind or downslope from the source term; and also between the source and population centers or aquifers and other bodies of water. The specific area to be sampled should ideally be an undisturbed flat area not subject to runoff or extensive earthworm activity, and with a stand of vegetation (especially grass). The area to be sampled is first laid out in grids. For smaller areas, one meter square grids are measured out and five subsamples are taken from the center and each corner of the grid. In larger areas, three grids are laid out, with subsamples (5) taken from the center and all of the corners. The subsamples are combined into one container and comprise a single soil sample.

(a) Procedures for Soil and Sediment Collection

Surface soils are obtained by the use of circular "cookie cutters" which may vary in the diameter (2" to 12") and depth (1" to 6"). After the vegetation has been cut at the surface, the cutter is forced into the ground either with the heels of the collectors shoes or with a rubber mallet. When the cutter is at the proper depth, twist the handle in order to shear off the top layer of soil, lift out the cutter and scrape the soil into a clear heavy-duty plastic bag. At this time large stones and roots may be removed, the bag is closed, and the pertinent information is recorded on the container and the collection form. For soils, the depth of the sample is an integral part of the sample description and therefore should be recorded. If a deeper subsurface sample is also required, the same points should be re-sampled with the cookie cutter or a clam-shelled auger (post-hole diggers) to a depth of 10-15cm. Another soil sampling apparatus would be a hole digger of the type used by golf courses. This tool may be sunk into the ground to sample soil at various depths.

Sediment samples are obtained by lowering a scoop mounted on the end of a long handle below the water and dragging the device along the bottom. Wearing disposable latex gloves, transfer the sediment to a one liter wide-mouthed plastic bottle. Soil and sediment containers should be surveyed with a pancake probe to ensure that the activity present

will not constitute a safety or contamination hazard during shipping and handling. The pertinent information must be recorded on the container and the collection form.

On-site preparation of soil for shipping and analysis consists of the following: the samples are spread out on a plastic sheet and the large aggregates are broken up; the soil is allowed to either air dry or placed in an oven to dry at 110°C and then ground manually with a mortar and pestle or automatically in a ball mill; blend the soil thoroughly and then sieve through a 35-mesh screen sieve, and then place the soil into clear plastic bags until analyzed. If required, divide the resulting soil sample into as many split samples as necessary. The analytical results from soil analysis may be reported as either per gram, per volume or per area for surface soil.

References

1. Idaho National Engineering Laboratory; Radiological and Environmental Sciences Laboratory - Analytical Chemistry Branch Procedures Manual. IDO-12096; 1982
2. Survey Procedures Manual for the ORAU Environmental Survey and Site Assessment Program. 1990
3. Procedures Manual; HASL-300 - Edition 27. Environmental Measurements Laboratory. 1992
4. Standard Practice for Planning the Sampling of Ambient Atmosphere. ASTM D 1357-82.
5. Standard Recommended Practice for General Ambient Analyzer Procedures. ASTM D 3249-79.
6. Standard Practice for Sampling Surface Soil for Radionuclides. ASTM C 998-90.
7. Standard Practice for Sampling Water. D 3370-82.
8. Sampling of Wastewater and Water. EPA-600/4-77-039
9. Quality assurance Handbook for Air Pollution Measurement Systems - Vol. II. EPA-600/4-77-027A
10. Environmental Monitoring Manual, ORAU; Training and Management Systems Division. 1991
11. Radioactivity in the Environment; Source, Distribution, and Surveillance. R. Kathren. Howard Academic Pub. 1984.

ENVIRONMENTAL SAMPLE COLLECTION FORM

le Collection Personnel - _____

US NRC REGION III
DIVISION OF RADIATION SAFETY & SAFEGUARDS

SMEAR/WIPE COLLECTION FORM

Smear Number	Location	Direct measurement	Removable Activity dpm/100cm ²	
			alpha	beta
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

Instrument - _____

Probe - _____

Background = _____

Note: All direct measurement readings include background

Date of survey _____

Survey by: _____

799 Roosevelt Road
Glen Ellyn, IL 60137
(708)-790-5500

Sample Collection Personnel

[illegible]

Relinquished by:		Date/Time	Received by:		Date/Time
Name	Organization		Name	Organization	

* Dispose of samples only after NRC Region III approval *

350 PREPARATION AND ANALYSIS OF WATER SAMPLES FOR ISOTOPIC GAMMA ANALYSIS

350.1 PURPOSE

To provide a method for the gamma isotopic analysis of water samples.

350.2 SCOPE

This procedure provides for the analysis of isotopic gamma activity in the water samples. It is applicable to nuclides emitting gamma rays with energies greater than 50 keV. In order to meet low sensitivities, a large volume of water may have to be analyzed.

