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CATALOGUE OF MONITORING ACTIVITIES AT ROCKY FLATS

Marilyn V. Werkema

Health, Safety, and Environment
ENVIRONMENTAL SCIENCES

Rockwell International

Energy Systems Group
Rocky Flats Plant
P.O. Box 464
Golden, Colorado 80401

U. S. DEPARTMENT OF ENERGY
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**CATALOGUE OF MONITORING ACTIVITIES
AT ROCKY FLATS**

1978, 1979

Marilyn V. Werkema

**Health, Safety, and Environment
ENVIRONMENTAL SCIENCES**

SUBJECT DESCRIPTORS

Ambient air monitoring
Environmental monitoring
Hydrologic test hole monitoring
NPDES compliance
Soil monitoring
Stack effluent monitoring
Surface water monitoring
Waterborne radioactivity

**ROCKWELL INTERNATIONAL
ENERGY SYSTEMS GROUP
ROCKY FLATS PLANT
P.O. BOX 464
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for the
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RFP-2921

CATALOGUE OF MONITORING ACTIVITIES AT ROCKY FLATS

1978, 1979

Marilyn V. Werkema

Abstract. A listing of environmental surveillance sampling endeavors for the years 1978 and 1979 is given in which sampling media, i.e., ambient air, stack effluent air, water, and soil are considered. Sampling locations, frequency of sampling, parameters analyzed, and control limits also are given. The objectives of the sampling are considered in defining the program.

INTRODUCTION

The Catalogue of Monitoring Activities at Rocky Flats is a statement of planned testing of radioactive and nonradioactive pollutants in the Rocky Flats environment.

The general objectives of the environmental monitoring program are

1. To demonstrate compliance with ERDA Manual Chapter 0524,* and all other federal, state, and local regulations that apply
2. To provide data annually for Plant-related dose impact, as required by ERDA Manual Chapter 0513
3. To provide indicators for operational control of emissions and dispersal of pollutants to levels that are as low as practical

4. To provide a data base for detecting and measuring releases caused by emergencies in addition to releases of materials not normally available for release from the Plant
5. To verify data from sources outside the Plant.

The purpose of the catalogue is to provide a historical record of the specific properties of the environmental monitoring program and the rationale or objective requiring the tests. A complete record would clearly state the purpose or objective of the sampling. Ideally, the objective will dictate (within the restrictions of technological capability) the choice of location, the frequency, parameters to be analyzed, minimum detectable activity or concentration (MDA or MDC), and the level of error that can be tolerated without preventing achievement of the objective. A clear statement of the objectives, linked to the specific characteristics just outlined, is the rationale for the program.

This catalogue covers the years 1978 and 1979. The catalogue is reviewed on an annual basis, and the rationale for the program changes as compliance requirements change, as public opinion requirements for estimates of impact change, and as Plant operations and activities change.

Sometimes technological development will

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* Adopted by the Department of Energy (DOE).

result in changes in reliability and efficiency of achieving the objective. Technical expertise is required to apply the data to the desired objective, and availability of various skills (such as statistical and chemical) may influence change.

A review of data reporting and notification is essential to achieving the objective. The program is reviewed annually to plan the most effective means of visualization, analysis, and reporting. The primary reporting medium of the program is the Annual Environmental Monitoring Report, prepared in accordance with ERDA Manual Chapter 0513. Additional interim reports are prepared monthly, presented to the Colorado Department of Health (CDH), and made available to the public.

Documents that provide details on the way in which the program is conducted include the Health, Safety, and Environmental Laboratories Quality Assurance Plan (precursor to an Environmental Sciences Quality Assurance Plan, in draft) and the procedure manuals of the Health, Safety, and Environmental Laboratories and the Environmental Analysis Group. Quality control aspects of the program are patterned in accordance with proposed Guidance 4.15 from the Nuclear Regulatory Commission, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment."

Acquisition and analysis of environmental samples are conducted in accordance with procedures of the Environmental Analysis Group and the Health, Safety, and Environmental Laboratories, both part of the Environmental Sciences Department at Rocky Flats. The analysis of standard samples is done monthly as a means of

internal quality control. Every effort is made to achieve a complete data set, as planned and outlined in the catalogue. For this purpose, partial samples are withheld from analysis pending completion of the primary sample through the laboratory. It is recognized that in the case of plutonium in water, the retained sample may be less reliable than the sample analyzed immediately after acquisition.

The catalogue is intended primarily to list those samples taken on a routine basis and reviewed for purposes of control and demonstration of environmental integrity. In the forefront of this technology is the awareness that new methods representing improved accuracy, precision, or comprehensive coverage may be available but they require validation. In general, these types of analyses are introduced into the routine program only after they have been used in special programs, reported in the technical literature, and critiqued by the public.

This catalogue is divided into four sections, each dealing with a separate medium containing suspected pollutants.

At Rocky Flats, rates of material usage dictate that the primary concerns be plutonium-239, tritium, americium-241, depleted uranium, and, to a lesser extent, enriched uranium. A special concern is directed at effluents as limited by an NPDES (National Pollutant Discharge Elimination System) permit for the Rocky Flats Plant and by EPA (Environmental Protection Agency) regulations regarding nonradioactive airborne contaminants. Beryllium is used in large quantities at Rocky Flats, and extensive monitoring for beryllium in Plant effluent air is conducted. There is a general surveillance for all alpha emitters, and to a lesser extent, beta and gamma emitters.

AMBIENT AIR MONITORING

The outline of the ambient air monitoring program is shown in Tables 1 and 2. The samplers are classified in three categories: onsite, perimeter, and community. All samples are taken weekly, and selected onsite samples are composited biweekly, (See Tables 1 and 2.) Analyses of perimeter and community samples are made from four-week composites. Total long-lived alpha analysis is done on weekly samples, as indicated in the tables. All samples emitting more than 0.009 pCi/m³ total long-lived alpha activity from a count taken 72 hours after collection are analyzed specifically for plutonium. All samples that do not receive specific plutonium analysis are stored for 18 months for possible plutonium analysis. Figures 1 and 2 show the locations of air samplers listed in the tables.

The objectives of onsite sampling are

1. To demonstrate compliance with ERDA Manual Chapter 0524 with regard to the health of employees. A limit of 2.0 pCi/m³ of plutonium-239 is required, but lower levels are readily achievable. A screening level of 0.009 pCi/m³ of total long-lived alpha is used because this is the most time-effective and convenient test known at this time.
2. To provide data for taking action to control emissions and dispersal. Where there are possible known sources of pollution, surveillance for control is required. One example of a potential source is the lip area of a former outside storage site now covered with asphalt.

Other examples are sewage sludge drying, spraying of wastewater, the landfill, and building docks.

3. To provide a data base for assessment of abnormal conditions. Beta, gamma, and long-lived alpha analyses are used for this purpose.

The objectives of perimeter sampling are

1. To demonstrate compliance with ERDA Manual Chapter 0524 at a plutonium-239 level of 0.02 pCi/m³.
2. To provide data for assessing the Plant-related dose impact. This is required annually by ERDA Manual Chapter 0513. Accuracy of measurement and correction for background are necessary to minimize the upper estimate of the Plant's impact. The frequency of measurement may be low.
3. To provide a data base for assessment of abnormal conditions.

The objectives for community sampling are

1. To provide data for assessing Plant impact.
2. To provide a data base for detecting and evaluating abnormal conditions.

Public concern favors monthly review of trends. It is questionable whether this exercise can be done at this frequency in a technically and scientifically justifiable manner.

During 1978, several proposals for investigatory analyses were considered.

Those proposals already initiated and others awaiting action are as follows:

(1) Americium-241 was analyzed at unspecified intervals from Samplers S-6 and S-9.* Completion of a report is scheduled for 1979. (2) Plutonium-239 was analyzed on Samplers S-2, S-15, and S-16. The purpose of this analysis was to provide background data for Buildings 371 and 374. (3) Beta analysis will be performed on selected samples by counting whole filter papers and by counting dissolved samples. The purpose of this study is the correlation between the two analytical techniques, each of which has different advantages. The dissolved sample technique is thought to be more accurate; the whole filter counting is more timely. (4) Gamma analysis was done at unspecified intervals on filters taken from Samplers S-5, S-9, S-15, S-37, S-44, an S-56. Completion of a report is scheduled for 1979.

