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FINAL SURFACE WATER INTERIM MEASURES/INTERIM REMEDIAL ACTION PLAN/ENVIRONMENTAL ASSESSMENT AND DECISION DOCUMENT SOUTH WALNUT CREEK BASIN

Rocky Flats Environmental Restoration Project

OCTOBER 1994

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FINAL

SURFACE WATER INTERIM MEASURES/ INTERIM REMEDIAL ACTION PLAN/ ENVIRONMENTAL ASSESSMENT AND DECISION DOCUMENT

SOUTH WALNUT CREEK BASIN

OPERABLE UNIT NO. 2

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant
Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM

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VOLUME I

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Prepared by:

EG&G Rocky Flats, Inc.
Rocky Flats Plant
Golden, Colorado 80401

REVIEWED FOR CLASSIFICATION/UCNI
By F. J. Curran
Date 3-22-91

INFORMATION ONLY

ENVIRONMENTAL RESTORATION PROGRAMS DIVISION

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Program Manager — Date

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Quality Assurance Program Manager — Date

Environmental Quality Support

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GLOSSARY OF ACRONYMS

ACRONYM	MEANING
ACL	Alternate Concentration Limit
Am	Americium
ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
BAT	Best Available Technology
BDAT	Best Demonstrated Available Technology
BDL	Below Detection Limits
CAA	Clean Air Act
CCl_4	Carbon Tetrachloride
CCR	Colorado Code of Regulations
CDH	Colorado Department of Health
CEARP	Comprehensive Environmental Assessment and Response Program
CEDE	Committed Effective Dose Equivalent
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
$CHCl_3$	Chloroform
CMS/FS	Corrective Measures Study/Feasibility Study
CRDL	Contract Required Detection Limit
CRP	Community Relations Plan
CS	Collection System (for Surface Water)
CWA	Clean Water Act
1,1-DCA	1,1-dichloroethane
1,2-DCA	1,2-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCE	1,2-dichloroethene
d/m/g	Disintegrations per Minute per Gram
DOE	Department of Energy
DOT	Department of Transportation
DRCOG	Denver Regional Council of Governments
EE/CA	Engineering Evaluation/Cost Analysis
EIS	Environmental Impact Statement

GLOSSARY OF ACRONYMS

ACRONYM	MEANING
EP	Extraction Procedure
EPA	Environmental Protection Agency
ER	Environmental Restoration Program
ERHSPP	Environmental Restoration Health and Safety Program Plan
FEMA	Federal Emergency Management Agency
FFACO	Federal Facility Agreement and Consent Order (otherwise known as the Inter-Agency Agreement, IAG)
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FRP	Fiberglass Reinforced Plastic
FS	Feasibility Study
ft/ft	Foot Per Foot
ft/yr	Foot Per Year
GAC	Granular Activated Carbon
$gal/ft^2/d$	Gallons Per Square Foot Per Day
GOCO	Government Owned, Contractor Operated
GPM	Gallons Per Minute
GPM/ft^2	Gallons Per Minute Per Square Foot
HEC	Health Effects Criterion
HS&E	Health, Safety and Environment
HSWA	Hazardous and Solid Waste Amendments of 1984
H_2O_2	Hydrogen Peroxide
IHSS	Individual Hazardous Substance Site
IAG	Inter-Agency Agreement - the Federal Facility Agreement & Consent Order (FFACO)
IDL	Instrument Detection Limit
IM/IRA	Interim Measures/Interim Remedial Action
IRAP/EA	Interim Remedial Action Plan/Environmental Assessment
IRIS	Integrated Risk Information System
KW	Kilowatt
KW-HR	Kilowatt-Hour
LCF	Latent Cancer Fatality
LDR	Land Disposal Restrictions
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal

GLOSSARY OF ACRONYMS

ACRONYM	MEANING
mg/kg	Milligrams Per Kilogram
mg/l	Milligrams Per Liter
M	Molarity
MDA	Minimum Detectable Activity
NCP	National Contingency Plan
NEMA	National Electrical Manufacturer's Association
NEPA	National Environmental Policy Act of 1969
NPDES	National Pollutant Discharge Elimination System
ORP	Oxidation Reduction Potential
OSA	Operational Safety Analysis
OU 2	Operable Unit No. 2
PCE	Tetrachloroethene
pCi/g	picoCuries per Gram
pCi/kg	picoCuries per Kilogram
pCi/l	picoCuries per Liter
PEL	Permissible Exposure Limits
PL	Public Law
POTW	Publicly Owned Treatment Works
PPB	Parts Per Billion
PPCD	Plan for Prevention of Contaminant Dispersion
PPM	Parts Per Million
PSI	Pounds Per Square Inch
Pu	Plutonium
PWF	Present Worth Factor
QA/QC	Quality Assurance/Quality Control
RAAMP	Radioactive Ambient Air Monitoring Program
RCRA	Resource Conservation and Recovery Act of 1976
RfD	Reference Dose
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RFP	Rocky Flats Plant
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SCFM	Standard Cubic Feet Per Minute

GLOSSARY OF ACRONYMS

ACRONYM	MEANING
SDWA	Safe Drinking Water Act
SSHSP	Site-Specific Health and Safety Plan
SW	Surface Water Monitoring Station
TBC	To Be Considered
1,1,1-TCA	1,1,1-Trichloroethane
1,1,2-TCA	1,1,2-Trichloroethane
TCE	Trichloroethene
TDS	Total Dissolved Solids
TOSCO	The Oil Shale Company
TSCA	Toxic Substances Control Act
U	Uranium
UMTRA	Uranium Mill Tailings Remedial Action
USFWS	United States Fish and Wildlife Service
UV	Ultraviolet
VOCs	Volatile Organic Compounds
x/Q	Average Dispersion Coefficient
μ	Micro
μCi/ml	Microcuries Per Milliliter
μg/l	Micrograms Per Liter
μg/kg	Micrograms Per Kilogram

EXECUTIVE SUMMARY

Water quality investigations have identified the presence of volatile organic compound (VOC) and radionuclide contamination of surface water at the Rocky Flats Plant (RFP). The subject Interim Measures/Interim Remedial Action Plan/Environmental Assessment (IM/IRAP/EA) addresses contaminated surface water in a portion of the South Walnut Creek drainage basin located within an area identified as Operable Unit No. 2 (OU 2). There is no immediate threat to public health and the environment posed by this surface water contamination. The affected surface water is contained within the plant boundary by existing detention ponds, and is treated prior to discharge for removal of volatile contaminants and suspended particulates to which radionuclides, if present, are likely to adsorb. However, there is a potential threat and the Department of Energy (DOE) is implementing this Surface Water IM/IRAP at the request of the U.S. Environmental Protection Agency (EPA) and Colorado Department of Health (CDH). Implementation of the Surface Water IM/IRA will enhance the DOE's efforts towards containing and managing contaminated surface water, and will mitigate downgradient migration of contaminants. Another factor in implementing this IM/IRA is the length of time it will take to complete the investigations and engineering studies necessary to determine the final remedy for OU 2.

In February and March 1990, representatives from DOE, EPA, and CDH met to discuss surface water IM/IRAs at the RFP site. The result of these meetings was a series of agreements, with the concurrence of all parties, to implement an IM/IRA for the cleanup of contaminated surface water in OU 2. OU 2 is defined in the Environmental Restoration Federal Facility Agreement and Consent Order (commonly known as the "Inter-Agency Agreement" or IAG), and is comprised of several Individual Hazardous Substance Sites (IHSSs) that were formerly known in aggregate as the 903 Pad, Mound, and East Trenches Areas.

On 26 September 1990, the DOE released for public comment a proposed Surface Water IM/IRA Plan and Decision Document for OU 2. In this Plan, specific point source locations in the South Walnut Creek and Woman Creek drainage basins were proposed for collection of surface water. According to the Plan, surface water collected in each basin was to be transferred to a treatment facility discharging to the South Walnut

Creek drainage. Comments on the IM/IRA Plan received during the public comment period, however, revealed strong opposition to the transfer of radionuclide contaminated seep water from the Woman Creek drainage to the South Walnut Creek drainage.

Opposition was based on the absence of a proven performance record for the proposed IM/IRA treatment facility with respect to radionuclide removal and the potential for treatment process upsets. In addition, the public voiced strong concern over potential worker and public health risks resulting from construction activities in the Woman Creek Basin (i.e., atmospheric suspension of radionuclide-contaminated dust). In light of these concerns, the DOE and regulatory agencies agreed to eliminate the proposed interbasin transfer of surface water seeps within this IM/IRA Plan and to collect and treat Woman Creek seepage under a separate OU 2 IM/IRA project. It is expected that the Surface Water IM/IRA Plan for Woman Creek Basin can be completed during the summer of 1991. This will allow adequate time to conduct bench-scale treatability studies of radionuclide removal treatment processes. The results of the bench-scale studies will provide a better assessment of applicable treatment technologies in selection of the preferred IM/IRA alternative for the Woman Creek Basin.

The Surface Water IM/IRA Plan dated 26 September 1990 has thus been modified to focus on collection and treatment of South Walnut Creek Basin contaminated surface water. The Plan presented in this document reflects this modification. In addition to previous consideration of collection of surface water at stations SW-59 and SW-61, this Plan also proposes collection at a third location designated as SW-132. SW-132 represents the discharge of a buried, corrugated metal culvert approximately 225 feet downgradient of SW-61. Recent field surveys and review of as-built site drainage drawings have identified the culvert to be a conduit for flow from the upper reach of South Walnut Creek within the Perimeter Security Zone (PSZ). Although water quality data are not available at this newly designated station, its character is expected to be similar to the flow at SW-61. A flow monitoring and sampling program has recently been initiated at SW-132. This South Walnut Creek Basin IM/IRA Plan provides for the collection of all flow from SW-59, SW-61, and SW-132, except during infrequent high flow periods resulting from high precipitation events. As discussed herein, the South Walnut

Creek Basin IM/IRA design flow is 60 gallons per minute (gpm). The average annual flow rate from SW-59, SW-61, and SW-132 should be less than 20 gpm, however.

This IM/IRA will be conducted in accordance with the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA); the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, the National Environmental Policy Act (NEPA) of 1969; and DOE NEPA guidelines (52 FR 47662-47670, December 1987). DOE and EG&G have prepared this IM/IRAP/EA to identify and evaluate interim remedial action alternatives for contaminated surface water in the South Walnut Creek drainage basin. Based on the evaluations, a preferred surface water collection and treatment system is recommended. DOE will implement this IM/IRA while work progresses on the RCRA Facility Investigation/CERCLA Remedial Investigation (RFI/RI) and RCRA Corrective Measures Study/CERCLA Feasibility Study (CMS/FS) for OU 2.

Having presented the general extent of the contamination within the South Walnut Creek Basin and the specific environmental issues associated with surface water contamination, this plan subsequently presents an evaluation of the remedial alternatives with respect to effectiveness, implementability, and costs. Effectiveness includes ability to meet Applicable or Relevant and Appropriate Requirements (ARARs). It must be noted, however, that in accordance with the National Contingency Plan (NCP) and the IAG, IM/IRAs need only attain ARARs to the greatest extent practicable.

Surface water will be collected at one seep and at two in-stream locations on South Walnut Creek upstream of the existing detention ponds. This will reduce the potential for further downstream contamination. Screening of surface water treatment technologies includes evaluation of: suspended solids, radionuclides, and metals removal by chemical treatment/cross-flow filtration, granular media filtration, and ion exchange, and evaluation of volatile organic contaminant removal by granular activated carbon (GAC) adsorption, ultraviolet peroxide oxidation, and air stripping with off-gas treatment. The chemical precipitation/cross-flow membrane filtration system, together with a GAC adsorption system, is selected as the preferred alternative. Laboratory

and field treatability studies are being implemented in order to verify the performance of the selected alternative. The current schedule for the field treatability studies calls for installation of a pilot system by Spring 1991. The field treatability unit will be operated to evaluate performance against chemical-specific ARARs. The results may indicate that it is not practicable to attain all ARARs for the Surface Water IM/IRA. Final performance requirements for the IM/IRA will require approval by the regulatory agencies. An additional function of the field treatability unit is the characterization and quantification of residuals generated by the treatment processes being operated, thus allowing confirmation or modification of assumptions made in this IM/IRA Plan regarding the nature of treatment residuals. Table D-1, Appendix D, shows the milestone schedule for the South Walnut Creek Basin Surface Water IM/IRA project.

The IM/IRAP/EA examines the environmental and health risks associated with each of the alternatives, including the preferred alternative, in accordance with the requirements of NEPA. The results of this evaluation illustrate that the potential negative impacts to air and water quality, land, and short- and long-term land productivity, as well as exposure of personnel, are minimal compared to the benefits of the resulting water quality improvements to the surface waters of the area.

SECTION 1

INTRODUCTION

Water quality investigations have identified the presence of volatile organic compound (VOC) and radionuclide contamination of surface water at the Rocky Flats Plant (RFP). The subject Interim Measures/Interim Remedial Action Plan/Environmental Assessment (IM/IRAP/EA) addresses contaminated surface water in a portion of the South Walnut Creek drainage basin located within an area identified as Operable Unit No. 2 (OU 2). There is no immediate threat to public health and the environment posed by surface water contamination because the affected surface water is contained within the plant boundary by existing detection ponds, and is treated prior to discharge for removal of volatile organic contaminants and suspended particulates to which radionuclides, if present, are likely to adsorb. However, there is a potential threat and the Department of Energy (DOE) is implementing this Surface Water Interim Measures/Interim Remedial Action (IM/IRA) at the request of U.S. Environmental Protection Agency (EPA) and Colorado Department of Health (CDH). Implementation of the Surface Water IM/IRA will enhance the DOE's efforts towards containing and managing contaminated surface water, and will mitigate downgradient migration of contaminants. Another factor in implementing this IM/IRA is the length of time it will take to complete the investigations and engineering studies necessary to determine the final remedy for OU 2.

In February and March 1990, representatives from DOE, EPA, and CDH met to discuss surface water IM/IRAs at the RFP site. The result of these meetings was a series of agreements, with the general agreement of all parties, to implement an IM/IRA for the clean-up of contaminated surface water in the area designated as OU 2. OU 2 is defined in the final Environmental Restoration Federal Facility Agreement and Consent Order (FFACO) (DOE, 1991), commonly known as the Inter-Agency Agreement (IAG), and is comprised of several Individual Hazardous Substance Sites (IHSSs) that were formerly known in aggregate as the 903 Pad, Mound, and East Trenches Areas.

On 26 September 1990, the DOE released for public comment a Surface Water IM/IRA Plan and Decision Document for OU 2. In this Plan, specific point source locations in the South Walnut Creek and

Woman Creek drainage basins were proposed for collection of surface water. According to the Plan, surface water collected in each basin was to be transferred to a treatment facility discharging to the South Walnut Creek drainage. Comments on the IM/IRA Plan received during the public comment period, however, revealed strong opposition to the transfer of radionuclide contaminated seep water from the Woman Creek drainage to the South Walnut Creek drainage.

Opposition was based on the absence of a proven performance record for the proposed IM/IRA treatment facility with respect to radionuclide removal and the potential for treatment process upsets. In addition, the public voiced strong concern over potential worker and public health risks resulting from construction activities in the Woman Creek Basin (i.e., atmospheric suspension of radionuclide-contaminated dust). In light of these concerns, the DOE and regulatory agencies agreed to eliminate the proposed interbasin transfer of surface water and to collect and treat Woman Creek seepage under a separate OU 2 IM/IRA project. It is expected that the Surface Water IM/IRA Plan for Woman Creek Basin can be completed during the summer of 1991. This will allow adequate time to conduct bench-scale treatability studies of radionuclide removal treatment processes. The results of the bench-scale studies will provide a better assessment of applicable treatment technologies in selection of the preferred IM/IRA alternative for the Woman Creek Basin.

The Surface Water IM/IRA dated 26 September 1990 has thus been modified to focus on collection and treatment of South Walnut Creek Basin contaminated surface water. The Plan presented in this document reflects this modification. In addition to previous consideration of collection of surface water at stations SW-59 and SW-61, this Plan also proposes collection at a third location designated as SW-132. SW-132 represents the discharge of a buried, corrugated metal culvert approximately 225 feet downgradient of SW-61. Recent field surveys and review of as-built site drainage drawings have identified the culvert to be a conduit for flow from the upper reach of South Walnut Creek within the Perimeter Security Zone (PSZ). Although water quality data are not available at this newly designated station, its character is expected to be similar to the flow at SW-61. A flow monitoring and sampling program has recently been initiated at SW-132. This South Walnut Creek Basin IM/IRA Plan will provide for the collection of all flow from SW-59, SW-61, and SW-132 except during infrequent high flow periods resulting from high precipitation events.

This IM/IRA will be conducted in accordance with the Resource Conservation and Recovery Act of 1976 (RCRA) as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Environmental Policy Act (NEPA) of 1969. DOE and EG&G have prepared this IM/IRA Plan to identify and evaluate interim remedial action alternatives for contaminated surface water in the South Walnut Creek drainage basin. Based on the evaluations, a preferred IM/IRA for the contaminated surface water is recommended.

This IM/IRA Plan has been prepared to conform with the requirements for an Engineering Evaluation/Cost Analysis (EE/CA) as defined in the National Contingency Plan (NCP) (FR Vol. 55, No. 46, 8813; 40 CFR 300.415[b][4]). It also conforms to the NEPA of 1969, as implemented by regulations promulgated by the President's Council on Environmental Quality (CEQ) (40 CFR 1500-1508), and DOE Guidelines (52 FR 47622-47670, December 15, 1987).

This finalized IM/IRAP document is also an EA. Although the 26 September 1990 proposed IM/IRAP contained all the information and assessments to make it an EA, it had not been approved as an EA by DOE Headquarters and therefore could not be labeled as an EA. However, in the Executive Summary of the 26 September 1990 proposed IM/IRAP, it was noted that once public comment was received and DOE Headquarters approved the NEPA aspects of the document, it would become an integrated CERCLA/RCRA - NEPA document (IM/IRAP/EA).

1.1 BACKGROUND

In March 1987, a Phase I Remedial Investigation (RI) under the Environmental Restoration (ER) Program [formerly known as the Comprehensive Environmental Assessment and Response Program (CEARP)] began at OU 2. The investigation consisted of the preparation of detailed topographic maps, radiometric and organic vapor screening surveys, surface geophysical surveys, a soil gas survey, a boring and well completion program, soil sampling and ground and surface water sampling. Phase I field activities were completed at

OU 2 during 1987, and a draft RI report was submitted to EPA and CDH on December 31, 1987 (Rockwell International, 1987a). Phase I data did not allow adequate definition of the nature and extent of contamination for the purpose of conducting a feasibility study of remedial alternatives pertaining to contaminated media. A draft Phase II RI Sampling Plan that presents the details and rationale for further field work to achieve this objective was submitted to the regulatory agencies in June 1988 (Rockwell International, 1988a). This draft sampling plan was subsequently revised and submitted as a final Phase II RCRA Facility Investigation/Remedial Investigation Feasibility Study (RFI/RIFS) sampling plan in April 1990 (EG&G, 1990a). The plan was approved by EPA in May 1990.

A draft IM/IRA plan for contaminated ground water at OU 2 was submitted in December 1989 (Rockwell International, 1989a). The plan was prepared based on limited knowledge of the nature and extent of ground-water contamination. Regulatory agency review of the document determined that, although an IM/IRA for ground water is required by the 1989 Agreement in Principle between DOE and CDH, insufficient information on the nature and extent of ground-water contamination exists at this time to pursue effective ground-water remediation. In order to facilitate early evaluation of the need for an IM/IRA for ground water at OU 2, the final Phase II RFI/RIFS sampling plan incorporates a phased investigation approach. The plan was approved by the regulatory agencies. The phased approach is to investigate alluvial and hydraulically connected bedrock migration pathways first, and then to subsequently investigate ground-water contaminant sources. This will allow planning, design, and implementation of a ground-water IM/IRA, if necessary, before completion of the RFI/RI and Corrective Measures Study/Feasibility Study (CMS/FS) for OU 2.

1.2 IM/IRA PLAN ORGANIZATION

Section 2 of this IM/IRA Plan provides site characterization information on the RFP and, in particular, OU 2. The discussion presented includes site characterization information for both the South Walnut Creek Basin and the Woman Creek Basin at OU 2. Although this IM/IRA Plan exclusively addresses the collection and treatment of contaminated South Walnut Creek Basin surface waters, it is useful to examine the characteristics of both basins. As discussed above, the collection and treatment of Woman Creek Basin seeps

at OU 2 will be addressed under a separate IM/IRA Plan. The discussion presented in Section 2 describes the potentially affected environment associated with the proposed IM/IRA and the results of the previous investigations at OU 2. The information included in Section 2 has been derived from the draft RI report and final Phase II RFI/RIFS Sampling Plan.

Section 3 identifies the objectives of the South Walnut Creek Surface Water IM/IRA, Applicable or Relevant and Appropriate Requirements (ARARs) and applicable environmental regulations. The objectives and ARARs define the criteria used to identify and evaluate IM/IRA alternatives.

Section 4 identifies technically feasible IM/IRA alternatives for the collection and treatment of contaminated South Walnut Creek Basin surface water. The IM/IRA alternatives selected address the objectives presented in Section 3. The alternatives are evaluated based on effectiveness, implementability, and cost criteria.

Section 5 summarizes the analysis performed in Section 4, and Section 6 presents the preferred IM/IRA. Bench and field treatability studies to evaluate the performance of the preferred IM/IRA are also discussed in Section 6.

Sections 7 and 8 specifically address NEPA requirements regarding an analysis of environmental impacts associated with the preferred IM/IRA and other IM/IRA alternatives, respectively. This analysis is intended to provide sufficient information to aid in a NEPA determination of environmental impacts of the proposed IM/IRA. The scope of the analysis does not include evaluation of the existing operations at the RFP, final remedial actions at OU 2 or subsequent remedial actions at other locations of the RFP. The environmental impacts of plant operation were previously analyzed in the final Environmental Impact Statement (EIS) (DOE, 1980). NEPA documentation for final remedial actions at OU 2 and any other RFP remedial actions will be provided in future documents.

Volume II of this IM/IRA Plan contains OU 2 surface water, sediment, ground-water, and soils chemistry data as well as the South Walnut Creek Basin Surface Water IM/IRA schedule and a tabulation of ARARs.