350.3 REFERENCES

- 350.3.1 HASL-300 EML Procedures Manual, Environmental Measurements Laboratory, U.S. Department of Energy, 376 Hudson St., New York, New York
- 350.3.2 ASTM D2459, Standard Method for Gamma Spectrometry of Water, Annual Book of ASTM Standard, Part 31, Water, 1978
- 350.3.3 Standard Test Method for High-Resolution Gamma-Ray Spectrometry of Water ASTM D3649-91

350.4 PRECAUTIONS

Follow the water sampling and preservation techniques which are described in Appendix B of Procedure 100, Sampling.

350.5 PROCEDURE

- 350.5.1 Shake the sample container before withdrawing an aliquot.
- 350.5.2 Transfer an appropriate aliquot to a clean counting container.
- 350.5.3 Suspended and Dissolved Solids
 - 350.5.3.1 If the sample contains suspended solids or to determine the activity in the solids, filter the sample through 0.45 um filter membrane.
 - 350.5.3.2 Dry the filter membrane containing suspended solids under an infra-red lamp or in an oven on low heat and submit for isotopic gamma analysis.

350.6 CALCULATIONS

322.6.1 Total Activity = Dissolved Activity + Suspended Solid Activity

$$322.6.2 \quad A = \frac{S - B}{(2.22E6)(EFF)(V)(T)(Br)}$$

where: A = Activity in uCi/ml
 EFF = Efficiency
 V = Sample volume, ml
 T = Counting time, minutes
 Br = Branching ratio (or abundance)
 S = Total counts
 B = Background counts

350.7 LIMITS OF DETECTION

<u>Counting Geometry</u>	<u>Count Time</u>	<u>Typical MDA (Cs-137) (uCi/ml)</u>
500 ml poly bottle	20 min	1E-6
500 ml Marinelli Beaker	20 min	1E-7

MOBILE LAB - AMS COUNTING PROCEDURE
6/8/95

DAY ONE

If storage dewar contains enough LN_2 to fill detector dewar:

Connect transfer hose with fittings on both ends to dewars. Open storage dewar valve fully, then back off 1/4 turn. Hold transfer hose near storage dewar until the hose stiffens. Fill detector dewar until you see liquid LN_2 escaping from release valve at bottom of detector dewar.

If storage dewar does NOT contain enough LN_2 to fill detector dewar:

Fill storage dewar from low pressure LN_2 cylinder. Vent storage dewar using small brass valve prior to removing top. Use transfer hose with only one fitting. Fill storage dewar until the LN_2 overflows. Turn top 3X after meeting contact - this will give a good seal. Wait until enough pressure is built up to transfer LN_2 to detector dewar (this may take many hours). Then fill detector dewar as explained above.

(Note: The storage dewar contains enough LN_2 to last about one week of constant use.)

Turn on power to NIM bin ONLY.

Turn on computer, monitor, and printer (if screen is blank - hit any key, then type NRC).

Computer:

GENIE PC - 2X
SPEC. ASST. - 2X
APPLIC.
MCA VIEW CONTROL
FILE (under MCA)
OPEN DATASOURCE
DETECTOR (should see DET01 in input box)
DET01 (should see DET01 in DATASOURCE box)
OK (should see screen)
click on top right square under MCA screen for larger screen
CLEAR (if necessary)

--> Now wait 5 hours **MINIMUM**.

DAY TWO

Top off detector dewar. Again, fill dewar until you see liquid LN_2 escaping from release valve at bottom of dewar.

Raise voltage:

toggle to ON
hit reset (ON light should be red)
slowly raise voltage to 2000 (two complete turns of the pot - no more than 3 lights in window should be lit)

--> Now wait 1 hour **MINIMUM**.

AM

Pole Zero Check

Place 1 uCi Cs-137 source on shelf C, count for 60 sec:

ACQUIRE ON (wait 60 sec)

push in button over PZ toggle (one or two times)

ACQUIRE OFF

CLEAR

NO

QC Check (with Marinelli)

Place Marinelli standard on detector.

EDIT
SAMPLE INFO
SAMPLE TITLE: ANALYTICS 48643-102 QC
COLLECTOR NAME: ANALYTICS
SAMPLE DESCRIPTION: ANALYTICS 48643-102 MARINELLI
SAMPLE ID: 48643QC1.CNF (example)
TYPE: STANDARD
QUANTITY: 1
UNITS: EACH
SAMPLE GEOMETRY: 94MAR
LOAD CAL
now **highlight** 94MAR in box on left
OK
change sample date and time
OK
MCA
ACQUIRE SETUP
change LIVE TIME to 1800 (sec)
OK (should see screen)
ACQUIRE ON
(you can change scale with MCA SCALE LOG, play with EXPAND, etc.)

