

Environmental Surveillance Report

U.S. Department of Energy

Rocky Flats Environmental Technology Site

Information Exchange

FOURTH QUARTER 2003



**Colorado Department
of Public Health
and Environment**

This is a numerical summary of environmental surveillance measurements performed by the Department during the past quarter.

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TABLE OF CONTENTS

| | |
|--|----|
| INTRODUCTION | 1 |
| Air Monitoring Stations - 2003 | 2 |
| Water Monitoring Stations - 2003 | 3 |
| DECISION RULES | 4 |
| ANALYTES OF INTEREST | 8 |
| AIR and WATER STANDARDS | |
| National Ambient Air Quality Standards | 10 |
| Colorado Water Quality Control Commission Standards for Radioactive Materials at and around RFETS | 11 |
| Sampling and Analytical Results for this Quarter | |
| AIR RESULTS | |
| Description of Air Sampling this Quarter | 14 |
| Graphs of Selected Air Results | 15 |
| Tabular Data | |
| Table A Gross Alpha and Gross Beta Radioactivity Suspended Airborne Particulate Material | 17 |
| Table B Alpha Spectrometric Analysis and Long-Lived Gross Alpha Radioactivity Concentrations in Suspended Airborne Particulate Material | 18 |

WATER RESULTS

Description of Precipitation and Surface Water
Sampling Done This Quarter 19

Graphs of Selected Water Results 22

Tabular Data

Table G1 CDPHE Surface Water Monitoring Program G1

Table H Inorganic Analysis of Surface Water H1

Table I Organic Analysis of Surface Water I1

GLOSSARY 24

Introduction

The purpose of this Environmental Surveillance Report (ESR) is to provide a quarterly update on Colorado Department of Public Health and Environment (CDPHE) air and surface water monitoring data at the Rocky Flats Environmental Technology Site (RFETS).

CDPHE currently has three Divisions that conduct monitoring at RFETS including the Air Pollution Control Division (APCD), the Hazardous Materials Waste Management Division, and the Laboratory and Radiation Services Division (LARS). APCD monitors air for contaminants such as particulates, oxides of nitrogen, ozone, volatile organic compounds (VOCs), and radionuclides beryllium. The Hazardous Materials Waste Management Division conducts surface water monitoring for many parameters, including metals, inorganics and radionuclides. The Radiation Control Division performs radiological monitoring in air, and precipitation.

Under normal conditions, groundwater and soils are not monitored by Colorado Department of Public Health and Environment (CDPHE), but are monitored by DOE.

Sampling and data analysis is performed by CDPHE according to the Rocky Flats Integrated Monitoring Plan (IMP), which describes not only the monitoring done by CDPHE, but also that done by the Site and surrounding communities. It is possible that CDPHE may do some additional sampling as part of a special study or for some unusual circumstances. This report describes the results of both types of CDPHE monitoring.

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BACKGROUND INFORMATION

MONITORING STATIONS

DECISION RULES

ANALYTES OF INTEREST

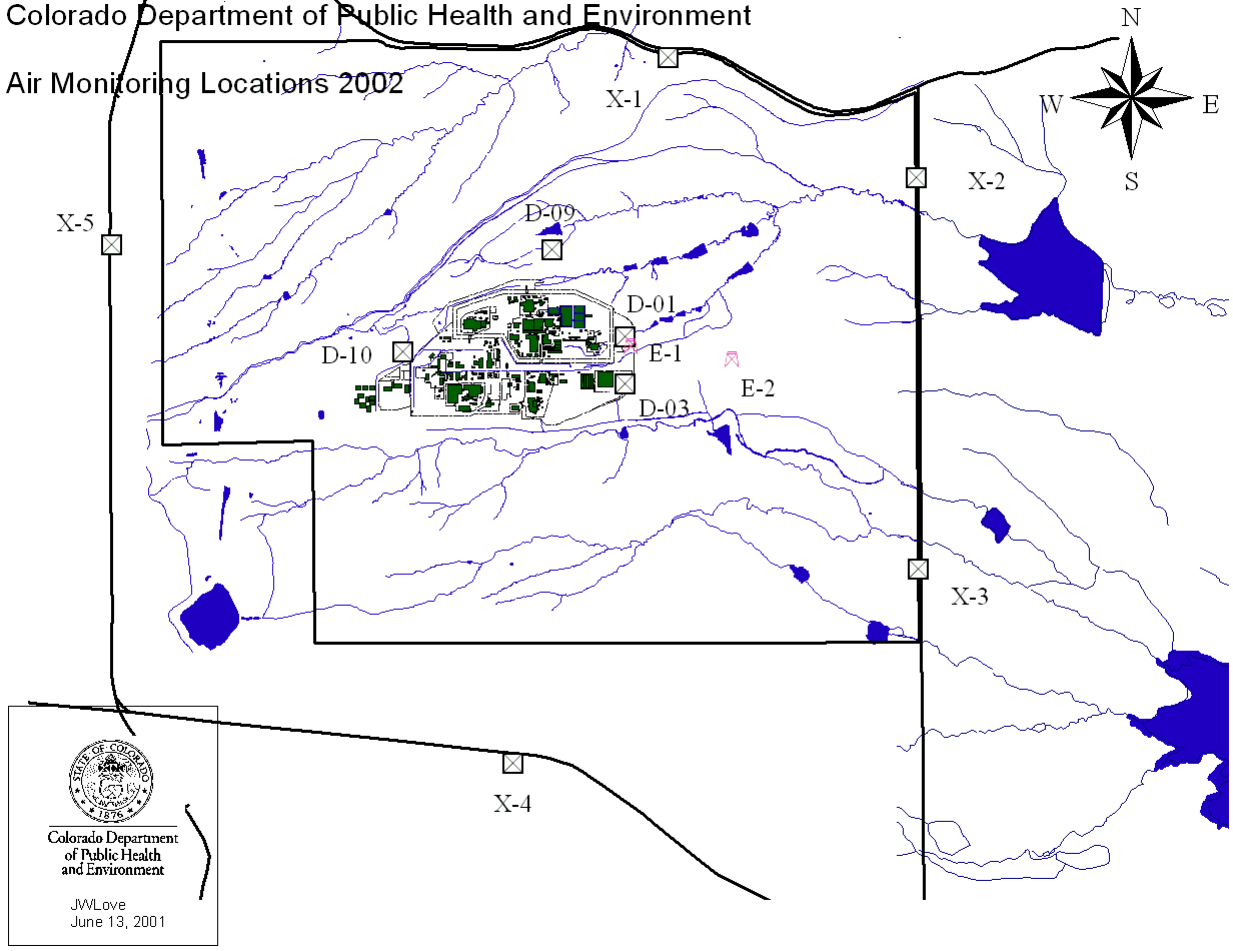
AIR STANDARDS

WATER STANDARDS

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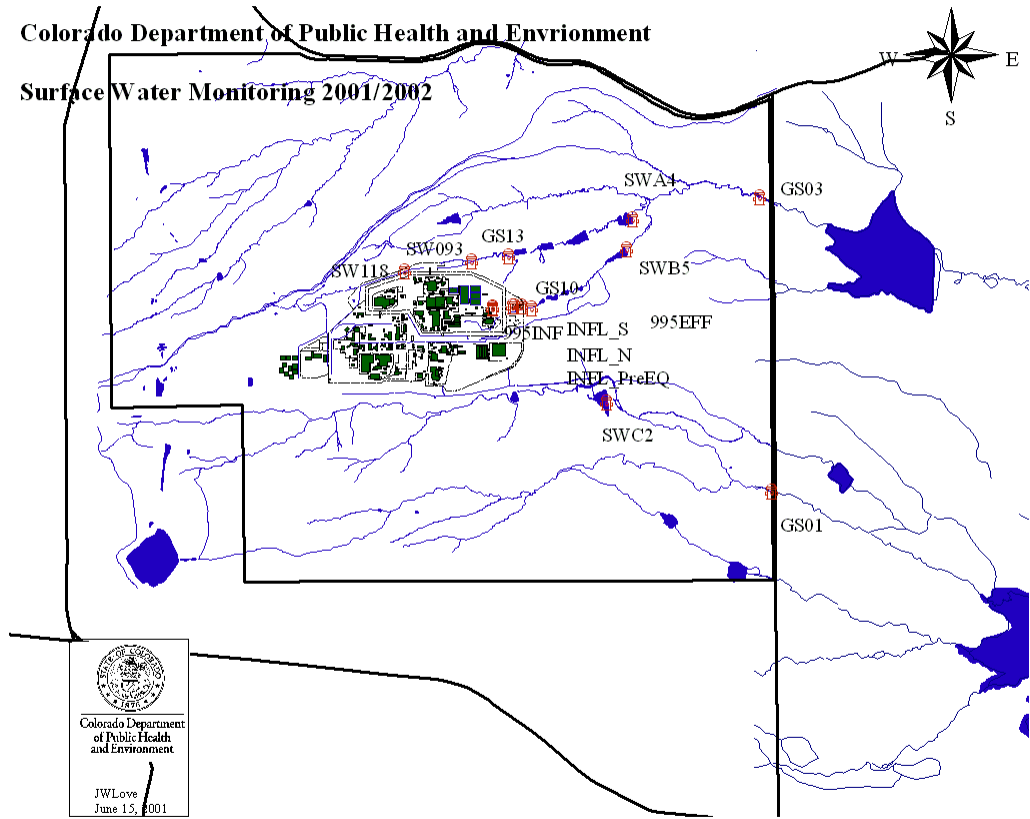
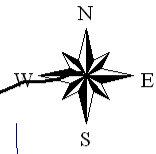
Colorado Department of Public Health and Environment

Air Monitoring Locations 2002



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Colorado Department of Public Health and Environment
Surface Water Monitoring 2001/2002



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June 13, 2001

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Decision Rules

The data acquired for each quarter is examined using standard methods of evaluation that are described in the Integrated Monitoring Plan (IMP). The methods use a series of decision rules to effectively analyze the data that has been collected, and make determinations about what actions need to be taken. Decision rules are if-then statements pertaining to data quality objectives. The decision rules define, quantitatively and qualitatively, the point at which a decision should be made or action should be taken.

The decisions could involve many different actions including, but not limited to, further analysis of data, implementation of new monitoring stations for source detection, management decisions, or evaluation of remediation alternatives. Any exceedence of an action level for a surface water or air contaminant during the quarter are summarized in this report, along with any actions taken or follow up investigations that are required.

The primary decision rules that pertain to each media are outlined below:

A. Air Monitoring

1. **Ambient Air Quality Monitoring:** Nitrogen Dioxide (NO₂), Ozone (O₃) and particulate monitoring is performed by APCD. Particulate monitoring includes monitoring of both fine particulates (PM₁₀) and total suspended solids (TSP).