SECTION 2

SITE CHARACTERIZATION

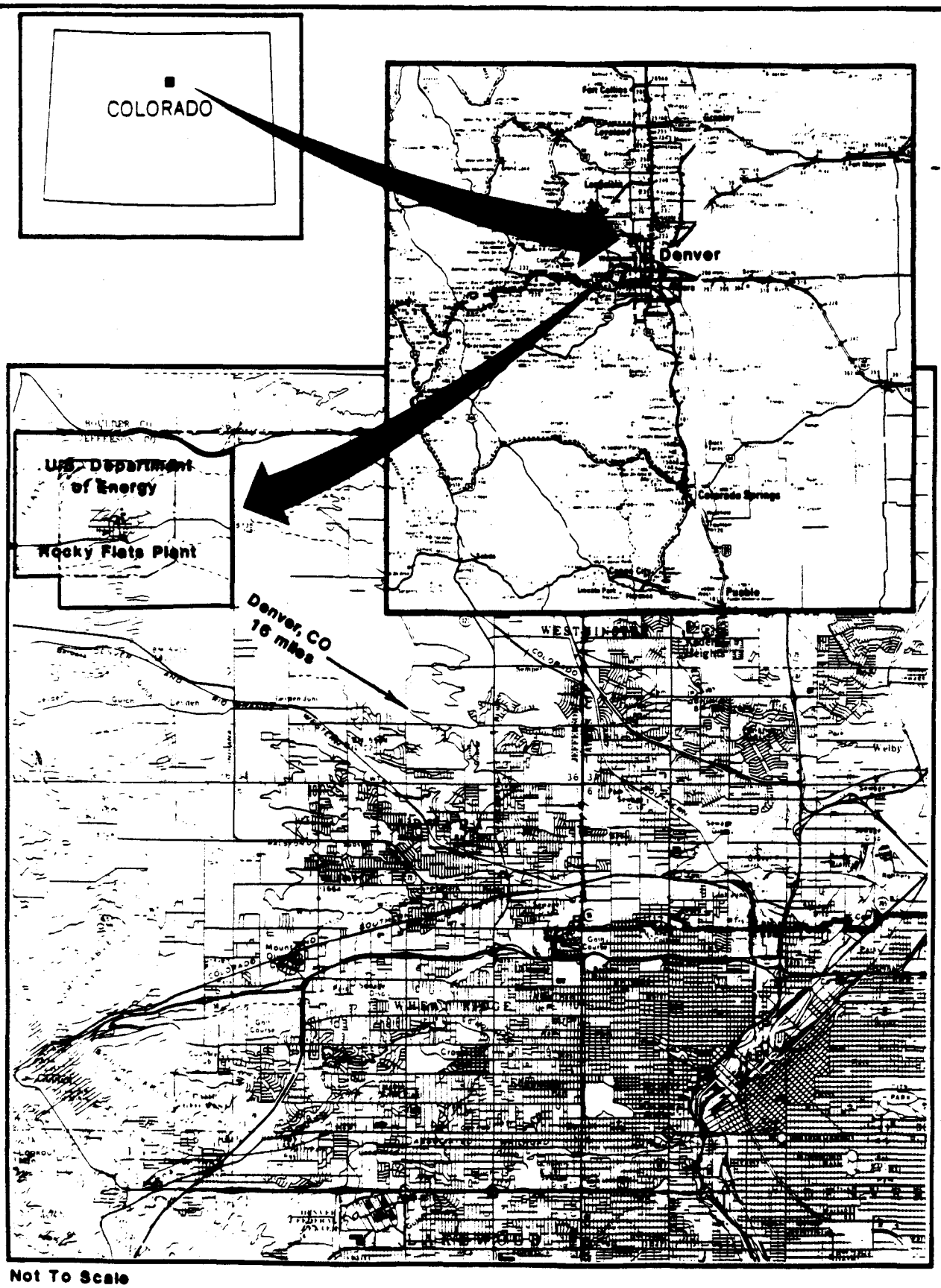
2.1 SITE DESCRIPTION AND BACKGROUND

2.1.1 Location and Facility Type

The RFP is located in northern Jefferson County, Colorado, approximately 16 miles northwest of downtown Denver (Figure 2-1). The plant site consists of approximately 6,550 acres of federally-owned land in Sections 1 through 4, and 9 through 15, of T2S, R70W, 6th principal meridian. Plant buildings are located within an area of approximately 400 acres, known as the RFP security area. The security area is surrounded by a buffer zone of approximately 6,150 acres.

The RFP is a government-owned, contractor-operated (GOCO) facility. It is part of a nationwide nuclear weapons research, development, production and plutonium reprocessing complex administered by the Rocky Flats Operations Office of the DOE. The operating contractor for the RFP is EG&G Rocky Flats, Inc. The facility manufactures components for nuclear weapons and conducts plutonium reprocessing and has been in operation since 1951. The RFP fabricates components from plutonium, uranium, beryllium, and stainless steel. Historically, production activities have included metal fabrication, machining, and assembly. Both radioactive and nonradioactive wastes are generated in the process. Current waste handling practices involve on-site and off-site recycling of hazardous materials and off-site disposal of solid radioactive materials at another DOE facility.

The RFP is currently an interim status RCRA hazardous waste treatment/storage facility. In the past, both storage and disposal of hazardous and radioactive wastes occurred at on-site locations. Preliminary assessments conducted under Phase 1 of the Environmental Restoration (ER) Program identified some of the past on-site storage and disposal locations as potential sources of environmental contamination.



Not To Scale

Figure 2-1 : Location of Rocky Flats Plant

2.1.2 Operable Unit 2 Description

OU 2 is comprised of the 903 Pad and Lip, Mound, and East Trenches Areas which are located east-southeast of the RFP as shown in Figure 2-2. The Areas of OU 2 lie within either the South Walnut Creek or Woman Creek drainage basins. Although this IM/IRA Plan exclusively addresses the collection and treatment of contaminated South Walnut Creek Basin surface water, it is useful to examine the historical uses and characteristics of all OU 2 Areas, including the 903 Pad and Lip Area which lies entirely within the Woman Creek drainage basin.

Twenty sites, designated as IHSSs, lie within OU 2: five in the 903 Pad Area, four in the Mound Area, and 11 in the East Trenches Areas. The historical use of the OU 2 IHSSs is discussed below.

2.1.2.1 903 Pad Area

Five sites are located within the 903 Pad Area (Figure 2-2). These sites are:

- 903 Drum Storage Site (IHSS Ref. No. 112)
- 903 Lip Site (IHSS Ref. No. 155)
- Trench T-2 Site (IHSS Ref. No. 109)
- Reactive Metal Destruction Site (IHSS Ref. No. 140)
- Gas Detoxification Site (IHSS Ref. No. 183)

Presented below are brief descriptions of each of these sites.

1. 903 Drum Storage Site (IHSS Ref. No. 112) -- The site was used from 1958 to 1967 to store drums containing radioactively contaminated, used machine cutting oil. The drums, some of which corroded and leaked, contained oils and solvents contaminated with plutonium or uranium. Most of the drums contained lathe coolant consisting of mineral oil and carbon tetrachloride (CCl_4) in varying proportions. However, an unknown number of drums contained hydraulic oils, vacuum pump oils, trichloroethene (TCE), tetrachloroethene (PCE), silicone oils, and acetone (Rockwell International, 1987b). Ethanolamine was also added to new drums after 1959 to reduce the drum corrosion rate. All drums were removed by 1968.

After the drums were removed, efforts were made to scrape and move the plutonium-contaminated soil into a relatively small area, cover it with fill material, and top it with an asphalt containment cover. This remedial action was completed in November 1969. An estimated 5,000 gallons of liquid leaked into the soil during use of the drum storage site. The liquid was estimated to contain 86 grams of plutonium (Rockwell International, 1987b).

2. 903 Lip Site (IHSS Ref. No. 155) -- During drum removal and clean-up activities associated with the 903 Drum Storage Site, winds distributed plutonium beyond the pad to the south and east. Although some plutonium-contaminated soils were removed, radioactive contamination is still present at the 903 Lip Site in the surficial soils.

3. Trench T-2 Site (IHSS Ref. No. 109) -- This trench was used prior to 1968 for the disposal of sanitary sewage sludge and flattened drums contaminated with uranium and plutonium.

4. Reactive Metal Destruction Site (IHSS Ref. No. 140) -- This site was used during the 1950s and 1960s primarily for the destruction of lithium metal (DOE, 1986). Small quantities of other reactive metals (sodium, calcium, and magnesium) and some solvents were also destroyed at this location (Illsley, 1978).

5. Gas Detoxification Site (IHSS 183) -- Building 952, located south of the 903 Drum Storage Site, was used to detoxify various bottled gases between June 1982 and August 1983.

A Phase I RI has been completed for these five sites. Phase II is planned for this fall.

2.1.2.2 Mound Area

The Mound Area is composed of four sites (Figure 2-2). These are:

- Mound Site (IHSS Ref. No. 113)
- Trench T-1 Site (IHSS Ref. No. 108)
- Oil Burn Pit No. 2 Site (IHSS Ref. No. 153)
- Pallet Burn Site (IHSS Ref. No. 154)

These sites are described individually below.

1. Mound Site (IHSS Ref. No. 113) -- The Mound Site contained approximately 1,405 drums containing primarily depleted uranium and plutonium contaminated lathe coolant. Some drums also contained "Perclene" (Smith, 1975). Perclene was a brand name of tetrachloroethene (Sax and Lewis, 1987). Some of the drummed wastes placed in the Mound Site were in solid form (Rockwell International, 1987b). Cleanup of the Mound Site was accomplished in 1970, and the materials removed were packaged and shipped to an off-site DOE facility as radioactive waste. Subsequent surficial soils sampling in the vicinity of the excavated Mound Site indicated 0.8 to 112.5 disintegrations per minute per gram (d/m/g) alpha activity. This radioactive contamination is thought to have come from the 903 Drum Storage Site via wind dispersion rather than from the Mound Site (Rockwell International, 1987a).

2. Trench T-1 Site (IHSS Ref. No. 108) -- The trench was used from 1954 until 1962 and contains approximately 125 drums filled with depleted uranium chips (Dow Chemical, 1971) and plutonium chips coated with lathe coolant. The drums are still present in this trench.

3. Oil Burn Pit No. 2 Site (IHSS Ref. No. 153) -- Oil Burn Pit No. 2 is actually two parallel trenches which were used in 1957 and from 1961 to 1965 to burn 1,082 drums of oil containing uranium (Rockwell International, 1987b). The residues from the burning operations and some flattened drums were covered with backfill. Clean-up operations were performed in the 1970s (Rockwell International, 1987b).

4. Pallet Burn Site (IHSS Ref. No. 154) -- An area southwest of Oil Burn Pit No. 2 was reportedly used to destroy wooden pallets in 1965. The types of hazardous substances or radionuclides that may have been spilled on these pallets is unknown. Clean-up actions were performed in the 1970s (DOE, 1986).

2.1.2.3 East Trenches Area

The East Trenches Area consists of nine burial trenches and two spray irrigation areas (Figure 2-2). The trench numbers and their respective IHSS designations are:

Trench T-3 -- IHSS Ref. No. 110

Trench T-4 -- IHSS Ref. No. 111.1

Trench T-5 -- IHSS Ref. No. 111.2

Trench T-6 -- IHSS Ref. No. 111.3

Trench T-7 -- IHSS Ref. No. 111.4

Trench T-8 -- IHSS Ref. No. 111.5

Trench T-9 -- IHSS Ref. No. 111.6

Trench T-10 -- IHSS Ref. No. 111.7

Trench T-11 -- IHSS Ref. No. 111.8

Trenches T-3, T-4, T-10, and T-11 are located north of the east access road, and trenches T-5 through T-9 are located south of the east access road. The trenches were used from 1954 to 1968 for disposal of depleted uranium, flattened depleted uranium and plutonium-contaminated drums, and sanitary sewage sludge. The wastes have not been disturbed since their burial.

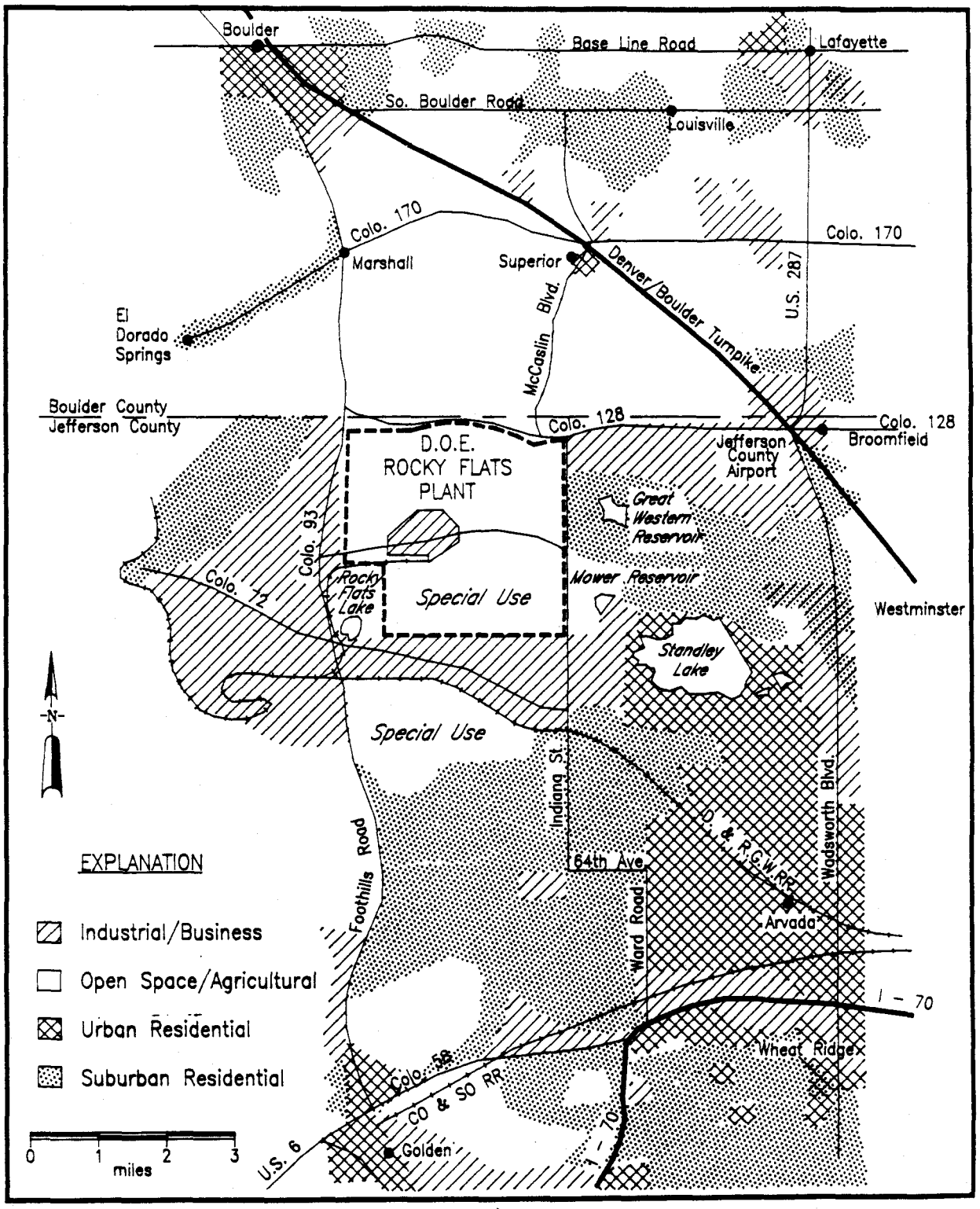
IHSS numbers 216.2 and 216.3 are part of the East Trenches Area and are designated as IHSSs because they were used for spray irrigation of sewage treatment plant effluent. The historical discharge of Pond B-3 was to this spray irrigation area. This practice has been terminated however, and the current Pond B-3 discharge is sent to Pond B-4.

2.1.3 Surrounding Land Use and Population Density

The RFP is located in a rural area (Figure 2-3). Approximately 50 percent of the area within ten miles of the RFP is in Jefferson County. The remainder is located in Boulder County (40 percent) and Adams County (10 percent). According to the 1973 Colorado Land Use Map, 75 percent of this land was unused or was used for agriculture. Since that time, portions of this land have been converted to housing, with several new housing subdivisions being started within a few miles of the buffer zone, southeast of the plant site.

A demographic study, using 1990 census data, shows that approximately 1.9 million people lived within the eight-county Denver metropolitan region. This region covers approximately 5,076 square miles and includes the following counties: Adams, Arapahoe, Boulder, Denver, Douglas, Jefferson, Clear Creek, and Gilpin. The most populated sector is to the southeast, toward the center of Denver. This sector had a 1989 population of approximately 600,000 people living between 10 and 50 miles from Rocky Flats. Recent population estimates registered by the Denver Regional Council of Governments (DRCOG) for the eight-county Denver metro region have shown distinct patterns of growth between the first and second halves of the decade. Between 1980 and 1985, the population of the eight-county region increased by 197,890, a 2.4 percent annual growth rate (DRCOG, 1989). Between 1985 and 1990 a population gain of 80,875 was recorded, representing a 0.9 percent annual increase. The 1990 population showed an increase of 9,300 (or 0.5 percent) from the same date in 1989 (DRCOG, 1990).

The RFP is approximately located in the center of RFP legal land area which is approximately 3 miles (north-south) by 4 miles (east-west). There are eight public schools within six miles of the RFP. The nearest



(after: Jefferson County Planning and Zoning Department, April, 1990)

FIGURE 2-3
LAND USE IN THE VICINITY OF ROCKY FLATS PLANT

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educational facility is the Witt Elementary School, which is approximately 2.7 miles east of the Plant buffer zone. The closest hospital is Centennial Peaks Hospital, located approximately seven miles northeast. The closest park and recreational area is the Standley Lake area, which is approximately five miles southeast of the Plant. Boating, picnicking, and limited overnight camping are permitted. Several other small parks exist in communities within ten miles. The closest major park, Golden Gate Canyon State Park, located approximately 15 miles to the southwest, provides 8,400 acres of general camping and outdoor recreation. Other national and state parks are located in the mountains west of the RFP, but all are more than 15 miles away.

Some of the land adjacent to the Plant is zoned for industrial development. Industrial facilities within five miles include the former TOSCO (The Oil Shale Company) laboratory (40-acre site located two miles south and now occupied by Analytica, Inc.), the Great Western Inorganics Plant (two miles south), the Frontier Forest Products yard (two miles south), the Idealite Lightweight Aggregate Plant (2.4 miles northwest), and the Jefferson County Airport and Industrial Park (990-acre site located 4.8 miles northeast).

Several ranches are located within ten miles of the Plant, primarily in Jefferson and Boulder Counties. They are operated to produce crops, raise beef cattle, supply milk, and breed and train horses. According to the 1987 Colorado Agricultural Statistics, 20,758 acres of crops were planted in Jefferson County (total land area of approximately 475,000 acres), and 68,760 acres of crops were planted in Boulder County (total land area of 405,760 acres). Crops consisted of: winter wheat, corn, barley, dry beans, sugar beets, hay, and oats. Livestock consisted of: 5,314 head of cattle, 113 hogs, and 346 sheep in Jefferson County, and 19,578 head of cattle, 2,216 hogs, and 12,133 sheep in Boulder County (Post, 1989).

2.2 AFFECTED AND SENSITIVE ENVIRONMENT

2.2.1 Physical Environment

The natural environment of the Plant and vicinity is influenced primarily by its proximity to the Front Range of the Rocky Mountains. The Plant is directly east of the north-south trending Rocky Mountains, with

an elevation of approximately 6,000 feet above sea level. The RFP is located on a broad, eastward-sloping plain of overlapping alluvial fans developed along the Front Range. The fans extend about five miles in an eastward direction from their origin in the abruptly rising Front Range and terminate on the east at a break in slope to low rolling hills. The continental divide is about 16 miles west of the Plant. The operational area at the Plant is located near the eastern edge of the fans on a terrace between stream-cut valleys (North Walnut Creek and Woman Creek). The Rocky Flats Alluvium (the deposit of coalescing alluvial fans) is exposed at the surface and consists of a topsoil layer underlain by as much as 100 feet of silt, clay, sand, and gravel.

The RFP is situated in a semiarid region that averages 15 inches of annual precipitation. Forty percent of the yearly total comes in the spring, much of it in the form of snow. Of the balance, 30 percent is accounted for by summer thunderstorms, with the rest occurring in the fall (11 percent) and winter months (19 percent). Average yearly snowfall is 85 inches. Runoff control structures exist to channel surface water from the Plant to monitoring ponds. These structures are sized to accommodate the 100-year storm event which is equivalent to four inches of rain in a six-hour period.

Mineral resources found in the vicinity of RFP include sand, gravel, crushed rock, clay, coal, and uranium. There are no known clay, coal or uranium deposits within the RFP buffer zone; however, these commodities are mined in the region, within 20 miles of the plant. The Schwartzwalder Uranium Mine is located approximately four miles southwest of the RFP. The mine has been the largest producer of vein type uranium ore in Colorado and ranks among the six largest of this type in the United States (DOE, 1980). Active sand and gravel mines lie within the buffer zone boundaries. There is an aggregate processing facility adjacent to the northwest corner of the buffer zone which reopened in 1989. Oil and natural gas production is also active in nearby northwest Adams County and east central Boulder County.

Oil and natural gas activity near Rocky Flats Plant includes oil field developments, pipeline, and production operations. The closest major oil and gas fields are in northwest Adams County (Jackpot and Spindle Fields), and a smaller field occurs in east central Boulder County (Boulder Field). A natural gas pipeline that originates in Wyoming and proceeds across eastern Colorado into Oklahoma is located

approximately ten miles north of the Plant in southern Boulder County. Local natural gas pipelines cross the south side of the Rocky Flats Plant. The nearest refinery operation is the Conoco Refinery located in Commerce City about 20 miles east of the Plant. A north-south oriented oil pipeline feeds in to the refinery from fields in northeastern Colorado and southeastern Wyoming (Donaldson and MacMillan, 1980).

There are four main drainages from the Plant property as shown on Figure 2-4. North Walnut, South Walnut, Rock and Woman Creeks all have intermittent streams which provide drinking water and irrigation water. There are a number of ditches crossing the area as well, conveying water collected off site to other areas, the Plant, Walnut Creek, or Woman Creek. Until late 1974, Plant wastewater had been discharged to Walnut Creek, and until 1975, filter backwash from the raw water treatment plant went into Woman Creek. All process wastewater is now either recycled or disposed through evaporation. Sanitary wastewater is discharged in accordance with the RFP's NPDES permit effluent requirements.

2.2.2 Regional and Local Hydrogeology

The stratigraphic section that pertains to the RFP includes, in descending order, unconsolidated surficial units (Rocky Flats Alluvium, various terrace alluviums, valley fill alluvium, and colluvium) (Figure 2-5), Arapahoe Formation, Laramie Formation, and Fox Hills Sandstone (Figure 2-6). Ground water occurs under unconfined conditions in both the surficial and shallow bedrock units. In addition, confined ground-water flow occurs in deeper bedrock sandstones.