Plutonium and tritium data taken in the routine monitoring program are reported monthly in a public meeting. Averages are calculated for perimeter samplers and for community samplers. Data from ambient air monitoring are reported to the national fallout network following atmospheric nuclear weapons testing by foreign countries. This response includes daily reporting of beta activity at selected sampling stations, and gamma spectral data on at least one sample from this group. It has been proposed that future air sampling be supplemented by sampling raw milk and forage.

Tritium concentrations in air are reported as picocuries of tritium per liter of water in the air.

Special samples were taken during 1978 at the samplers indicated in Figure 2. These samples were taken weekly, composited biweekly, and analyzed for plutonium. These data were reported to the Rocky Flats legal staff.

STACKS

Stack sampler filters are changed three times a week: Monday, Wednesday, and Friday. They are composited on a monthly basis for isotopic analyses and beryllium analysis as indicated in Tables 3 and 4.* Analyses for tritium are done as indicated in the tables.

Control of stack effluents is accomplished by review of total long-lived alpha data. Samples having alpha activity greater than 0.02 pCi/m^3 are held for isotopic analysis without compositing. Gamma analysis is done on filter papers having radioactivity that exceeds the control guide level. The building superintendent for the area in which the sample was taken investigates the cause of emission. Other control action guidelines are shown in Table 5.

The objectives of the stack sampling program are as follows:

1. To provide data for controlling emissions to levels that are as low as can be reasonably achieved
2. To demonstrate compliance with (a) the EPA regulation (10 grams per 24 hours per point source) for beryllium and (b) State of Colorado Emission Control Regulations (Numbers 1, 7, and 8) for nonradioactive effluents

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* Sampler locations are shown in Figures 1 and 2.

* Abbreviations and symbols used for all tables in this catalogue are identified in Appendix A.

3. To estimate Plant impact as a function of total release
4. To provide a data base for the detection, measurement, and initiation of control actions relating to abnormal emissions

Surveillance of nonradioactive effluents, other than beryllium, is not required by law. Estimates, however, of releases of material such as CCl_4 , SO_2 , and NO_x indicate that compliance is achieved, based on the consumption of CCl_4 and fossil fuels used in the production of steam.

Monitoring systems for these effluents exist and are being developed, but release data are not being accumulated at this time.

WATER

Many developments in the Rocky Flats water program have been evident since 1970. Recently the "Primary Drinking Water Regulations for the State of Colorado" were enacted, and it is anticipated that the revised "Colorado Water Quality Standards" will be enacted. These acts were considered during development of the water testing program at Rocky Flats.

The control levels for water pollutants at select locations are shown in Tables 6 and 7. Sampling locations are identified in Tables 8-46, which also identify the parameters of interest measured, the frequency of measurement, and the control guide for each particular parameter. Users of the data also are listed. The control guide of 15 pCi/l for gross alpha excludes uranium and radon. At all locations where gross alpha exceeds

40 pCi/l, an analysis for plutonium is done by the liquid scintillation method.

Quarterly reports are filed with the EPA in compliance with the NPDES permit. Violations of NPDES limits are reported within a five-day notification period.

The objectives of sampling are, in general, the four listed earlier: (1) compliance with regulations, (2) control of operations, (3) estimate of Plant impact, and (4) detection of abnormal conditions. More specific objectives are shown on the appropriate tables.

SOIL SAMPLING

During 1978, an extensive soil sampling program was conducted by the legal staff in areas adjacent to the Plant. The program outlined in Table 47 pertains to 1979.

The method of soil sampling recommended for specified locations will depend upon application of the data. Surface samples are used when concern with the data includes resuspension of radioisotopes. The deeper samples are used for measures of total radioisotopes inventory and to define the transport of radionuclides to subsurface layers.

Previous sampling programs have included sampling on ground lines on the Plant site, in the buffer zone, and offsite. Inasmuch as laboratory resources are limited, and greater emphasis is required for interpretation of data, the soil sampling program is now scoped to include only soil samples for special investigations.

The schedule of soil sampling for the time period through 1984 (subject to

annual revision) is shown in Table 47. To detect potential migration of plutonium and americium, it will be necessary to collect and analyze samples from a strip along the Plant's east boundary (the "East Strip") (see Figure 3) on an annual basis for at least three years. Likewise, analyses of soil from the eastern perimeter of the Plant site to compare with the EPA screening level will require sample collection over a period of three to six years.

During 1979, plans call for collecting and analyzing soil samples from four sites in the "East Strip." Twenty surface samples will be taken and analyzed for plutonium, americium, and gamma emitters. Five profiles at each of three depths will be sampled at one site. These 15 profile samples will be analyzed for the same radionuclides indicated previously and will be evaluated to determine the extent of radionuclide migration.

Additional surface samples will be collected from a 10-acre plot on the west side of Indiana Street.* Six soil samples, made up as a composite of 10 subsamples, will be analyzed for

plutonium using the EPA soil sampling method.

REFERENCES

1. Energy Research and Development Administration, Manual Chapter 0524, "Standards for Radiation Protection," March 30, 1977. Adopted by the U.S. Department of Energy.
2. Energy Research and Development Administration, Manual Chapter 0513, "Effluent and Environmental Monitoring and Reporting," March 20, 1974. Adopted by the U.S. Department of Energy.
3. "Annual Environmental Monitoring Report," RFP-ENV-78, Rockwell International, Energy Systems Group, Rocky Flats Plant, May 15, 1979.

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* See Figure 2 for location of Indiana Street.

TABLE 1. Ambient Air Monitoring Program - 1978

Legend for "Analyses" Columns

1 - total long-lived alpha	4 - tritium
2 - plutonium	5 - pilot study, gamma
3 - beta	6 - pilot study, americium

Onsite Samplers

(Collected weekly on Monday and Tuesday. Analyzed weekly for TLL α and ^3H ; all other analyses biweekly)^a

<u>Sampler Number</u>	<u>Analyses</u>	<u>Sampler Number</u>	<u>Analyses</u>
S-2	1 (2) ^b	S-13	1
S-3	1	S-14	1
S-4	1 4	S-15	1 (2) ^b (5) ^b
S-5	1 2 3 (5) ^b	S-16	1 (2) ^b
S-6	1 2 3 (6) ^b	S-17	1 4
S-7	1 2 3	S-18	1
S-8	1 2 3	S-19	1 2 3 4
S-9	1 2 3 (5) ^b (6) ^b	S-20	1 2 3 4
S-10	1	S-21	1 2 3 4
S-11	1	S-22	1
S-12	1	S-23	1
		S-24	1

Perimeter Samplers

(Collected weekly on Friday. Analyzed weekly for TLL α and ^3H ; all other analyses made from four-week composites.)

<u>Sampler Number</u>	<u>Analyses</u>	<u>Sampler Number</u>	<u>Analyses</u>
S-31	1 2	S-38	1 2 3
S-32	1 2 4	S-39	1 2
S-33	1 2	S-40	1 2
S-34	1 2	S-41	1 2 3
S-35	1 2	S-42	1 2
S-36	1 2 4	S-43	1 2
S-37	1 2 (5) ^b	S-44	1 2 3 (5) ^b
		S-45	(c)
		S-46	(c)
		S-47	1 2

(continued)

TABLE 1. (concluded)

Community Samplers

(Collected weekly on Thursday. Analyzed weekly for TLL α ;
all other analyses made from four-week composites.)

<u>Sampler Number</u>	<u>Analyses</u>	<u>Sampler Number</u>	<u>Analyses</u>
S-51	1 2	S-60	1 2
S-52	1 2	S-61	1 2
S-53	1 2	S-62	1 2 3
S-54	1 2 3	S-63	1 2
S-55	1 2	S-64	1 2
S-56	1 2 3 (5) ^b	S-65	1 2
S-57	1 2	S-66	1 2
S-58	1 2	S-67	1 2
S-59	1 2	S-68	1 2

-
- a. The schedule of collection may deviate from that given in the text.
b. Parentheses indicate pilot or investigatory sampling.
c. Special litigation samples. Filter collection performed by Colorado Department of Health; analyses performed by LFE Laboratories, Richmond, California.