IF: A perimeter monitor detects an NO₂ (annual arithmetic mean) concentration of 0.053 parts per million (ppm), an O₃ (1 hr av. time) concentration of 0.12 ppm, a TSP measurement of 75 micrograms per cubic meter (µg/m³) averaged over a 1 year time period or 150 µg/m³ over a 24-hour time period, or a PM₁₀ concentration of 50 µg/m³ annually or 150 µg/m³ in a 24-hour period (Include these values in a table in the report, too confusing this way)

THEN: The Site's operating permit may potentially be revised to mitigate the exceedence.

2. **Beryllium (Be) Monitoring:** Emission points (stacks) are monitored for Be.

IF: Be emissions from a source exceed 10 g in a 24-hour period

THEN: CDPHE may take enforcement action.

IF: Ambient Be concentrations at monitoring sites exceed 0.01 µg/m³ over a 30-day Period

THEN: CDPHE may take action to identify the source.

3. Volatile Organic Compound (VOCs) Monitoring: Various VOC monitoring stations exist around the perimeter of the site and are maintained by APCD. It is possible that remediation processes could release significant levels of VOCs. VOC data does not tend to vary and the measured concentrations are generally very low. A significant increase from normal levels of any VOC at any monitoring site could indicate a potential problem.

IF: A measured value of any VOC exceeds trends in historical data

THEN: An investigation will be enacted to determine the source of the elevated VOC concentration.

4. Radiological Ambient Air Quality Monitoring: LARS and APCD air sampling locations are monitored for radiological contaminants, PM₁₀ and total suspended particulates (TSP).

IF: Measured values of radionuclides exceed typical trends existing in historical data

THEN: Any number of actions may be taken including, but not limited to, analysis of samples for verification, comparison of samples from nearest DOE monitoring sites, ComRad Program samplers, and/or APCD monitoring sites, request for investigation or explanation of elevated results from DOE, calculation of public dose/risk and/or a presentation to CDPHE management.

B. Surface Water Monitoring

1. Pond Predischage Monitoring: Analytes of Interest (AoIs) and some VOCs are monitored in the ponds previous to pond discharge so that discharge will not result in exceedence of stream standards.

IF: Predischage monitoring indicates apparent exceedence of stream standards

THEN: CDPHE will notify the Site of additional AoIs for that discharge.

AND: The Site would then perform flow-paced POC monitoring for the additional AoIs during that discharge, as part of the Segment 4 compliance monitoring.

OR

The Site may evaluate alternative water management options, which avoid immediate discharge including, but not limited to, treatment, storage or disposal.

2. Wastewater Treatment Plant (WWTP) Influent Radiological and Metals Monitoring: The Site has made an effort to eliminate any possible connections between waste streams containing radionuclides and WWTP influent. Therefore, it is assumed that radiologic loads will not significantly increase from baseline values. Radiologic parameters include total plutonium, total americium, total uranium, tritium, as well as alpha and beta activity. Metals parameters include for the total recoverable fraction - arsenic, beryllium, cadmium, chromium (total), iron, lithium, and thallium; plus special metals (total recoverable fraction) – silver, copper, manganese, nickel and selenium. Decontamination and decommissioning (D&D) activities

could potentially introduce radiologic loads to WWTP influent. The influent is monitored to track sources of contaminants that may be introduced during the cleanup process, through evaluation of pollutant loads and concentrations coming through the WWTP collection system.

IF: Influent loading for any of the radiologic parameters exceeds baseline values determined from historical data

THEN: Evaluation will be performed to determine the source of contamination.

3. Performance Monitoring: Performance monitoring is conducted where specific D&D operations or remedial action pose a concern for a specific contaminant release that could impact surface water or groundwater. Performance monitoring is integrated with groundwater investigations and conducted to improve monitoring network resolution to isolate impacts of individual projects. CDPHE conducts performance monitoring in association with the Mound and East Trenches groundwater plume and treatment system, and Solar Pond Plume Treatment System.

a. Mound and East Trenches – VOC and metal contamination are present in the area of the Mound and East Trenches plume (south of South Walnut Creek). In order to ensure that stream standards are being attained, monitoring for VOCs and selected metals will be conducted in South Walnut Creek in the immediate vicinity where the groundwater contaminant plumes may be intersecting the stream.

IF: VOC or metal concentrations exceed stream standards

THEN: The monitoring frequency and number of sampling locations may be increased.

ELSE: VOC monitoring will be discontinued after three years and metals concentrations will be reviewed using the following Decision Rule.

IF: Metals concentrations are lower than stream standards, but significantly higher than the concentrations found at other RFETs locations.

THEN: Further investigation of in-stream concentrations and the cause of unusually high concentrations will be considered.

ELSE: Metals monitoring may be discontinued after a period of three years.

b. Solar Pond Plume Treatment System – The Solar Ponds groundwater contaminant plume contains elevated concentrations of nitrate, uranium and chloride, as well as lower concentrations of several metals. A groundwater treatment system has been installed, monitoring is being conducted to ensure that stream standards are being attained. The Site collects nitrate and uranium parameters. CDPHE collects metals and nitrate (as part of the *Ad Hoc* Nitrate Study).

IF: Metals or nitrate concentrations exceed stream standards.

THEN: The monitoring frequency and number of sampling locations may be

increased.

ELSE: Metals and nitrate monitoring will be continued until it has been demonstrated that metals concentrations at the most down gradient portion of the Solar Pond Plume are declining.

4. Ad Hoc Program: *Ad Hoc* Monitoring may be requested by DOE or the stakeholders to collect specific information related to special projects or to support decision-making processes. CDPHE has taken the responsibility for an evaluation of nitrate loading on Walnut Creek, and man-made versus natural uranium by inductively coupled plasma/mass spectrometry (ICP/MS) methodology.

a. Nitrate Loading - Nitrate from the Solar Pond Groundwater Plume and treated effluent from the on-site Sewage Treatment Plant pose potential impact to surface water in the Walnut Creek Drainage and pond system. To supplement in-place continuous performance monitoring, for more accurate evaluation of nitrate loading, CDPHE is conducting additional water quality monitoring, consisting of grab samples for nitrate and ammonia analysis.

IF: No upward trend or high variability is detected.

THEN: Monitoring will continue on a quarterly basis.

ELSE Monitoring frequency may change.

b. Uranium ICP/MS – Conducted to augment the ICP/MS evaluation of groundwater at RFETs. The Uranium ICP/MS study has been undertaken to evaluate where man-made uranium isotopes are present in groundwater versus natural uranium in groundwater. The Site is supporting CDPHE in the collection of samples and analysis by ICP/MS.

IF: Sample results indicate non-natural uranium,

THEN: Evaluate potential sources of non-natural uranium and whether loading from that source may change over time.

5. Stream Segment 4, Non-POC Monitoring – POC monitoring will be supplemented to assess the effect of reduced flows and reduced nutrient loading to the Walnut Creek drainage as a result of the Sites' closure process. Monitoring for select metals will be conducted to ensure that stream standards are attained. To assist with the assessment of loading inorganics, nutrients (nitrate and ammonia) and physical parameters (pH, dissolved oxygen, hardness, total suspended solids) are also collected.

IF: Concentrations or loadings of specified contaminants exceed their 95% upper tolerance levels (UTLs)

THEN: CDPHE will notify the Site and the Cities, and RFETS may propose a change in ambient standards.

| Analytes of Interest | | | | |
|----------------------|------------------------------|-----|-------|---|
| Analytes | | Air | Water | Purpose of Monitoring |
| Radio nuclide | Pu | X | X | High level of public concern. Known carcinogen. Known past releases (within the past 8 years) have exceeded RFCA stream standards and action levels. This provides reasonable cause to expect future releases in excess of RFCA Action Levels. |
| | U | X | X | Known renal toxicity. Past exceedances provide reasonable cause to expect future releases in excess of RFCA stream standards and action levels. |
| | Am | X | X | Known carcinogen. Known past exceedances provide reasonable cause to expect future releases in excess of RFCA stream standards and action levels. |
| | Tritium | | X | Is an AOI due to past releases to drinking water supplies |
| Metals | Be | X | X | Known to cause berylliosis in susceptible individuals when exposed in inhalation. May also cause contact dermatitis. Will be monitored as an indicator of releases from process and waste storage areas. |
| | Cr | | X | Physiological and dermal toxicity. High level of regulatory concern due, in part to the chromic acid of incident of 1989. Low levels can cause significant ecological damage. |
| | Ag | | X | Highly toxic to fish at low levels, if chronic. State of Colorado has temporarily removed its stream standard for silver, while under study. The study has been completed, and the standard will be reinstated at the next triennial review of South Platte stream standards, if not before. Used at RFETS only for photographic development. Routinely accepted by POTWs as municipal waste, but discharge is regulated. May be removed from this list later if data do not support concern. |
| | Cd | | X | Highly toxic to fish at low levels, if chronic. Known human carcinogen (prostate cancer) and depletes physiologic calcium. Used at RFETS in plating processes. Monitoring data for the Interceptor Trench System (ITS) and the proposed discharge of untreated ITS waters into Walnut Creek provide reasonable cause to expect future releases in excess of RFCA Action Levels |
| | Hardness | | X | Required to evaluate metals analyses, due to its effect on solubility to these metals. |
| Particulates | Total suspended particulates | X | | Monitored to provide information on total airborne particulate levels. Filters also used for metals and radionuclides analyses. |

| Analytes of Interest | | | | |
|---|-------------------------------|-----|-------|---|
| Analytes | | Air | Water | Purpose of Monitoring |
| | PM ₁₀ particulates | X | | Monitored to provide information on fine airborne particulate levels. Filters also used for metals and radionuclides analyses. |
| Volatile Organic Compounds | VOCs | X | X | A variety of volatile organic compounds, some of which are toxic to humans and ecology. Known discharges to air and water as well as groundwater infiltration. |
| Real Time Monitoring of Physical and Indicator Parameters (Note A) | PH | | X | Toxicity to humans and ecology. Regulatory concern due to chronic acid incident. Real-time monitoring is an inexpensive and effective method of detecting acid spills such as (chromic acid or plutonium nitrate) or failure of treatment systems. |
| | Conductivity | | X | Conductivity is an indicator of total dissolved solids, metals, anions, and pH. Real-time monitoring of conductivity is an inexpensive indicator of overall water quality. |
| | NO ₃ | | X | Past releases near RFCA stream standards and action levels upstream of ponds provide reasonable cause to expect future releases in excess of RFCA stream standards and action levels. ITS discharges are often high in nitrate, and may challenge RFCA action levels. |
| | Flow | | X | Required to detect flow events, evaluate contaminant loads and plan pond operations and discharges. Affects nearly every decision rule, and is the most commonly discussed attribute of RFETS surface waters. |
| | Oxides of Nitrogen | X | | Monitored due to RFETS historical use of nitric acid. |
| | Ozone | X | | Monitored as part of the CDPHE network. Not required or part of monitoring for RFETS. |
| | Wind speed | X | | Monitored to provide emergency response modeling information. |
| | Wind direction | X | | Monitored to provide emergency response modeling information. |
| | Temperature | X | | Monitored to provide emergency response modeling information. |

Note A: These parameters provide real-time indication for a wide variety of regulated contaminants, and are also required component for monitoring for AoIs. They require no laboratory analysis and are the RFETS most cost effective defensive monitoring.