2.2.2.1 Alluvial Materials

The Rocky Flats Alluvium underlies a large portion of the Plant. The alluvium is a broad planar deposit consisting of a topsoil layer underlain by up to 100 feet of poorly stratified silt, clay, sand, gravel and cobbles. Unconfined ground-water flow occurs in the Rocky Flats Alluvium which is relatively permeable. Recharge to the alluvium is from precipitation, snowmelt, and water losses from ditches, streams, and ponds that are cut into the alluvium. General water movement in the Rocky Flats Alluvium is from west to east and toward the

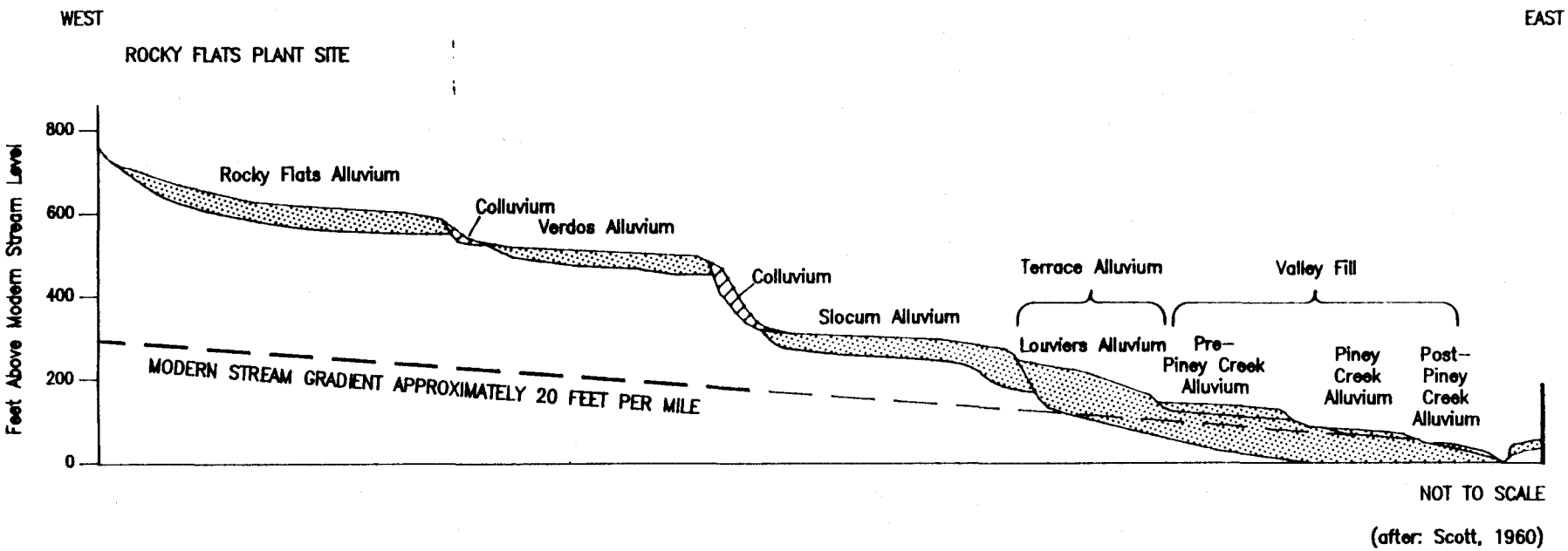
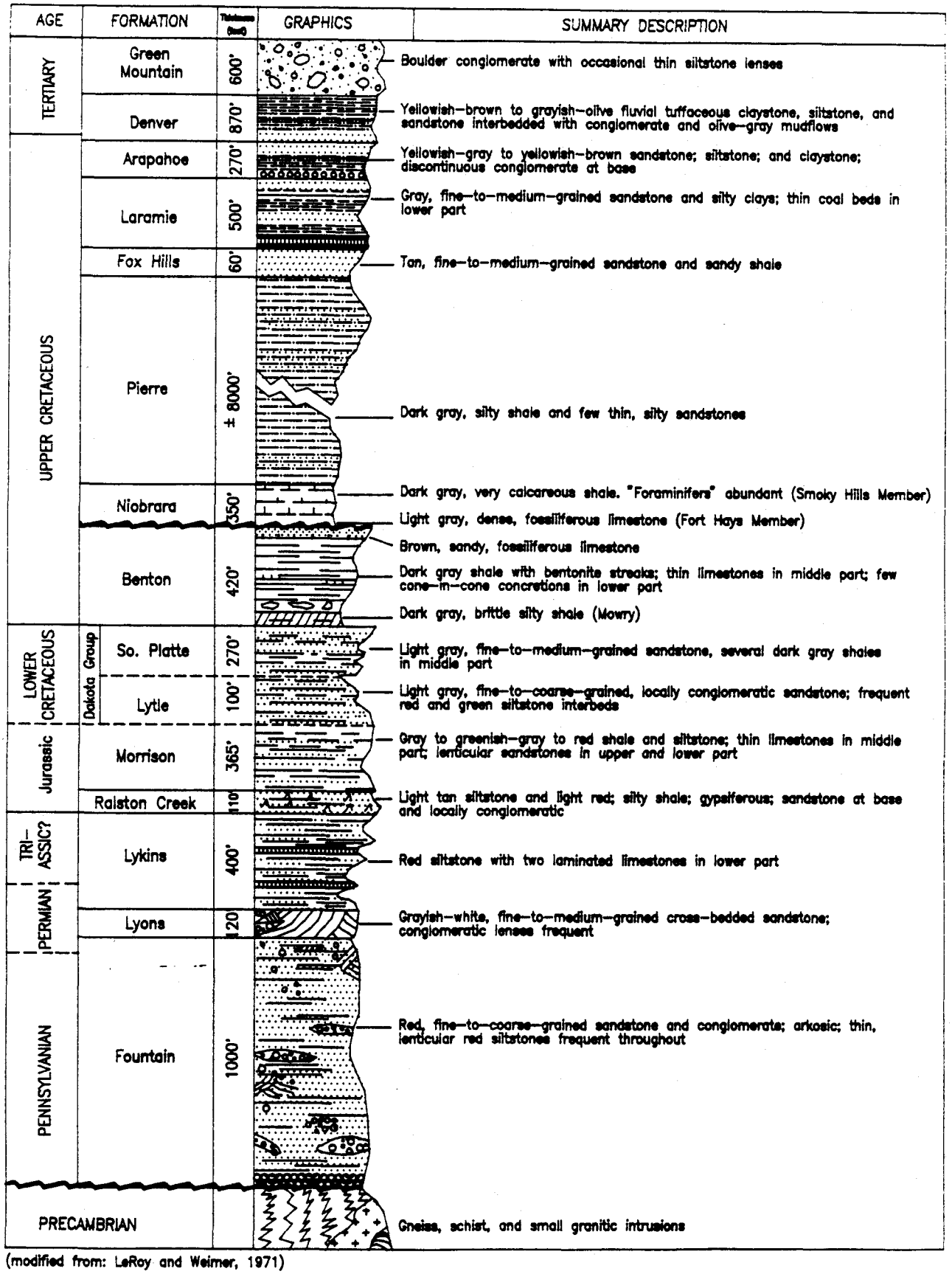


FIGURE 2–5

EROSIONAL SURFACES AND ALLUVIAL DEPOSITS
EAST OF THE FRONT RANGE, COLORADO



(modified from: LeRoy and Weimer, 1971)

FIGURE 2-6
GENERALIZED STRATIGRAPHIC SECTION

881-803A.PJ-080190

drainages. Ground-water flow is also controlled by sediment drainages in the top of bedrock. The water table in the Rocky Flats Alluvium rises in response to recharge during the spring and declines during the remainder of the year. Discharge from the alluvium occurs at minor seeps in the colluvium that covers the contact between the alluvium and bedrock along the edges of the valleys. OU 2 is situated on a terrace of Rocky Flats Alluvium that thins east of the Plant and does not directly supply water to wells located downgradient of Rocky Flats.

Various other alluvial deposits occur topographically below the Rocky Flats Alluvium in the Plant drainages. Colluvium (slope wash) mantles the valley side slopes between the Rocky Flats Alluvium and the valley bottoms. In addition, remnants of younger terrace deposits including the Verdos, Slocum, and Louviers Alluvia occur occasionally along the valley side slopes. Recent valley fill alluvium occurs in the active stream channels.

Unconfined ground-water flow occurs in these surficial units. Recharge is from precipitation, percolation from streams and ditches during periods of surface water runoff, and by seeps discharging from the Rocky Flats Alluvium. Discharge is by evapotranspiration and by seepage into other geologic formations and streams. The direction of ground-water flow is generally downslope through colluvial materials and then along the course of the stream in valley fill materials. During periods of high surface water flow, water is lost to bank storage in the valley fill alluvium and returns to the stream after the runoff subsides.

2.2.2.2 Bedrock Materials

The Cretaceous Arapahoe Formation underlies surficial materials beneath the Plant. This formation is a fluvial deposit composed of overbank and channel deposits. It consists primarily of claystone with some sandstone and is nearly flat lying beneath the Plant (less than a two-degree dip) based on the draft seismic profiling report (Rockwell International, 1989a). The sand bodies within the claystone are composed of fine-grained sands and silts, and their hydraulic conductivity is relatively low compared to the overlying Rocky Flats

Alluvium. A high resolution seismic reflection survey is ongoing at the Plant to further characterize bedrock geology.

The Arapahoe Formation is recharged by ground-water movements from overlying surficial deposits and by leakage from streams. The main recharge areas are under the Rocky Flats Alluvium, although some recharge from the colluvium and valley fill alluvium likely occurs along the stream valleys. Recharge is greatest during the spring and early summer when rainfall and stream flow are at a maximum and water levels in the Rocky Flats Alluvium are high. Ground-water movement in the Arapahoe Formation is generally toward the east, although flow within individual sandstones is not fully characterized at this time. Regionally, ground-water flow in the Arapahoe Formation is toward the South Platte River in the center of the Denver Basin (Robson, 1981a).

The Laramie formation underlies the Arapahoe and is composed of two units, a thick upper claystone and a lower sandstone. The claystone is greater than 700 feet thick and is of very low hydraulic conductivity; therefore, the U.S. Geologic Survey (Hurr, 1976) concludes that Plant operations will not impact any units below the upper claystone unit of the Laramie Formation.

The lower sandstone unit of the Laramie Formation and the underlying Fox Hills Sandstone comprise a regionally important aquifer in the Denver Basin known as the Laramie-Fox Hills Aquifer. Aquifer thickness ranges from 200 to 300 feet near the center of the basin. These units subcrop west of the Plant and can be seen in clay pits excavated through the Rocky Flats Alluvium. The steeply dipping beds of these units west of the Plant (approximately a 50-degree dip) quickly flatten to the east (less than two-degree dip) based on preliminary results of the high resolution seismic reflection study (Rockwell International, 1989a). Recharge to the aquifer occurs along the rather limited outcrop area exposed to surface water flow and leakage along the Front Range (Robson, 1981b).

Sixteen wells were completed in various zones within bedrock during the 1987 drilling program at OU 2. Although claystone was the most frequently encountered lithology immediately below the alluvium/bedrock

contact, interbedded sandy, silty and lignitic units with both gradational and sharp contacts were present as well. All of the bedrock encountered directly beneath surficial materials was weathered, and some saturated sandstones were encountered.

2.2.3 Site Hydrology

2.2.3.1 Surface Water

Surface water drainage patterns at the RFP are shown on Figures 2-2 and 2-4. A discussion of the major OU 2 surface water features, including the South Walnut Creek and Woman Creek drainages, is presented below. Although this IM/IRA Plan addresses collection and treatment of contaminated South Walnut Creek Basin surface water; the Woman Creek drainage is included in the following discussion to provide a complete description of OU 2 hydrology. Collection and treatment of Woman Creek Basin seepage southeast of the 903 Pad Area will be addressed in a separate IM/IRA Plan as discussed in Section 1.

South Walnut Creek

The headwaters area of South Walnut Creek has been filled during construction of RFP facilities. As a result, flow originates from a buried culvert located west of Building 991. Flow in the upper reach of South Walnut Creek is directed to the south of Building 991 and under the Perimeter Security Zone (PSZ) fence by a buried metal corrugated culvert. The culvert outlet is located in the South Walnut Creek drainage approximately 500 feet downgradient of the PSZ fence near the discharge of the sewage treatment plant (see Figure 4-2). A concrete culvert and a second metal corrugated culvert also discharge into the South Walnut Creek drainage just downgradient of the PSZ fence and north of the Mound Area. The flow from the concrete culvert originates as seepage from the hillside south of Building 991 and flows into a ditch along the slope. The metal corrugated culvert drains plant runoff collecting in a drainage south of the PSZ. The combined flow then enters the South Walnut Creek detention pond system. Below the detention ponds, South Walnut Creek, North Walnut Creek, and an unnamed tributary join within the buffer zone to form Walnut Creek. Great Western

Reservoir is located approximately one mile east of this confluence and is a drinking water source for Broomfield. Flow is routed around Great Western Reservoir by the Broomfield diversion canal.

The South Walnut Creek detention pond system consists of five ponds (B-1, B-2, B-3, B-4, and B-5) that retain surface water runoff and RFP discharges for flood control, and for monitoring and treatment prior to downstream release. All flow in the pond system is eventually detained in Pond B-5, where it is treated and monitored prior to discharge. Water is discharged from Pond B-5 in accordance with the Plant's NPDES permit (discharge point 006). Ponds B-1 and B-2 are reserved for spill control, surface water runoff, or treated sanitary waste of questionable quality. Pond B-3 is used as a holding pond for sanitary sewage treatment plant effluent. The historical discharge of Pond B-3 was a spray irrigation system located in the vicinity of the East Trenches. This practice has been terminated, however, and the current Pond B-3 discharge is sent to Pond B-4. In addition to Pond B-3 discharge, Ponds B-4 and B-5 receive surface water runoff from the central portion of the Plant. The surface water runoff received by Pond B-4 is collected by the Central Avenue Ditch and the South Walnut Creek Drainage.

Woman Creek

Woman Creek is located south of the Plant, with headwaters in largely undisturbed Rocky Flats Alluvium. Runoff from the southern part of the Plant is collected in the South Interceptor Ditch located north of the creek and delivered downstream to Pond C-2 (see Figure 2-2). Pond C-1 (upstream of C-2) receives stream flow from Woman Creek. Flow in Woman Creek is also influenced by diversion of water from Rocky Flats Lake into the creek by local landowners. The discharge from Pond C-1 is diverted around Pond C-2 into the Woman Creek channel downstream. Water in Pond C-2 is treated and monitored prior to discharge. Discharge from Pond C-2 is in accordance with the Plant's NPDES permit (discharge point 007). Historically, discharge from Pond C-2 has been to Woman Creek, however, since October of 1989, treated water is being pumped to the South Walnut Creek drainage and flows off site via the Broomfield diversion canal.

Flow in Woman Creek and the South Interceptor Ditch is intermittent. This has been observed by field investigation crews since 1986 and is indicative of frequent interaction with the shallow ground-water system.

2.2.3.2 Ground Water

Ground water occurs in surficial materials (Rocky Flats Alluvium, colluvium, and valley fill alluvium) and in Arapahoe sandstones and claystones at OU 2. These two flow systems, which are hydraulically connected at shallower portions of the Arapahoe Formation, are discussed separately below.

Ground Water in Surficial Materials

Ground water is present in the Rocky Flats Alluvium, colluvium, and valley fill alluvium under unconfined conditions. Recharge to the water table occurs as infiltration of incident precipitation and as seepage from ditches and creeks. In addition, detention ponds along South Walnut Creek and Woman Creek recharge the valley fill alluvium. Figure 2-7 shows the potentiometric surface of uppermost ground water measured between April 4 and April 8, 1988, and the locations of alluvial and bedrock wells in the vicinity of OU 2.

The shallow ground-water flow system is quite dynamic, with large water level changes occurring in response to precipitation events and stream and ditch flow. For example, between mid-April and September, 1986, water levels in wells 1-86 and 4-86 (completed in valley fill alluvium) dropped more than four and eight feet, respectively. Alluvial water levels are highest during the months of May and June. Water levels decline during late summer and fall, and some wells go completely dry at this time of year. Ground-water flow in the Rocky Flats Alluvium is generally from west to east, following the surface of the claystone bedrock.

Alluvial ground water discharges to seeps, springs, surface water drainages, and subcropping Arapahoe Sandstone at OU 2. Seeps and springs occur along the edge of the Rocky Flats Alluvium terrace (at the alluvium/bedrock contact) and on the side slopes of the terrace. Seeps and springs on the terrace side slopes

may be due to thinning of colluvial materials. Ground water in colluvial materials south of the 903 Pad and East Trenches Areas discharges to the South Interceptor Ditch, and ground water in valley fill materials discharges to Woman or South Walnut Creeks.

Hydraulic conductivity values were estimated for surficial materials from drawdown-recovery tests performed on 1986 wells during the initial site characterization and from slug tests performed on selected 1986 and 1987 wells during the Phase I RI (Rockwell International, 1987a). The average ground-water velocities in the Rocky Flats Alluvium, Woman Creek Valley Fill Alluvium, and South Walnut Creek Valley Fill Alluvium are 84 ft/yr, 145 ft/yr, and 20 ft/yr, respectively (Rockwell International, 1987a). These values are based on a horizontal gradient of 0.02 feet/feet (ft/ft), an effective porosity of 0.1, and mean hydraulic conductivities of 4×10^{-4}, 7×10^{-4} and 9.5×10^{-5} cm/s for Rocky Flats, Woman Creek Valley Fill and South Walnut Creek Valley Fill Alluvium, respectively. The calculations assume year-round saturation. However, as discussed above, portions of the Rocky Flats Alluvium, colluvium, and valley fill alluvium are not continuously saturated. Thus, the shallow ground water must flow at less than the calculated annual average velocities. The reactivity of dissolved constituents could further reduce contaminant migration rates below estimated ground-water velocities.

Bedrock Ground Water

The greatest potential for ground-water flow in the Arapahoe Formation occurs in the meandering lenticular sandstones contained within the claystones (i.e., the basal formation) due to their relatively higher permeability. Flow within individual sandstones is assumed to be from west to east, but the geometry of the bedrock ground-water flow path is not fully understood at this time due to its dependence upon the continuity of the sandstones and their hydraulic interconnection (Robson, 1981a). Ground-water recharged to sandstones occurs as infiltration from alluvial ground water where sandstones subcrop beneath the alluvium and by leakage from claystones overlying the sandstones. Ground-water from the basal formation of the Arapahoe aquifer is used for irrigation, livestock, watering, and domestic purposes. Wells are located east of the RFP within the Denver Basin.

There is a strong downward gradient between ground water in surficial materials and bedrock. Vertical gradients range from 0.31 ft/ft between wells 35-86 and 34-86 to 1.05 ft/ft between wells 41-86 and 40-86. These gradients imply a relatively high hydraulic conductivity contrast between the surficial materials and bedrock, which is supported by hydraulic conductivity test results.

Flow within sandstones is regionally west to east. The geometry of the ground-water flow path in the bedrock is not fully understood at this time because it depends upon the continuity of the sandstones and their interconnection. Evaluation of the lateral extent and degree of interconnection of the sandstone units is a primary goal of the Phase II and Phase III Remedial Investigations for OU 2.

Hydraulic conductivity values for Arapahoe sandstones were estimated from drawdown-recovery tests performed in 1986, slug tests performed in 1987, and packer tests performed in 1986 and 1987. The maximum horizontal ground-water flow velocity in sandstone is 75 ft/yr using a hydraulic conductivity of 83 ft/yr, a horizontal gradient of 0.09 ft/ft, and an assumed effective porosity of 0.1.

2.2.4 Ecology

Within the Plant boundaries a variety of vegetation thrives. Included are species of flora representative of tall grass prairie, short grass plains, lower montane, and foothill ravine regions, with none being on the endangered species list. It is evident that the vegetative cover along the Front Range of the Rocky Mountains has been radically altered by human activities such as burning, timber cutting, road building, and overgrazing for many years. Since the acquisition of the RFP property, vegetative recovery has occurred as evidenced by the presence of grasses like big bluestem and sideoats grama (two disturbance-sensitive species). No vegetative stresses attributable to hazardous waste contamination have been identified (DOE, 1980).

The animal life inhabiting the RFP and its buffer zone consists of species associated with western prairie regions. The most common large mammal is the mule deer, with an estimated 100 to 125 permanent residents. There are a number of small carnivores, such as the coyote, red fox, striped skunk, and long-tailed

weasel. A profusion of small herbivore species can be found throughout the Plant and buffer zone consisting of species such as the pocket gopher, white-tailed jackrabbit, and the meadow vole (DOE, 1980).

Commonly observed birds include western meadowlarks, horned larks, mourning doves, and vesper sparrow. A variety of ducks, killdeer, and red-winged blackbirds are seen in areas adjacent to ponds. Mallards and other ducks frequently nest and raise young on several of the ponds. Common birds of prey in the area include marsh hawks, red-tailed hawks, ferruginous hawks, rough-legged hawks, and great horned owls (DOE, 1980).

Bull snakes and rattlesnakes are the most frequently observed reptiles. Eastern yellow-bellied racers have also been seen. The eastern short-horned lizard has been reported on the site, but these and other lizards are not commonly observed. The western painted turtle and the western plains garter snake are found in and around many of the ponds (DOE, 1980).

2.2.5 Sensitive Environments and Endangered Species

The Endangered Species Act of 1973 (Public Law 93-0205), as amended, provides that all federal agencies implement programs for the conservation of listed endangered and threatened species. Federal agencies must ensure that actions authorized, funded, or carried out by them will not jeopardize the continued existence of any endangered or threatened species.

The U. S. Fish and Wildlife Service (USFWS) has indicated that the two endangered species of interest in the RFP area are the bald eagle and the black-footed ferret (Rockwell International, 1988c). Prairie dog towns provide the food source and habitat for ferrets. Since there are no prairie dog towns in or near the 881 Hillside Area which is near the 903 Pad, Mound and East Trenches, the USFWS has determined that ferrets probably do not exist in the investigation area. Bald eagles are occasional visitors to the area, primarily during migration times. Sightings are rare and little suitable habitat exists on the RFP site other than some perching locations. No nests are found on the RFP site. The proposed action will not adversely affect the bald eagle.

The USFWS has concurred with these findings subsequent to a field visit on 15 June 1988 (Rockwell International, 1988c).

Other animal species of interest that exist in the RFP area include burrowing owls and Swainson's hawks. Cottonwood trees within approximately one quarter mile of the 903 Pad, Mound, and East Trenches Areas were investigated to determine if any raptor nests exist and none were found. The nearest population of burrowing owls is approximately two miles to the east. The nearest population of Swainson's Hawks could be in the cottonwood trees in the area of the North Walnut Creek or Rock Creek drainages, north of the 881 Hillside area.

The 903 Pad, Mound, and East Trenches Areas are not used, nor intended for use, as a public or recreational area, nor for the development of any unique natural resource. No unique ecosystems were found at the RFP during extensive biological studies (DOE, 1980).