TABLE 2. Ambient Air Monitoring Program - 1979

Legend for "Analyses" Columns

1 - total long-lived alpha	4 - tritium
2 - plutonium	5 - gamma pilot study, continuation
2A- collect and retain filter, no analysis	special spring sampling 2-1-79 through 5-31-79
	6 - pilot study, americium

Onsite Samplers

(Collected weekly on Monday and Wednesday. Analyzed weekly for TLL α and ^3H ; all other analyses biweekly.)

<u>Sampler Number</u>	<u>Analyses</u>	<u>Sampler Number</u>	<u>Analyses</u>
S-2	1	S-13	1
S-3	1	S-14	1
S-4	1 4	S-15	1
S-5	1 2 4	S-16	1 2 4
S-6	1 2 6	S-17	1
S-7	1 2	S-18	1
S-8	1 2	S-19	1 2
S-9	1 2 6	S-20	1 2
S-10	1	S-21	1 2
S-11	1	S-22	1
S-12	1	S-23	1
		S-24	1

Perimeter Samplers

(Collected weekly on Friday. Gamma counted weekly; other analyses made from four-week composites.)

<u>Sampler Number</u>	<u>Analyses</u>	<u>Sampler Number</u>	<u>Analyses</u>
S-31	2	S-38	1 2
S-32	2	S-39	2
S-33	2	S-40	2
S-34	2	S-41	2
S-35	2	S-42	2
S-36	2	S-43	2
S-37	2 5	S-44	2 5

(continued)

TABLE 2. (concluded)

Community Samplers

(Collected weekly on Thursday. Analyses made from four-week composites.)

<u>Sampler Number</u>	<u>Analyses</u>	<u>Sampler Number</u>	<u>Analyses</u>
S-51	2A	S-57	2A
S-52	2A	S-58	2
S-53	2	S-59	2
S-54	1 2 5	S-60	1 2
S-55	2	S-61	1 2
S-56	1 2 5	S-62	1 2 5

NOTE: Routine beta sampling has been temporarily discontinued. During the interim period, informal data collection will continue, and planning and review meetings will be held with Health, Safety, and Environmental Laboratories (HS&EL) and Service Labs personnel to determine an appropriate beta sampling and analytical program. Capability for analysis of fallout network samples will be maintained.

Legend for Tables 3 and 4

- n - Number of samples extracted from the exhaust system during the collection period
- FPS - Filterable particulate sample
- ^3H - Tritium collection using water-filled impinger
- TLL α - Direct radiometric analysis for long-lived alpha-emitting isotopes
- Pu - Plutonium-239 and -240
- Am - Americium-241
- U - Uranium-233, -234, and -238
- Be - Stable beryllium
- MWF - Monday, Wednesday, Friday
- (MC) - Monthly composite of the MWF sample collection
- Q - Collection: samples are collected on MWF during one week of each quarter
Analysis: samples collected on MWF are analyzed on MWF
- (WC) - Weekly composite of the MWF sample collection

TABLE 3. Stack Monitoring Program - 1978^a

Building Exhaust System	n	Analytical Frequency					
		TLL α	Pu	U	³ H	Be	Am
374 Main ^b	1	MWF	(MC)	(MC)	MWF	(MC)	(MC)
444-D1	1	MWF	-	(MC)	-	(MC)	-
444-D2,3	1	MWF	-	(MC)	-	(MC)	-
444-D5	1	MWF	-	(MC)	-	(MC)	-
447 Main	1	MWF	-	(MC)	-	(MC)	-
559-561	3	MWF	(MC)	(MC)	MWF	(MC)	(MC)
707-101	2	MWF	(MC)	(MC)	Q	(MC)	(MC)
707-102	2	MWF	(MC)	(MC)	MWF	(MC)	(MC)
707-105	3	MWF	(MC)	(MC)	Q	(MC)	(MC)
707-106	2	MWF	(MC)	(MC)	Q	(MC)	(MC)
707-107	3	MWF	(MC)	(MC)	MWF	(MC)	(MC)
707-108	3	MWF	(MC)	(MC)	Q	(MC)	(MC)
771 Main	3	MWF	(MC)	(MC)	(WC)	(MC)	(MC)
771C Main	2	MWF	(MC)	(MC)	(WC)	(MC)	(MC)
771C Room	3	MWF	(MC)	(MC)	(WC)	(MC)	(MC)
774-202	2	MWF	(MC)	(MC)	(WC)	(MC)	(MC)
774-BC	2	-	(MC)	(MC)	MWF	(MC)	(MC)
776-201	2	MWF	(MC)	(MC)	MWF	(MC)	(MC)
776-202 ^b	2	MWF	(MC)	(MC)	-	(MC)	(MC)
776-204	3	MWF	(MC)	(MC)	MWF	(MC)	(MC)
776-205	2	MWF	(MC)	(MC)	MWF	(MC)	(MC)
776-206	2	MWF	(MC)	(MC)	MWF	(MC)	(MC)
776-250	5	MWF	(MC)	(MC)	MWF	(MC)	(MC)
776-251	3	MWF	(MC)	(MC)	-	(MC)	(MC)
776-252	2	MWF	(MC)	(MC)	-	(MC)	(MC)
778-Laundry	2	MWF	(MC)	(MC)	-	(MC)	(MC)
779-729	2	MWF	(MC)	(MC)	Q	(MC)	(MC)
779-782	3	MWF	(MC)	(MC)	MWF	(MC)	(MC)
865E	1	MWF	-	(MC)	-	(MC)	-
865W	1	MWF	-	(MC)	-	(MC)	-
881-D1-4	4	MWF	(MC)	(MC)	MWF	(MC)	(MC)
881-D5,6	2	MWF	(MC)	(MC)	-	(MC)	(MC)
883A	1	MWF	-	(MC)	-	(MC)	-
883B	1	MWF	-	(MC)	-	(MC)	-
886-875	3	MWF	(MC)	(MC)	-	(MC)	(MC)
889	1	MWF	-	(MC)	-	(MC)	-
991-985	3	MWF	(MC)	(MC)	-	(MC)	(MC)

a. See the legend that precedes this table.

b. Operational in the future.

c. Water fraction, no particulate sample collected.

TABLE 4. Stack Monitoring Program - 1979^a

Building Exhaust System	n	Collection Frequency		Analytical Frequency					
		FPS	³ H	TLL α	³ H	Pu	Am	U	Be
374 Main	1	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
444-D1	1	MWF	-	MWF	-	-	-	(MC)	(MC)
444-D2	1	MWF	-	MWF	-	-	-	(MC)	(MC)
444-D5	1	MWF	-	MWF	-	-	-	(MC)	(MC)
447 Main	1	MWF	-	MWF	-	-	-	(MC)	(MC)
559-561	3	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
707-101	2	MWF	Q	MWF	Q	(MC)	(MC)	(MC)	(MC)
707-102	2	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
707-105	3	MWF	Q	MWF	Q	(MC)	(MC)	(MC)	(MC)
707-106	2	MWF	Q	MWF	Q	(MC)	(MC)	(MC)	(MC)
707-107	3	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
707-108	3	MWF	Q	MWF	Q	(MC)	(MC)	(MC)	(MC)
771 Main	3	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
771C Main	2	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
771C Room	3	MWF	-	MWF	-	(MC)	(MC)	(MC)	(MC)
774-202	2	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
774-B	2	-	MWF	MWF ^b	MWF ^b	(WC) ^b	(WC) ^b	(WC) ^b	(WC) ^b
776-201	2	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
776-202	2	MWF	-	MWF	-	(MC)	(MC)	(MC)	(MC)
776-204	3	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
776-205	2	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
776-206	2	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
776-250	5	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
776-251	3	MWF	-	MWF	-	(MC)	(MC)	(MC)	(MC)
776-252	2	MWF	-	MWF	-	(MC)	(MC)	(MC)	(MC)
778-Laundry	2	MWF	-	MWF	-	(MC)	(MC)	(MC)	(MC)
779-729	2	MWF	Q	MWF	Q	(MC)	(MC)	(MC)	(MC)
779-782	3	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
865E	1	MWF	-	MWF	-	-	-	(MC)	(MC)
865W	1	MWF	-	MWF	-	-	-	(MC)	(MC)
881-D1,2,3,4	4	MWF	MWF	MWF	MWF	(MC)	(MC)	(MC)	(MC)
-D5,6	2	MWF	-	MWF	-	(MC)	(MC)	(MC)	(MC)
883A	1	MWF	-	MWF	-	-	-	(MC)	(MC)
883B	1	MWF	-	MWF	-	-	-	(MC)	(MC)
886-875	3	MWF	-	MWF	-	(MC)	(MC)	(MC)	(MC)
889 Main	1	MWF	-	MWF	-	-	-	(MC)	(MC)
991-985	3	MWF	-	MWF	-	(MC)	(MC)	(MC)	(MC)

a. See the legend preceding Table 3.

b. Water fraction.