NATIONAL AMBIENT AIR QUALITY STANDARDS

| POLLUTANT | AVERAGING TIME | STANDARD |
|--|---|------------------------|
| Carbon Monoxide (CO) | | |
| Primary Standard | 1 Hour ^(a) | 35 ppm |
| Primary Standard | 8 Hour ^(a) | 9 ppm |
| Ozone (O ₃) | | |
| Primary and Secondary Standards (up to 1997) | 1 Hour ^(b) | 0.12 ppm |
| Primary and Secondary Standards (as of July 1997) | 8 Hour ^(c) | 0.08 ppm |
| Nitrogen Dioxide (NO ₂) | | |
| Primary and Secondary Standards | Annual Arithmetic Mean | 0.053 ppm |
| Sulfur Dioxide (SO ₂) | | |
| Primary Standard | Annual Arithmetic Mean | 0.030 ppm |
| Primary Standard | 24 Hour ^(a) | 0.14 ppm |
| Secondary Standard | 3 Hour ^(a) | 0.5 ppm |
| Particulates (PM ₁₀) | | |
| Primary and Secondary Standards | Annual Arithmetic Mean ^(d) | 50 µg/m ³ |
| Primary and Secondary Standards | 24 Hour ^(b) prior to July 1997, ^(e) as of July 1997 | 150 µg/m ³ |
| Fine Particulates (PM _{2.5}) (as of July 1997) | | |
| Primary and Secondary Standards | Annual Arithmetic Mean ^(d) | 15.0 µg/m ³ |
| Primary and Secondary Standards | 24 Hour ^(f) | 65 µg/m ³ |
| Lead (Pb) | | |
| Primary and Secondary Standards | Calendar Quarter Average | 1.5 µg/m ³ |
| Total Suspended Particulates (TSP) | | |
| Primary Standard | Annual Geometric Mean ^(g) | 75 µg/m ³ |
| Primary Standard | 24 Hour ^(g) | 260 µg/m ³ |
| Secondary Standard | Annual Geometric Mean ^(g) | 60 µg/m ³ |
| Secondary Standard | 24 Hour ^(g) | 150 µg/m ³ |

- (a) Not to be exceeded more than once per year.
- (b) Statistically estimated number of days with concentrations above this level averaged over a three-year period, is not to be more than 1 per year.
- (c) The three-year average of the fourth maximum value for each year is not to exceed this level.
- (d) The average of three years of annual averages (based on quarterly averages) is not to exceed this level.
- (e) The three-year average of the 99th percentile for each year is not to exceed this level.
- (f) The three-year average of the 98th percentile for each year is not to exceed this level.
- (g) The TSP standard was replaced by the PM₁₀ standard on July 1, 1987. TSP is now a State standard only and was temporarily suspended from 30 August 1993 to 30 October 1995 by the AQCC.

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**Colorado Water Quality Control Commission Standards for
Radioactive Materials at and around RFETS**

| | SEGMENT 2 Standley Lake | SEGMENT 3 Great Western Reservoir | SEGMENTS 4a and 5 Woman Creek | SEGMENTS 4a, 4b and 5 Walnut Creek |
|---------------------|-----------------------------------|--|---|--|
| Gross Alpha (pCi/L) | 6 | 5 | 7 | 11 |
| Gross Beta (pCi/L) | 9 | 12 | 8 | 19 |
| Plutonium (pCi/L) | 0.03 | 0.03 | 0.15* | 0.15 * |
| Americium (pCi/L) | 0.03 | 0.03 | 0.15* | 0.15 * |
| Tritium (pCi/L) | 500 | 500 | 500 | 500 |
| Uranium (pCi/L) | 3 | 4 | 11 | 10 |

* The modification is a narrative standard requiring that the concentration of americium and plutonium be consistent with attaining the numerical water quality standard in Segment 4(b) of Big Dry Creek

Standards for Inorganics and Metals

| Inorganic/Metal | SEGMENTS 4a & 4b Standards (µg/L) | SEGMENT 5 Action Levels (µg/L) |
|------------------------------|--|---|
| Ammonia | * | * |
| Beryllium, total recoverable | 4 | 4 |
| Cadmium, dissolved ** | 1.5 | 1.5 |
| Cadmium, Total recoverable | 5 | - |
| Chloride | 250,000 | 250,000 |
| Chromium (VI), dissolved** | 11 | 11 |
| Copper, dissolved** | 16 | 16 |
| Iron, dissolved | 300 | - |
| Iron, total recoverable | 1000 | 1000 |
| Manganese, dissolved** | 50 | 1000 |
| Manganese, total recoverable | 200 | - |
| Nitrate | 10,000 | 100,000 TM |
| Nitrite | 500 | 4500 TM |
| Phosphate, ortho | - | - |
| Phosphate, total | - | - |
| Selenium, dissolved** | 5 | 5 |
| Silver, dissolved** | 0.59 | 0.59 |
| Sulfate | 250,000 | 250,000 |
| Sulfide | 2 | 2 |

*There is no unionized ammonia standard for Segment 5 or Segment 4b. A standard of 0.1 mg/L applies to Segment 4a.

**The standards for these metals were calculated using a formula based on hardness. A hardness value of 143 mg/L was used because this is the average hardness found in these waters.

TM – Temporary Modification

EPA Method 524.2 for VOCs in Surface Waters

| VOCs | MCL (µg/L) | MDL (µg/L) | PQL (µg/L) | VOCs | MCL (µg/L) | MDL (µg/L) | PQL (µg/L) |
|---------------------------|---------------|---------------|---------------|--------------------------|---------------|---------------|---------------|
| 1,1,2-Tetrachloroethane | none | 0.5 | 0.5 | Chloroform | 5.7 | 0.5 | 0.5 |
| 1,1,1-Trichloroethane | 200 | 0.5 | 0.5 | Chloromethane | none | 0.5 | 0.5 |
| 1,1,2,2-Tetrachloroethane | 0.18 | 0.5 | 0.5 | Dibromochloromethane | none | 0.5 | 0.5 |
| 1,1,2-Trichloroethane | 3 | 0.5 | 0.5 | Dibromomethane | none | 0.5 | 0.5 |
| 1,1-Dichloroethane | none | 0.5 | 0.5 | Dichlorodifluoromethane | none | 0.5 | 0.5 |
| 1,1-Dichloroethene | 7 | 0.5 | 0.5 | Ethylbenzene | 700 | 0.5 | 0.5 |
| 1,1-Dichloropropene | none | 0.5 | 0.5 | Fluorotrichloromethane | none | 0.5 | 0.5 |
| 1,2,3-Trichlorobenzene | none | 0.5 | 0.5 | Hexachlorobutadiene | 14 | 0.5 | 0.5 |
| 1,2,3-Trichloropropane | none | 0.5 | 0.5 | Isopropylbenzene | none | 0.5 | 0.5 |
| 1,2,4-Trichlorobenzene | 70 | 0.5 | 0.5 | Naphthalene | 28 | 0.5 | 0.5 |
| 1,2,4-Trimethylbenzene | none | 0.5 | 0.5 | Propylbenzene | none | 0.5 | 0.5 |
| 1,2-Dichlorobenzene | 600 | 0.5 | 0.5 | Styrene | 100 | 0.5 | 0.5 |
| 1,2-Dichloroethane | 0.38 | 0.5 | 0.5 | Tetrachloroethene | 5 | 0.5 | 0.5 |
| 1,2-Dichloropropane | 0.52 | 0.5 | 0.5 | Toluene | 1000 | 0.5 | 0.5 |
| 1,3,5-Trimethylbenzene | none | 0.5 | 0.5 | Trichloroethene | 5 | 0.5 | 0.5 |
| 1,3-Dichlorobenzene | 600 | 0.5 | 0.5 | Vinyl chloride | 2 | 0.5 | 0.5 |
| 1,3-Dichloropropane | none | 0.5 | 0.5 | Xylene, (total) | 10,000 | 0.5 | 0.5 |
| 1,4-Dichlorobenzene | 75 | 0.5 | 0.5 | cis-1,2-Dichloroethene | 70 | 0.5 | 0.5 |
| 2,2-Dichloropropane | none | 0.5 | 0.5 | cis-1,3-Dichloropropene | none | 0.5 | 0.5 |
| 2-Chlorotoluene | none | 0.5 | 0.5 | n-Butylbenzene | none | 0.5 | 0.5 |
| 4-Chlorotoluene | none | 0.5 | 0.5 | sec-Butylbenzene | none | 0.5 | 0.5 |
| 4-Isopropyltoluene | none | 0.5 | 0.5 | tert-Butylbenzene | none | 0.5 | 0.5 |
| Benzene | 1.2 | 0.5 | 0.5 | trans-1,2-Dichloroethene | 100 | 0.5 | 0.5 |
| Bromobenzene | none | 0.5 | 0.5 | trans-1,3-Dichloroethene | none | 0.5 | 0.5 |
| Chloroethane | none | 0.5 | 0.5 | Methylene Chloride | 4.7 | 0.5 | 0.5 |
| Bromodichloromethane | 0.56 | 0.5 | 0.5 | | | | |
| Bromoform | 4.3 | 0.5 | 0.5 | | | | |
| Carbon Tetrachloride | 0.27 | 0.5 | 0.5 | | | | |
| Chlorobenzene | 100 | 0.5 | 0.5 | | | | |
| Chloroethane | none | 0.5 | 0.5 | | | | |
| 1,1-Dichloropropene | none | 0.5 | 0.5 | | | | |

EPA Method 515.1 for Chlorinated Acid Herbicides

| Contaminant | MDL (µg/L) | PQL (µg/L) | Contaminant | MDL (µg/L) | PQL (µg/L) |
|-------------|---------------|---------------|--------------------------|---------------|---------------|
| Acifluorfen | 0.3 | 3 | 3,5-Dichlorobenzoic acid | 0.8 | 8 |
| Bentazon | 0.4 | 4 | Dichlorprop | 0.3 | 3 |
| Cloramben | 1.2 | 12 | Dinoseb | 0.6 | 6 |
| 2,4-D | 0.3 | 3 | 4-Nitrophenol | 0.8 | 8 |
| Dalapon | 0.7 | 7 | Pentachlorophenol | 0.6 | 6 |
| 2,4-DB | 0.5 | 5 | Picloram | 0.5 | 5 |
| DCPA | 0.4 | 4 | 2,4,5-T | 0.3 | 3 |
| Dicamba | 0.3 | 3 | 2,4,5-TP | 0.3 | 3 |