2.2.6 Wetlands

Initial consultation with the USFWS and the U.S. Army Corps of Engineers was conducted in the spring of 1988. Wetlands at the RFP site were delineated. The proposed action is not located in the delineated wetlands. Aerial photography imagery for the 903 Pad, Mound, and East Trenches Areas was examined for wetlands identification followed by limited site inspection (EG&G, 1990b). Two isolated stands of wetlands vegetation containing common cat-tail (*Typha latifolia*) were located primarily within IHSS 140, where ground water flowing toward the terrace edges emerges as seeps or springs at the contact between the alluvium and bedrock. The two areas are each less than 20 square feet in size.

Linear wetlands areas have been identified along both the Woman Creek and South Interceptor Ditch drainage areas. These drainages collect surface water upgradient from OU 2 and deliver the water to pond C-2 for treatment. Evenly-spaced drop structures along the South Interceptor Ditch have lowered flow velocities, increased sediment accumulation, and created fairly dense linear stands of wetlands. From a point

due south of Building 881 and extending to the C-2 Pond, approximately 0.15 acres of wetland are contained within this portion of the South Interceptor Ditch. Wetland species observed were primarily cattails (greater than 95 percent predominance), spike rush (Eleocharis macrostachya) and bullrush (Scirpus americanus). The wetlands function primarily as flow attenuation features with additional minor contributions to wildlife habitat and water quality enhancement. Drainage contribution to the South Interceptor Ditch from OU 2 is minimal.

2.2.7 Historic Sites

The National Historic Preservation Act of 1966 (Public Law 89-665) together with subsequent law amendments (Public Laws 91-243, 93-54, 94-422, 94-458) provides that all federal agencies implement programs for the protection of archeological and historical resources.

The 903 Pad, Mound and East Trenches Areas have been highly disturbed over a number of years. Due to this disturbance and the topographic position of the subject area, the State Office of Archeology and Historic Preservation has determined that this action will not impact cultural resources (Burney, 1989). An archaeological and historical survey of the RFP was conducted between July 18 and August 22, 1988, which determined two sites have potential eligibility to the National Register of Historic Places. However, insufficient information currently exists to make this determination. These two sites are located northwest and southwest of the investigation area and will not be disturbed by the proposed action (Burney, 1989).

2.3 CONTAMINANTS – DESCRIPTION AND SOURCES

2.3.1 Background Characterization

In order to facilitate the interpretation of chemical results in non-background areas, a background characterization program has been implemented to define the spatial and temporal variability of naturally occurring constituents. Fieldwork was conducted in 1989, and a draft Background Geochemical Characterization Report was prepared and submitted to the regulatory agencies on December 15, 1989

(Rockwell International, 1989c). The document summarizes the background data for ground water, surface water, sediments, and geologic materials, and identifies preliminary statistical boundaries of background variability. Spatial variations in the chemistry of geologic materials and water were addressed by placing sample locations throughout background areas at the Plant. The goal of evaluating temporal variations in water chemistry has not yet been achieved because at least two years of quarterly data are needed.

The draft report has been updated by incorporation of analytical data that were unavailable in December 1989, including additional rounds of ground-water and surface water samples for which laboratory analyses were not available. The information in the draft background geochemical report has been used to preliminarily characterize inorganic contamination at the 903 Pad, Mound, and East Trenches Areas. The draft report presents tolerance intervals for surface water, sediment, and various soil lithologies and hydrogeologic units (ground water). The tolerance intervals are statistical ranges of the background analyte concentrations in the various media that represent 95 percent of the population with 95 percent confidence. Summary tables of the upper limits of these tolerance intervals are provided in Tables A-1 through A-4 (see Appendix A) for reference.

2.3.2 Ground-Water Contamination

Ground water at the RFP has been monitored since 1986. Wells have been installed throughout the property and are sampled quarterly. The following discussion is based on the resulting data.

2.3.2.1 Volatile Organic Contamination

Table A-5 (Appendix A) presents all volatile organic compounds (VOCs) with concentrations that are above detection limits in the unconfined ground-water system during the second quarter of 1989. These are the most recent validated data pertaining to the same season for which the background levels were determined. Maximum concentrations of volatile organics based on the complete data set (1986-1989 sampling) are summarized in Table A-6. The primary volatile organic ground-water contaminants (CCl_4, PCE,

and TCE) are portrayed with isopleths in Figures 2-8 through 2-10 based on second quarter 1989 data for both unconfined alluvial and bedrock wells.

The data in Tables A-5 and A-6 confirm the relative dominance of CCl_4, PCE and TCE in alluvial and shallow bedrock ground water at OU 2 compared to other volatile organic compounds, and documents occurrences of 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethene (1,2-DCE), and vinyl chloride (all are possible degradation products of the principal contaminants), and 1,1,1-TCA, total-1,2-DCE, 2-hexanone, $CHCl_3$, methylene chloride, acetone and carbon disulfide. The latter four analytes were reported at levels below detection limit and therefore represent only estimated values.

The distribution of the principal contaminants suggests that the 903 Pad is the main source of CCl_4, with possible contributions from the northern East Trenches. The Mound Area is the main source of PCE, and TCE occurs throughout OU 2 implying multiple sources. The Phase II Work Plan for this site discusses volatile organic ground-water contamination in further detail (EG&G, 1990a).

2.3.2.2 Inorganic Contamination

Major Ions

Major ions and total dissolved solids (TDS) are somewhat elevated above background throughout and downgradient of the 903 Pad, Mound and East Trenches Areas (Table A-7, Appendix A). Total dissolved solids typically ranged between 400 and 1000 milligrams per liter (mg/ℓ); chloride was generally 30-100 mg/ℓ, nitrate was 2-10 mg/ℓ, and most sulfate concentrations were between 10 and 100 mg/ℓ in the second quarter of 1989. In general, major cations were accordingly elevated. The highest concentrations of major ions are in well 29-87 southeast of the 903 Pad, although ground water at the northernmost wells (34-87 and 35-87) was also quite high in TDS (~1000 mg/ℓ).

Metals

Aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, strontium, vanadium and zinc exceeded background in one or more wells in the second quarter of 1989. Table A-8 (Appendix A), a summary of multiple sampling events (up to fourteen samples collected from each well during 1987-1989), shows that only a subset of these analytes repeatedly exceed background (upper limit of the tolerance interval) and/or exceed background by a wide margin. The sporadic exceedances of background, and the absence of apparent gradients in metal concentrations with respect to IHSSs, hinders drawing definite conclusions as to whether these constituents are derived from IHSSs (EG&G, 1990a). Section 2.3.5 makes reference to this and other ambiguities in the ground-water chemistry data to the extent that they may be relevant to the Surface Water IM/IRA Plan.

Radionuclides

Table A-9 (Appendix A) shows that dissolved concentrations of the uranium isotopes (U-234, U-235, and U-238), plutonium, and americium have been above background at OU 2. The maximum concentration for uranium 238 was 28 ± 2 pCi/ℓ in well 12-87 in the 903 Pad Area. Numerous occurrences of uranium at lower concentrations and in wells completed in diverse lithologies demonstrate that the distribution of uranium is not thoroughly delineated at OU 2. With respect to plutonium and americium, results at wells 15-87 and 11-87 were the most elevated (plutonium 0.522 ± .117 pCi/ℓ and 0.199 ± 0.07 pCi/ℓ, respectively; americium 0.831 ± 0.148 pCi/ℓ and 0.06 ± .05 pCi/ℓ, respectively).

2.3.3 Soil Contamination

The extent of soil contamination at the 903 Pad, Mound, and East Trenches Areas was determined from soil samples collected in 1987 during the Phase I RI. Samples were collected from boreholes drilled in and adjacent to known IHSS locations (Figure 2-11). Two-foot intervals were composited for organic analyses, and two- to ten-foot intervals were composited for all other analytes. Boreholes were not drilled into sites still

containing wastes (the trenches and 903 Pad) due to potential health hazards to field workers and potential for release of waste constituents to the environment. The soils data are summarized here because of the potential influences contaminated soils may have on surface water quality. Either direct contributions via overland runoff, or direct influences via ground-water interactions are possible. The discussion is considered preliminary because wastes were not directly sampled and soils data are still being evaluated.

VOCs, including PCE, TCE, toluene, 2-butanone, CCl_4, acetone and methylene chloride, were reported in samples from the 903 Pad and East Trenches Areas (see Table A-10). Occurrences of total xylenes, ethylbenzene and toluene were also reported for the 903 Pad Area, whereas 1-2-dichloroethane (1,2-DCA), 1,1,1-TCA, and 1,1,2-TCA were reported in an East Trenches borehole. The Mound Area, like other portions of OU 2, contained acetone (hundreds of $\mu g/\ell$) and methylene chloride (typically tens of $\mu g/\ell$) at concentrations too low to unambiguously demonstrate contamination with these compounds. Other organic constituents in the Mound Area (PCE, $CHCl_3$, 1,2-DCA) were less numerous and at lower levels than at other areas within OU 2. Semi-volatile organic compounds di-n-Butyl phthalate, bis(2-Ethylhexyl) phthalate, and N-nitrosodiphenylamine were detected in numerous boreholes throughout OU 2 (see Table A-11, Appendix A).

Several metals occurred above background in soil samples (aluminum, arsenic, barium, cadmium, calcium, iron, mercury, manganese, lead, antimony, vanadium and zinc), although most exceeded background by less than a factor of two and/or in only one or two samples. Table A-12 (Appendix A) presents maximum metal concentrations in soils.

Plutonium and americium are the principal radionuclide contaminants exhibiting elevated concentrations in soils. Table A-13 (Appendix A) presents maximum radionuclide concentrations in soils at OU 2. Highest concentrations occurred in samples that included the surface. Because many of the surface soil samples were mixed into large composites, the Phase I RI data do not rule out the presence of radionuclides other than plutonium and americium. Cesium-137, tritium, and uranium were detected, albeit at near-background concentrations and in fewer than ten samples. Surface contamination of soils with plutonium and americium was further demonstrated by a recent aerial radiological survey (EG&G, 1989). The radioactivity detected in

that survey was associated with known radioactive material storage and handling areas (i.e., the 903 Pad), and was attributed to plutonium, americium, and a uranium decay product. The survey indicated elevated concentrations of americium in soils east of the 903 Pad Lip Site as high as 97 pCi/g, and by inference from their expected activity ratio, plutonium as high as 500 pCi/g. Subsequent analysis of samples from the area with high americium concentrations indicated plutonium concentrations as high as 457 pCi/g. The cesium-137 activity was at a level consistent with global fallout and not enriched in the Plant area.

2.3.4 Sediment Contamination

Sediments in Woman Creek and South Walnut Creek were sampled in the fall of 1986, and in March and October of 1989. Stations SED-28, SED-29, and SED-25 are located within the South Interceptor Ditch in the Woman Creek drainage (Figure 2-12). SED-30 and SED-31 are seeps on the South Interceptor Ditch berm near station SED-29. SED-27 and SED-26 are along Woman Creek just upstream of Pond C-2. Stations SED-11, SED-12, and SED-13 are located along South Walnut Creek. SED-11 is the most upgradient station, SED-12 is just upstream of Pond B-1, and SED-13 is just downstream of Pond B-5. Stations SED-1 and SED-2 on Woman Creek and an ephemeral tributary, respectively, are both downstream of OU 2, just west of Indiana Street within the boundary of the buffer zone (east of area depicted by Figure 2-12).

2.3.4.1 Woman Creek Drainage

VOCs were detected in samples from the sediments in the Woman Creek drainage (Table A-14, Appendix A). Chloromethane was present at SED-29 (60 μg/kg), and chloroform was reported at SED-31 (18 μg/kg). Several sediment samples contained methylene chloride and acetone at very low concentrations. These compounds were frequently found in associated blanks. SED-30 contained 220 μg/kg acetone at one sampling, but acetone was also present in the blank for this sample and was undetected in two other sampling events for this station in 1989. Acetone and methylene chloride results in this area are believed to be laboratory artifacts. The only other volatile organic compounds detected in the Woman Creek drainage sediment samples were TCE (8 μg/kg) at SED-31 (estimated below detection limits elsewhere), and toluene estimated below detection limit at SED-29 and SED-30.

Of the metals, beryllium, lithium, silver, tin, and zinc were notably elevated above background in the sediment of the South Interceptor Ditch and Woman Creek (Table A-15, Appendix A). Concentrations of silver (as high as 49 mg/kg) are greater than five times the upper limit of the background range at stations SED-25, SED-26, and SED-30. Beryllium was not detected in the background samples (<1.1 mg/kg) but occurs at concentrations ranging from 3.8 to 15.5 mg/kg in all the sediment samples collected from the South Interceptor Ditch and Woman Creek. Although tin was not above background (<22.8 mg/kg) at SED-27, SED-28, and SED-31, it occurred in a range from 364 to 1080 mg/kg in stations SED-25, SED-26, SED-29, and SED-30. Concentrations of zinc (as high as 735 mg/kg) are greater than the upper limit of the background range at stations SED-11, SED-28, SED-29, and SED-30.

Plutonium was above background at stations SED-1, SED-2, SED-25, SED-26, SED-29, and SED-30, ranging in concentration from 0.06 to 0.85 pCi/g (Table A-16, Appendix A). Contaminated surface soil from the 903 Pad Area, transported primarily by wind, may be the source of this plutonium.

2.3.4.2 South Walnut Creek Drainage

The South Walnut Creek sediment monitoring stations include SED-11, SED-12 and SED-13. Only one sample was obtained from each of SED-12 and SED-13 (13 August 1986). Due to prioritization of sampling activities, additional samples were not collected from these stations. Table A-14, Appendix A shows that acetone was reported for all three stations and was also associated with laboratory blanks. SED-11 was found to contain TCE and 2-butanone at concentrations of 39 mg/kg and 12 μg/kg, respectively. All other VOCs were either not detected or reported below detection limits for SED-11, SED-12 and SED-13.

As in the Woman Creek drainage, beryllium, lithium, silver, and tin are elevated in the sediments at SED-11. They occurred at concentrations of 2.5, 7.2, 15.0, and 404 mg/kg, respectively. Zinc was also notably elevated, occurring at a concentration of 735 mg/kg (the upper limit of the background tolerance interval is 93 mg/kg). Uranium 235 was reported at a concentration of 0.2 pCi/g for SED-11 and americium levels were reported at 0.19 pCi/g and 0.03 pCi/g for SED-12 and SED-13, respectively. Plutonium was also found at a

concentration of 0.35 pCi/g at SED-12. Wind-dispersed contaminated soils from the 903 Pad and Lip Area may be the source of these radionuclides.

2.3.5 Surface Water Contamination

Twenty-six surface water and surface seep stations in the vicinity of the 903 Pad, Mound, and East Trenches Areas were sampled during field activities from 1986 through 1990 (see Appendix B). The following discussion is based on all available data because many seeps or stream stations were dry during some samplings. These data have been summarized in Appendix C and compared to ARARs (see Section 3 for ARAR identification). Total radiochemical and metals data, although presented in the Appendix, are not discussed because an assessment methodology that accounts for varying concentrations of suspended solids is still being developed. Surface water monitoring locations are shown on Figure 2-12.

Flowing surface water in drainages was sampled at stations on the South Interceptor Ditch and Woman Creek just upstream of Pond C-2 and at stations upstream of the B-series ponds on South Walnut Creek. The B-series ponds were not sampled for this investigation, as they will be subsequently investigated as part of another operable unit.

The surface water seeps are downslope and southeast of the 903 Pad Area, and downslope and north of the Mound Area and East Trenches Areas. Because surface water at seeps and in streams represents ground-water discharge (intermittent discharge with respect to streams), the surface water compositions are similar to those of local ground water. The data for both media show that PCE, TCE, CCl_4, and their degradation products are the principal VOCs, and they show very similar major ion contents as well. However, there is enough variability within stations so that it is not possible to demonstrate surface/ground-water connections on a well-by-well, seep-by-seep basis.

2.3.5.1 Surface Water Stations Southeast of 903 Pad Area

There are several seeps downslope to the southeast of the 903 Pad. Surface water stations established at these seeps in the 903 Pad Lip Area are designated SW-50, SW-51, SW-52, SW-55, SW-57, SW-58, and SW-77. Station SW-50 is closest to the 903 Pad, and SW-57 and SW-52 are south of SW-50. SW-51 and SW-58 are located in a ditch along the road east of SW-50; however, overland flow of seepage from SW-50, SW-52, and SW-57 will also enter the ditch. Water in the ditch passes under the road south of these locations through a culvert. The discharge of the culvert is sampled at station SW-55. SW-77 is another seep located on the east side of the road, just north of SW-55. It is noted, therefore, that SW-51, SW-58, and SW-55 are physically connected and likely receive flow from SW-50, SW-52, and SW-57. Farther downgradient stations include seeps at SW-53, SW-62, SW-63, and SW-64; SW-27, SW-30, SW-54, and SW-70 on the South Interceptor Ditch; and SW-26, SW-28, and SW-29 on Woman Creek.

Data for seeps in the vicinity of the 903 Pad Lip Site and farther downgradient at SW-53, SW-63, and SW-64 indicate organic contamination. Contaminants in seeps in the vicinity of the 903 Lip Site include 1,1-DCE, 1,2-DCE, CCl_4, TCE, and PCE, with concentrations of CCl_4 and TCE exceeding 1000 $\mu g/\ell$. Occasionally 1,2-DCE and TCE are present at SW-53, low concentrations of CCl_4 and TCE (<20 $\mu g/\ell$) occur at SW-63, and low concentrations of TCE occur at SW-64. Methylene chloride also occasionally occurs in these seeps, but at concentrations near the detection limit, and frequently also occurs in the laboratory blanks. Low and very infrequent concentrations of these and other VOCs occur at seep SW-62 as well as at stations along the South Interceptor Ditch. The water-quality data for stations along the South Interceptor Ditch and Woman Creek do not provide unambiguous evidence of contamination; however, the VOC concentrations in the upgradient seeps suggest that a solvent plume within alluvial ground water is migrating to the southeast, which is consistent with the alluvial ground-water flow direction. It is inferred that VOC contaminated alluvial ground water approaches the South Interceptor Ditch and Woman Creek.

With respect to inorganic and dissolved radionuclide contamination, there are somewhat elevated concentrations of TDS, major ions, aluminum, strontium, zinc, and uranium at most of these stations. Unlike

the absence of VOCs in surface water at stations along the South Interceptor Ditch (SW-70, SW-30, SW-54, and SW-27), all have somewhat elevated uranium concentrations (generally less than 10 pCi/ℓ of total uranium). These concentrations are usually above ARAR (5 pCi/ℓ). Although the 903 Pad Area cannot be ruled out as the source of the uranium, the occurrence of elevated uranium as far upgradient as SW-70 suggests the 881 Hillside Area as a potential source. Alluvial ground water at the 881 Hillside contains levels of uranium above background.

Seeps in the vicinity of the 903 Pad Lip Site (SW-50, SW-53, and SW-54) had detectable plutonium and/or americium during one sampling event in 1989 (two events for SW-53). The samples contained substantial suspended solids and were not filtered at the time of collection, and surface soils in the vicinity of the seeps are contaminated with radionuclides. Furthermore, total radiochemistry data do indicate notably higher plutonium and americium concentrations than in filtered samples, demonstrating that most of the radionuclides are in a particulate form. Therefore, the local soils represent the most direct potential source for seep contamination. However, there were traces of plutonium in a few ground-water samples (highest concentration at well 15-87, 0.522 ± 0.117 pCi/ℓ) so ground water is also a potential source of radionuclides in seeps, albeit a less significant one.

It is noted that plutonium and americium are essentially insoluble in natural waters, but they can migrate in colloidal form, and colloidal-size particles can pass through 0.45 μm filters such as those used in the previous investigation (Puls and Barcelona, 1989). The DOE is currently conducting a study to assess the distribution of plutonium and americium in surface water with respect to suspended solids particle size. The study will include filtration of surface water through three pore sizes, and laboratory analysis for plutonium and americium in the filtered and unfiltered fractions (<0.10 μm, 0.10 μm to <0.20 μm, 0.20 μm to <0.45 μm, and ≥ 0.45 μm). Although this study was not explicitly designed to differentiate colloidal and dissolved radionuclides, and therefore will be unable to quantify colloidal material under 0.1 μm, it will demonstrate whether a significant portion of the radionuclides are between 0.1 and 0.45 μm and thereby provide some indication of the importance of colloidal transport. Also, if most of the plutonium is particulate in nature (>0.1 μm in size), it is likely plutonium can be removed from surface water by unit processes effective at removal of suspended solids, e.g., sedimentation and filtration.

Regardless of the transport mode, total plutonium concentrations occur above background at station SW-29 on Woman Creek (range: <Minimum Detectable Activity [MDA] - .315 ± .115 pCi/ℓ), and dissolved plutonium was detectable during one sampling event (.159 ± .142 pCi/ℓ). Dissolved plutonium was also detectable at station SW-70 on the South Interceptor Ditch (.11 ± .09 pCi/ℓ); however, the total plutonium concentration was 0.011 ± .057 pCi/ℓ during this sampling event, rendering this data questionable. The one datum that exists in the remedial investigation data base indicates total plutonium is not above background in Pond C-2 (dissolved radionuclide data do not exist).

2.3.5.2 Upper South Walnut Creek

At the Mound Area, approximately 150 feet downgradient of the PSZ fence, station SW-60 (see Figure 4-2) is located at the outlet of a corrugated metal culvert. The culvert discharges plant runoff that is collected in a drainage ditch located outside of and south of the PSZ. Stations SW-56 (not sampled in 1989) and SW-101 are located on a ditch within the PSZ that collects seepage originating from the hillside south of Building 991. Water in the ditch flows beneath the PSZ through a concrete culvert and discharges to the South Walnut Creek drainage just to the north of SW-60. The discharge from the concrete culvert has recently been assigned surface water monitoring station SW-133. Station SW-59 is located downstream of SW-60 on the south bank of the drainage at what appears to be a spring or drain discharge. The combined flow of SW-59, SW-60, and SW-133 is sampled at SW-61, which is located at the confluence. (Note: Prior to November 1987, SW-61 was located at the outlet of the concrete culvert mentioned above. The sample data for 7/22/87 and 11/11/87 were obtained from the effluent of the concrete culvert.) Flow from the upper reach of South Walnut Creek is discharged approximately 225 feet downstream of SW-61 from the outlet of a corrugated metal culvert. This discharge has never been assigned as a surface water monitoring station and has, therefore, never been sampled. It has recently been assigned station SW-132, however. The flow in South Walnut Creek upstream of Pond B-4 is primarily the combined flow from SW-132 and the drainage flow at SW-61. Station SW-23 is located upgradient of Pond B-1. SW-22 is located southeast of the principal drainage and was dry during the reported sampling events. It is noted that a sewage treatment plant is located just downgradient of SW-61 on the north bank of the drainage. The effluent from the plant is piped directly to Pond B-3.