TABLE 5. Control Action Guidelines for Stack Emissions

	<u>1978</u>	<u>1979</u>
TLL α	0.02 pCi/m ³	0.02 pCi/m ³
³ H	1000 pCi/m ³	1000 pCi/m ³
Be	10 μ g/sample	0.01 μ g/m ³ , 30-day avg
Pu	-	0.02 pCi/m ³
U	-	1.0 pCi/m ³
Am-241	-	0.07 pCi/m ³

TABLE 6. Water Control Guides - 1978

<u>Location</u>	<u>Parameter</u>	<u>Control Guide (pCi/l)</u>	<u>Action Taken</u>
Pond A-3	Pu ^a	1.0	review of analysis
	Pu ^b	10.0	notification
	³ H	2000	notification
Pond B-3	gross alpha	40	hold release
	beta	60	hold release
	³ H	1500	hold release
Pond B-4	Pu ^b	10.0	notification
Sewage treatment plant	³ H	2500	hold in Pond B-1
Walnut Creek at Indiana Street	Pu ^a	7.0	notification
	³ H	2000	notification
Great Western Reservoir	Pu ^a	7.0	notification
	³ H	2000	notification
Standley Lake	Pu ^a	7.0	notification
	³ H	2000	notification

a. Pulse height analysis.

b. Liquid scintillation analysis.

TABLE 7. Water Control Guides - 1979

<u>Location</u>	<u>Parameter</u>	<u>Control Guide (pCi/l)</u>	<u>Action Taken</u>
Pond A-3	Pu	1.0	review of analysis
	gross alpha	40	hold release
	gross beta	50	hold release
	gamma	positive	hold release
	NO ₃ ⁻ (as N)	10.0	review of analysis
	³ H	1500	hold release
	pH	6.0-9.0	hold release
Pond B-3	gross alpha	40	hold release
	gross beta	50	hold release
	³ H	1500	hold release
	gamma (414 keV)	positive	hold release
	pH	6.0-9.0	hold release
Pond B-4	Pu	2.0	review of analysis
Walnut Creek at Indiana Street	Pu	1.0	notification and review of analysis
	gross alpha	40	notification and review of analysis
	gross beta	50	notification and review of analysis
	³ H	1000	notification and review of analysis
Great Western Reservoir	Pu	0.02	notification and review of analysis
	³ H	1000	notification and review of analysis
Standley Lake	Pu	0.02	notification and review of analysis
	³ H	1000	notification and review of analysis

TABLE 8. Water Treatment Plant Raw Water - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guides</u>
Am	quarterly	-
Pu	quarterly	-
U	weekly	-
Cr	quarterly	-
F ⁻	quarterly	-
Hg	quarterly	-
PCBs	quarterly	-
Cd	quarterly	-
SS	quarterly	-
TDS	quarterly	-
Be	quarterly	-
³ H	quarterly	-

TABLE 9. Water Treatment Plant Raw Water - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide (pCi/l)</u>
Gross alpha	weekly	40
Gross beta	weekly	50
U	weekly	5
TDS	monthly	-
31 elements	quarterly	-
11 elements	quarterly	-

NOTE: The objectives are (1) accumulation of baseline data for control of water treatment plant, and (2) impact relative to uranium contribution.

TABLE 10. Water Treatment Plant Treated Water - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Ra-226	every 5 mo	3 pCi/l
Ra-226 plus Ra-228	every 5 mo	5 pCi/l
Gross beta	every 5 mo	50 pCi/l
Gross alpha	every 5 mo	15 pCi/l
Sr-90	every 5 mo	8 pCi/l
Ag	every 5 mo	0.05 mg/l
As	every 5 mo	0.05 mg/l
Ba	every 5 mo	1.0 mg/l
Be	every 5 mo	-
Ca	every 5 mo	-
Cd	every 5 mo	0.01 mg/l
Cl ⁻	every 5 mo	-
CN ⁻	every 5 mo	-
Color	every 5 mo	-
Cr	every 5 mo	0.05 mg/l
Cu	every 5 mo	1.0 mg/l
F ⁻	every 5 mo	1.4-2.4 mg/l
Fe	every 5 mo	-
Hardness	every 5 mo	-
Hg	every 5 mo	0.002 mg/l
Linear alkyl sulfonates	every 5 mo	-
Mg	every 5 mo	-
Mn	every 5 mo	-
Na	every 5 mo	-
NH ₃	every 5 mo	-
NO ₃ ⁻ (as N)	every 5 mo	10.0 mg/l
P	every 5 mo	-
Pb	every 5 mo	0.05 mg/l
Free available chlorine	daily	< 0.2 mg/l
Total bacteria and coliform	4 days/wk	-
Fecal coliform	4 days/wk	1-4/100 ml
Se	every 5 mo	0.01 mg/l
SO ₄ ⁼	every 5 mo	-
Alkalinity	every 5 mo	-
TDS	every 5 mo	500.0 mg/l
Turbidity	every 5 mo	1.0 NTU
Zn	every 5 mo	-
³ H	annually	1000.0 pCi/l
Endrin	every 3 yrs	0.0002 mg/l
Lindane	every 3 yrs	0.004 mg/l
Methoxychlor	every 3 yrs	0.1 mg/l
Toxaphene	every 3 yrs	0.005 mg/l
2,4-D	every 3 yrs	0.1 mg/l
2,4,5-TP Silvex	every 3 yrs	0.01 mg/l
U	weekly	-

(continued)

TABLE 10. (concluded)

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences, Industrial Hygiene, Utilities.

TABLE 11. Water Treatment Plant Treated Water - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
pH	daily	6.5-8.5
Free available chlorine	daily	0.2 mg/l
Turbidity	daily	1.0 NTU
Total bacteria	4 days/wk	-
Total coliform	4 days/wk	-
Fecal coliform	4 days/wk	1-4/100 ml
Gross alpha	weekly	15 pCi/l
Gross beta	weekly	50 pCi/l
U	weekly	-
³ H	weekly	1500 pCi/l
31 elements	quarterly	as indicated below
11 elements	quarterly	as indicated below
Alkalinity	quarterly	-
Total hardness	quarterly	-
Ag	quarterly	0.05 mg/l
As	quarterly	0.05 mg/l
Ba	quarterly	1.0 mg/l
Cd	quarterly	0.01 mg/l
Cr	quarterly	0.05 mg/l
Cu	quarterly	1.0 mg/l
Hg	quarterly	0.002 mg/l
Pb	quarterly	0.05 mg/l
Se	quarterly	0.01 mg/l
Zn	quarterly	5.0 mg/l
NH ₃	quarterly	-
Ra-226	annually	3.0 pCi/l
Ra-226 plus Ra-228	annually	5.0 pCi/l
Sr-90	annually	8.0 pCi/l
Color	annually	15 units
Cl ⁻	annually	250 mg/l
CN ⁻	annually	0.005 mg/l
F ⁻	annually	1.4-2.4 mg/l
SO ₄ ⁼	annually	250 mg/l
MBAS	annually	0.5 ppm
NO ₃ ⁻ (as N)	annually	10.0 mg/l
TDS	annually	500 mg/l
Endrin	annually	0.0002 mg/l
Lindane	annually	0.004 mg/l
Methoxychlor	annually	0.1 mg/l
Toxaphene	annually	0.005 mg/l
2,4-D	annually	0.1 mg/l
2,4,5-TP Silvex	annually	0.01 mg/l

(continued)

TABLE 11. (concluded)

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated.