EPA Method 525.2 for SVOCs in Surface Waters

| SVOCs | MCL (µg/L) | MDL (µg/L) | PQL (µg/L) | SVOCs | MCL (µg/L) | MDL (µg/L) | PQL (µg/L) |
|----------------------------|---------------|---------------|---------------|-----------------------------|---------------|---------------|---------------|
| 1,2,4-Trichlorobenzene | none | 5 | 10 | Benzo(a)anthracene | none | 5 | 10 |
| 1,2-Dichlorobenzene | none | 5 | 10 | Benzo(a)anthracene | 0.2 | 5 | 10 |
| 1,3-Dichlorobenzene | none | 5 | 10 | Benzo(b)fluoranthene | none | 5 | 10 |
| 1,4-Dichlorobenzene | none | 5 | 10 | Benzo(ghi)perylene | none | 5 | 10 |
| 2,4,5-Trichlorophenol | none | 5 | 10 | Benzo(k)fluoranthene | none | 5 | 10 |
| 2,4,6-Trichlorophenol | none | 5 | 10 | Butyl benzyl phthalate | none | 5 | 10 |
| 2,4-Dichlorophenol | none | 5 | 10 | Chrysene | none | 5 | 10 |
| 2,4-Dimethylphenol | none | 5 | 10 | Di-n-butylphthalate | none | 5 | 10 |
| 2,4-Dinitrophenol | none | 25 | 10 | Di-n-octylphthalate | none | 5 | 10 |
| 2,4-Dinitrotoluene | none | 5 | 10 | Dibenz(a,h)anthracene | none | 5 | 10 |
| 2-Chloronaphthalene | none | 5 | 10 | Dibenzofuran | none | 5 | 10 |
| 2-Methyl-4,6-dinitrophenol | none | 25 | 50 | Diethyl phthalate | none | 5 | 10 |
| 2-Chlorophenol | none | 5 | 10 | Dimethyl phthalate | none | 5 | 10 |
| 2-Methylnaphthalene | none | 5 | 10 | Hexachlorobutadine | none | 5 | 10 |
| 2-Methylphenol | none | 5 | 10 | Hexachlorocyclopentadiene | 50 | 5 | 10 |
| 2-Nitroaniline | none | 5 | 10 | Hexachloroethane | none | 5 | 10 |
| 2-Nitrophenol | none | 5 | 10 | Indeno(1,2,3-cd)pyrene | none | 5 | 10 |
| 3,3-Dichlorobenzidine | none | 5 | 10 | Isophorone | none | 5 | 10 |
| 3-Nitroaniline | none | 25 | 50 | N-Nitosodi-n-propylamine | none | 5 | 10 |
| 4-Bromophenylphenylether | none | 5 | 10 | N-Nitrosodiphenylamine | none | 5 | 10 |
| 4-Chloro-3-methylphenol | none | 10 | 20 | Naphthalene | none | 5 | 10 |
| 4-Chloroaniline | none | 10 | 20 | Nitrobenzene | none | 5 | 10 |
| 4-Chlorophenylphenylether | none | 5 | 10 | Pentachlorophenol | 1 | 25 | 10 |
| 4-Methylphenol | none | 5 | 10 | Phenanthrene | none | 5 | 10 |
| 4-Nitroaniline | none | 25 | 50 | Phenol | none | 5 | 10 |
| 4-Nitrophenol | none | 25 | 50 | Pyrene | none | 5 | 10 |
| Acenaphthene | none | 5 | 10 | bis(2-Chloroethoxy)methane | none | 5 | 10 |
| Acenaphthylene | none | 5 | 10 | bis(2-Chloroethyl) ether | none | 5 | 10 |
| Anthracene | none | 5 | 10 | bis(2-Ethylhexyl) phthalate | 6 | 5 | 10 |

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AIR RESULTS

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**CDPHE AIR MONITORING
FOURTH QUARTER 2003**

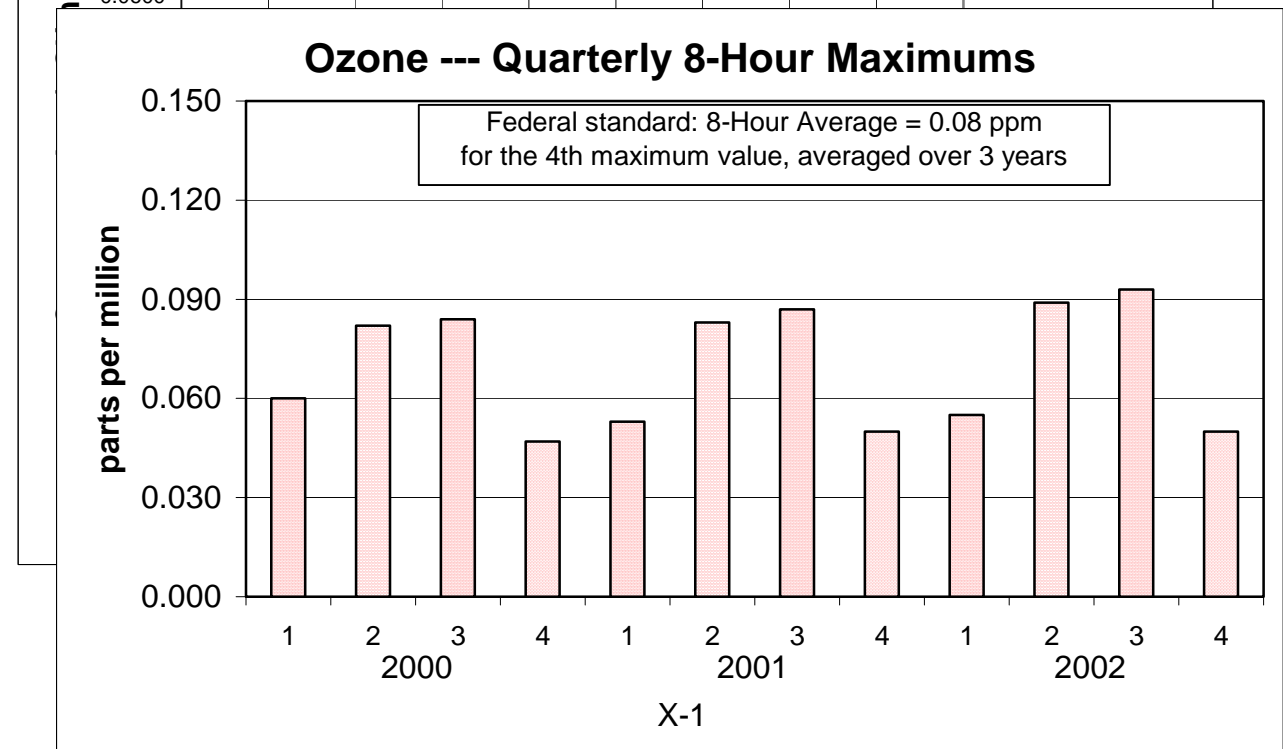
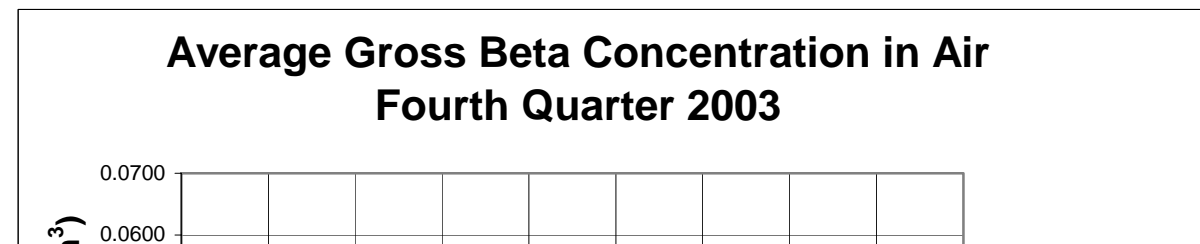
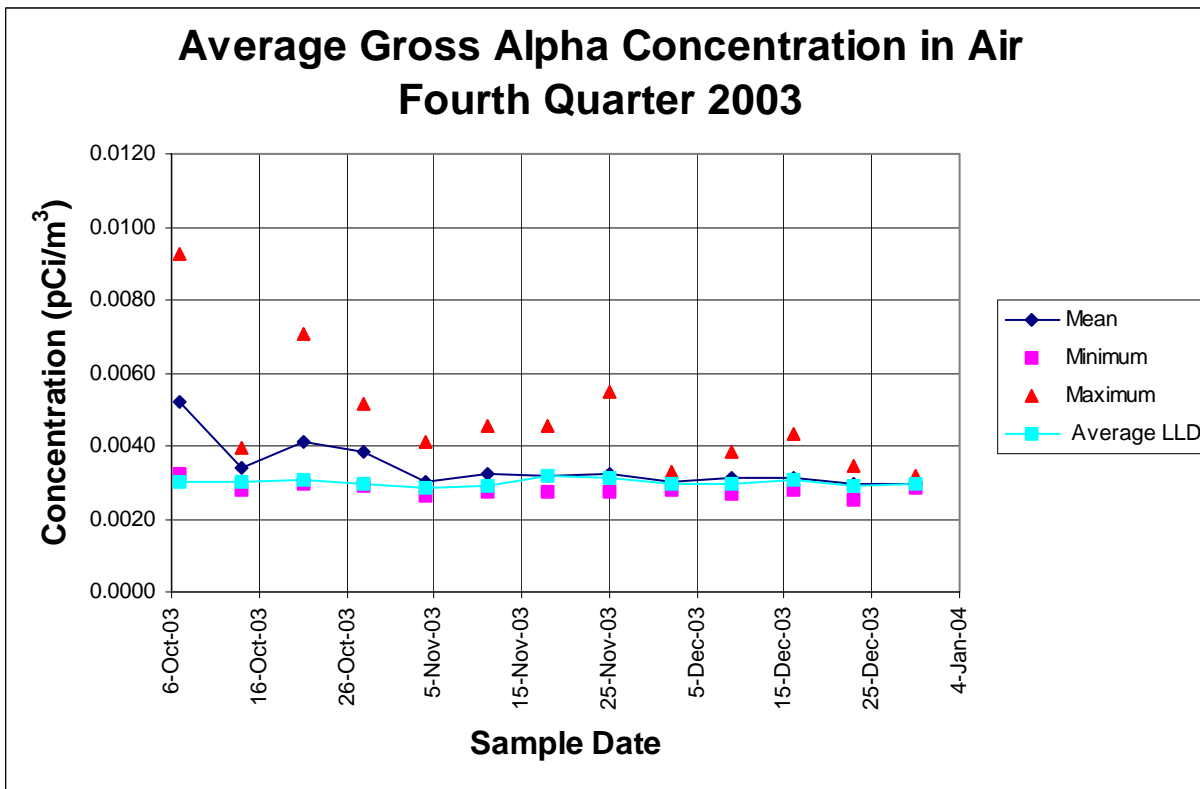
Laboratory and Radiation Services Division

AIR MONITORING:

Table A contains the complete gross alpha /gross beta results for the 4th quarter 2003. Table B-1 contains plutonium, americium and isotopic uranium results for the 3rd quarter of 2003 for all sample locations. Third quarter plutonium data is nearly identical to that of the second quarter 2003, while americium and uranium activities were slightly higher. Otherwise, these data show no obvious anomalies, compared to historical data.