South Walnut Creek Basin surface water, as characterized by data for stations SW-56, SW-59, SW-60, SW-61, and SW-101, contain CCl_4, PCE, and TCE in concentrations in excess of 200 $\mu g/\ell$, with lesser and infrequent concentrations of 1,1-DCE, 1,1-DCA, 1,2-DCE, vinyl chloride (all are possible degradation products of TCE and PCE), acetone, bromo-dichloromethane, and methylene chloride. The latter compounds may be contaminants, but the data do not allow this conclusion to be drawn with certainty. These stations also frequently have surface water concentrations above ARARs for TDS and uranium. The TDS and uranium concentrations are typical of the alluvial ground water in the vicinity of the 903 Pad and Mound Areas. CCl_4, PCE, TCE, and elevated zinc are also present in the alluvial ground water at the Mound Area.

The only datum available for Station SW-23 (August 1986 sampling) shows an absence of VOCs. Although there are no August 1986 data for the upstream stations, the data suggest the organics have volatilized over this reach.

2.3.5.3 Seeps at the East Trenches Areas

Of the two seeps at the East Trenches Areas (SW-65 and SW-103), SW-65 has no apparent organic contamination, and SW-103 has the constant presence of CCl_4 at concentrations less than 10 $\mu g/\ell$. Dissolved uranium was also above ARAR at SW-65. Like the 903 Pad and Mound Areas, the chemistry of these seeps is similar to the localized ground water.

2.3.6 Air Contamination

The 903 Pad Area is recognized as the principal source of airborne plutonium contamination at the RFP. An extensive air monitoring network known as the Radioactive Ambient Air Monitoring Program (RAAMP) is maintained at the Plant in order to monitor particulate emissions from the 903 Pad Area and other Plant facilities. Historically, the particulate samplers located immediately east, southeast, and northeast of the 903 Pad, Mound, and East Trenches Areas have shown the highest plutonium concentrations. This finding is corroborated by the results of soil surveys which indicate elevated plutonium concentrations to the east,

particularly southeast of the area. However, RAAMP has found ambient air samples for plutonium to be well within the DOE guidelines of 20.0 x 10^{-6} pCi/ℓ established for the protection of human health (Rockwell International, 1987b).

2.3.7 Summary of Contamination

The Phase I RI investigations of environmental media lead to the general conclusions that volatile organic and radionuclide contamination exists in soils, surface water and ground water around several OU 2 IHSSs, and that the distribution and magnitude of the contamination can be better delineated via sampling and analysis planned for the Phase II investigation.

TCE, PCE and CCl_4 are the principal organic contaminants in surface and ground waters, with lesser amounts of their degradation products and other compounds at numerous sampling sites throughout OU 2. Plutonium and americium in surface water samples are other apparent indicators of RFP-derived contamination.

Several metals and other inorganic constituents (including uranium) are also above background in the environmental media, but the data do not permit unambiguous conclusions with regard to contamination. The uncertainty results in part from the absence of clear concentration gradients and from the limited knowledge of the inorganic composition of waste sources in OU 2. Natural processes (e.g., evaporative concentration) may govern the source and distribution of such inorganic constituents. This will be further investigated in the context of long-term remediation at OU 2.

2.4 ANALYTICAL DATA

Organic, inorganic and radionuclide contaminants exist in OU 2 surface water. Volume II (Appendix B) presents a compilation of volatile organic, inorganic and radiochemistry data for all surface water stations at OU 2 that are available at this time. Only a small fraction of the data have been validated; they are identified in the appendices by a qualifier adjacent to each datum. The qualifiers "V" (valid), "A" (acceptable with

qualifications), and "R" (rejected) are assigned in accordance with the ER Program Quality Assurance/Quality Control (QA/QC) Plan (Rockwell International, 1989b). Rejected data either did not conform to the QA/QC procedures, or insufficient documentation exits to demonstrate conformance with these procedures. These data, at best, can only be considered qualitative measures of the analyte concentrations. The schedule for the IM/IRA does not permit waiting for all data to be validated. However, the validated data and their similarity to unvalidated data are considered sufficient to justify and to define the general configuration of the IM/IRA.

2.5 SITE CONDITIONS THAT JUSTIFY AN IM/IRA

As discussed in Section 1, there is no immediate threat to the public health and environment posed by surface water contamination in South Walnut Creek Basin. The affected surface water is contained within the plant boundary by existing detention ponds, and is treated and monitored prior to discharge. There is, however, potential for an imminent threat to develop and implementation of this IM/IRA will reduce the likelihood that such a threat will result by enhancing DOE's efforts to manage contaminated surface water. Although downstream safeguards are provided by the B-Ponds, this IM/IRA should reduce the potential for off-site migration and uncontrolled releases of contaminated surface water by reducing contaminated surface water loading to the Ponds. In addition, by collecting contaminated surface water through diversions at the sources, this IM/IRA will mitigate downstream migration of contaminants and could reduce the size and cost of future RFP remedial actions. Such an action is consistent with the goals for a final remedy at the site.

This IM/IRA focuses only on controlling the migration of hazardous substances in South Walnut Creek Basin surface water and does not address soil or ground-water contamination. An OU 2 Phase II RI Plan has been prepared to further characterize the extent of contamination in preparation for further remedial actions at OU 2.

SECTION 3

IDENTIFICATION OF INTERIM REMEDIAL ACTION OBJECTIVES

3.1 SCOPE OF INTERIM MEASURES/INTERIM REMEDIAL ACTION

The overall objective of the South Walnut Creek Basin IM/IRA at OU 2 is the mitigation of downgradient contaminant migration within surface water by means of the collection and treatment of contaminated surface water to achieve, to the extent practicable, ARARs (see Section 3.3). ARARs are used in defining the remediation goals for the interim action. Based on the meetings between DOE, CDH, and EPA during February and March 1990, and comments received during the public comment period, DOE is proposing this IM/IRA Plan which specifies point source locations for the collection of contaminated surface water, and provides for the collection and treatment of flows exclusive of those resulting from high precipitation events.

3.2 INTERIM REMEDIAL ACTION SCHEDULE

Revisions to this plan based on public comment, preparation of a Responsiveness Summary pursuant to the public meeting, treatability studies, and design and implementation of this IM/IRA will occur through Spring 1991. Milestone dates for specific activities are presented in Table D-1, Appendix D. Table D-1 shows the milestone schedule as proposed in the draft FFACO/IAG (DOE, 1990a).

3.3 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The NCP [FR Vol 55, No. 46, 8848; 40 CFR 300.430 (e)] requires that, in development of alternatives for final remediation, the following be considered:

1. ARARs;
2. for systemic contaminants, concentration levels that will not cause adverse effects to the human population and sensitive subgroups over a lifetime of exposure;

3. for carcinogens, concentration levels that represent an excess lifetime individual cancer risk less than 10^{-4} considering multiple contaminants and multiple pathways of exposure;

4. factors related to detection limits;

5. for current or potential sources of drinking water, attainment of Maximum Contaminant Level Goals (MCLGs) or Maximum Contaminant Levels (MCLs), if MCLGs are zero; and,

6. attainment of Clean Water Act (CWA) water quality criteria where relevant and appropriate.

The IAG, in paragraph 150, states "Interim Remedial Actions/Interim Measures shall, to the greatest extent practicable, attain ARARs." Also for interim actions, the NCP [40 CFR 300.430(f)] specifically notes that an ARAR can be waived if the action is to become part of the final remedy that will attain ARARs. The results of the treatability studies identified in Section 6.4 will allow evaluation of the extent to which the IM/IRA will attain ARARs, i.e., it may not be practicable to attain all ARARs for this interim action and ARAR waivers or alternate concentration limits may be requested after the study is completed.

This section identifies and analyzes ARARs relevant to the South Walnut Creek Basin IM/IRA and discusses how the action will be protective of human health and the environment. This remedial action is considered an on-site IM/IRA to be administered under CERCLA; therefore, only substantive and not administrative requirements of regulations (such as RCRA) apply. Permits, for example, are not required (per paragraph 121 of the IAG).

"Applicable requirements," as defined in 40 CFR 300.5, means "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable." "Relevant and appropriate requirements," also defined in 40 CFR 300.5, means "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws, that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA

site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate." In addition to applicable or relevant and appropriate requirements, advisories, criteria, or guidance may be identified to be considered (TBC) for a particular release. As defined in 40 CFR 300.400(g)(3), the "to be considered" (TBC) category consists of advisories, criteria, or guidance developed by EPA, other federal agencies, or states that may be useful in developing remedies. Use of "TBCs" is discretionary rather than mandatory as is the case with applicable or relevant and appropriate requirements.

In general, there are three categories of ARARs. These categories are:

- Ambient or chemical-specific requirements
- Location-specific requirements
- Performance, design, or other action-specific requirements

Each category is discussed in more detail below.

3.3.1 Ambient or Chemical-Specific Requirements

Ambient or chemical-specific requirements set health- or risk-based concentration limits in various environmental media for specific hazardous substances or pollutants. These requirements set protective clean-up levels for the chemicals of concern in the designated media, or indicate a safe level of air emission or wastewater discharge. The chemical-specific ARARs identified herein are used in defining the remediation goals for clean up of contaminated surface water and discharge of treated water.

ARARs are derived primarily from federal and state health and environmental statutes and regulations. The following may be considered when establishing clean-up standards, but are not considered ARARs: Health Effects Assessments, Health Advisories, Chemical Advisories, and Guidance Document criteria. These and any

proposed standards are classified as items to be considered, or TBCs. Where background concentrations for constituents are above the ARAR for that constituent, a waiver from the ARAR may be appropriate. A summary of ARARs for the contaminants found in South Walnut Creek Basin surface water at OU 2 are presented in Appendix E, Tables E-1.1 through E-1.4. Tables E-1.1, E-1.2, E-1.3, and E-1.4 present ARARs for volatile organics, metals, conventional pollutants, and radionuclides, respectively and will be applied to operations involving water treatment effluent.

As discussed in 55 FR8741, when more than one ARAR has been identified for a contaminant, the most stringent standard has been identified as the ARAR which the IM/IRA will attain to the greatest extent practicable. Where no ARAR standard exists, a TBC standard has been identified which the IM/IRA will treat as a goal to achieve. An ARAR analysis for volatile organics, metals, conventional pollutants, and radionuclides, respectively, is presented in Tables E-2.1, E-2.2, E-2.3, and E-2.4. The screening process includes consideration of both ground-water and surface water standards because of the probable interaction of alluvial ground water and surface water in the drainages of the RFP. Of the elements/compounds detected in South Walnut Creek Basin surface water at OU 2, there are no ARARs for calcium, magnesium, potassium, sodium, bicarbonate, and strontium. However, the TDS ARAR establishes the acceptable aggregate concentration for the above major ions (excluding strontium). Although no ARAR or TBC exists for strontium, an objective of this IM/IRA will be to reduce strontium to background levels.

3.3.1.1 Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and MCL Goals

Because South Walnut Creek Basin surface water at OU 2 is a source of drinking water, MCLs are relevant and appropriate for all phases of the IM/IRA. MCLs are derived from the Safe Drinking Water Act (SDWA) (PL 93-523). They represent the maximum permissible level of a contaminant in water which is delivered to the free-flowing outlet of the ultimate user of a public water system [40 CFR 141.2(C)]. Per the new NCP, MCLGs have also been considered in developing clean-up standards.

3.3.1.2 Ambient Water Quality Criteria

The Ambient Water Quality Criteria (AWQC) are non-enforceable guidance developed under the CWA. Guidance is set for surface waters for the protection of aquatic life and for the protection of human health, based on consumption of both drinking water and aquatic organisms from that water. The proposed IM/IRA involves treatment and discharge to surface water that has a use-protected designation, aquatic life Class II warm water classification. Although not ARAR, per the new NCP, the AWQC are considered as relevant and appropriate preliminary remediation goals. Final remediation goals will be set according to ARARs and for total risk due to carcinogens that represent an excess upperbound lifetime cancer risk to an individual to between 10^{-4} to 10^{-6} lifetime excess cancer risk when the final remedy is selected for all of OU 2.

3.3.1.3 Colorado Surface and Ground-Water Quality Standards

The Colorado Water Quality Control Commission (WQCC) has proposed ground-water quality standards for many compounds for protection of both human health and agricultural uses. These proposed standards are considered TBC since they are not enforceable standards until RFP's ground water is classified by the WQCC. Where standards exist for both human health and agricultural uses, the more stringent standard is selected as TBC.

Permanent surface water quality standards have been adopted by WQCC for Walnut Creek. These include standards for many organic, inorganic and radionuclide parameters. These standards went into effect March 30, 1990, and are considered applicable to this interim remedial action.

For both ground water and surface water standards, some of the standards are lower than the current standard detection limits for the constituents. When this occurs, the WQCC Practical Quantitation Limit (PQL) will be considered as the ARAR.

3.3.1.4 RCRA Ground-Water Protection Standards

Owners or operators of facilities that treat, store, or dispose of hazardous waste must ensure that hazardous constituents listed in 6 CCR (Colorado Code of Regulations) 1007-3 and 40 CFR 261, Appendix VIII, entering the ground water from a regulated unit do not exceed concentration limits under 6 CCR 1007-3 and 40 CFR 264.94. The concentration limits include standards for 14 compounds, with background[1] or alternate concentration limits (ACLs), used as the standard for the other RCRA Appendix VIII constituents. These concentration limits apply to RCRA-regulated units subject to permitting (landfills, surface impoundments, waste piles, and land treatment units) that received RCRA hazardous waste after July 26, 1982. Although this area does not contain RCRA-regulated hazardous waste management units, it does contain IHSSs. As a result, these RCRA (Subpart F) regulations are considered relevant and appropriate for ground water remediation. These requirements are not applicable or relevant and appropriate with respect to the proposed interim remedial action in that they do not specifically address the collection, treatment, and discharge of surface waters nor are these activities sufficiently similar to the circumstances regulated by the RCRA Subpart F requirements to be relevant and appropriate. RCRA ground-water protection requirements relate specifically to protection against degradation of the uppermost aquifer by a regulated unit, or a solid waste management unit (SWMU) in the case of Corrective Action activities, which clearly do not relate to the collection, treatment, and discharge of surface waters, whether or not such waters have been affected by the introduction of ground water through seeps. The RCRA ground-water requirements do provide an effective mechanism for the protection of the uppermost aquifer and, consequently, potential drinking water sources. Accordingly, since effluent discharges could potentially affect downstream drinking water sources, the Subpart F requirements have been included as TBC for surface water. Background concentrations for 40 CFR 264, Appendix IX constituents not listed in Appendix VIII are also TBC for surface water.

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[1] TBC background surface water values for RCRA Subpart F are applied using maximum concentrations from background surface water at RFP.

3.3.1.5 Protection of Human Health and the Environment

As illustrated by the hazard quotients and carcinogenic risks listed in Tables E-1.1 through E-1.4, achieving the ARARs should result in a clean-up action that is protective of human health and the environment. For non-carcinogens, the protectiveness goal is a hazard index of 1. The hazard index is the sum of the hazard quotients [i.e., the estimated daily intake (dose) to reference dose ratios] for all of the contaminants combined, which have been computed and are presented in Table E-1. In assessing non-carcinogenic risk, a hazard index of one or less is considered to be acceptable. If the hazard index exceeds one, it indicates that there might be the potential for adverse non-carcinogenic health effects occurring. Unlike the method used to evaluate the potential for carcinogenic toxicity, the hazard index does not indicate the probability of adverse health effects occurring, but it is used as a benchmark for determining where there is a potential concern. With respect to carcinogens, cumulative cancer risk should be less than 10^{-4} (individual cancer risks shown in Table E-1 are considered additive). As noted in Table E-1, the calculated incremental cancer risks exceed 10^{-4} for some of the organic carcinogens as well as for arsenic and beryllium. However, the cancer risks are computed on the basis of the detection limit and therefore can only be considered a possible maximum carcinogenic risk; the actual risk is unknown but likely to be considerably lower. Removing these contaminants to non-detectable levels and attaining, to the extent practicable, the other ARARs, the IM/IRA is considered protective of human health and the environment.

3.3.2 Location-Specific Requirements

Location-specific ARARs are limits placed on the concentration of hazardous substances or the conduct of activities solely because they occur in certain locations. These may restrict or preclude certain remedial actions or may apply only to certain portions of a site. Examples of location-specific ARARs which pertain to the IM/IRA are federal and state siting laws for hazardous waste facilities (40 CFR 264.18, fault zone and floodplain restrictions), and federal regulations requiring that actions minimize or avoid adverse effects to wetlands (40 CFR Part 6 Appendix A and 40 CFR Parts 230-231).

More specifically, in addition to the requirements described above, pertinent location-specific ARARs include: Colorado requirements for siting of hazardous waste facilities and wastewater treatment facilities (Colorado Revised Statute 25-15-101, 203, 208, 302 and 25-8-292, 702, respectively), National Historic Preservation Act requirements for preservation of significant articles and historic properties (36 CFR Parts 65 and 800, respectively), federal critical habitat protection requirements (50 CFR Parts 200, 402 and 33 CFR Parts 320-330), and federal requirements for the protection of fish and wildlife resources (40 CFR 6.302).

A summary of location-specific ARARs which the IM/IRA will attain to the greatest extent practicable is presented in Table E-4.

3.3.3 Performance, Design, or Other Action-Specific Requirements

Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to management of hazardous substances or pollutants. These requirements are not triggered by the specific chemicals present at a site, but rather by the particular IM/IRA alternatives that are evaluated as part of this plan. Action-specific ARARs are technology-based performance standards, such as the Best Available Technology (BAT) standard of the Federal Water Pollution Control Act. Other examples include RCRA treatment, storage, and disposal standards, and Clean Water Act pretreatment standards for discharges to publicly-owned treatment works (POTWs). RCRA LDRs for certain contaminants [40 CFR Part 268.40] are also action-specific ARARs for the disposal of secondary wastes generated during water treatment. Action-specific ARARs, which the IM/IRA will attain to the greatest extent practicable, are included in Table E-3.1. Table E-3.2 presents RCRA land disposal restrictions (LDR) which are ARAR and applicable to non-effluent wastes (e.g., treatment sludges, excavated soils, used treatment materials) if they may be determined to contain hazardous wastes. LDR requirements are relevant and appropriate for wastes which are not hazardous wastes, as defined in 40 CFR, Part 261, but do contain hazardous substances.

As explained in the National Contingency Plan (see 55 FR 8666) OSHA requirements for worker protection in hazardous waste operations and emergency response (29 CFR 1910.120) are applicable to

workers involved in hazardous substance-related activities, as well as other OSHA requirements related to specific circumstances or activities. These requirements are not environmental in nature, however, and are not to be included as ARARs. Those requirements which are applicable are just that, applicable, while non-applicable requirements could, at most, be relevant and could be included as guidance to be considered (TBC).

SECTION 4

IDENTIFICATION AND ANALYSIS OF IM/IRA ALTERNATIVES

4.1 SURFACE WATER COLLECTION AND TREATMENT ALTERNATIVES

This section presents the technique for collection of contaminated surface water and a detailed evaluation of alternative treatment technologies. Treatment technologies corresponding to the following categories are evaluated in this section:

- Treatment for Suspended Solids Removal;
- Treatment for Radionuclide Removal; and
- Treatment for Volatile Organic Constituent Removal.

The treatment technologies selected for consideration are based on their probability of attaining the effluent requirements (ARARs presented in Section 4.1.2). The process for critical evaluation of the treatment technologies is presented in Section 4.2. The evaluation criteria include effectiveness, implementability and cost of the technology. Section 4.3 examines in detail the technique of surface water collection by diversion at the sources. The treatment technologies are presented and evaluated in Section 4.4. The treatment system designs presented in Section 4.4 are conceptual, with only enough detail to determine relative costs. Detailed design and costing for the IM/IRA will be conducted after the results of the bench and field-scale treatability studies are obtained. The comparative cost evaluations employ a standard 30-year basis for present worth analysis. However, the actual service life of the South Walnut Creek Basin Surface Water IM/IRA is not known at this time. The IM/IRA could, for example, become a part of the long-term OU 2 remedial action. Lastly, all solid waste generated during the IM/IRA, with the exception of activated carbon (e.g., filter cake, excavated soils from installation of the surface water diversion and collection structures, and sediments accumulating in the collection system during operation) will be characterized and handled according to the RFP waste management operating procedures. For costing purposes, however, it is assumed that these wastes will be handled and disposed as low-level mixed waste.

4.1.1 Surface Water Collection Technologies

Figure 4-1 illustrates the locations of the South Walnut Creek Basin surface water seeps and in-stream monitoring stations. As mentioned in Section 1.0, general agreement between EPA, CDH and DOE was reached on the specific locations for collection of contaminated surface water. These locations are designated in Figure 4-1 as the "IM/IRA Surface Water Monitoring Stations" and include SW-56, SW-59, SW-60, SW-61, SW-101, and SW-132. It was agreed that flows at these stations would be collected either at the stations or immediately downstream at a point of confluence. Figure 4-2 offers a detailed plan view of the locations of SW-59, SW-60, SW-61, SW-132, and SW-133 in the South Walnut Creek drainage. Contaminated water in the drainage ultimately enters Pond B-5 via Pond B-4.

At the meetings in February and March 1990 between DOE and the regulatory agencies, seep SW-103 was also targeted for collection. It is located within the South Walnut Creek Drainage upstream of Pond B-5 (Figure 4-1). The seep contains trace concentrations of CCl_4 (<10 ug/ℓ) and concentrations of total plutonium, americium, uranium, and several metals above ARARs. However, at the time, the physiographic features of the seep were not discussed. Of particular note is the large area of seepage (approximately 30,000 sq. ft.) and the location of the seep on a steep hillside. These features necessitate an elaborate drainage system for seepage collection that would require disturbance of large areas of potentially contaminated saturated soils which would likely result in release of significant quantities of contaminants downstream. Construction at SW-103 would also have a negative impact on the large area of wetland present at this seep. For these reasons, and because the CCl_4 and dissolved inorganic constituent concentrations in the seepage are low, and the contribution of radionuclide and metals contamination from SW-103 to the South Walnut Creek drainage above the detention ponds is likely to be insignificant relative to that resulting from contaminated surface water runoff, collection of water at this seep is no longer recommended for this IM/IRA. Since the environmental impacts of construction of a surface water collection system at SW-103 appears to outweigh the benefits of collecting and treating this seepage, consideration of collection at SW-103 is deferred until additional hydrogeological and contaminant characterization information is gathered and assessed during conduct of the Phase II RFI/RIFS Alluvial Work Plan for OU 2.

Several alternatives exist for collecting the contaminated South Walnut Creek Basin surface waters mentioned above. First and foremost is collection of surface water by diversion at the source. This technique employs existing or newly constructed diversion structures at the seep or in-stream stations to divert the surface water into collection sumps. This method of surface water collection was agreed to by EPA, CDH, and DOE in the February and March 1990 meetings. This technique will be further discussed and evaluated in Section 4.3. For comparative purposes, two other surface water collection methods are discussed below.