.
.
.
.
data taking ends
FILE (under MCA)
SAVE AS 48643QC1.CNF
OK (should see screen)
APPLIC
GAMMA SPEC ANALYSIS
FILE (under gamma spec)
OPEN DATASOURCE
48643QC1.CNF (in file box)
OK
ANALYZE
B - RX REPORT W/O BACKGROUND

.
FILE
SAVE (asterisk after 48643QC1.CNF goes away)
FILE
EXIT (should see screen)

Look at Interference Corrected Report, compare Co-60 result with source certificate in white binder (require $\pm 5\%$ agreement)

Energy Recal (with Marinelli)

Place Marinelli standard on detector.

EDIT
SAMPLE INFO
SAMPLE TITLE: ANALYTICS 48643-102 QC
COLLECTOR NAME: ANALYTICS
SAMPLE DESCRIPTION: ANALYTICS 48643-102 MARINELLI
SAMPLE ID: 48643QC1.CNF (example)
TYPE: STANDARD
QUANTITY: 1
UNITS: EACH
SAMPLE GEOMETRY: 94MAR
LOAD CAL
now **highlight** 94MAR in box on left
OK
change sample date and time
OK
CLEAR (if necessary) followed by NO
MCA
ACQUIRE SETUP
change LIVE TIME to 1800 (sec)
OK (should see screen)
ACQUIRE ON
(you can change scale with MCA SCALE LOG, play with EXPAND, etc.)

.
.
.
.
data taking ends
EXPAND OFF
FILE (under MCA)
SAVE
APPLIC
GAMMA SPEC ANALYSIS
FILE (under gamma spec)
OPEN DATASOURCE
highlight DETECTOR in box on left (should see DET01 in INPUT box)
highlight DET01 in INPUT box (should see DET01 in DATASOURCE box)
OK (should be in GAMMA DET01 screen)
CALIBRATE
ENERGY RECAL (should be in ENERGY CALIBRATION/RECAL screen)
POPULATE (should be in POPULATE screen)
highlight CERTIFICATE FILE
OK (should be in OPEN CERTIFICATE file screen)
highlight 48643102.CTF
OK (should be in ENERGY CALIBRATION/RECAL screen)
AUTO
SHOW
now study graph - should see straight line, green boxes w/ good fit -
also, energy/channel should be about 0.495 KeV/ch
PRINT
OK (should be in ENERGY CALIBRATION/RECAL screen)
OK (should be in GAMMA DET01 screen)
FILE
SAVE
FILE (under GAMMA: DET01)
EXIT (should be in MCA: DET01 screen)
FILE

SAVE AS
48643QC1.CNF
OK
APPLICATIONS
GAMMA SPEC
FILE (under gamma spec)
OPEN DATASOURCE
48643QC1.CNF
OK (should see screen)
ANALYZE
B - RX REPORT W/O BACKGROUND

FILE
SAVE (asterisk after filename goes away)
FILE
EXIT (should see screen)

Counting Sample

Fill out green logbook (see naming convention in brown notebook), also record date and time. Then, place Marinelli sample on detector.

EDIT
SAMPLE INFO
SAMPLE TITLE: AMS BSMT WATER TANK 853 BATCH 3
COLLECTOR NAME: AMS/NRC
SAMPLE DESCRIPTION: AMS BSMT WATER TANK 853 BATCH 3 SAMPLE 20
SAMPLE ID: B8503201.CNF (b/85/03/20/count 1)
TYPE: WATER
QUANTITY: 0.5
UNIT: LITER
SAMPLE GEOMETRY: 94MAR
SAMPLE DATE: 5/1/95 AT 1:00 AM (use 12 hr. clock)
OK (should see screen)
MCA
ACQUIRE SETUP
CHANGE LIVE TIME TO 3600 (for a one hour count)
OK (should see screen)
CLEAR
NO
ACQUIRE ON
(can now play with EXPAND)

data taking ends
FILE (under MCA)
SAVE AS B8503201.CNF
OK (should see screen)
APPLIC
GAMMA SPEC
FILE (under gamma spec)
OPEN DATASOURCE
B8503201.CNF (in file box)
OK (should see screen)
ANALYZE
C - MD ANALYSIS W/O BACKGROUND

FILE
SAVE (asterisk after B8503201.CNF goes away)
FILE
EXIT (should see screen)

SHUT DOWN

Computer:

FILE (under M(A)
CLOSE
NO
FILE
EXIT
top left 2X
again 2X
any gray area - RIGHT 1X
SHUTDOWN
OK
YES

Turn off computer, display, and printer.
Turn off HV.
Turn off NIM bin.
Turn off AC.
Turn off breakers, etc.