2. Graphical Presentation

Graphs of pertinent and abnormal data from air monitoring are presented in this section.



Environmental Surveillance Report

**TABLE A: GROSS ALPHA AND GROSS BETA RADIOACTIVITY CONCENTRATIONS
IN SUSPENDED AIRBORNE PARTICULATE MATERIAL**

FOURTH QUARTER 2003

| Location | Sampler Type | Number of Samples | Gross Alpha | | | Gross Beta | | | |
|---------------------------------|--------------|-------------------|-------------------------|------------------------|------------------------|-------------------------|------------------------|------------------------|--------|
| | | | Mean pCi/m ³ | Max pCi/m ³ | Min pCi/m ³ | Mean pCi/m ³ | Max pCi/m ³ | Min pCi/m ³ | |
| INDUSTRIAL AREA SAMPLERS | | | | | | | | | |
| D-1 | TSP | 13 | < | 0.0043 | 0.0075 | 0.0021 | 0.0227 | 0.0384 | 0.0091 |
| D-3 | TSP | 4 | < | 0.0040 | 0.0062 | 0.0019 | 0.0296 | 0.0366 | 0.0238 |
| E-1-T | TSP | 11 | < | 0.0037 | 0.0053 | 0.0021 | 0.0198 | 0.0371 | 0.0079 |
| BUFFER ZONE SAMPLERS | | | | | | | | | |
| D-9 | TSP | 13 | < | 0.0026 | 0.0067 | 0.0005 | 0.0202 | 0.0349 | 0.0108 |
| D-10 | TSP | 13 | < | 0.0022 | 0.0048 | 0.0009 | 0.0183 | 0.0320 | 0.0087 |
| D-15 | TSP | 9 | | 0.0025 | 0.0041 | 0.0005 | 0.0181 | 0.0338 | 0.0137 |
| E-2-T | TSP | 12 | < | 0.0024 | 0.0060 | 0.0000 | 0.0207 | 0.0339 | 0.0128 |
| SITE BOUNDARY SAMPLERS | | | | | | | | | |
| X-1 | TSP | 13 | < | 0.0015 | 0.0041 | 0.0000 | 0.0184 | 0.0327 | 0.0089 |
| X-2 | TSP | 13 | < | 0.0027 | 0.0092 | 0.0008 | 0.0208 | 0.0383 | 0.0100 |
| X-3 | TSP | 12 | < | 0.0024 | 0.0070 | 0.0002 | 0.0218 | 0.0404 | 0.0127 |
| X-4 | TSP | 11 | < | 0.0027 | 0.0046 | 0.0010 | 0.0230 | 0.0541 | 0.0089 |
| X-5 | TSP | 13 | < | 0.0026 | 0.0057 | 0.0009 | 0.0203 | 0.0401 | 0.0088 |

TSP = Total Suspended Particulates

PM10 = Particulate Material < 10 microns in diameter

Environmental Surveillance Report

**TABLE B: ALPHA SPECTROMETRIC ANALYSIS AND LONG-LIVED GROSS ALPHA RADIOACTIVITY
CONCENTRATIONS IN SUSPENDED AIRBORNE PARTICULATE MATERIAL**

THIRD QUARTER 2003

| | | | | | | | | Mean |
|----------|----------------|------------------------|------------------------|--|--------------------|--------------------|--------------------|--------------------|
| LOCATION | SAMPLER | ²³⁹⁺²⁴⁰ Pu | ²⁴¹ Am | ²³⁹⁺²⁴⁰ Pu/ ²⁴¹ Am | ²³⁴ U | ²³⁵ U | ²³⁸ U | Gross Alpha |
| | TYPE | pCi/M ³ | pCi/M ³ | Ratio | pCi/M ³ | pCi/M ³ | pCi/M ³ | pCi/M ³ |
| D-1 | TSP/Continuous | 0.000005 ± 0.000002 | < 0.000004 | --- | 0.000055 | < 0.000004 | 0.000052 | < 0.0043 |
| D-3 | TSP/Continuous | 0.000045 ± 0.000007 | 0.000005 ± 0.000002 | 9.0 ± 3.9 | 0.000048 | < 0.000004 | 0.000042 | < 0.0040 |
| X-1 | TSP/Continuous | < 0.000004 | < 0.000004 | --- | 0.000043 | 0.000005 | 0.000039 | < 0.0026 |
| X-2 | TSP/Continuous | < 0.000004 | < 0.000005 | --- | 0.000044 | < 0.000004 | 0.000035 | < 0.0034 |
| X-3 | TSP/Continuous | < 0.000003 | < 0.000004 | --- | 0.000045 | < 0.000004 | 0.000041 | < 0.0041 |
| X-4 | TSP/Continuous | < 0.000004 | < 0.000003 | --- | 0.000042 | < 0.000004 | 0.000047 | < 0.0032 |
| X-5 | TSP/Continuous | < 0.000004 | < 0.000006 | --- | 0.000058 | < 0.000004 | 0.000055 | < 0.0033 |

pCi/m³ = Picocuries per cubic meter

TSP = Total Suspended Particulates

Continuous = continuous sampling

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WATER RESULTS

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CDPHE Surface Water Sampling

Fourth Quarter 2003

Surface water sampling conducted by CDPHE for the 4rd Quarter 2003, included:

- Wastewater Treatment Plant (WWTP) influent samples from Building 995 were collected on October 22, 2003, November 19, 2003, and December 17, 2003. Samples from the north and south parts of the sewer system were collected from Building 990 on December 17, 2003.
- Pre-discharge samples were collected from Pond A-4 on November 10, 2003 and from Pond B-5 on December 10, 2003.
- Nitrate and performance monitoring samples were taken from North and South Walnut Creek on December 11 and 17, 2003. VOC samples were taken at Ponds B2N and B2S on December 11, 2003. Nitrate samples were taken at SW-093, GS-13, A3, A4, B5, GS-09 and GS-10. Chloride samples were taken at SW-093, GS-13, A3, and GS-10. Metals samples were taken at GS-9 and GS-13. SW-118 was not sampled because the stream was frozen.

Table G provides a summary of the sample activity and parameters collected by CDPHE. Table H presents inorganic results and Table I presents VOC results. Several samples from this quarter await analysis.

Wastewater Treatment Plant Influent

WWTP Influent is monitored to evaluate routine and non-routine discharges to the WWTP. The CDPHE sampling supplements sampling conducted by the Site for WWTP operational evaluations and permit requirements. Only the CDPHE results are presented in this document. Reference Table G for monitoring specifics.

Chromium, Copper, iron, manganese, lithium, nickel, gross beta, plutonium, and uranium were detected in influent samples during this quarter. None of the detections exceeded the respective effluent limit or stream standard except americium in Building 990 North Pipe and Building 995 influent. There are some quality control issues for these samples and they are being re-analyzed.

Pre-Discharge Monitoring

The Pre-Discharge sampling program is conducted for compliance evaluation of the Site's ability to discharge storm water and treated wastewater to the Big Dry Creek drainage. Pre-Discharge Monitoring is conducted at the terminal ponds on Walnut Creek (Pond A4 and Pond B5). Typically the Walnut Creek Ponds A4 and B5 are discharged 8-10 times per years and Woman

Creek Pond C2 once a year. Sampling is conducted by both the Site and CDPHE. Only the CDPHE results are presented in this document. Reference Table G for monitoring specifics. These quarters' pre-discharge samples from Ponds A-4 and B-5 did not exhibit any concentrations above established RFCA action levels or applicable WQCC stream standards.

Point of Compliance - Surface Water Results

Point of Compliance monitoring is conducted below the terminal ponds and at the Site boundary along Indiana Street, on both Walnut and Woman Creek. Point of Compliance monitoring is conducted to evaluate Site compliance with WQCC stream standards and RFCA action levels, as appropriate. Point of Compliance monitoring activities are shared between CDPHE and the Site. Only the CDPHE monitoring results are presented in this document. Reference Table G for monitoring specifics. Samples did not exhibit any concentrations above established AFCA action levels or applicable WQCC stream standards.

Nutrient Sampling - North Walnut Creek

This *Ad Hoc* program conducted by CDPHE monitors nutrient concentrations related to nitrate and ammonia in the North and South Walnut Creek drainages as a result of Sewage Treatment Plant Operations and Solar Pond Groundwater Plume. The nitrate profile in the Walnut Creek drainages exhibits a pattern of elevated levels in excess of the underlying standard, since the time the French drain and active treatment system for the solar pond area was dismantled and discontinued, and the installation of the passive solar pond plume passive treatment project. Historically the highest exceedences are at GS-13, which more represent the full impact of the solar pond nitrate plume into North Walnut Creek.

These quarters' nitrate results ranged from <0.3 mg/L to 3 mg/L. All results were less than the temporary modification of 100 mg/L. The normal Colorado standard for nitrate is 10 mg/L.

These quarters' total ammonia results ranged from <0.03 mg/L to 0.53 mg/L. Calculating for unionized ammonia exhibited concentrations ranging from 0.0008 to 0.01 mg/L, compared against the conservative unionized standard of 0.1 mg/L (segment 4a stream standard), no samples exceed the stream standard.

Performance Monitoring – Mound/East Trench Plume

The Mound and East Trenches groundwater contaminant plumes contain volatile organic compounds (VOCs) and select metals. Groundwater collection and treatment systems are in place and appear to be effective. However, it is possible that some contaminated groundwater either was down gradient of the collection systems before installation, or that some groundwater may be by-passing the collection trenches. There is no in-stream monitoring specified in the Decision Documents for these systems that can either verify or disprove this. In order to ensure that stream standards are being attained, monitoring for VOCs and selected metals was commenced during second quarter 2002 in South Walnut Creek in the immediate vicinity of where the groundwater contamination plumes may be intersecting the stream.

