THIS IS ONE VOLUME OF A SIX VOLUME SET WHICH INCLUDES:

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VOLUME II: GROUNDWATER (GW)
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EG&G ROCKY FLATS PLANT EMD MANUAL OPERATION SOP	Manual: Procedure No.: Page: Effective Date:	5-21000-OPS SW.13, Rev. 2 1 of 11 March 1, 1992
Category 2	Organization:	Environmental Management

TITLE:
BACTERIOLOGICAL WATER SAMPLING

Approved By:

(Name of Approver) / / (Date)

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2.0 PURPOSE AND SCOPE

This SOP describes procedures that will be used at the Rocky Flats Plant (RFP). It addresses the current EPA and State of Colorado Primary Drinking Water Regulations concerning the collection of bacteriological water samples but is applicable to all bacteriological water sampling for the RFP. The purpose of this procedure is to ensure that the collection of representative bacteriological samples meets applicable regulations and appropriate sampling protocols as specified in the Colorado Primary Drinking Water Regulations, Colorado Department of Health, Water Quality Control Division, Drinking Water Section, April 30, 1991.

The Code of Federal Regulations (CFR), Part 141.1, defines a public water system as "a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year." Public water systems are classified as either community or non-community water systems. A community water system is defined as "a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents." A non-community water system is defined as "a public water system that is not a community system."

Under the authority of the Colorado Department of Health (CDH), Colorado Primary Drinking Water Regulations, public water systems must collect total coliform samples at regular intervals throughout the month from sites that are representative of the water throughout the distribution system. Community water systems must monitor for total coliform at a frequency based on the population served by the system, as specified in the CDH, Colorado Primary Drinking Water Regulations. Non-community water systems utilizing surface water must monitor at the same frequency as liked-sized community water systems. The RFP qualifies as a non-transient, non-community public water system that utilizes surface water and must, therefore, meet the requirements of the Colorado Primary Drinking Water Regulations pertaining to this type of system.

3.0 RESPONSIBILITIES AND QUALIFICATIONS

All personnel performing these procedures are required to have the appropriate health and safety training as specified in the site-specific Health and Safety Plan. In addition, all personnel are required to have a complete understanding of the procedures described within this SOP and receive specific training regarding these procedures, if necessary.

Personnel performing bacteriological sampling will be geologists, hydrologists, engineers, or field technicians with an appropriate amount of applicable field experience or on-the-job training under supervision of another qualified person.

4.0 REFERENCES

4.1 SOURCE REFERENCES

The following is a list of references reviewed prior to the writing of this procedure:

MCD-51, NPDES Compliance Inspection Manual. USEPA, May 1988.

Code of Federal Regulations. 40 CFR parts 141 and 142.

Methods for Chemical Analysis of Water and Waste. USEPA 1979.

Colorado Primary Drinking Water Regulations. Colorado Department of Health, Water Quality Control Division, Drinking Water Section, April 30, 1991

DOE Order 5400.1. General Environmental Protection Program, November 8, 1988.

Microbiological Methods for Monitoring the Environment, Water and Wastes. Environmental Monitoring and Support Laboratory, Cincinnati. EPA-600/8-78-017-December, 1978.

Standard Methods for the Examination of Water and Waste Water. APHA-AWWA-WPOF-17th Edition, 1989.

Manual for the Certification of Laboratories Analyzing Drinking Water, 3rd Edition. The Laboratory Certification Program Revision Committee EPA/570/9-90/008-April 1990.

4.2 INTERNAL REFERENCES

Related SOPs cross-referenced by this SOP are as follows:

- SOP FO.3, General Equipment Decontamination
- SOP FO.13, Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples
- SOP FO.14, Field Data Management
- SOP SW.2, Field Measurements of Surface Water Field Parameters
- SOP SW.3, Surface Water Sampling

5.0 METHODS

Colorado Primary Drinking Water Regulations require non-community water systems using surface water to monitor at the same frequency as like-sized community water systems. Based on the current RFP population served, a minimum of nine samples per month will be collected.

5.1 ROUTINE SAMPLE COLLECTION AND PRESERVATION

Collection of representative bacteriological samples from the water system requires that a reliable procedure be developed and implemented. Sampling sites and frequencies will be as specified in the Field Sampling Plan. Samples will be collected and preserved as follows:

- Samples will be collected as specified in SOP SW.7, Collection of Tap Water Samples.