The objective is compliance with Colorado Primary Drinking Water Regulations for which the limits are shown.

ERDA Manual Chapter 0550 (adopted by DOE) lists rules and regulations by which Rocky Flats operates its drinking water supply.

TABLE 12. Sewage Treatment Plant Influent - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40 pCi/l
Pu	if gross alpha > 40 pCi/l	-
^3H	weekly	1200 pCi/l
Gamma*	weekly	positive
pH	daily	6.0-9.0
F ⁻	daily	-

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* NaI detection system is used.

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environment Sciences, Utilities.

TABLE 13. Sewage Treatment Plant Influent - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40 pCi/l
pH	daily	6.0-9.0
P	daily	-
COD	daily	-
³ H	daily	1500 pCi/l
Gamma	weekly	Positive

NOTE: When control guides are exceeded, data reliability and contaminant sources(s) are investigated.

The objectives are (1) data for control of sewage release operations (control guides are administrative), (2) data base detection and measurement of abnormal conditions, and (3) operational control.

TABLE 14. Sewage Treatment Plant Effluent - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Pu	daily	5.0 pCi/l
^3H	daily	1500.0 pCi/l
Gamma	daily	positive
NO_3^- (as N)	daily	< 5, > 10.0 mg/l
P	daily	8.0 mg/l ^a
pH	daily	6.0-9.0 ^a
F^-	daily	1.7 mg/l ^a
Total residual chlorine	daily	0.5 mg/l
SS	daily	15/25 ^b .0 mg/l ^a
Kjeldahl-N	daily	-
NO_2	daily	-
COD	daily	50.0 mg/l
Dissolved oxygen	3 days/wk	> 4/> 2 ^d .0 mg/l ^a
mg/l ^a		
BOD_5	3 days/wk	10/25 ^b .0 mg/l ^a
Fecal coliform	3 days/wk	200/100.0 ml ^c
Total bacteria and coliform	3 days/wk	-
Cr	weekly	0.05 mg/l ^a
Color	weekly	-
Oil and grease	weekly	10.0 mg/l ^a
Turbidity	weekly	25.0 NTU

- a. Control guides are regulated by the NPDES permit and reported to EPA and Colorado Department of Health (CDH).
b. Daily average/daily maximum.
c. 30-day average.
d. Daily average/daily minimum.

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences, Utilities.

TABLE 15. Sewage Treatment Plant Effluent - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gamma	daily	positive
pH	daily	6.0-9.0
P	daily	8.0 mg/l
NO ₃ (as N)	daily	10.0 mg/l
NO ₂ (as N)	daily	-
Kjeldahl-N	daily	-
Total nitrogen {Kjeldahl, NO ₃ (as N), NO ₂ }	daily	20.0 mg/l
F ⁻	daily	1.4-2.4 mg/l ^a
Temperature	daily	-
Free chlorine, residual	daily	0.5 mg/l
SS	daily	15/25 mg/l ^b
COD	daily	50 mg/l
BOD ₅	3 days/wk	10/25 mg/l ^b
Total coliform	3 days/wk	-
Fecal coliform	3 days/wk	200/100 ml
Dissolved oxygen	3 days/wk	4/2 mg/l ^c
TOC	3 days/wk	-
Cr ⁶⁺	weekly	0.05 mg/l
Color	weekly	-
Oil and grease	weekly	10.0 mg/l
Turbidity	weekly	25.0 NTU
Pu	weekly	2.0 pCi/l
U	weekly	5.0 pCi/l
Am	weekly	1.0 pCi/l

a. Control guide is temperature dependent.

b. Daily average/daily maximum.

c. Daily average/daily minimum.

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated. EPA is notified per NPDES requirements.

The objectives are (1) compliance with the NPDES permit and (2) operational control.

TABLE 16. Pond B-3 - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	MWF	40 pCi/l
Gross beta	MWF	60 pCi/l
pH	MWF	6.0-9.0
³ H	MWF	1000.0 pCi/l
Gamma	MWF	Ge(Li) system used (pilot program)

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences, Utilities.

TABLE 17. Pond B-3 - 1979

<u>Parameter</u>	<u>Analytical Frequency*</u>	<u>Control Guide</u>
Gross alpha	2 days/wk	40 pCi/l
Gross beta	2 days/wk	50 pCi/l
Gamma	2 days/wk	positive
³ H	2 days/wk	1500 pCi/l
pH	2 days/wk	6.9-9.0

* Frequency is subject to change based on operational considerations.

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated.

The objectives are (1) data for control of liquid effluent release, and (2) Plant impact - release estimate for Pu and ³H.

TABLE 18. Pond B-4 - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40 pCi/l
Total residual chlorine	daily	0.1 mg/l*
Gamma	weekly	positive
³ H	weekly	1000 pCi/l
Am	weekly	1.0 pCi/l
Gross beta	weekly	50 pCi/l
Pu	weekly	2.0 pCi/l
U	weekly	5.0 pCi/l
Gamma	weekly	Ge(Li) system used (pilot program)
COD	quarterly	-
NH ₃	quarterly	-
NO ₃ ⁻ (as N)	quarterly	-
SS	quarterly	-
F ⁻	quarterly	-
P	quarterly	-
Total solids	quarterly	-
Sr-90	quarterly	-
Iodine-131	quarterly	-
Sr-89	quarterly	-
Cs-134	quarterly	-
11 elements	quarterly	-
31 elements	quarterly	-

* Control guide is regulated by the NPDES permit and is reported to the EPA and CDH.

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences, Utilities.

TABLE 19. Pond B-4 - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40 pCi/l
Total residual chlorine*	daily	0.1 mg/l
Pu	weekly	2.0 pCi/l
U	weekly	5.0 pCi/l
Am	weekly	1.0 pCi/l
³ H	weekly	1500.0 pCi/l
Gamma	weekly	positive
Gross beta	weekly	50 pCi/l
31 elements	quarterly	-
11 elements	quarterly	-
Bromacil	annually	-
2,4-D	annually	0.1 mg/l

* NPDES requirement.

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated. EPA is notified of NPDES violations.

The objectives are (1) compliance with NPDES permit, (2) Plant impact - release estimates for ³H, Pu, U, and Am, and (3) detection of abnormal conditions.

TABLE 20. Pond A-1 Bypass - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40 pCi/l
Gross beta	daily	50 pCi/l
³ H	daily	1000 pCi/l
NO ₃ (as N)	daily	10 mg/l

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences, Liquid Waste Processing.

TABLE 21. Pond A-1 Bypass - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40 pCi/l
Gross beta	daily	50 pCi/l
^3H	daily	1500 pCi/l
NO_3^- (as N)	daily	10 mg/l

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated.

The objective is the detection of abnormal conditions.

TABLE 22. Pond A-3 - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	Before and during release	40 pCi/l
Gross beta	Before and during release	60 pCi/l
Gamma	Before and during release	positive
^3H	Before and during release	1000 pCi/l
NO_3^- (as N)	Before and during release	10 mg/l
pH	Before and during release	6.0-9.0
Pu	During release	
Am	During release	
U	During release	
Gamma	Before and during release	Ge(Li) systems used

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences, Liquid Waste Processing.

TABLE 23. Pond A-3 - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	Before release	40 pCi/l
Gross beta	Before release	50 pCi/l
Gamma	Before release	positive
³ H	Before release	1500 pCi/l
Pu	During release	1.0 pCi/l
U	During release	5.0 pCi/l
Am	During release	0.5 pCi/l
pH	Before and during release	6.0-9.0
NO ₃ (as N)	Before and during release	10 mg/l

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated; EPA is notified of excursions per NPDES requirements.

The objectives are (1) compliance with NPDES permit, (2) estimate of Plant impact, and (3) control of operations.