Tetrachloroethene, trichloroethene, vinyl chloride, cis-1,2-dichloroethene, dibromochloromethane, chloroform, carbon tetrachloride, and bromodichloromethane were found in Pond B2. The concentrations of tetrachloroethene, trichloroethene, carbon tetrachloride, and vinyl chloride exceed normal state surface water standards.

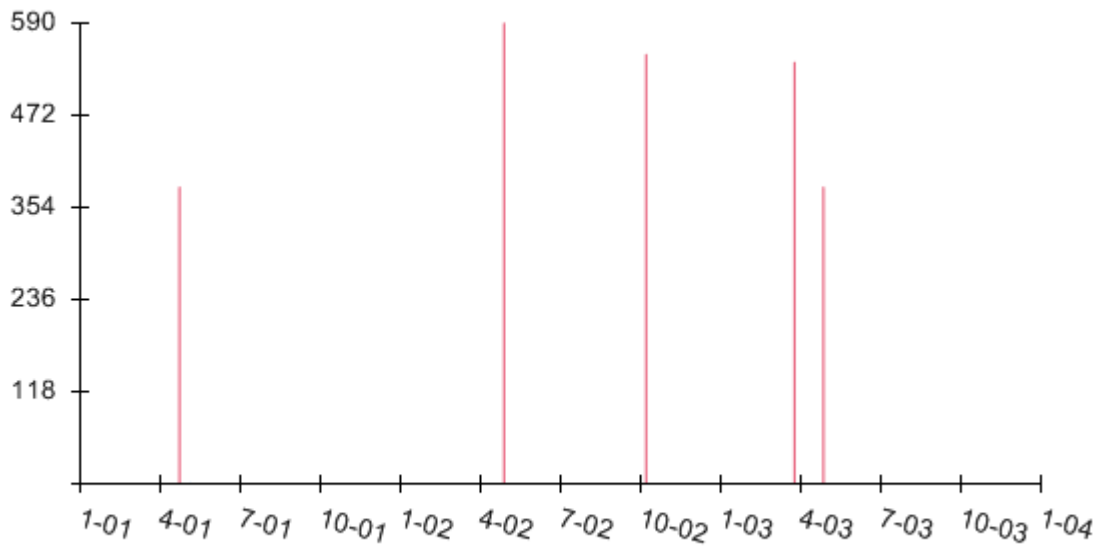
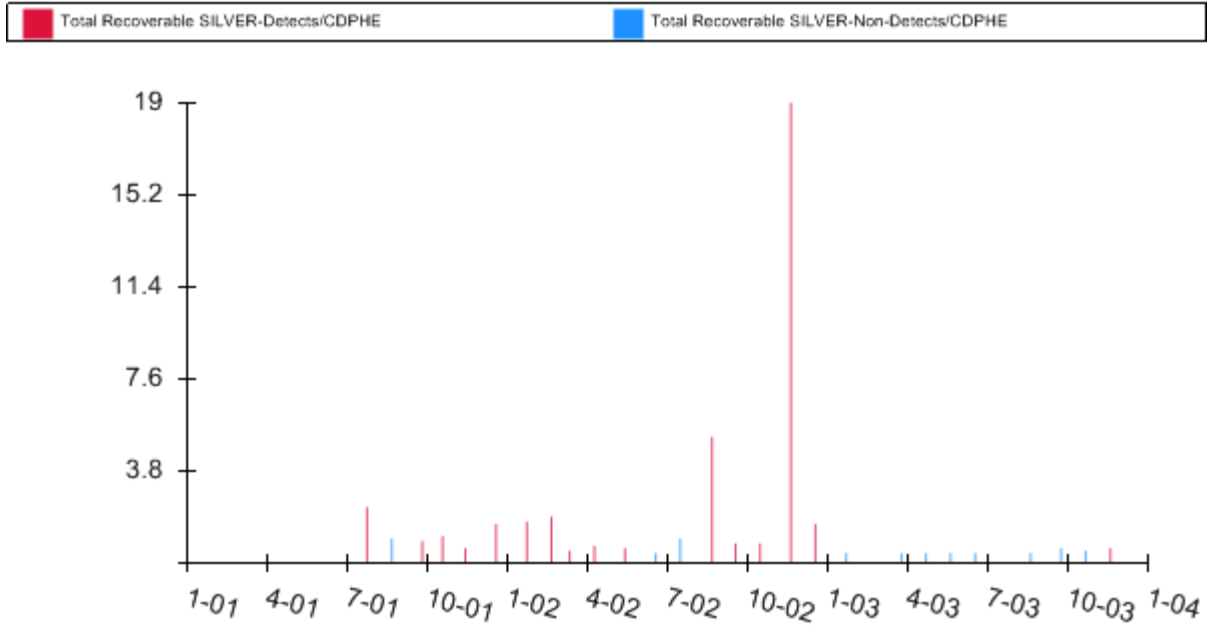
Performance Monitoring – Solar Pond Plume

The Solar Ponds groundwater contaminant plume contains high levels of nitrates and uranium, and lower concentrations of several other metals. Groundwater collection and treatment systems have been installed, and the treatment appears to be effective. However, it is possible that some contaminated groundwater either was already down gradient of the collection system before it was installed, or, that some groundwater may be bypassing the collection trench.

While the Site monitors in-stream uranium concentrations, CDPHE will perform in-stream monitoring for metals. This data will be used in order to ensure that stream standards are being attained. It should be noted that both the Site and CDPHE monitor nitrate concentrations at this location, and the CDPHE nitrate monitoring is described in the ad-hoc section of this ESR.

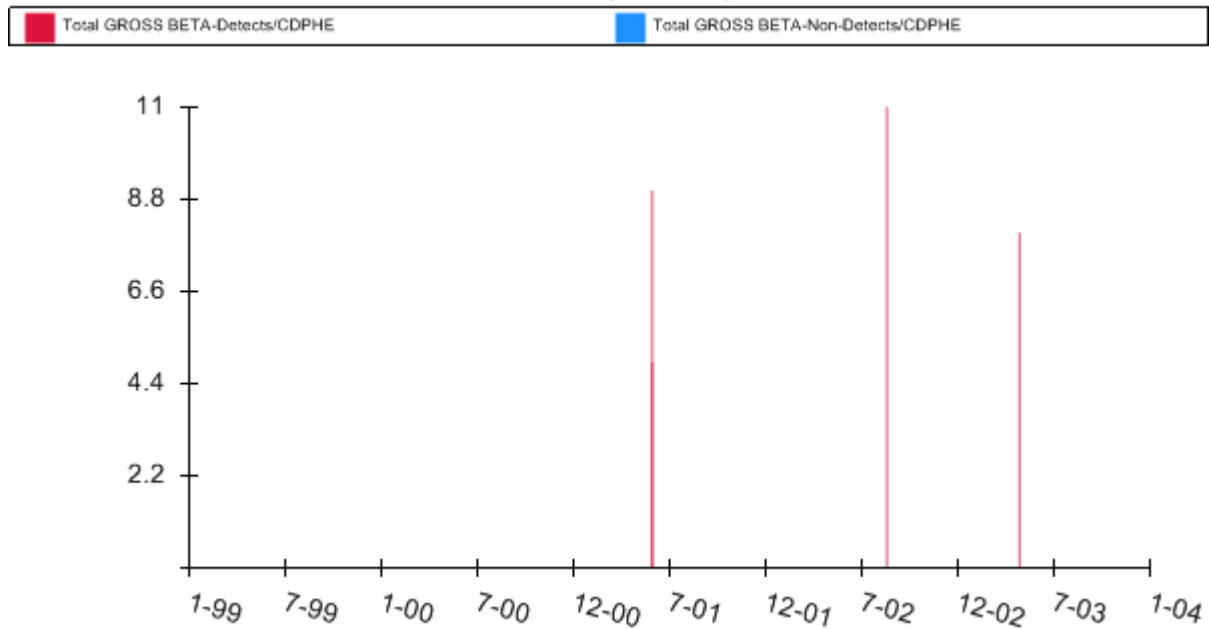
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Total Recoverable SILVER at 995INF reported in ug/L for CDPHE Data.



CHLORIDE at SWA4 reported in mg/L for CDPHE Data.

Total GROSS BETA at SWC2 reported in pCi/L for CDPHE Data.



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TABLE G – CDPHE SURFACE WATER MONITORING PROGRAM

| Sampling Frequencies for Listed Locations & Parameters | | | Pre Discharge | | Treatment Plant Influent | | Performance Monitoring | | Ad Hoc Program | Stream Segment 4, POC Monitoring, Non-POC Monitoring at Indiana | | | | | |
|--|----------|-------------------------------------|---|-------------------|---------------------------------------|---|---|------------------------|---------------------------------------|---|--------------------------|------------------------------------|--------------------------|---|--------------------------|
| Parameter or Method | Method | Total # Analyses Per Year All Sites | Pond A4 or Pond B5 | Pond C2 | Bldg 995 Following Equalization Basin | : Bldg 990 N. & S. Interceptors Prior to Equalization Basin | Mound/ East Trenches Plume (footnote a) | Solar Pond Plume | Nitrate Study 8 Stations (footnote b) | During Pond Releases (footnote c) | | Dry Weather Flow - No Pond Release | | Following Storm Events - No Pond Release ^d | |
| | | | SWA4 or SWB5 | SWC2 | INFL | 990 INFL_N 990 INFL_S | SWB1, SWB2, SWB3, GS09 | GS13 | various | SW114 (GS03) Walnut Ck | SW001 (GS01) Woman Ck | SW114 (GS03) Walnut Ck | SW001 (GS01) Woman Ck | SW114 (GS03) Walnut Ck | SW001 (GS01) Woman Ck |
| Field pH | | na | Field pH and Temperature Will be Collected for All Samples >>>>>>>> | | | | | | | | | | | | |
| Field Temp, C | | na | Field pH and Temperature Will be Collected for All Samples >>>>>>>> | | | | | | | | | | | | |
| Field DO | | na | 10/yr ¹ | 1/yr ¹ | | | | | | | | | | | |
| RADS - Total (unfiltered), RUSH | | | | | | | | | | | | | | | |
| Americium - 241 | TRU SPEC | 11 | 10/yr ¹ | 1/yr ¹ | | | | | | | | | | | |
| Plutonium - 239/240 | TRU SPEC | 11 | 10/yr ¹ | 1/yr ¹ | | | | | | | | | | | |
| Gross Alpha | 900.0 | 11 | 10/yr ¹ | 1/yr ¹ | | | | | | | | | | | |
| Gross Beta | 900.0 | 11 | 10/yr ¹ | 1/yr ¹ | | | | | | | | | | | |
| RADS - Total (unfiltered) | | | | | | | | | | | | | | | |
| Americium - 241 | TRUSP EC | 20 | | | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Plutonium - 239/240 | TRUSP EC | 20 | | | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Gross Alpha | 900.0 | 20 | | | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Gross Beta | 900.0 | 20 | | | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Uranium, Fluorometric | 908.0 | 25 | Quarterly ¹ | 1/yr ¹ | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Metals - Dissolved (filtered) | | | | | | | | | | | | | | | |
| Ag | 200.8 | 22 - 26 | Quarterly ¹ | 1/yr ¹ | | | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Cu | 200.8 | 22 - 26 | Quarterly ¹ | 1/yr ¹ | | | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Mn | 200.7 | 22 - 26 | Quarterly ¹ | 1/yr ¹ | | | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Ni | 245.1 | 22 - 26 | Quarterly ¹ | 1/yr ¹ | | | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Se | 200.8 | 22 - 26 | Quarterly ¹ | 1/yr ¹ | | | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |

| | | | | | | | | | | | | | | | |
|-----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Metals - Total Recoverable | | | | | | | | | | | | | | | |
|-----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