A second method of surface water collection is by ground-water withdrawal using an upgradient well array or french drain. This technique lowers the ground-water table and eliminates seepage, allowing separation of contaminated ground water (seepage) from surface water runoff, e.g., at SW-59. However, the hydrogeology at OU 2 is not adequately understood to design an effective ground-water withdrawal system. For example, it is not known whether the seepage is due to water originating in the Rocky Flats Alluvium and being released to the surface through colluvium because of slope changes and/or bedrock highs, or whether the source of the water is bedrock sandstone subcropping in this vicinity. This information is critical to the design of an effective ground water withdrawal system. EPA alluded to the issue in their transmittal letter (January 9, 1990) which accompanied their comments on the draft OU 2 ground-water IM/IRA Plan, wherein they stated ". . . this OU is difficult to address on an interim basis due to the lack of comprehensive quality data characterizing the nature and extent of contamination. It is uncertain whether the most probable imminent threat, the alluvial ground-water system, can be effectively addressed at this time." For this reason, collection of surface water by ground-water withdrawal is eliminated as a reasonable alternative for this IM/IRA and will not be considered for further detailed evaluation.

A third collection alternative is to allow the contaminated surface water to continue to flow through the South Walnut Creek drainage into detention Pond B-5. The contaminated South Walnut Creek Basin surface water, along with all other waters collected and detained in Pond B-5 would be transferred from the Pond for treatment. This method has three primary drawbacks. First, there is a potential threat of transferring the surface water contaminants to ground waters within the South Walnut Creek drainage basin via infiltration. Secondly, release of VOCs to the atmosphere will occur while the surface water is in transit to detention Pond

B-5. Finally, allowing the South Walnut Creek Basin surface waters to mix with other waters retained in Pond B-5 generally increases the volume of dilute contaminated water at the RFP facility that may require treatment. For these reasons, collection of South Walnut Creek Basin surface waters at detention Pond B-5 is eliminated as a reasonable alternative for the IM/IRA and will not be considered for further detailed evaluation.

4.1.2 Surface Water Treatment Technologies

Based on the objectives of the Surface Water IM/IRA discussed in Section 3.1, Table 4-1 has been prepared to establish the basis for conceptual design for surface water treatment. The influent constituent concentrations listed in Table 4-1 are estimated from a flow-weighted maximum concentration model based on the maximum constituent concentrations observed at the SW-59 and SW-61 collection points. The flow values used to weight the maximum concentrations used in the model are the corresponding collection system design flows (established in Section 4.3 and listed in Table 4-5). A spreadsheet illustrating computation of the flow-weighted maximum concentration computation is shown in Table F-1, Appendix F. To be conservative, the maximum constituent concentrations used in the model for SW-61 also includes maximum observed concentrations for the group of stations upgradient of SW-61 (i.e., SW-56, SW-60, and SW-101). Unfortunately, station SW-132 was only recently assigned to the OU 2 surface water sampling program and concentration data for this discharge are not available for use in the treatment system design model. As discussed in Section 1, however, the water quality characteristics of this stream are expected to be similar to that at SW-61. This assumption has been used to provide a reasonable conceptual treatment system design basis in the absence of SW-132 data. The design basis will be updated as SW-132 concentration and flow data become available to verify the influent concentrations computed herein.

Table F-1 shows that strict application of the flow weighted concentration model predicts vinyl chloride, methylene chloride and acetone influent concentrations above their respective ARAR values. However, examination of the surface water data presented in Appendix B reveals that these constituents are not likely

TABLE 4-1

BASIS FOR DESIGN OF SURFACE WATER TREATMENT PLANT

	Units	Influent Concentration[a]	Effluent Requirements[b]
Organics			
1,1-Dichloroethene	µg/ℓ	142	7
1,1-Dichloroethane	µg/ℓ	6	1U*
1,2-Dichloroethene (total)	µg/ℓ	10	1U*
Chloroform	µg/ℓ	82	1U
Carbon Tetrachloride	µg/ℓ	219	5U
Trichloroethene	µg/ℓ	153	5U*
Tetrachloroethene	µg/ℓ	279	1U
Dissolved Metals			
Beryllium	mg/ℓ	0.0053	0.1
Manganese	mg/ℓ	0.5790	0.050
Strontium	mg/ℓ	0.8396	0.396**
Tin	mg/ℓ	0.9036	0.100
Total Metals			
Aluminum (Al)	mg/ℓ	25.1214	0.2U
Antimony (Sb)	mg/ℓ	0.0655	0.060
Barium (Ba)	mg/ℓ	1.8530	1.000
Beryllium (Be)	mg/ℓ	0.0519	0.1
Cadmium (Cd)	mg/ℓ	0.0132	0.01
Chromium (Cr)	mg/ℓ	0.1918	0.05
Cobalt (Co)	mg/ℓ	0.1232	0.050
Copper (Cu)	mg/ℓ	0.2664	0.2
Iron (Fe)	mg/ℓ	183.9643	1.000
Lead (Pb)	mg/ℓ	0.1954	0.05
Lithium (Li)	mg/ℓ	0.4100	2.500
Manganese (Mn)	mg/ℓ	3.3068	1.000
Mercury (Hg)	mg/ℓ	0.0022	0.002
Molybdenum (Mo)	mg/ℓ	0.1574	0.100
Nickel (Ni)	mg/ℓ	0.2239	0.2
Selenium (Se)	mg/ℓ	0.0070	0.01
Strontium (Sr)	mg/ℓ	0.8600	0.382**
Vanadium (V)	mg/ℓ	0.5019	0.1
Zinc (Zn)	mg/ℓ	1.3475	2.0

* No ARAR standard exists for this constituent; effluent requirement is TBC concentration, considered as an IM/IRA treatment goal.

** No ARAR or TBC standard exists for this constituent; effluent requirement is background concentration, considered as an IM/IRA treatment goal.

TABLE 4-1 (cont.)

BASIS FOR DESIGN OF SURFACE WATER TREATMENT PLANT

	Units	Influent Concentration[a]	Effluent Requirements[b]
Dissolved Radionuclides			
Gross Alpha	pCi/ℓ	20.11	11
Gross Beta	pCi/ℓ	39.90	19
Total Uranium	pCi/ℓ	9.96	10
Total Radionuclides			
Gross Alpha	pCi/ℓ	730	11
Gross Beta	pCi/ℓ	545	19
Plutonium 239,240	pCi/ℓ	3.28	0.05
Americium 241	pCi/ℓ	0.53	0.05
Total Uranium	pCi/ℓ	11.69	10

---

a The influent concentrations are based on flow-weighted maximum concentrations of station SW-59 and the following group of stations: SW-56, SW-60, SW-61, and SW-101. The computation is illustrated by the spreadsheet shown in Table F-1, Appendix F. The maximum observed concentrations for each station or group of stations is multiplied by the corresponding collection station design flow. The multiplication products for each collection station are summed and divided by the sum of the CS-59 and CS-61 design flows (42 gpm). Concentration data used in the flow-weighted maximum concentration computation is obtained from the 1987, 1988, 1989, and 1990 field investigations.

b Based on Applicable or Relevant and Appropriate Requirements (ARARs). The "U" designation following many of the effluent concentrations indicates that the concentration is the detection limit for that constituent.

to be present in the influent at levels above ARAR. Vinyl chloride, methylene chloride and acetone were detected at levels above ARAR only at stations SW-56, SW-60 and SW-101. However, as proposed in Section 4-3, contaminated surface water from these stations will be collected at the downstream station SW-61 where vinyl chloride, methylene chloride and acetone have always been estimated below detection limits and/or were also present in the associated laboratory blanks. These compounds are, therefore, not included in the basis for design of the surface water treatment plant. The effluent concentrations listed in Table 4-1 correspond to the ARAR for each constituent.

Treatment technologies for radionuclides and metals removal that are considered in this IM/IRA Plan include chemical precipitation, cross-flow membrane filtration, and ion exchange. Liquid-phase Granular Activated Carbon (GAC) adsorption, air stripping with liquid and vapor phase GAC adsorption, and ultraviolet (UV)/peroxide oxidation are considered for VOC removal. Many treatment units suitable for removal of VOCs and radionuclides from water require that suspended solids be removed from the influent to prevent performance degradation and/or fouling. Removal of suspended solids down to the 1 μm particle size range ensures optimum treatment system performance. The two candidate influent pretreatment alternatives for removal of suspended solids considered for this IM/IRA are cross-flow membrane filtration and polymer addition with granular media filtration in a continuous backwash filter. Pretreatment is also a vehicle for removal of particulate radionuclides and metals and, with chemical addition, should facilitate precipitation and adsorption of soluble radionuclides and metals.

4.2 IM/IRA ALTERNATIVE EVALUATION PROCESS

The following discussion of the IM/IRA alternative evaluation process is based on EPA guidance set forth in the March 1990 NCP.

4.2.1 Effectiveness

The criteria for effectiveness evaluation of remedial alternatives includes protection and the use of alternatives to land disposal. Protection includes protection of the community and workers during the remedial action; threat reduction; length of time until protection is achieved; compliance with criteria, advisories and guidance; risk of potential exposure to residuals remaining on site; and continued reliability over the life of the IM/IRA. The effectiveness criteria also includes use of alternatives to land disposal, thus promoting treatment or recycling. In addition, the alternatives will be evaluated with respect to reduction of toxicity, mobility, and volume of wastes per the March 1990 NCP.

4.2.2 Implementability

The criteria for implementability evaluation of remedial alternatives includes technical feasibility, availability, and administrative feasibility. Technical feasibility includes the ability to: construct the technology; maintain its operation; meet process efficiencies or performance goals; demonstrated performance; evaluate impact of environmental conditions; and comply with the SARA requirement that removal actions should contribute to the efficient performance of long-term remedial action to the extent practicable. Availability includes the availability of necessary equipment, materials and personnel; availability of adequate off-site treatment, storage, and disposal capacity, if appropriate; and description of post-remedial site controls which will be required at the completion of the action. Administrative feasibility includes the likelihood of public acceptance of the alternative, including site and local concern; coordination of activities with other agencies; and ability to obtain any necessary approvals or permits.

4.2.3 Costs

The criteria for evaluation of remedial alternative cost includes total cost and statutory limits. Total cost includes direct capital costs, indirect capital costs, and operating and maintenance costs. Since the surface water IM/IRA at OU 2 is not an EPA-financed remedial action, the $2 million statutory cost limit does not apply.

4.3 EVALUATION OF THE IM/IRA SURFACE WATER COLLECTION SYSTEM

As discussed earlier, South Walnut Creek Basin contaminated surface waters will be collected by diversion at the sources. This section further describes this technique as it applies to the surface water seep and in-stream monitoring stations considered in this IM/IRA. This presentation includes a discussion of the anticipated seep and in-stream monitoring station flows, and an evaluation of the collection technique per the evaluation process outlined in Section 4.2.

4.3.1 Surface Water Collection by Diversion at the Sources

4.3.1.1 Description

Figure 4-3 shows the locations of the surface water diversion and collection systems proposed for the IM/IRA. The collection systems (CSs) are denoted CS-59, CS-61, and CS-132. The proposed location of the surface water treatment plant is also indicated on Figure 4-3. The CSs provide for automatic pipeline transfer of the collected surface water to the treatment system.

Design flow rates for surface water collection systems CS-59, CS-61, and CS-132 are based on flows from stations SW-59, SW-61, and SW-132, respectively. The design flow rates are maximum flows observed in the 1988, 1989, and 1990 field investigations, excluding flows related to high precipitation events. Only design flows will be collected from the South Walnut Creek Basin surface water monitoring stations. Historical flow data for SW-59 are listed in Table 4-2. Table 4-2 lists only two flow rates of sufficient quantity to be measurable for SW-59 (each 4.5 gallons per minute [gpm]). Rocky Flats personnel have observed flows at SW-59 monthly since Spring 1990. They report that a flow of approximately 0.5 gpm was occurring at each observation. It is expected that all flows at SW-59 will be diverted for treatment.

Historical flow data for SW-61 are listed in Table 4-3. Table 4-3 indicates two high flow events for SW-61 of 166 gpm. All other historical flow data for SW-61 are below 36 gpm. To complement the historical data

TABLE 4-2

SURFACE WATER FLOW DA

Flow (GPM)[2]
4.5
4.5
0
0
0
0
0
0
0
0

1 Flow data are obtained from the 1988 and 1989 field

2 A flow rate of zero indicates either no seepage or observed flows at SW-59 monthly since the spring of 0.5 gpm was occurring at each observation.

TABLE 4-3

SURFACE WATER FLOW DATA FOR SW-61[1]

Flow (GPM)[2]	Date of Flow Measurement
35.9	07/01/88
166	03/20/89
9.0	05/15/89
9.0	06/09/89
9.0	07/06/89
4.5	08/03/89
18.0	09/11/89
4.5	10/03/89
4.5	11/06/89
0	12/06/89
18.0	02/09/90
166	03/12/90

1 Flow data are obtained from the 1988, 1989 and 1990 field investigations.

2 A flow rate of zero indicates either no seepage or an imperceptible flow.

and to obtain wet season flow data not corresponding to a major precipitation event, a flow measurement at SW-61 was obtained in April 1990. A cutthroat flume manufactured by Baski Water Instruments, Inc. was used to measure the flow at SW-61. A flow of 37.5 gpm at SW-61 was recorded.

Historical flow data are not available at SW-132 as this is a newly designated monitoring station. However, it was observed during October 1990 and December 1990 field surveys that the flow at SW-132 was approximately equal to the flow at SW-60. The design flow rate for CS-132 will thus be based on historical flow data for SW-60. Table 4-4 indicates a maximum observed flow of 18 gpm for SW-60.

Based on the historical data available and the April 1990 field measurement, design flow rates and average annual withdrawal rates for each of the collection systems were established. The design and withdrawal flow rates are presented in Table 4-5. A design flow of 37.5 gpm is assigned to SW-61. This flow represents an above-average precipitation wet season flow not corresponding to a major storm event. The historical maximum flow for SW-59, 4.5 gpm, is used as the design basis for the collection system at this seep. A design flow of 18 gpm is assigned to CS-132 based on the historical maximum flow observed at SW-60. Average annual withdrawal rates shown in Table 4-5 are estimated as follows: For SW-61, the historical flow data spanning the 12-month period of March 1989 to March 1990 (See Table 4-3) is averaged. In the averaging process 37.5 gpm, the design withdrawal rate at SW-61, is substituted for 166 gpm for the 3/20/89 and 3/12/90 recorded measurements. This calculation gives an annual average withdrawal rate of approximately 14 gpm. Averaging the historical flow data for SW-59 (See Table 4-2), the annual average withdrawal rate at SW-59 is found to be approximately 1 gpm. As with the design flow rate for SW-132, the annual average withdrawal rate for SW-132 will be estimated from historical flow data at SW-60. Averaging the historical flow data at SW-60 gives an estimate of the annual average withdrawal rate of 5 gpm at SW-132.

TABLE 4-4

SURFACE WATER FLOW DATA FOR SW-60[1]

Flow (GPM)[2]	Date of Flow Measurement
0	07/01/88
4.5	03/16/88
4.5	03/16/89
9.0	05/15/89
4.5	06/09/89
4.5	07/06/89
4.5	08/03/89
18.0	09/11/89
4.5	10/03/89
0	11/06/89
0	12/06/89

1 Flow data are obtained from the 1988 and 1989 field investigations.

2 A flow rate of zero indicates either no seepage or an imperceptible flow.

TABLE 4-5

DESIGN FLOWS AND AVERAGE ANNUAL WITHDRAWAL RATES FOR SURFACE WATER DIVERSION AND COLLECTION SYSTEM

STATION	DESIGN FLOW (GPM)	AVERAGE ANNUAL WITHDRAWAL RATES (GPM)
SW-59	4.5	1
SW-61	37.5	14
SW-132	18.0	5
TOTAL	60.0 gpm	20 gpm

The flows from SW-60 and SW-133 will be collected at the downstream station SW-61 by a new surface water diversion weir and pump station. A schematic of an example surface water diversion and collection system is illustrated in Figure 4-4. The weir at SW-61 will serve to divert up to 37.5 gpm from the drainage. Contaminated surface water will flow from upstream of the weir to a manhole and sump. For cost estimating purposes, it will be assumed that a 1,000-gallon capacity, precast concrete sump will be used at CS-61. Submersible pumps installed in the sump along with a level control system will automatically transfer collected water to the treatment facility. The pumping capacity will be designed to accommodate the 37.5 gpm design flow. If the inflow into the pump station manhole exceeds the pumping rate, however, the excess flow will return through overflow piping to the drainage immediately downstream of the CS-61 weir. The seep flow from SW-59 will be isolated from the South Walnut Creek drainage and collected separately from CS-61 by diversion into a sump. For cost estimating purposes, it is assumed that a 500-gallon capacity,precast concrete sump will be used. Submersible pumps and level controls will automatically transfer the collected water to the treatment system. The pumping capacity will be designed to accommodate the 4.5-gpm design flow for CS-59. Although unlikely, if the inflow to the CS-59 pump station exceeds the pumping capacity, the excess flow will be discharged to South Walnut Creek via an overflow pipe. The overflow will enter South Walnut Creek upgradient of CS-61 and will either be collected by, or allowed to pass, CS-61 depending on whether the creek flow is less than or greater than the 37.5 gpm design flow for CS-61. The flow at SW-132 will be collected and transferred to the treatment system in the same manner as for flow at SW-61. CS-132 will be designed, however, to divert and collect 18 gpm. For cost estimating purposes, a 1,000-gallon pre-cast concrete sump will be used.

All sumps and pipes will be provided with secondary containment to meet RCRA tank regulations. Pipelines will be heat traced and insulated to prevent freezing in the winter.

4.3.1.2 Effectiveness

Collection of OU 2 surface water in the South Walnut Creek Basin by diversion at the sources is an effective method that satisfies the objectives of the IM/IRA discussed in Section 3.1. Minimization of potential

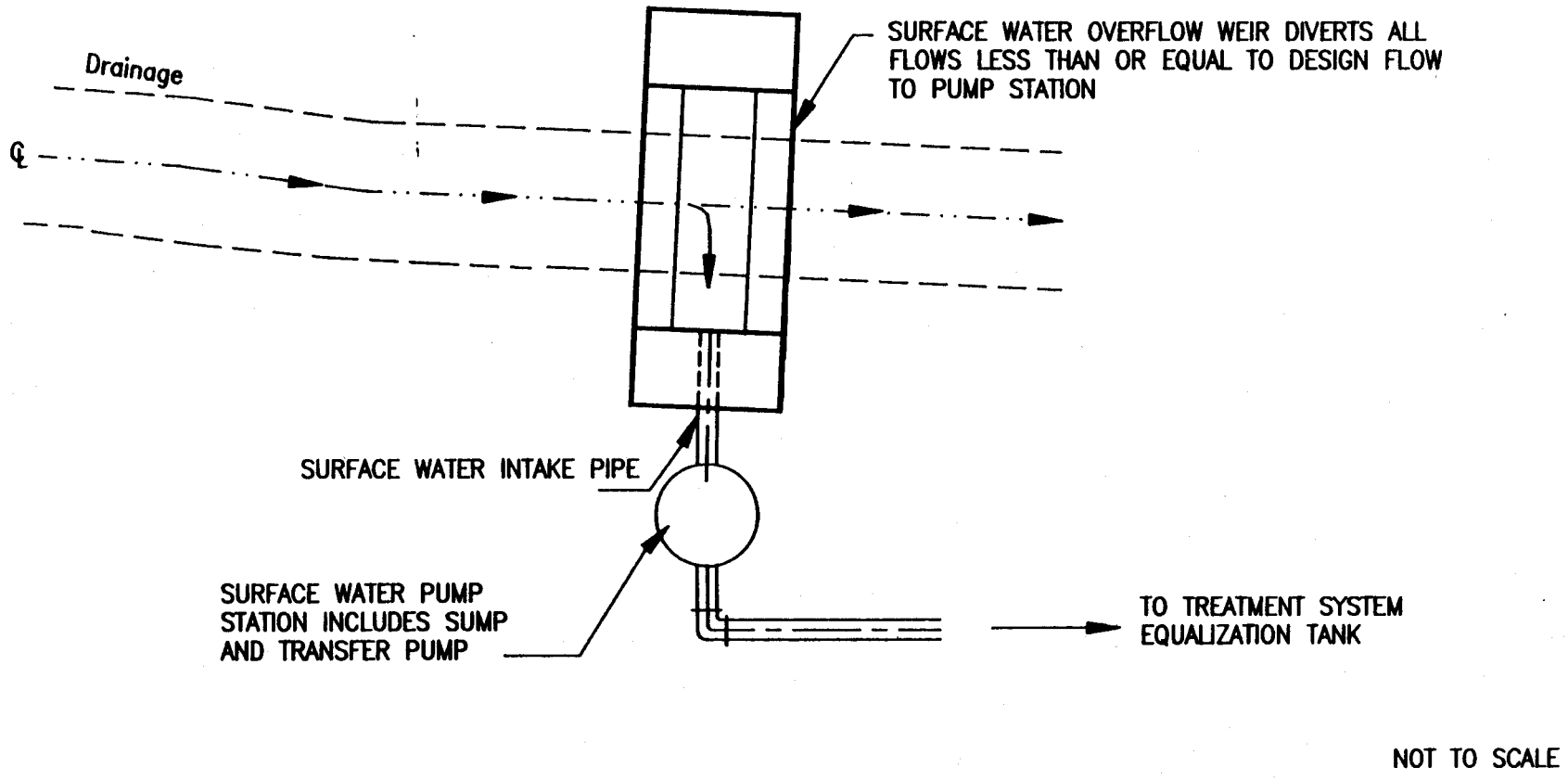

FIGURE 4-4

TYPICAL SURFACE WATER DIVERSION AND COLLECTION SYSTEM (PLAN VIEW)

threats to human health and the environment is achieved by diverting, collecting, and treating contaminated surface waters at or near the source. Downstream contaminant migration via surface water and ground water and release of VOCs to the atmosphere is minimized with this surface water collection system. The implementation of this collection action should not adversely affect the safety of nearby communities, and the risk to the environment should not be increased.

The surface water is collected and automatically transferred to the treatment system with little opportunity for worker contact. As a result worker exposure to potentially contaminated surface water is minimized. Where worker exposure to surface water occurs (i.e., sediment removal), pumping equipment minimizes contact time, and standard personal protective equipment will offer a high degree of protection.

Residuals (i.e., collected sediments) will not remain on site; they will be treated or disposed according to the standard RFP waste management procedures and project-specific SOPs. The SOPs will be prepared after the IM/IRA design is finalized to address specific waste handling activities. The collection structures are simple in design, and will require little periodic preventive maintenance to ensure continued reliability over the life of the IM/IRA.