- Samples will be collected at the frequency specified in the Field Sampling Plan which at a minimum will comply with the requirements of Section 3.1, paragraph (1) (e) (iv) of the Colorado Primary Drinking Water Regulations.

- Samples will be collected in pre-sterilized plastic or glass containers, preserved with sodium thiosulfate ($Na_2S_2O_3$) to 0.008 percent and cooled to 4°C, except that the $Na_2S_2O_3$ is not required when chlorine is not present. All sample bottles will be filled to 1-2 inches below the top. This will allow head space for mixing at the analytical lab.

- The Standard Sample size will be 100 ml.

5.2 REPEAT SAMPLING AFTER DETECTION OF COLIFORM BACTERIA

When a routine sample is total coliform positive, additional bacteriological samples will be collected as follows:

(1) Samples will be collected within 24 hours after notification of the positive results.

(2) Samples will be collected from the original total coliform-positive tap sample location, one sample from five service connections upstream, and one sample from five service connections downstream of the original total coliform-positive site. If the tap sample location is less than five service connections from the beginning or end of the distribution system, then available service connections from the coliform-positive location to the beginning or end of the distribution system will be sampled.

(3) When the total coliform positive sample site is less than two service connections from the end of the distribution system, the RFP Industrial Hygiene Department (telephone number: 966-4229) will be contacted for guidance concerning appropriate sampling locations. The Industrial Hygiene Department will contact CDH for guidance in selection of the proper sampling locations.

(4) If one or more repeat samples in the set are positive for coliform, an additional set of repeat samples will be collected as specified in items 1 through 3 above. This process will be repeated until coliforms are not detected in one complete set of sample. If it is determined that the maximum contaminant level (MCL) for total coliforms (see Subsection 5.6) has been exceeded, then CDH will be notified of the noncompliance. The RFP Industrial Hygiene Department will also be contacted for guidance in identifying the source of the problem and correcting the problem.

(5) If it is determined that the maximum contaminant level has been exceeded, monitoring will be continued as specified in items 2 and 3, at a minimum frequency of once per week for the remainder of the month or until total coliforms are not detected in two consecutive samples taken at the original sampling site.

5.3 FECAL COLIFORM AND ESCHERICHIA (E. COLI) TESTING

If any routine or repeat sample is positive for total coliform, the total coliform-positive culture medium will be analyzed for fecal coliforms or E. coli to determine if they are present. If either fecal coliforms or E. coli are present, the CDH will be notified by the end of the day after receipt of the test results, unless results are received after the CDH is closed for the day, in which case the CDH will be notified before the end of the next business day.

5.4 SAMPLE ANALYSIS

All samples will be analyzed by a laboratory certified by the CDH to perform drinking water analyses. Samples will be analyzed by one of the methods specified in 40 CFR, Part 141.21(f)(1) - (6).

At the present time the RFP on-site lab (123) is in the process of state certification. Off-site labs will be used until 123 lab is certified.

5.5 INVALIDATION OF TOTAL COLIFORM SAMPLE RESULTS

Samples in which total coliform are not detected will be invalidated by the laboratory if any of the following conditions occur:

(1) The sample produces a turbid culture in the absence of gas production using an analytical method where gas formation is examined (e.g., the Multiple-Tube Fermentation Technique); or

(2) The sample produces a turbid culture in the absence of an acid reaction in the Presence-Absence (P-A) Coliform Test; or

(3) The sample exhibits confluent growth or produces colonies too numerous to count with an analytical method using a membrane filter (e.g., Membrane Filter Technique).

(4) If a laboratory invalidates a sample, another sample will be collected from the same location as the original sample within 24 hours of being notified of the interference problem, and the sample will be analyzed for the presence of total coliform. Re-sampling within 24 hours of the notification of interference problems will continue and the samples analyzed until a valid result is obtained. If logistical reasons prevent re-sampling within the 24-hour time limit, the CDH will be contacted to request that this requirement be waived, and a new time limit established by the CDH for re-sampling.

The CDH may also invalidate total coliform sample results if the following conditions are met:

(1) The laboratory establishes that improper sample analysis caused the total coliform-positive result.