TABLE G – CDPHE SURFACE WATER MONITORING PROGRAM

| Sampling Frequencies for Listed Locations & Parameters | | | Pre Discharge | | Treatment Plant Influent | | Performance Monitoring | | Ad Hoc Program | Stream Segment 4, POC Monitoring, Non-POC Monitoring at Indiana | | | | | |
|--|--------|-------------------------------------|------------------------|-------------------|---------------------------------------|---|---|--------------------------|---------------------------------------|---|---------------------------|------------------------------------|---------------------------|---|---------------------------|
| Parameter or Method | Method | Total # Analyses Per Year All Sites | Pond A4 or Pond B5 | Pond C2 | Bldg 995 Following Equalization Basin | : Bldg 990 N. & S. Interceptors Prior to Equalization Basin | Mound/ East Trenches Plume (footnote a) | Solar Pond Plume | Nitrate Study 8 Stations (footnote b) | During Pond Releases (footnote c) | | Dry Weather Flow - No Pond Release | | Following Storm Events - No Pond Release ^d | |
| | | | SWA4 or SWB5 | SWC2 | INFL | 990 INFL_N 990 INFL_S | SWB1, SWB2, SWB3, GS09 | GS13 | | various | SW114 (GS03) Walnut Ck | SW001 (GS01) Woman Ck | SW114 (GS03) Walnut Ck | SW001 (GS01) Woman Ck | SW114 (GS03) Walnut Ck |
| (unfiltered) | | | | | | | | | | | | | | | |
| As | 200.8 | 42 - 46 | Quarterly ¹ | 1/yr ¹ | Monthly ² | Quarterly ¹ | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Be | 200.8 | 42 - 46 | Quarterly ¹ | 1/yr ¹ | Monthly ² | Quarterly ¹ | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Cd | 200.8 | 42 - 46 | Quarterly ¹ | 1/yr ¹ | Monthly ² | Quarterly ¹ | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Cr(VI) dslvd?? | 200.8 | 42 - 46 | Quarterly ¹ | 1/yr ¹ | Monthly ² | Quarterly ¹ | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Fe | 200.7 | 42 - 46 | Quarterly ¹ | 1/yr ¹ | Monthly ² | Quarterly ¹ | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Lithium | 200.8 | 42 - 46 | Quarterly ¹ | 1/yr ¹ | Monthly ² | Quarterly ¹ | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Thallium | 200.8 | 42 - 46 | Quarterly ¹ | 1/yr ¹ | Monthly ² | Quarterly ¹ | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Special TR Metals (unfiltered) For STP Influent - until domestic sewage contributions are discontinued: | | | | | | | | | | | | | | | |
| Ag | 200.8 | 20 | | | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Cu | 200.7 | 20 | | | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Mn dslvd?? | 200.7 | 20 | | | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Ni | 245.1 | 20 | | | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Se | 200.8 | 20 | | | Monthly ² | Quarterly ¹ | | | | | | | | | |
| Hardness as CaCO3 | 130.2 | 22-26 | Quarterly ¹ | 1/yr ¹ | | | | Quarterly ¹ | Quarterly ¹ | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Organic Analyses | | | | | | | | | | | | | | | |
| VOCs | 502.2 | 8 | | | | | | Semi-Annual ¹ | | | | | | | |

TABLE G – CDPHE SURFACE WATER MONITORING PROGRAM

| Sampling Frequencies for Listed Locations & Parameters | | | Pre Discharge | | Treatment Plant Influent | | Performance Monitoring | | Ad Hoc Program | Stream Segment 4, POC Monitoring, Non-POC Monitoring at Indiana | | | | | |
|--|--------|-------------------------------------|------------------------|-------------------|---------------------------------------|---|---|------------------|---------------------------------------|---|--------------------------|------------------------------------|--------------------------|---|--------------------------|
| Parameter or Method | Method | Total # Analyses Per Year All Sites | Pond A4 or Pond B5 | Pond C2 | Bldg 995 Following Equalization Basin | : Bldg 990 N. & S. Interceptors Prior to Equalization Basin | Mound/ East Trenches Plume (footnote a) | Solar Pond Plume | Nitrate Study 8 Stations (footnote b) | During Pond Releases (footnote c) | | Dry Weather Flow - No Pond Release | | Following Storm Events - No Pond Release ^d | |
| | | | SWA4 or SWB5 | SWC2 | INFL | 990 INFL_N 990 INFL_S | SWB1, SWB2, SWB3, GS09 | GS13 | various | SW114 (GS03) Walnut Ck | SW001 (GS01) Woman Ck | SW114 (GS03) Walnut Ck | SW001 (GS01) Woman Ck | SW114 (GS03) Walnut Ck | SW001 (GS01) Woman Ck |
| Nutrients/Inorganics | | | | | | | | | | | | | | | |
| Ammonia as N | 350.2 | 52 - 56 | 10/yr ¹ | 1/yr ¹ | | | | | Quarterly ¹ | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Nitrite/Nitrate as N | 353.2 | 52 - 56 | 10/yr ¹ | 1/yr ¹ | | | | | Quarterly ¹ | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Phosphate, T | 365.1 | 20 - 24 | 10/yr ¹ | 1/yr ¹ | | | | | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Orthophosphate | 365.2 | 20 - 24 | 10/yr ¹ | 1/yr ¹ | | | | | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Solids, total suspended | 160.1 | 40 - 44 | 10/yr ¹ | 1/yr ¹ | Monthly ¹ | Quarterly ¹ | | | | Quarterly ¹ | 1/yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ | 2 / yr ¹ |
| Chloride | 325.3 | 5 | Quarterly ¹ | 1/yr ¹ | | | | | | | | | | | |

^a Metals and hardness monitoring will be conducted at GS09, below Pond B4. VOC monitoring will be conducted in Ponds B-1 and B-2 from the surface, and at the outfall from Ponds B-3 and below B-4 at GS09. VOC monitoring will be conducted in late fall

^b Nitrate Special Study Stations: SW118, SW093, GS13, Pond A-4, GS10, EFFL, Pond B-5, SW114. Station EFFL is the outfall from the STP.

^c Metals monitoring at Indiana Street "During Pond Releases", will be conducted for those pond discharges where metals monitoring was done for the Pre-Discharge sample.

^d "Storm Event / No Pond Release" related monitoring may be conducted by the Site as part of its Buffer Zone Hydrologic Monitoring Program. If not, the State will attempt to schedule grab sample collection.

¹ Grab Sample

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Environmental Surveillance
TABLE H - INORGANIC ANALYSIS OF SURFACE WATER
FOURTH QUARTER 2003

| Location | Sample Date | Parameter | Analysis | Units | *Analysis* | |
|--|-------------|--------------------------------------|----------|----------------|------------|-----|
| | | | | | 1st | 2nd |
| Influent To Sewage Treatment Plant (INFL) | | | | | | |
| | 10/22/2003 | | | | | |
| | | pH | 7.34 | Standard Units | | |
| | | Temperature | 18.1 | °C | | |
| | | Americium ²⁴¹ , Total | < 0.007 | pCi/L | | |
| | | Gross Alpha | < 3 | pCi/L | | |
| | | Gross Beta | 15 | pCi/L | +/- | 5 |
| | | Plutonium ²³⁹⁺²⁴⁰ , Total | < 0.007 | pCi/L | | |
| | | Uranium, Total | < 1 | ug/L | | |
| | | Arsenic, Total Recoverable | < 1 | ug/L | | |
| | | Beryllium, Total Recoverable | < 1 | ug/L | | |
| | | Cadmium, Total Recoverable | 1.5 | ug/L | | |
| | | Chromium, Total Recoverable | 4 | ug/L | | |
| | | Copper, Total Recoverable | 30 | ug/L | | |
| | | Iron, Total Recoverable | 400 | ug/L | | |
| | | Lithium, Total Recoverable | 28 | ug/L | | |
| | | Manganese, Total Recoverable | 35 | ug/L | | |
| | | Nickel, Total Recoverable | < 150 | ug/L | | |
| | | Selenium, Total Recoverable | 1.1 | ug/L | | |
| | | Silver, Total Recoverable | < 0.5 | ug/L | | |
| | | Thallium, Total Recoverable | < 1 | ug/L | | |
| | | Total Suspended Solids | 80 | mg/L | | |
| | 11/19/2003 | | | | | |
| | | pH | 7.23 | Standard Units | | |
| | | Temperature | 12.5 | °C | | |
| | | Arsenic, Total Recoverable | < 1 | ug/L | | |
| | | Beryllium, Total Recoverable | < 1 | ug/L | | |
| | | Cadmium, Total Recoverable | 0.9 | ug/L | | |
| | | Chromium, Total Recoverable | < 20 | ug/L | | |
| | | Copper, Total Recoverable | 9 | ug/L | | |
| | | Iron, Total Recoverable | 210 | ug/L | | |
| | | Lithium, Total Recoverable | 5 | ug/L | | |
| | | Manganese, Total Recoverable | 27 | ug/L | | |
| | | Nickel, Total Recoverable | < 30 | ug/L | | |
| | | Selenium, Total Recoverable | < 1.0 | ug/L | | |
| | | Silver, Total Recoverable | 0.6 | ug/L | | |
| | | Thallium, Total Recoverable | < 1 | ug/L | | |
| | | Total Suspended Solids | 50 | mg/L | | |
| | 12/17/2003 | | | | | |
| | | pH | 6.65 | Standard Units | | |
| | | Temperature | 9.6 | °C | | |
| | | Arsenic, Total Recoverable | 0.9 | ug/L | | |
| | | Beryllium, Total | < 1 | ug/L | | |
| | | Cadmium, Dissolved | 1.1 | ug/L | | |
| | | Chromium, Total | < 3 | ug/L | | |
| | | Chromium, Total Recoverable | < 3 | ug/L | | |
| | | Copper, Total Recoverable | 35 | ug/L | | |
| | | Iron, Total Recoverable | 460 | ug/L | | |
| | | Lithium, Total | 19 | ug/L | | |
| | | Manganese, Total Recoverable | 50 | ug/L | | |
| | | Nickel, Total Recoverable | < 150 | ug/L | | |
| | | Selenium, Dissolved | 1.4 | ug/L | | |
| | | Selenium, Total | 1.4 | ug/L | | |
| | | Thallium, Total | < 1 | ug/L | | |