TABLE 24. Pond C-1 - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40
Gamma	weekly	positive
^3H	weekly	1000
Am	weekly	0.5
Gross beta	weekly	50
Pu	weekly	1.0
U	weekly	5.0
Gamma	weekly	Ge(Li) system used (pilot program)
pH	2 days/mo	-
TDS	2 days/mo	-
COD	monthly	-
NO_3^- (as N)	monthly	-
Cr	quarterly	-
CN^-	quarterly	-
Oil and grease	quarterly	-
PCBs	quarterly	-
Phenol	quarterly	-
Linear alkyl sulfonates	quarterly	-
As	quarterly	-
Cl^-	quarterly	-
11 elements	quarterly	-
31 elements	quarterly	-
F^-	quarterly	-
P	quarterly	-
SO_4^{2-}	quarterly	-
Total solids	quarterly	-
Sr-90	quarterly	-

USERS OF DATA: Environmental Sciences.

TABLE 25. Pond C-1 - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40 pCi/l
Gross beta	weekly	50 pCi/l
³ H	weekly	1500 pCi/l
Pu	weekly	1.0 pCi/l
U	weekly	5.0 pCi/l
Am	weekly	0.5 pCi/l
Gamma	weekly	positive
pH	2 days/mo	6.0-9.0
TDS	2 days/mo	-
COD	monthly	-
NO ₃ (as N)	monthly	10 mg/l
31 elements	quarterly	-
11 elements	quarterly	-
Free chlorine residual	intermittent*	-
Bromacil	annually	-
2,4-D	annually	0.1 mg/l

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* When reverse osmosis plant is operating.

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated; EPA is notified of excursions as per NPDES requirements.

The objectives are (1) compliance with NPDES permit and (2) detection of abnormal conditions.

TABLE 26. Solar Evaporation Ponds - 1978

Solar Ponds 207-A, -B, and -C

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	every 5 mo	-
Am	every 5 mo	-
Be	every 5 mo	-
Gross beta	every 5 mo	-
Cm	every 5 mo	-
CN ⁻	every 5 mo	-
³ H	every 5 mo	-
NO ₃ ⁻ (as N)	every 5 mo	-
pH	every 5 mo	-
Pu	every 5 mo	-
Sr-90	every 5 mo	-
TDS	every 5 mo	-
U-234	every 5 mo	-
U-235	every 5 mo	-
U-238	every 5 mo	-

POND 207-C

Pu	monthly	25
U-234	monthly	15,000
U-235	monthly	500
U-238	monthly	20,000
Am	monthly	10
³ H	monthly	20,000
Gross alpha	monthly	50,000
Gross beta	monthly	50,000
TDS	monthly	-
pH	monthly	-

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences, Liquid Waste Processing.

TABLE 27. Solar Evaporation Ponds - 1979

Solar Pond 207-A

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	quarterly	-
Gross beta	quarterly	-
^3H	quarterly	-
Pu	quarterly	-
Am	quarterly	-
U-234	quarterly	-
U-235	quarterly	-
U-238	quarterly	-
Be	quarterly	-
CN ⁻	quarterly	-
NO ₃ ⁻ (as N)	quarterly	-
TDS	quarterly	-
pH	quarterly	-

Solar Pond 207-B

Analyses as necessary until the pond goes into service for Reverse Osmosis unit.

Solar Pond 207-C

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Pu	monthly	25 pCi/l
U-234	monthly	20,000 pCi/l
U-235	monthly	500 pCi/l
U-238	monthly	20,000 pCi/l
Am	monthly	10.0 pCi/l
^3H	monthly	20,000 pCi/l
Gross alpha	monthly	50,000 pCi/l
Gross beta	monthly	50,000 pCi/l
TDS	monthly	-
pH	monthly	-

NOTE: When control guides are exceeded, data reliability and contaminant sources(s) are investigated. Process waste management personnel are notified of excursion.

The objectives are (1) control of Bldg. 374 operations and (2) estimate Plant impact.

TABLE 28. Sumps and Landfill Test Holes - 1978

SUMPS 1, 2, and 3

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	weekly	-
Gross beta	weekly	-
^3H	weekly	-
NO_3^- (as N)	weekly	-

LANDFILL TEST HOLE 2

Sr-90	quarterly	-

LANDFILL TEST HOLE 46

^3H	quarterly	-

USERS OF DATA: Liquid Waste Processing, Utilities, and Environmental Sciences.

TABLE 29. Sumps and Landfill Test Holes - 1979

SUMPS 1, 2, 3, and 6

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	weekly	-
Gross beta	weekly	-
³ H	weekly	-
NO ₃ (as N)	weekly	-

NOTE: Landfill test holes 2 and 46 have been eliminated from catalogue.

TABLE 30. Holding Tank Test Holes - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha*	April and October	-
Conductivity	April and October	-
pH	April and October	-
Pu	April and October	-
NO ₃ (as N)	April and October	-
TDS	April and October	-

* If gross alpha > 40 pCi/l.

USERS OF DATA: Environmental Sciences, Liquid Waste Processing, and Utilities.

TABLE 31. Holding Tank Test Holes - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	March, June, September	-
Conductivity	March, June, September	-
pH	March, June, September	-
NO ₃ (as N)	March, June, September	-
TDS	March, June, September	-

NOTE: Possible modifications at a later date, following a more complete analysis.

TABLE 32. Process Waste Treatment Pond,
Landfill Ponds (East and West), and
Landfill Bypasses (North and South) - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily ^a	40 pCi/l
Pu	If gross alpha > 40 pCi/l	-
Gamma (NaI)	weekly	positive
³ H	weekly	1000 pCi/l ^b
NO ₃ (as N)	weekly	10 mg/l ^b
Sr-90	weekly	-
Gamma	weekly	Ge(Li) system used (Pilot program)
Be	monthly	-
Cd	monthly	-
COD	monthly	-
Cr	monthly	-
31 elements	monthly	-
Hg	monthly	-
PCBs	monthly	-
Phenol	monthly	-
Total solids	monthly	-

- a. West landfill pond only. The east pond was checked weekly.
b. East landfill pond only.

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences, Liquid Waste Processing.

TABLE 33. Process Waste Treatment Pond,
Landfill Ponds (East and West), and
Landfill Bypasses (North and South) - 1979

PROCESS WASTE TREATMENT POND

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	weekly	40 pCi/l
^3H	weekly	-
NO_3^- (as N)	weekly	-
Gamma	weekly	-

LANDFILL PONDS (EAST AND WEST)

Gross alpha	weekly	40 pCi/l
Gamma	weekly	positive
^3H	weekly	1500 pCi/l
Sr-90	weekly	-
31 elements	monthly	-
Be	monthly	-
Cd	monthly	-
Hg	monthly	-
PCB's	monthly	-
Phenol	monthly	-
TDS	monthly	-
COD	monthly	-
TOC	monthly	-
Na	monthly	-
Ca	monthly	-
Mg	monthly	-
Conductivity	monthly	-
pH	monthly	-

LANDFILL BYPASSES (NORTH AND SOUTH)

Gross alpha	weekly	40 pCi/l
^3H	weekly	1500 pCi/l
NO_3^- (as N)	weekly	10 mg/l

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated.

The objectives are (1) control of landfill operations and (2) detection of abnormal conditions.

TABLE 34. Walnut Creek at Indiana Street - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40
Pu	If gross alpha > 40 pCi/l	-
Gamma	daily	positive
³ H	daily	1000
pH	daily	-
NO ₃ (as N)	daily	-
Gross beta	weekly	50
Sr-90	weekly	-
U	weekly	5
Am	weekly	0.5
Pu	weekly	1
Gamma	weekly	Ge(Li) systems used (pilot program)
CN ⁻	quarterly	-
Cr	quarterly	-
Oil and grease	quarterly	-
PCBs	quarterly	-
Phenol	quarterly	-
Linear alkyl sulfonates	quarterly	-
As	quarterly	-
Cl ⁻	quarterly	-
11 elements	quarterly	-
31 elements	quarterly	-
F ⁻	quarterly	-
P	quarterly	-
SO ₄ ⁼	quarterly	-
Total Solids	quarterly	-

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences.