(2) On the basis of the results of repeat samples collected, the CDH determines that the total coliform-positive sample resulted from a domestic or other non-distribution system plumbing problem as shown by repeat samples from the original tap continuing to show coliform bacteria, while the other repeat samples are coliform negative.

Total coliform sample results invalidated under this subsection will not count towards meeting the minimum monitoring requirements.

5.6 REPORTING AND COMPLIANCE

Maximum contaminant levels (MCLs) are based on the presence or absence of total coliform in a sample, and not on coliform density. When fewer than 40 routine samples per month are collected,

the system is in compliance with the MCL for total coliform if no more than one sample collected during a month is total coliform positive. When a system collects 40 or more samples in a month, the system is in compliance with the MCL for total coliforms if no more than 5.0 percent of the samples collected during the month are total coliform positive.

Any fecal coliform-positive repeat sample or E. coli-positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or E. coli-positive sample constitutes a violation of the MCL for total coliform. This is a violation that may pose an acute risk to health.

Compliance with the MCL for total coliforms will be determined for each compliance period in which monitoring for total coliform is required. Results of all routine and repeat total coliform samples will be submitted to the CDH for review. Results of both routine and repeat samples will be utilized for compliance determination, except for results that have been invalidated according to the procedures specified in Subsection 5.5. Special purpose samples, such as those taken to determine whether disinfection practices are sufficient following pipe installation or repair, will not be used to determine compliance with the MCL for total coliform.

If the MCL for total coliform is exceeded, the violation will be reported to the CDH Water Quality Control Division no later than the end of the next business day after learning of the violation. Written notification of the violation will be given to CDH within 10 days after learning of the violation. The public will be notified in accordance with Article 12 of the Colorado Primary Drinking Water Regulations.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance (QA) and Quality Control (QC) activities will be accomplished according to applicable project plans as well as quality requirements presented in this SOP.

The Quality Assurance Project Plan (QAPjP) outlines program-wide quality assurance objectives and identifies organization and responsibilities for attaining those objectives. The QAPjP also defines general QA methods to be implemented on projects. However, each project's Quality Assurance Addendum (QAA) defines project-specific organization and responsibilities, and specific methods and frequencies that will apply to a given project, such as QA audits and QA samples.

QA samples for Bacteriological sampling fall into two categories:

- Duplicate
- TFC field readings

SOP FO.13, Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples, describes the general handling of samples. The field sampling plan specifies QA sample functions.

Sample collection procedures will be the same as those described in Subsection 5.5 for duplicate samples. Duplicates are obtained immediately after the collection of the original sample that they are intended to duplicate. Since bacteriological samples are collected directly into the sample containers, no sampling equipment is utilized and, therefore, equipment rinsates are not collected.

When sampling for bacteria within predetermined locations along the plant water distribution system, QA/QC checks can be performed by collecting and determining Total Free Chlorine (TFC) values in the field. At any point within the system the TFC should range from 1.0 mg/L to 0.5 mg/L. *If the TFC is lower than 0.5 mg/L this may indicate: (1) inadequate chlorine distribution* from the Water Treatment Plant (WTP), or (2) inadequate purging before the sample is collected. If the TFC reading is below 0.5 mg/L the samplers will repurge the system and take another TFC reading. With a confirmation of low TFC the samplers will contact the EG&G contact.

7.0 DOCUMENTATION

Proper chain of custody and documentation will be maintained at all times by following SOP FO.13, Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples. A permanent record of the implementation of this SOP will be kept by documenting field observations and data. Observations and data will be recorded on pre-approved field forms that identify the required data entries or in a bound field notebook with consecutively numbered pages. Field logbooks will generally be utilized to summarize the daily field activities and to document project information not required by the field forms.

Permanent ink will be used for all entries in the logbooks and on the field forms. Mistakes will be crossed out with a single line, initialed, and dated. Unused pages or partial pages will be voided by drawing a line through the blank sections and initialing. Any deviation from this SOP requires documentation in the site supervisor's logbook.

The field activity daily log narrative should create a chronological record of the media team's activities, including the time and location of each activity. Any descriptions of problems encountered, personnel contacted, deviations from the SOP, and visitors on site should also be included. The weather conditions, date, signature of the person responsible for entries, and the number of field activity daily log sheets used to record media team activities for a given day will also be included. Sample identification and data handling will conform to SOP FO.14, Data Base Management.