Environmental Surveillance
TABLE H - INORGANIC ANALYSIS OF SURFACE WATER
FOURTH QUARTER 2003

| Location | Sample Date | Parameter | Analysis | Units | *Analysis* | |
|--|-------------|--------------------------------------|----------|----------------|------------|-----|
| | | | | | 1st | 2nd |
| | | Total Suspended Solids | 50 | mg/L | | |
| North Influent to Sewage Treatment Plant (INFL-N) | | | | | | |
| | 12/17/2003 | | | | | |
| | | pH | 8.39 | Standard Units | | |
| | | Temperature | 14.4 | °C | | |
| | | Arsenic, Total Recoverable | < 0.5 | ug/L | | |
| | | Beryllium, Total | < 1 | ug/L | | |
| | | Cadmium, Dissolved | 1.2 | ug/L | | |
| | | Chromium, Total | < 3 | ug/L | | |
| | | Chromium, Total Recoverable | < 3 | ug/L | | |
| | | Copper, Total Recoverable | 42 | ug/L | | |
| | | Iron, Total Recoverable | 710 | ug/L | | |
| | | Lithium, Total | 9 | ug/L | | |
| | | Manganese, Total Recoverable | 43 | ug/L | | |
| | | Nickel, Total Recoverable | < 150 | ug/L | | |
| | | Selenium, Dissolved | 1.7 | ug/L | | |
| | | Selenium, Total | 1.7 | ug/L | | |
| | | Thallium, Total | < 1 | ug/L | | |
| | | Total Suspended Solids | 180 | mg/L | | |
| South Influent to Sewage Treatment Plant (INFL-S) | | | | | | |
| | 12/17/2003 | | | | | |
| | | pH | 8.32 | Standard Units | | |
| | | Temperature | 13.1 | °C | | |
| | | Arsenic, Total Recoverable | 0.5 | ug/L | | |
| | | Beryllium, Total | < 1 | ug/L | | |
| | | Cadmium, Dissolved | 1.4 | ug/L | | |
| | | Chromium, Total | < 3 | ug/L | | |
| | | Chromium, Total Recoverable | < 3 | ug/L | | |
| | | Copper, Total Recoverable | 41 | ug/L | | |
| | | Iron, Total Recoverable | 470 | ug/L | | |
| | | Lithium, Total | 17 | ug/L | | |
| | | Manganese, Total Recoverable | 46 | ug/L | | |
| | | Nickel, Total Recoverable | < 150 | ug/L | | |
| | | Selenium, Dissolved | < 1.0 | ug/L | | |
| | | Selenium, Total | < 1.0 | ug/L | | |
| | | Thallium, Total | < 1 | ug/L | | |
| | | Total Suspended Solids | 350 | mg/L | | |
| Pre-Discharge Monitoring | | | | | | |
| Pond B-5 | | | | | | |
| | 11/10/2003 | | | | | |
| | | Americium ²⁴¹ , Total | < 0.007 | pCi/L | | |
| | | Gross Alpha | 3 +/- 3 | pCi/L | | |
| | | Gross Beta | 10 +/- 5 | pCi/L | | |
| | | Plutonium ²³⁹⁺²⁴⁰ , Total | < 0.005 | pCi/L | | |
| | | Uranium, Total | 1 | ug/L | | |
| | | Copper, Dissolved | < 5 | ug/L | | |
| | | Manganese, Dissolved | 13 | ug/L | | |
| | | Nickel, Dissolved | < 30 | ug/L | | |
| | | Selenium, Dissolved | < 1.0 | ug/L | | |

Environmental Surveillance
TABLE H - INORGANIC ANALYSIS OF SURFACE WATER
FOURTH QUARTER 2003

| Location | Sample Date | Parameter | Analysis | Units | *Analysis* | |
|--|-------------|--------------------------------------|----------|-------|------------|-----|
| | | | | | 1st | 2nd |
| | | Silver, Dissolved | < 0.5 | ug/L | | |
| | | Ammonia as N | 0.03 | mg/L | | |
| | | Chloride | 140 | mg/L | | |
| | | Hardness as CaCO ₃ | 110 | mg/L | | |
| | | Nitrate/Nitrite | 0.99 | mg/L | | |
| | | Orthophosphate | 0.84 | mg/L | | |
| | | Phosphate, Total | 3.3 | mg/L | | |
| | | Total Suspended Solids | 25 | mg/L | | |
| | | Unionized Ammonia | 0.0013 | mg/L | | |
| Pond A-4 | | | | | | |
| | 11/10/2003 | | | | | |
| | | Americium ²⁴¹ , Total | < 0.007 | pCi/L | | |
| | | Gross Alpha | < 4 | pCi/L | | |
| | | Gross Beta | 11 +/- 5 | pCi/L | | |
| | | Plutonium ²³⁹⁺²⁴⁰ , Total | < 0.007 | pCi/L | | |
| | | Uranium, Total | 2 | ug/L | | |
| | | Copper, Dissolved | 5 | ug/L | | |
| | | Manganese, Dissolved | 28 | ug/L | | |
| | | Nickel, Dissolved | < 30 | ug/L | | |
| | | Selenium, Dissolved | < 1.0 | ug/L | | |
| | | Silver, Dissolved | < 0.5 | ug/L | | |
| | | Ammonia as N | 0.35 | mg/L | | |
| | | Chloride | 390 | mg/L | | |
| | | Hardness as CaCO ₃ | 230 | mg/L | | |
| | | Nitrate/Nitrite | < 0.3 | mg/L | | |
| | | Orthophosphate | 0.12 | mg/L | | |
| | | Phosphate, Total | 0.49 | mg/L | | |
| | | Total Suspended Solids | 15 | mg/L | | |
| | | Unionized Ammonia | 0.0008 | mg/L | | |
| Nutrient Monitoring | | | | | | |
| South Walnut Creek above B-Series Bypass (GS10) | | | | | | |
| | 12/11/2003 | | | | | |
| | | Ammonia as N | 0.53 | mg/L | | |
| | | Chloride | 730 | mg/L | | |
| | | Nitrate/Nitrite | 0.50 | mg/L | | |
| Walnut Creek below Portal 3 (SW093) | | | | | | |
| | 12/11/2003 | | | | | |
| | | Ammonia as N | 0.08 | mg/L | | |
| | | Chloride | 1100 | mg/L | | |
| | | Nitrate/Nitrite | 0.97 | mg/L | | |
| Pond A3 | | | | | | |
| | 12/11/2003 | | | | | |
| | | Ammonia as N | 0.03 | mg/L | | |
| | | Chloride | 280 | mg/L | | |
| | | Nitrate/Nitrite | 3.2 | mg/L | | |

Environmental Surveillance
TABLE H - INORGANIC ANALYSIS OF SURFACE WATER
THIRD QUARTER 2003

| Location | Sample | | Analysis | Units | *Analysis* | |
|-----------------|---------------|------------------|-----------------|--------------|-------------------|------------|
| | Date | Parameter | | | 1st | 2nd |

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Environmental Surveillance
TABLE I – VOLATILE ORGANIC ANALYSIS OF SURFACE WATER
FOURTH QUARTER 2003

| Location | Sample Date | Parameter | Analysis Level | Units | *Analysis* | |
|----------------------|-------------|--------------------------|----------------|-------|------------|-----|
| | | | | | 1st | 2nd |
| Pond B2 North | | | | | | |
| | 12/11/2003 | Total Trihalomethanes | 2.7 | ug/L | | |
| | | Tetrachloroethylene | 3.0 | ug/L | | |
| | | cis-1,2-Dichloroethylene | 3.5 | ug/L | | |
| S | | Trichloroethylene | 18 | ug/L | | |
| | | Dibromochloromethane | 2.0 | ug/L | | |
| | | Chloroform | 0.7 | ug/L | | |
| Pond B2 South | | | | | | |
| | 12/11/2003 | Bromodichloromethane | 1.5 | ug/L | | |
| | | Dibromochloromethane | 14 | ug/L | | |
| | | Tetrachloroethylene | 21 | ug/L | | |
| | | cis-1,2-Dichloroethylene | 37 | ug/L | | |
| | | Carbon Tetrachloride | 6.2 | ug/L | | |
| | | Vinyl Chloride | 11 | ug/L | | |
| | | Total Trihalomethanes | 22 | ug/L | | |
| | | Trichloroethylene | 150 | ug/L | | |
| | | *Trichloroethylene | 200 | ug/L | | |
| | | Chloroform | 6.2 | ug/L | | |

* EPA Water Method 624

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GLOSSARY

| | |
|--------------------|--|
| Ag | silver |
| Am | americium |
| AOI | analyte of interest |
| APCD | Air Pollution Control Division |
| AQCC | Air Quality Control Commission |
| ALF | action level framework |
| B | found in blank |
| Be | beryllium |
| CAS | chemical abstracts service number |
| Cd | cadmium |
| CDPHE | Colorado Department of Public Health and Environment |
| Cr | chromium |
| D&D | decontamination and decommissioning |
| DOE | Department of Energy |
| EPA | Environmental Protection Agency |
| ESR | Environmental Surveillance Report |
| H | exceeds holding time |
| IMP | Integrated Monitoring Plan |
| J | detected but below practical quantitative limit |
| LARS | Laboratory and Radiation Services |
| mg/L | Milligram per liter |
| MCL | Maximum Contaminant Level (below MCL is safe) |
| MDL | minimum detection level |
| Nd | not detected |
| NO ₃ | nitrate |
| pCi/L | picocuries per liter |
| pCi/m ³ | picocuries per cubic meter |
| PM | particulate material |
| ppb | parts per billion |
| ppm | parts per million |
| PQL | practical quantitative level |
| Pu | plutonium |
| QNS | quantity not sufficient |
| RFCA | Rocky Flats Cleanup Agreement |
| RFETS | Rocky Flats Environmental Technology Site |
| TLV | ACGIH Threshold limit value |
| TSP | Total Suspended Particulate |
| TSS | Total Suspended Solids |
| µg/L | microgram per liter |
| µg/m ³ | micrograms per cubic meter |
| U | uranium |
| VOCs | volatile organic compounds |
| WQCC | Water Quality Control Commission |
| WQCD | Water Quality Control Division |
| WWTP | wastewater treatment plan |

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If you have questions or comments about this report, or if you would like to be placed on the mailing or email list to receive copies of this report in the future, please write to:

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