TABLE 35. Walnut Creek and Indiana Street Gauging Station - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	daily	40 pCi/l
Gamma	daily	positive
^3H	daily	1000 pCi/l
pH	daily	6.0-9.0
NO_3^- (as N)	daily	10 mg/l
Gross beta	weekly	50 pCi/l
Pu t	weekly	1.0 pCi/l
U	weekly	5.0 pCi/l
Am	weekly	0.5 pCi/l
31 elements	quarterly	-
11 elements	quarterly	-
I-131	quarterly	-
Sr-89	quarterly	-
Cs-134	quarterly	-
Bromacil	annually	-
2,4-D	annually	0.1 mg/l

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated.

TABLE 36. Great Western Reservoir and Standley Lake - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>MDA Begun July 1978</u>	<u>Control Guide</u>
^3H	weekly	-	1000 pCi/l
U	weekly	-	5 pCi/l
Am	weekly	0.02 pCi/l	0.1 pCi/l
Pu	weekly	0.02 pCi/l	0.1 pCi/l
NO_3^- (as N)	weekly	-	2.0 mg/l
Cr	monthly	-	-
CN^-	monthly	-	-
Oil and grease	monthly	-	-
PCBs	monthly	-	-
Phenol	monthly	-	-
Linear alkyl sulfonates	monthly	-	-
As	monthly	-	-
Cl^-	monthly	-	-
11 elements	monthly	-	-
31 elements	monthly	-	-
F^-	monthly	-	-
P	monthly	-	-
$\text{SO}_4^{=}$	monthly	-	-
Total solids	monthly	-	-

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences.

TABLE 37. Great Western Reservoir and Standley Lake - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
^3H	weekly	1500 pCi/l
NO_3^- (as N)	weekly	2.0 pCi/l
U	monthly	5.0 pCi/l
Pu	monthly	0.02 mg/l
Am	monthly	0.02 mg/l
31 elements	quarterly	-
11 elements	quarterly	-

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated. Radionuclide excursions are reported to DOE.

The objective is verification of data.

TABLE 38. Forty-Three Hydrologic Test Holes - 1978

Parameter	Analytical Frequency	Control Guide
Gross alpha	5-mo interval for all parameters	40 pCi/l
Am	5-mo interval for all parameters	0.1 pCi/l
As	5-mo interval for all parameters	-
B	5-mo interval for all parameters	-
Be	5-mo interval for all parameters	-
Gross beta	5-mo interval for all parameters	50 pCi/l
Ca	5-mo interval for all parameters	-
Cd	5-mo interval for all parameters	-
Cl ⁻	5-mo interval for all parameters	-
Cr	5-mo interval for all parameters	-
Conductivity	5-mo interval for all parameters	1000 μ ho
Cu	5-mo interval for all parameters	-
F ⁻	5-mo interval for all parameters	-
Fe	5-mo interval for all parameters	-
³ H	5-mo interval for all parameters	1000 pCi/l
Hardness	5-mo interval for all parameters	-
K	5-mo interval for all parameters	-
Li	5-mo interval for all parameters	-
Mg	5-mo interval for all parameters	-
Mn	5-mo interval for all parameters	-
Mo	5-mo interval for all parameters	-
Na	5-mo interval for all parameters	-
NH ₃	5-mo interval for all parameters	-
NO ₂ ⁻	5-mo interval for all parameters	-
NO ₃ ⁻ (as N)	5-mo interval for all parameters	10 mg/l
P	5-mo interval for all parameters	-
Gamma (NaI)	5-mo interval for all parameters	positive
Pb	5-mo interval for all parameters	-
Pu	5-mo interval for all parameters	0.1 pCi/l
SO ₄ ⁼	5-mo interval for all parameters	-
Sr-90	5-mo interval for all parameters	-
TDS	5-mo interval for all parameters	1000 mg/l
U	5-mo interval for all parameters	5 pCi/l
Zn	5-mo interval for all parameters	-
Gamma	5-mo interval for all parameters	Ge(Li) system used (pilot program)

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences, Liquid Waste Processing.

TABLE 39. Forty-Three Hydrologic Test Holes - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	March, June, September	40 pCi/l
Gross beta	March, June, September	50 pCi/l
^3H	March, June, September	1500 pCi/l
Pu	March, June, September	0.1 pCi/l
U*	March, June, September	5.0 pCi/l
Am	March, June, September	0.1 pCi/l
Gamma	March, June, September	positive
TDS	March, June, September	1000.0 mg/l
Conductivity	March, June, September	1000.0 μmho
Alkalinity	March, June, September	-
Hardness	March, June, September	-
pH	March, June, September	6.0-9.0
Cl^-	March, June, September	-
F^-	March, June, September	-
$\text{SO}_4^{=}$	March, June, September	-
NH_3 (as N)	March, June, September	-
NO_2^- (as N)	March, June, September	-
NO_3^- (as N)	March, June, September	10 mg/l
P	March, June, September	-
31 elements	March, June, September	-
11 elements	March, June, September	-
TOC	March, June, September	-

* This includes U-234, -235, and -238. The control guide for all three isotopes, in total, is 5.0 pCi/l.

NOTE: When control guides are exceeded, data reliability and contaminant source(s) are investigated.

The objective is the detection of abnormal conditions.

TABLE 40. Ten Building Footings Drains - 1978

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	5-mo interval for all parameters	> 40 pCi/l
Gross beta	5-mo interval for all parameters	> 50 pCi/l
Conductivity	5-mo interval for all parameters	> 1000 μ mho
NO ₃ (as N)	5-mo interval for all parameters	> 10 mg/l
pH	5-mo interval for all parameters	6.0 to 9.0
TDS	5-mo interval for all parameters	1000 mg/l
Gamma (NaI)	5-mo interval for all parameters	positive
Gamma	5-mo interval for all parameters	Ge(Li) system used (pilot program)

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences.

TABLE 41. Footing Drains and Building Sumps - 1979

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Gross alpha	March, June, September	40 pCi/l
Gross beta	March, June, September	50 pCi/l
Conductivity	March, June, September	1000 μ mho
NO ₃ ⁻ (as N)	March, June, September	10 mg/l
pH	March, June, September	6.0-9.0
TDS	March, June, September	1000 mg/l
Gamma (NaI)	March, June, September	positive
³ H	March, June, September	1500 pCi/l

NOTE: Subject to modification at a later date to include radionuclide analysis on a pilot program basis.

When control guides are exceeded, data reliability and contaminant source(s) are investigated.

The objective is the detection of abnormal conditions.

TABLE 42. Municipal and Regional Waters Through June 1978

COMMUNITY WATER TAPS
(Broomfield, Boulder, and Westminster)

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide (pCi/l)</u>
Am	weekly	0.1
Pu	weekly	0.1
U	weekly	5.0

COMMUNITY WATER TAPS
(Arvada, Denver, Golden, Lafayette, Louisville, and Thornton)

Am	quarterly	0.1
Pu	quarterly	0.1
U	quarterly	5.0

REGIONAL WATERS (35)
(16 sites > 5 miles from Rocky Flats)

Am	annually	0.1
³ H	annually	1000.0
Pu	annually	0.1
U	annually	5.0

NOTE: When control guides are exceeded, an investigation is conducted and control action is taken as required.

USERS OF DATA: Environmental Sciences.

TABLE 43. Municipal and Regional Waters Beginning July 1978

COMMUNITY WATER TAPS
(Broomfield, Boulder, and Westminster)

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>MDA^a (pCi/l)</u>	<u>Control Guide (pCi/l)</u>
Am	weekly sample, monthly composite	0.02	0.05
Pu	weekly sample, monthly composite	0.02	0.05
(b)	monthly composite	per law	-
U	weekly sample, monthly composite	-	5.0

COMMUNITY WATER TAPS
(Arvada, Denver, Golden, Lafayette, Louisville, and Thornton)^c

Am	quarterly	0.1	0.1
Pu	quarterly	0.1	0.1
U	quarterly	-	5.0

REGIONAL WATERS
(15 surface and 15 drinking water samples for regional background^d)

Am	annually	(e)	0.1
Pu	annually	(e)	0.1
U	annually	(e)	5.0
³ H	annually	(e)	1000.0

- a. MDA - Minimum detectable activity.
b. Total long-lived alpha, beta, and gamma followed by radium-226, and -228 analysis as required by Colorado drinking water regulations.
c. Control actions involve (1) reviewing laboratory records, (2) investigating cause or source, and (3) recommending initiation of offsite discussions.
d. Control actions are to review laboratory records and to investigate source.
e. Dependent upon application of data.