4.3.1.3 Implementability

The equipment and materials required to construct the surface water diversion and collection systems are standard and readily available. The systems are standard in design and do not require special skills for installation. Sump installation may result in disturbance of potentially contaminated soils and potential impact to the environment by release of contaminated dust to the atmosphere and release of contaminated soil via surface water runoff. This impact will be minimized by implementing project-specific health and safety plan procedures during construction (e.g., dust suppression, windspeed monitoring/construction shutdown). The health and safety guidance documents pertinent to this IM/IRA Plan are discussed in Section 7. The proposed collection system locations are easily accessible and power exists in the area. Since the collection systems

are simple in design they should offer reliable and relatively maintenance-free operation over the life of the IM/IRA. Manholes and sumps will require periodic cleaning to remove accumulated solids.

4.3.1.4 Costs

Assumed capital and operating costs for the surface water diversion alternative are shown in Table 4-6. The collection system can be constructed for $203,500, with annual operation and maintenance costs of $14,600. At an interest rate of 10 percent and an operating life of 30 years, the present worth of this system is approximately $341,100.

4.4. EVALUATION OF SURFACE WATER TREATMENT TECHNOLOGIES

4.4.1 Suspended Solids Removal

In this section, chemical treatment/cross-flow membrane filtration (in this document "chemical treatment" is often dropped from "chemical treatment/cross-flow membrane filtration" for brevity) and granular media filtration using a polymer and continuous backwash filter are evaluated to determine the cost-effective technology for suspended solids removal. These two processes differ from conventional water clarification (chemical addition followed by gravity separation and filtration) by virtue of the lower sludge volumes generated. As discussed in the following subsections, each of these technologies will also remove radionuclides and metals to a certain degree.

4.4.1.1 Cross-Flow Membrane Filtration

Description

Cross-flow membrane filtration is a membrane separation technology for removal of suspended solids, dissolved metals, and radionuclides. (Chemical addition and removal mechanisms for dissolved metals and

TABLE 4-6

ASSUMED COSTS FOR SURFACE WATER DIVERSION AND COLLECTION SYSTEMS

A. EQUIPMENT AND MATERIALS		CAPITAL COST (DOLLARS)	ANNUALCOST (DOLLARS)
Quantity	Item		
2	1000-gallon precast concrete sump	4,000	
1	500-gallon precast concrete sump	1,000	
6	Liquid transfer pump	3,000	
1200 l.f.	Insulated heat traced piping	4,200	
400 cu yd	Concrete	50,000	
3	Pump station intake structures	3,000	
B. INSTALLATION			
Quantity	Item		
3	[1] Diversion structure	36,200	
3	[2] Sump installation	17,000	
1 lot	[3] Surface water diversion berms	6,900	
1 lot	[4] Contaminated soil disposal	10,400	

---

1 Installation costs for surface water diversion structures at CS-59, CS-61, and CS-132 are based on 520 manhours of labor at $60/hr, plus a $5,000 backhoe rental charge.

2 Sump installation costs are based on 200 manhours of labor at $60/hr, plus a $5,000 backhoe rental charge.

3 Surface water diversion berm costs are based on 60 cubic yards of fill at $11 per cubic yard, and 70 manhours of labor at $60 per hour, plus a $2,000 heavy equipment rental charge. A berm, 300 feet in length, will be installed on each bank of the South Walnut Creek drainage. The cross section of the berms are assumed to be trapezoidal [1 foot high X 2 feet wide (top) X 3 feet wide (bottom)].

4 To be conservative, it is estimated that soils excavated for collection system sump installation will be disposed of as hazardous mixed waste ($450 per cubic yard transportation and disposal cost at the Nevada Test Site). The estimated volume of excavated soils is approximately 23 cubic yards, and corresponds to the following: 3 cubic yards for CS-59, 10 cubic yards for CS-61, and 10 cubic yards for CS-132.

TABLE 4-6 (cont.)

ASSUMED COSTS FOR SURFACE WATER DIVERSION AND COLLECTION SYSTEMS

C. OPERATION AND MAINTENANCE		CAPITAL COSTS (DOLLARS)	ANNUAL COSTS (DOLLARS)
Quantity	Item		
3	[5] Collection System Cleaning		$ 1,900
-	[6] Sediment Disposal		6,000
-	[7] Pipeline Maintenance		1,800
	[8] Power		2,500
	SUBTOTAL	$135,700	$ 12,200
D. ENGINEERING AND CONTINGENCY			
Design at 25% of Capital Cost		$ 33,900	
Construction Management at 5% of Capital Cost		6,800	
Contingency at 20%		27,100	2,400
	TOTAL COST	$203,500	$14,600

PRESENT WORTH

Present Worth Factor (PWF)	=	9.427 (30 years, 10%i for annual costs)
$14,600/year x 9.427	=	$ 137,600
1990 Capital Cost	=	$ 203,500
		$ 341,100

---

5 Annual collection system cleaning costs are based on 32 manhours of labor at $60/hr. Collection system cleaning involves removal of sediments that build up in the sumps and behind the diversion weirs.

6 To be conservative, it is estimated that sediments recovered from collection system cleaning will be disposed of as hazardous mixed waste ($450 per cubic yard transportation and disposal costs at the Nevada Test Site). The cost estimated is based on approximately 9.5 cubic yards of sediments recovered annually. This waste volume is based on an average suspended solids concentration of 350 ppm (see Section 4.4.1.1). It is assumed that approximately 20 percent of the suspended solids in the surface water will accumulate in the collection system sumps and trenches, and the resulting waste will be 30 percent solids by weight.

7 Annual pipeline maintenance costs are based on 100 manhours of labor at $60/hr.

8 Annual electrical power costs are based on two 3-hp (CS-61 and CS-132) and one 1-hp (CS-59) liquid transfer pumps at $0.07/Kwh.

radionuclides are discussed in Section 4.4.2.1.) As shown in Figure 4-5, the process consists of chemical addition, filtration through a 0.1 μm filter, solids recirculation, solids separation and dewatering, and final neutralization. As discussed in more detail in Section 4.4.2.1, chemical addition is a pretreatment step for initiating precipitation, co-precipitation, and adsorption of metals, i.e., conversion to the solid phase. However, the solids will aid in the removal of influent suspended solids by coagulation of fine particles and/or enmeshment in the hydrous metal oxide flocs. The pretreated feed combines with the recycle stream (2 to 5 percent solids) from the membrane filtration unit and is subsequently filtered mechanically. The membrane filter is in a shell and tube configuration with the membrane on the inside of the tubes. The permeate passes through the tubes perpendicular to the main flow at a low operating pressure. The flux through the filter is high relative to other membrane technologies, e.g., reverse osmosis and ultrafiltration, because of the large pore diameter of the filter. Flux rates of 200 to 400 gallons per square foot per day (gal/ft^2/d) are typical for the membrane. A fraction of the recycle slurry is bled off for solids removal through gravity separation and mechanical dewatering. The permeate (flow passing through the filter) is neutralized by addition of sulfuric acid prior to discharge.

For the surface water IM/IRA, it is assumed for costing purposes that a modular and skid-mounted unit will be required, with an assumed output capacity of 40 to 80 gpm and approximately 40 kilowatts (KW) of power. The unit would contain the following components:

- 2 1200-gallon reaction tanks;
- 1 3000-gallon concentration tank;
- 1 700-gpm recirculation pump
- 1 cleaning system; and
- 28 tubular membrane filtration modules.

Auxiliary tanks and process equipment would include:

- 2 250-gallon chemical feed tanks;

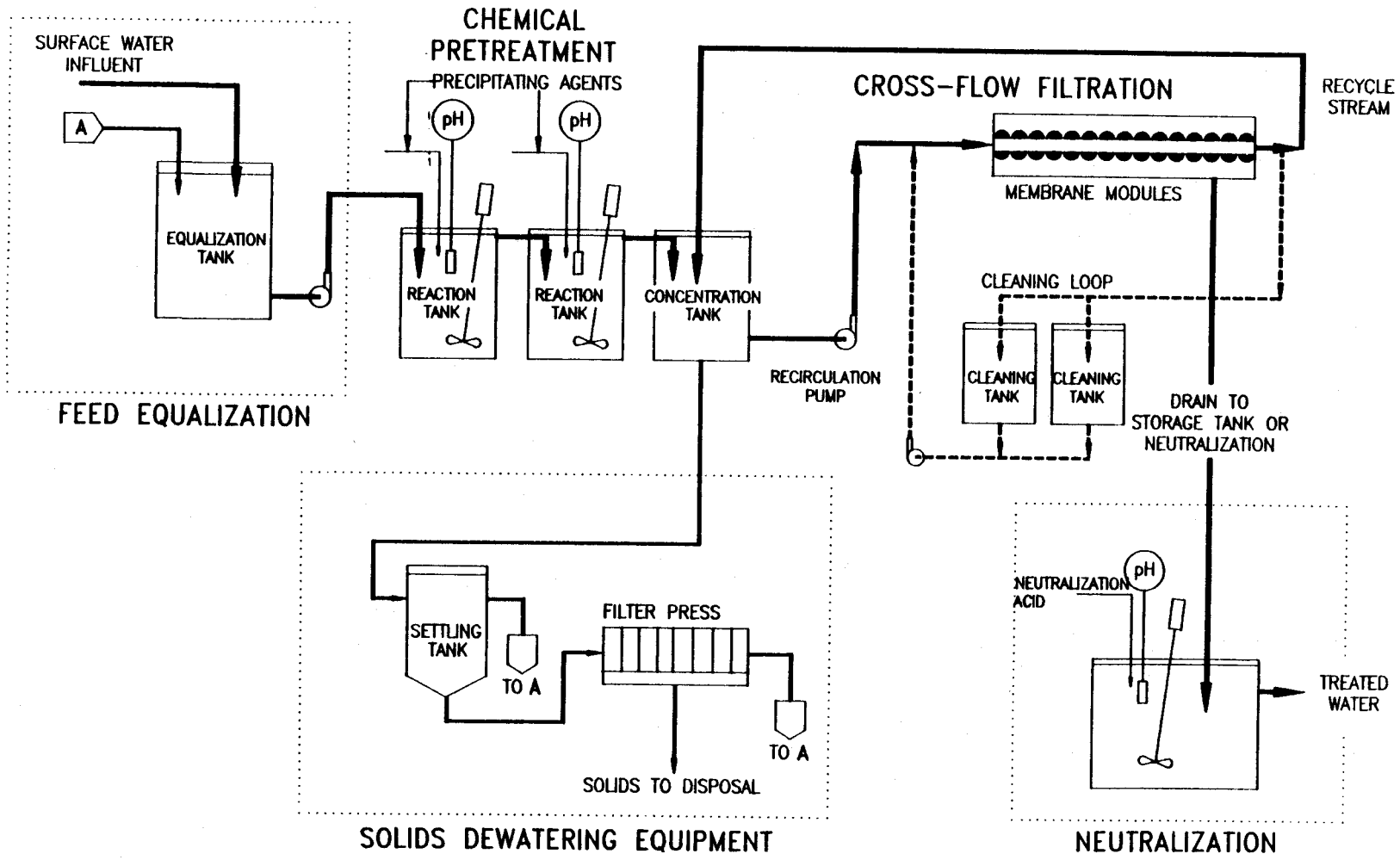

FIGURE 4-5

PROPOSED CROSS FLOW MEMBRANE FILTRATION SYSTEM SCHEMATIC

- 1 1500-gallon solids sedimentation tank;
- 1 10-cubic-feet per day plate and frame filter press for sludge dewatering; and
- 1 10,000-gallon feed equalization tank.

Effectiveness

Cross-flow membrane filtration is effective at removal of suspended solids. There are numerous applications of this technology in use throughout the United States. Effluent suspended solids concentrations are less than 1 mg/ℓ (Tiepel and Shorr, 1985). Because the radionuclides and metals are largely associated with the suspended solid fraction (see Section 4.4.2.1), simple suspended solids removal is anticipated to remove greater than 99 percent of these constituents. Toxicity of contaminated surface waters is thus significantly reduced in terms of potential future radionuclides and metals exposure, and it is likely that the ARARs will be achieved with the proper chemical feed. Treated water will be monitored to ensure contaminants are within regulatory guidelines. Cross-flow membrane filtration provides reliable and automated surface water treatment service requiring minimal operator intervention. Workers can be easily trained on the safe operation of the unit and handling of dewatered solids. This, together with health and safety design considerations (trailer venting, alarm/emergency shutdown systems, automated clean-in-place equipment, etc.) provides a high degree of worker protection. Sludges generated by the cross-flow membrane filtration process will be handled according to the RFP standard waste management procedures and project-specific SOPs.

Implementability

Cross-flow membrane filtration as described above has been used in industry and municipalities for wastewater treatment and for ground-water and surface water remediation since 1979. There are hundreds of units in operation today demonstrating that cross-flow membrane filtration is a reliable process. The high solids content of the recycle flow produces scour action on the membrane, minimizing fouling and thus the cleaning frequency (1 hour every 40 to 80 hours of operation). The membrane, an inert fluorocarbon material, can be cleaned with strong oxidants (hypochlorite) to remove bacterial films, or strong acids or bases to

remove deposited metal hydroxides. The membrane will not degrade in the presence of the dilute concentrations of the solvents in the surface water. The equipment required to construct a cross-flow membrane filtration system is standard and readily available and special skills are not required for installation. Off-site permitted disposal facilities are available for disposal of treatment residuals.

The demonstrated performance and anticipated effectiveness for remediating OU 2 surface waters collected from South Walnut Creek Basin should result in a high degree of public acceptance of cross-flow membrane filtration.

Costs

Assumed capital and operational costs for the cross-flow membrane filtration system are shown in Table 4-7. Note that since the economic analysis of the treatment alternatives is a comparative one, process stream monitoring and analysis costs are not included in the cost estimate for cross-flow membrane filtration or other treatment units examined in this section since these costs are common to all treatment units. In calculating sludge disposal costs, values for influent suspended solids concentration (350 ppm) and average annual year-round influent flow (20 gpm) were estimated. The influent suspended solids concentration is based on a flow-weighted average concentration calculation similar to that used for calculating the influent contaminant concentrations in Table 4-1. The suspended solids concentration data used in the computation was obtained from the 1987, 1988 and 1989 field investigations. The average year-round influent flow of 20 gpm is estimated in Section 4.3.1.1. A cross-flow membrane filtration system can be installed for $486,500, with annual operation and maintenance costs of $249,000 per year. Assuming a 10 percent interest rate and a 30-year operating life, the present worth of the system is $2,833,500.

TABLE 4-7

ASSUMED COSTS FOR CROSS-FLOW MEMBRANE FILTRATION PROCESS

Item		Capital Cost (Dollars)	Annual Cost (Dollars)
A.	Cross-Flow Membrane Filtration Unit (60 GPM Design Flow)	$216,100	

Includes:

Quantity	Item
2	1200-gallon Reaction Tank with Mixer pH Controller and Metering Pump
1	3000-gallon Concentration Tank
1	700-gpm Recirculation Pump Membrane Filtration Modules Membrane Cleaning System [1]Electrical [1]Piping

B. AUXILIARY EQUIPMENT

Quantity	Item	
1	10,000-gallon Equalization Tank	$ 14,500
1	Lime Slurry System Includes 250-gallon Tank, Mixer, Recirculation Pump, Level Control	11,400
2	Powdered Chemical System Includes 250-gallon Tank, Mixer, Metering Pump	6,000
1	Neutralization System Includes 1500-gallon Tank, Mixer, Metering Pump pH monitor/controller	19,500
1	10-Cu. Ft. Filter Press Includes Feed Pump, Dumpster, Air Blowdown System	36,000
2	Trailer	44,000

TABLE 4-7 (cont.)

ASSUMED COSTS FOR CROSS-FLOW MEMBRANE FILTRATION PROCESS

Item		Capital Cost (Dollars)	Annual Cost (Dollars)
C.	OPERATING COSTS		
	[2]Operation and Maintenance		$131,000
	[3]Monitoring and Analysis		
	[4]Power		24,500
	[5]Sludge Waste Disposal		32,000
	[6]Treatment Chemicals		20,000
	SUBTOTAL	$347,500	$207,500
D.	ENGINEERING AND CONTINGENCY		
	Design at 15% of Total Capital Cost	$ 52,100	
	Construction Management at 5% of Total Capital Cost	17,400	
	Contingency at 20%	69,500	41,500
	TOTAL COST	$486,500	$249,000

Present Worth:

Present Worth Factor (PWF) =	9.427 (30 years, 10%i for annual costs)
$249,000/year x 9.427 =	$2,347,000
1990 Capital Cost =	486,500
	$2,833,500

1 Electrical and mechanical service for connections less than or equal to 10 feet are included in the cost of the basic system.

2 Operation and maintenance for surface water treatment is based on one operator per shift, for three shifts per day at 2 hours per shift, seven days per week, at $60/hour.

3 Monitoring and analytical costs are not included because they are the same for all treatment technologies considered for the IM/IRA.

4 Power cost estimate is based on a process power requirement of 40 KW, operated continuously at $0.07/Kw-Hr. (Conversion factor: 0.7457 kilowatts/horsepower)

5 To be conservative in cost estimating, it is assumed that filter press sludge will be disposed of as a mixed waste ($450 per cubic yard transportation and disposal cost at the Nevada Test Site). Annual production of filter cake is based on a daily average influent flow of 20 gpm containing approximately 350 ppm of suspended solids and the chemical additions noted in footnote 6. The filter cake produced is assumed to be 30% solids by weight with a density of 80 pounds per cubic foot. (Conversion factors: 7.48 gallons/cubic foot, 8.34 pounds of water/gallon)

6 Chemical consumption costs are based on an average year-round influent flow of 20 gpm, 0.3 pounds of iron and 1 pound of lime required per 1,000 gallons of surface water treated.

4.4.1.2 Granular Media Filtration

Description

The continuous backwash, continuous upflow sand filter was introduced to the United States in 1979 (Hetzer, 1987). As shown in Figure 4-6, polymer is injected into the surface water, followed by rapid mixing in an in-line static mixer. Water rises through the bed where flocculation, coagulation and floc removal occur. Clean water overflows a weir at the top of the sand bed. As the water rises, sand moves downward through the bed countercurrent to this flow of water. This downward motion is induced by an air lift system in the center of the bed (centralized pipe with air injection at the base) that draws the sand upward. Turbulent flow is created in this air lift, scouring the dirt from the sand. The dirt/sand slurry spills over at the top of the airlift into a compartment with a perforated bottom and overflow weir. The rapidly settling sand separates from the dirt in this compartment, and the clean sand is returned to the top of the sand bed. The dirty water exiting the filter would be directed to a sedimentation tank, and the overflow from this tank sent back to the filter. The solids from this tank will require dewatering and disposal waste management operating procedures. Continuous upflow sand filters are typically designed based on a hydraulic loading of 4-5 gpm/ft^2. For the surface water IM/IRA, a packaged fiberglass unit with filtration area of 12 ft^2, a diameter of 4 feet, a height of 12 feet with a sand bed depth of 40 inches (3.3 tons of sand), and requiring 0.5 to 1.5 standard cubic feet per minute (SCFM) of air at 15 to 25 pounds per square inch (psi) would be applicable. A 10,000-gallon settling tank as well as a sludge conditioning and dewatering system will also be required.

Effectiveness

Granular media filtration with polymer addition is as effective at removal of suspended solids as conventional flocculation/coagulation and rapid sand filtration. Plutonium, americium, metals and, to a lesser extent, uranium will be largely removed in this unit because plutonium and americium exist predominantly as colloids in natural waters (Orlandini, 1990). The unit operation equipment is simple in design, offers operational reliability, and requires no special skills for installation. Workers can be easily trained on the safe operation

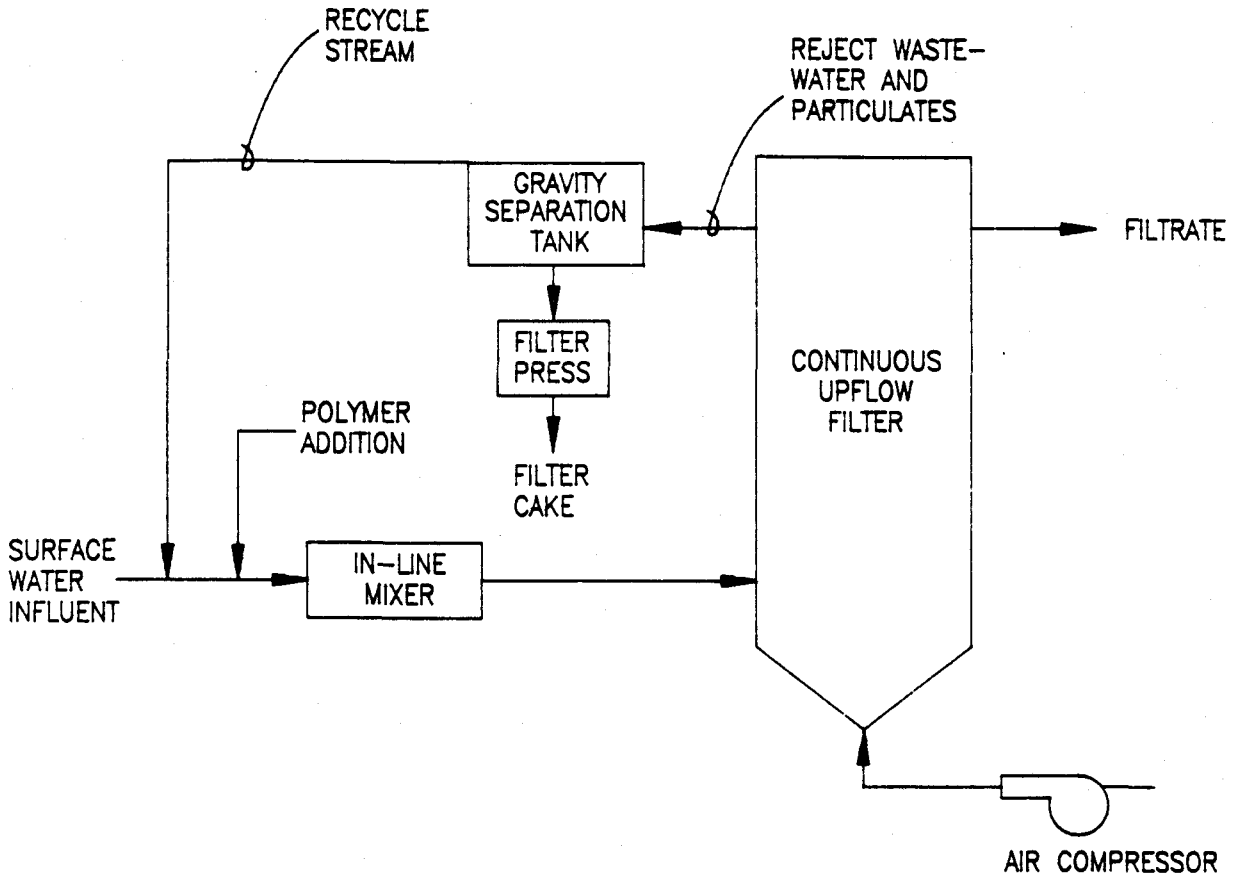

FIGURE 4-6

GRANULAR MEDIA FILTRATION TREATMENT UNIT

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of the unit and handling of dewatered solids. This, together with health and safety design considerations, provides a high degree of worker protection. The effluent from this system will be suitable for subsequent downstream treatment for dissolved radionuclide, metals and organics removal.