TABLE 44. Municipal and Regional Waters 1979

COMMUNITY WATER TAPS
(Broomfield, Boulder, and Westminster)

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide (pCi/l)</u>
³ H	weekly	1500
U	weekly	5.0
Pu	monthly	0.02
Am	monthly	0.02

COMMUNITY WATER TAPS
(Arvada, Denver, Golden, Lafayette, Louisville, and Thornton)

Pu	quarterly	0.02
U	quarterly	5.0
Am	quarterly	0.02
³ H	quarterly	1500

OFFSITE WATERS - 1979 PILOT PROGRAM
(Ralston Reservoir, South Boulder Diversion Canal,
Dillon Reservoir, Boulder Reservoir, Bottled Water)

Pu	annually	0.02
U	annually	5.0
Am	annually	0.02
³ H	annually	1500
Gamma	annually	positive

NOTE: The objectives are (1) compliance with Colorado Primary Drinking Water Regulations, (2) verification of testing by other parties, and (3) assessment of Plant impact.

TABLE 45. Laundry Process Water - 1979

TANKS 776A and 776B		
<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide (pCi/l)</u>
Pu	weekly	1667
³ H	weekly	-
U	weekly	-
Am	weekly	-
POND B-2 ^a		
Pu	weekly	-
³ H	weekly	-
U	weekly	-
Am	weekly	-
POND A-2 ^b		
Pu ^c	weekly	-
³ H	weekly	-
U	weekly	-
Am	weekly	-

- a. Sampled only when water is pumped to Pond A-2.
 b. Sampled only when spray is evaporated.
 c. Liquid scintillation plutonium.

NOTE: The objective is operational control.

If the control guide of 1000 d/m/l total long-lived alpha is exceeded, Waste Management will not release water from laundry process tanks 776A and 776B to Pond B-2. Instead, water will be sent to the Plutonium Recovery Building.

TABLE 46. Building 374 Product Water - 1979
(boiler makeup water)

<u>Parameter</u>	<u>Analytical Frequency</u>	<u>Control Guide</u>
Pu	weekly	-
U-234	weekly	-
U-235	weekly	-
U-238	weekly	-
Am	weekly	-
³ H	weekly	-
Gamma	weekly	-

NOTE: The objectives are (1) operational control and (2) detection of abnormal conditions.

TABLE 47. Soil Sample Program - 1979

I. TRANSECT AND RADIAL SAMPLES (COMBINED)

A. Purpose

1. Study variability in plutonium concentration in soils needed for other studies
2. Study migration of radioactivity
  - a. Vertical movement
  - b. Horizontal changes

B. Location (See Figure 3)

1. "East Strip" along Plant Boundary
  - a. Site numbers 14, 15, 16, and 17 or
  - b. Site numbers 18, 19, 20, and 21

C. Methods

1. Collection

- a. Surface (10 X 10 X 5 cm) (20 samples)
  - (1) Five samples at each site
  - (2) Each sample to be a composite of five subsamples
  - (3) Environmental Analysis and Control (EA&C) procedure to be used for sample collection
- b. Profile (15 samples)
  - (1) Five profiles at one site
  - (2) Each profile will have samples at three depths, e.g., 10, 20, and 30 cm
  - (3) EA&C procedure to be used as adapted for profiles

2. Analyses (35 samples)

- a. Plutonium
  - (1) Radiochemical analysis

(continued)

TABLE 47. (continued)

- (2) Expected range is from 5 to 100 d/m/g
- b. Americium
  - (1) Radiometric analysis
  - (2) Expected range is from 0.5 to 10 d/m/g
- c. Gamma Emitters
  - (1) Radiometric analysis by gamma ray spectrometry
  - (2) Expected radionuclides are low levels of strontium and cesium plus uranium and thorium decay chains
- D. Evaluation of Data
  - 1. Statistics
    - a. Mean values at each site
    - b. Variance at each site should be less than gradient between sites
    - c. Low variance should permit annual repetitive sampling
  - 2. Determine feasibility for continuation of migration study, which might take five years.
- E. Data Display
  - 1. Maps and tables
  - 2. Graphs and line diagrams

II. EASTERN PERIMETER FAMILIARIZATION WITH EPA GUIDANCE

- A. Purpose
  - 1. Compare eastern perimeter soils with EPA screening level of $0.2 \mu\text{Ci}/\text{m}^2$.
- B. Locations
  - 1. Six 10-acre plots along Indiana Street
  - 2. Each plot about 2640 feet apart and 500 feet west of Indiana Street
  - 3. One plot to be sampled each year until complete.

(continued)

TABLE 47. (concluded)

C. Methods

1. Collection

a. Surface (10 X 10 X 1 cm)

- (1) Six samples per 10-acre plot
- (2) Each sample should be a composite of 10 subsamples
- (3) EA&C procedure to be used as applicable

2. Analysis

a. Plutonium (2 to 10 d/m/g)

- (1) Radiochemical

D. Evaluation of Data

1. Statistics

- a. Mean value for each plot
- b. Distribution of values is expected to be log normal
- c. Precision is expected to be less than 25 percent at the 95 percent confidence level

FIGURE 1. Locations of Onsite Ambient Air Samplers

Legend
 ▲ - perimeter samplers
 ● - community samplers
 X - litigation samplers

FIGURE 2. Locations of Offsite Ambient Air Samplers

FIGURE 3. Survey Grid for Soil Sampling Program

Appendix A
ABBREVIATIONS AND SYMBOLS

Ag	silver
Al	aluminum
Am	americium
As	arsenic
B	boron
Ba	barium
Be	beryllium
BOD ₅	biochemical oxygen demand, 5-day
Ca	calcium
Cd	cadmium
Ce	cerium
Cl ⁻	chloride
Cm	curium
CN ⁻	cyanide
Co	cobalt
COD	chemical oxygen demand
Cr	chromium
Cs	cesium
Cu	copper
F ⁻	fluoride
Fe	iron
Gamma (NaI)	gamma measurement using sodium iodide equipment
Ge	germanium
Ge(Li)	germanium lithium detector
³ H	tritium
Hg	mercury
I	iodine
K	potassium
Kjeldahl-N	NH ₃ + organic N
Li	lithium
MBAS	methylene blue active substances

Mg	magnesium
Mn	manganese
Mo	month
MWF	Monday, Wednesday, Friday
N	nitrogen
Na	sodium
Nb	niobium
NH ₃	ammonia
Ni	nickel
NO ₂	nitrite
NO ₃	nitrate
NTU	Nephelometric turbidity unit
P	total phosphorus
Pb	lead
PCBs	polychlorinated biphenyls
pH	measurement of hydrogen ion concentration
Pu	plutonium
Ra	radium
Rb	rubidium
Sb	antimony
Se	selenium
Si	silicon
Sn	tin
SO ₄ ²⁻	sulfate
Sr	strontium
SS	suspended solids (total)
Ta	tantalum
TDS	total dissolved solids

Te	tellurium
Th	thorium
Ti	titanium
Tl	thallium
TLL α	total long-lived alpha
TOC	total organic carbon
U	uranium
V	vanadium
W	tungsten
Zn	zinc
Zr	zirconium

31 elements: Ag, Al, B, Ce, Co, Cr, Cs, Cu, Fe, Ge, Li, Mn, Mo, Nb, Ni, P, Pb, Rb, Sb, Sn, Sr, Ta, Te, Th, Tl, Ti, U, V, W, Zn, and Zr

11 elements: Be, Ba, Ca, Cd, Cr, Hg, K, Mg, Na, Se, and Si

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