Implementability

Granular media filtration with polymer addition is a demonstrated technology with regard to suspended solids removal. Continuous upflow sand filters are particularly suitable for small water treatment plants where operating personnel are limited. They operate continually without the need to be shut down for backwashing because they are self-cleaning and have no moving parts. The unit operation equipment required (i.e., continuous upflow filter, in-line static mixers, filter press, etc.) are standard and readily available. The upflow filter with continuous backwash is available as a complete unit and a minimal amount of structural mounting and piping is required to place it into service. Off-site permitted disposal facilities are available for disposal of treatment residuals. The demonstrated performance and anticipated effectiveness and reliability of granular media filtration should result in acceptance of the technology by the public.

Costs

Relative to conventional suspended solids removal, granular media filtration with polymer addition is cost effective in terms of both capital and operating expenses. Assumed capital and operational costs for the continuous upflow sand filter and appurtenances are shown in Table 4-8. The system can be installed for $167,100, with annual operation and maintenance costs of $82,700 per year. Assuming a 10 percent interest rate and 30-year operating life, the present worth of the system is $946,700.

TABLE 4-8

ASSUMED COSTS FOR GRANULAR MEDIA FILTRATION TREATMENT UNIT

Cost Item	Annual Cost (Dollars)	Capital (Dollars)
A. EQUIPMENT		
Quantity / Item		
1 Continuous Upflow Sand Filter	$ 24,000	
1 10,000-Gallon Equalization Tank	12,500	
1 Air Compressor and Dryer	3,800	
1 Pump and Associated Piping	500	
1 10,000-Gallon Sedimentation Tank	12,500	
1 10-cubic feet per day filter press	44,000	
1 Trailer	22,000	
B. OPERATION AND MAINTENANCE		
[1]Operator and Maintenance		$ 43,800
[2]Monitoring and Analysis		
[3]Power		2,600
[4]Sludge Waste Disposal		22,000
[5]Polymer Consumption		500
SUBTOTAL	$119,300	$ 68,900
C. ENGINEERING AND CONTINGENCY		
Design at 15% of Total Capital Cost	$ 17,900	
Construction Management at 5% of Total Capital Cost	6,000	
Contingency at 20%	23,900	13,800
TOTAL COST	$167,100	$ 82,700

PRESENT WORTH

Present Worth Factor (PWF) =	9.427 (30 years, 10%i for annual costs)	
$82,700/year x 9.427 =	$779,600	
1990 Capital Cost =	167,100	
	$946,700	

1 Operating and maintenance costs are based on 2 manhours of labor per day at $60/hour.

2 Monitoring and analytical costs are not included because they are the same for all treatment technologies considered for this IM/IRA.

3 Electric power costs are based on a 3 hp pump and a 2 kw air compressor at $0.07 per kwh. (Conversion factor: 0.7457 kilowatts/horsepower)

4 To be conservative in cost estimating, it is assumed that filter press sludge will be disposed of as a mixed waste ($450 per cubic yard transportation and disposal cost at the Nevada Test Site). Annual production of filter cake is based on an average year-round influent flow of 20 gpm containing approximately 350 ppm of suspended solids. The filter cake produced is assumed to be 30% solids by weight with a density of 80 lbs. per cubic foot. Rationale for a 20 gpm average annual influent flow and an average TSS influent concentration of 350 ppm is presented in Section 4.4.1. (Conversion factors: 7.48 gallons/cubic foot, 8.34 pounds of water/gallon)

5 Polymer consumption costs are based on an average year-round influent flow of 20 gpm and 0.5 ppm polymer concentration.

4.4.2 Radionuclides and Metals Removal

4.4.2.1 Cross-Flow Membrane Filtration

Description

The cross-flow membrane filtration system (as applied to suspended solids removal) was previously discussed in Section 4.4.1.1. In this section the chemistry and removal mechanisms for radionuclides and metals, as applied to cross-flow membrane filtration, are discussed.

There are five oxidation states of plutonium (Pu) in aqueous solutions: Pu(III), Pu(IV), Pu(V), Pu(VI), and Pu(VII). However, under the oxidizing and near-neutral conditions expected in the surface water, the Pu(IV) oxidation state is the most stable (Cleveland, 1979). Pu(IV) is practically insoluble under these conditions because it readily hydrolyzes to form $Pu(OH)_4(s)$ and, upon loss of water, to produce the thermodynamically stable $PuO_2(s)$. This solid phase is a colloidal polymer of neutral or positive charge. Increasing pH tends to reduce the charge density of the polymer, and at pHs above 9 it is presumed that the colloid becomes negatively charged. This reduction in charge density and eventual conversion to an anionic form at pHs above 9 decreases its adsorption affinity for soils and thus increases its mobility in the soil/water environment. In solution, Pu(V) and Pu(VI) coexist as ions with the Pu(IV) polymer. At a pH of 8, the dominant ionic form of plutonium may be $PuO_2CO_3OH^-$ occurring at a concentration of approximately 10^{-12}M (1.5×10^{-5} pCi/ℓ). However, the solubility of plutonium can be increased through complexation with humic acids.

Americium (Am) has one oxidation state in aqueous solutions: Am (III). Under oxidizing and near-neutral conditions expected in surface water, Am (III) strongly complexes with colloidal material and should exist in the particulate fraction (Orlandini, 1990).

There are four oxidation states of uranium in aqueous solutions: U(III), U(IV), U(V), and U(VI) (Sorg, 1987). U(III) and U(V) are unstable, and U(VI) is the thermodynamically predicted oxidation state of uranium

under oxidizing conditions. U(VI) predominantly exists as the uranyl ion (UO_2^{2+}). The uranyl ion readily complexes with the common anions chloride, sulfate, nitrate, and carbonate. In water with carbonate alkalinity and a pH range of 7-10, the dominant soluble species of U(VI) are $UO_2(CO_3)_2^{2-}$ and $UO_2(CO_3)_3^{4-}$. At pH exceeding 9.5, the uranium hydroxide complex $(UO_2)_3(OH)_5^+$ becomes predominant. Unlike plutonium, uranium is significantly more soluble in water.

Soluble plutonium, americium, uranium and metals are removed from solution in the cross-flow membrane filtration process by adsorption on a ferric hydroxide floc. The most effective removal of uranium by conventional coagulation using iron salts is at a pH greater than 9.5. This is presumed to be due to the predominance of the positively charged uranium hydroxide ion in the presence of the negatively charged ferric hydroxide (Sorg, 1987). Because the predominant form of plutonium and most metals in the surface water is particulate, the cross-flow membrane filtration process will remove this radionuclide from the influent through adsorption to, and enmeshment in, the ferric hydroxide.

Ferric sulfate [$Fe_2(SO_4)_3$] is the iron salt of choice for introducing ferric iron to the influent stream. Because of the hydrolysis of ferric iron, the pH drops to 2 or 3, which facilitates dissolution of the iron salt. The ferric sulfate is automatically fed in dry form to the influent in reaction tank No. 1 (see Figure 4-5). The ferric ion will rapidly hydrolyze at high pH (9 to 11) to form ferric hydroxide $Fe(OH)_3(s)$. Hydrated lime [$Ca(OH)_2$] is automatically added in reaction tank No. 2, and is used to raise the pH, which also improves the compressibility of the ferric hydroxide sludge. In surface water treatment applications, iron and lime consumption is typically 0.3 lbs and 1 lb, respectively, per 1,000 gallons of influent. These estimates will be made more exact based on the bench and field-scale treatability studies described in Section 6. An adjustment with a pH controller will be required prior to discharge of the permeate to maintain the effluent in a pH range of 6 to 9.

Effectiveness

Although limited, there is data demonstrating the removal of plutonium from water using cross-flow membrane filtration. The only data available is from a study performed at the RFP using a small-scale, cross-flow membrane filtration unit (< 1 gpm) treating plutonium- and uranium-contaminated laundry wastewater. Results are shown below:

Parameter	Concentration (pCi/ℓ) Influent	Effluent
Gross alpha	2,480	5.3
Gross beta	3,933	8.9
Total uranium	1,238	2.25
Plutonium	63.4	0.25

The plutonium removal efficiency indicated by these test results is greater than 99 percent. Other data from previous test runs on laundry waste water indicated effluent plutonium concentrations less than the detection limit (0.1 pCi/ℓ). Considering the complexing agents present in laundry water, it is possible that the cross-flow membrane filtration process can meet the ARAR for plutonium of 0.05 pCi/ℓ. Using the percent plutonium removal for the above reported test and the expected influent concentration of plutonium to the treatment facility, the ARAR will be achieved based on theoretical calculations.

Data demonstrating removal of americium from natural waters is not available at the time of this writing. However, americium's strong affinity for particulates in natural waters suggests that americium should be removed from South Walnut Creek Basin surface waters by cross-flow membrane filtration via the suspended solids removal mechanisms. This observation is supported by examination of the dissolved and total americium concentrations detected in South Walnut Creek Basin surface water samples (Appendix B). Examination of these data reveals that there were no instances where dissolved americium concentrations exceeded the ARAR. Total americium concentrations (i.e., dissolved plus particulate), however, exceeded the ARAR on several occasions.

Because of its ubiquity in water supplies, there is considerably more information on the removal of uranium during water treatment. Uranium removal efficiencies have been reported for conventional coagulation/filtration water treatment, and data exist for cross-flow membrane filtration used at the RFP and at Uranium Mill Tailings Remedial Action (UMTRA) sites. The UMTRA project is a DOE-sponsored program to clean up low-level radioactive uranium mill tailings and associated contaminated surface water runoff in eleven western states and Pennsylvania. With regard to conventional water treatment, using a dose of 10 mg/ℓ of ferric sulfate as a coagulant with a pH of 10, 80 percent removal of uranium has been reported (Sorg, 1987). Use of ferrous sulfate at doses between 20 to 25 mg/ℓ and at the same pH resulted in removals as high as 92 to 93 percent. For cross-flow membrane filtration, the above-reported test at the RFP indicates achieving greater than 99 percent removal and meeting the ARAR for uranium (10 pCi/ℓ). At the Canonsburg UMTRA site, water containing 4,400 pCi/ℓ of total uranium was treated to achieve a total uranium concentration of less than 1 pCi/ℓ. Although specific data is unavailable, the cross-flow membrane filtration unit operating at the Durango UMTRA site is achieving effluent uranium concentrations below the Colorado in-stream standards for that area.

It would appear that cross-flow membrane filtration should be effective for removal of plutonium, americium and uranium as well as other metals from South Walnut Creek Basin surface water. ARARs should be achieved for plutonium, americium and uranium, although there is less data and correspondingly less certainty on the performance of the system for plutonium and americium removal. ARARs for gross alpha and gross beta should also be achieved. The gross alpha is largely from uranium and particulate forms of plutonium and americium, and most of the gross beta arises from uranium 238 daughters, e.g., thorium 243 and protactinium 234. The thorium and protactinium predominantly exist in the particulate fraction and should be removed by cross-flow membrane filtration via adsorption on iron hydroxide. Although cesium 137, potassium 40, lead 210, and strontium 90 (which are more soluble) also contribute to gross beta activity, the success of the current filtration operation to lower the gross beta concentration at Pond B-5 would indicate that they are not significant contributors to the gross beta activity in South Walnut Creek. Removal of the radionuclides should effectively reduce the potential threat to the public health and the environment. The ARAR for TDS may not be achieved with cross-flow membrane filtration as a result of the addition of ferric sulfate and lime to the process influent.

The ARAR for TDS is not a public health-based standard; rather, it is a secondary drinking water standard set for aesthetic reasons. The bench and field-scale treatability studies will provide TDS concentration data of treated effluent.

Implementability

See Section 4.4.1.1 for a discussion of the implementability of the cross-flow membrane filtration process.

Costs

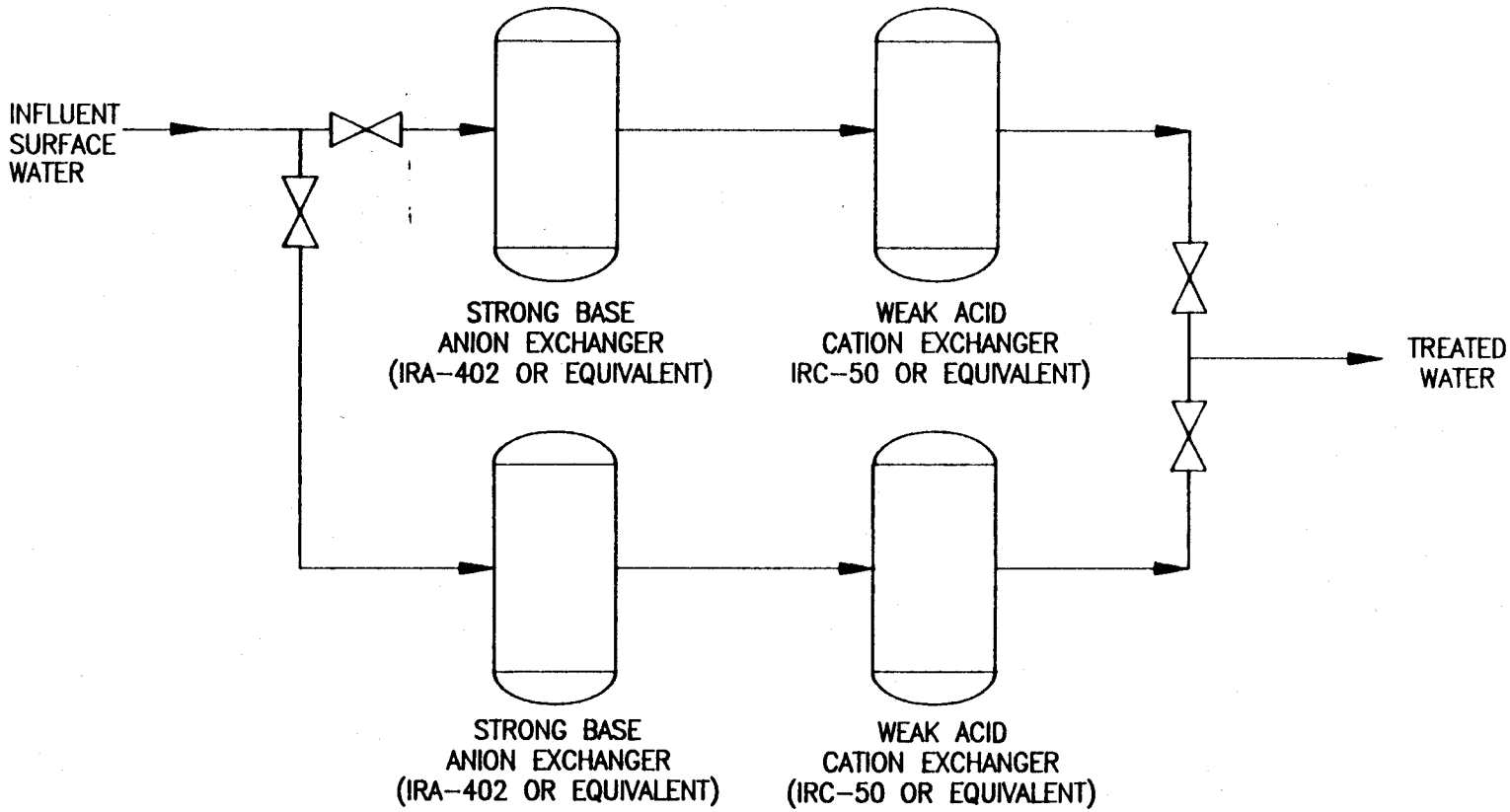
See Section 4.4.1.1 (Table 4-6) for a presentation of the assumed capital and operating and maintenance costs of the cross-flow membrane filtration process.

4.4.2.2 Ion Exchange

Description

The ion exchange treatment system for the removal of radionuclides consists of a strong base anion exchanger followed by a weak acid cation exchanger (Figure 4-7). These exchangers are designed for the removal of uranium and plutonium/americium, respectively. Both ion exchangers have been designed conservatively using a hydraulic loading less than 5 gpm/ft^2 and a bed capacity less than 2 gpm/ft^3. This translates to a 4-foot diameter column with a resin bed depth of 3 feet. The column will include 100 percent freeboard. This freeboard is necessary for resin expansion during regeneration or for backwashing if required.

The strong base anion exchanger will contain 37.5 ft^3 of Rohm and Haas IRA-402 resin or equivalent in the chloride form. Regeneration will not be required because of the high affinity and capacity of the resin



ON-LINE, STAND-BY UNITS

NOTES

1. STRONG BASE ANION EXCHANGE RESIN IRA-402 IS MANUFACTURED BY ROHM AND HAAS COMPANY.
2. WEAK ACID CATION EXCHANGE RESIN IRC-50 IS MANUFACTURED BY ROHM AND HAAS COMPANY.

FIGURE 4-7

ION EXCHANGE TREATMENT SYSTEM

for uranium. The expected life of the unit is greater than 30 years at the expected influent uranium concentration. Although other anions will be adsorbed to the resin, the preferential adsorption of uranium over other anions in solution will, over time, displace these anions. The spent resin will ultimately require solidification and disposal at the Nevada Test Site.

The cation exchanger will contain 37.5 ft^3 of Rohm and Haas IRC-50 weak acid cation exchange resin or equivalent in the sodium form. This resin has a high affinity for high molecular weight metals, e.g., mercury, copper, lead, and zinc. Published information on the removal of plutonium and americium from natural waters by ion exchange has not been found. A cation exchange resin with a high affinity for heavy metals is most likely to remove plutonium and americium because these constituents will predominantly exist as colloids carrying a positive charge. The performance of ion exchange for the removal of plutonium and americium is unknown; however, it is noted that most of the plutonium and americium should be removed during upstream suspended solids removal. There is insufficient information to determine the frequency at which the resin will require regeneration. It is assumed that, like the anion exchanger, the cation exchanger will not require regeneration over the life of the IM/IRA.

Effectiveness

Ion exchange has been proven to remove heavy metals and uranium from water to meet the ARARs, whereas plutonium and americium removal using this technology is unproven. Ion exchange has been used to remove uranium from mine water for many years and has been studied extensively by EPA for the removal of uranium from drinking water (Sorg, 1987). Ion exchange is commonly used for the removal of plutonium from strong acid solutions, but no information exists on the use of ion exchange for the removal of plutonium (or americium) present in natural waters. The absence of plutonium and americium removal efficiencies in ion exchange does not allow conclusions to be drawn with regard to its effectiveness in reducing the toxicity of influent South Walnut Creek Basin surface waters, and thus, protection of human health and the environment and public health.

An ion exchange system is for the most part a self-contained and automated operation. Workers may be easily trained on the safe operation of the system. There is uncertainty as to whether the cation exchanger (i.e., plutonium and americium removal) will require regeneration. This lends uncertainty as to the volume of treatment residuals that will be generated as well as the degree of worker exposure in handling the regeneration wastes. The anion exchanger will not require regeneration, as discussed earlier, as the uranium carbonate complex will preferentially displace major ions that will initially load onto the resin.

Implementability

Ion exchange is a well established technology that has demonstrated long-term reliability and performance in water treatment and after applications. The vessels, piping and pumps required to construct a system are commercially available, off-the-shelf items. The anion and cation exchange resins, however, are specific to each application and, as suggested above, effective resins for plutonium and americium removal from surface waters may not be readily available. If the weak acid cation exchanger requires regeneration (i.e., plutonium and americium removal), an acid regeneration system would be required, and the wastewater from regeneration would require storage and treatment at the Building 374 Process Waste Treatment System (chemical precipitation/flash evaporation). If regeneration of the cation exchange resin is not required, operation and maintenance requirements for the system will be low. Effluent would be routinely monitored for breakthrough of the radionuclides shown in Table 4-1. The removal of suspended solids in a pretreatment step is required to prevent fouling of the resin.

At this time, the degree of uncertainty associated with plutonium and americium removal suggests the public will not readily accept ion exchange as a preferred treatment technology. Demonstration of technical feasibility through treatability study testing is necessary.

Costs

Assumed capital and operational cost for the ion exchange system is shown in Table 4-9. Costs for pretreatment of the influent for removal of suspended solids are not considered in Table 4-9. The system can be installed for $289,900, with annual operation and maintenance costs of $45,400 per year. The operation and maintenance cost assumes that regeneration of the weak acid cation exchange resin will not be required. At an interest rate of 10 percent and an operating life of 30 years, the present worth of the system is $717,900.

4.4.3 Organic Contaminant Removal

4.4.3.1 Activated Carbon Adsorption

Description

With a GAC adsorption system, the surface water will be pumped through two GAC columns in series and operated in downflow fixed-bed mode (Figure 4-8). A second set of GAC columns will be maintained in stock. Each carbon column is 60 inches in diameter and 87 inches high, and contains 2000 pounds of carbon. Based on a flow rate of 60 gpm, the hydraulic loading to each column will be approximately 3 gpm/ft. The empty bed contact time for each column will be approximately 18 minutes. To completely utilize the carbon, columns are arranged in series, allowing the lead column to become fully exhausted before regeneration while the second (polishing) column ensures effluent quality. Periodic samples will be taken from the effluent of each unit, and when the lead unit effluent exceeds ARARs, the lead carbon column will be removed, the polishing (second) column will become the lead column, and a stock carbon unit will be put in service as the polishing unit. The carbon column with the exhausted carbon will then be shipped to an off-site location for regeneration.

TABLE 4-9

ASSUMED COSTS FOR ION EXCHANGE TREATMENT SYSTEM

Item		Capital Cost (Dollars)	Annual Cost (Dollars)
A.	EQUIPMENT		
Quantity	Item		
2	Strong Anion/Weak Cation Exchange Treatment System	$ 160,000	
1	2500-gallon Regeneration Waste Storage Tank	3,000	
2	Trailer	$ 44,000	
B.	OPERATION AND MAINTENANCE		
	[1]Operation and Maintenance		36,000
	[2]Power		1,800
	[3]Monitoring and Sampling		
	SUBTOTAL	$ 207,000	37,800
C.	ENGINEERING AND CONTINGENCY		
	Design at 15% of Capital Cost	$ 31,100	
	Construction Management at 5% of Capital Cost	10,400	
	Contingency at 20%	41,400	7,600
	TOTAL	289,900	45,400

PRESENT WORTH

Present Worth Factor (PWF) =	9.427 (30 years, 10%i for annual costs)	
$ 45,400/year x 9.427 =	$ 428,000	
1990 Capital Cost	289,900	
	$ 717,900	

1 Operation and maintenance costs are based on 50 manhours of labor per month at $ 60/hour.

2 Power estimates are based on two 2-hp process pumps operated continuously at $ 0.07 per kwh. (Conversion factor: 0.7457 kilowatts/horsepower)

3 Monitoring and analytical costs are not included because they are the same for all treatment technologies considered for the IM/IRA.

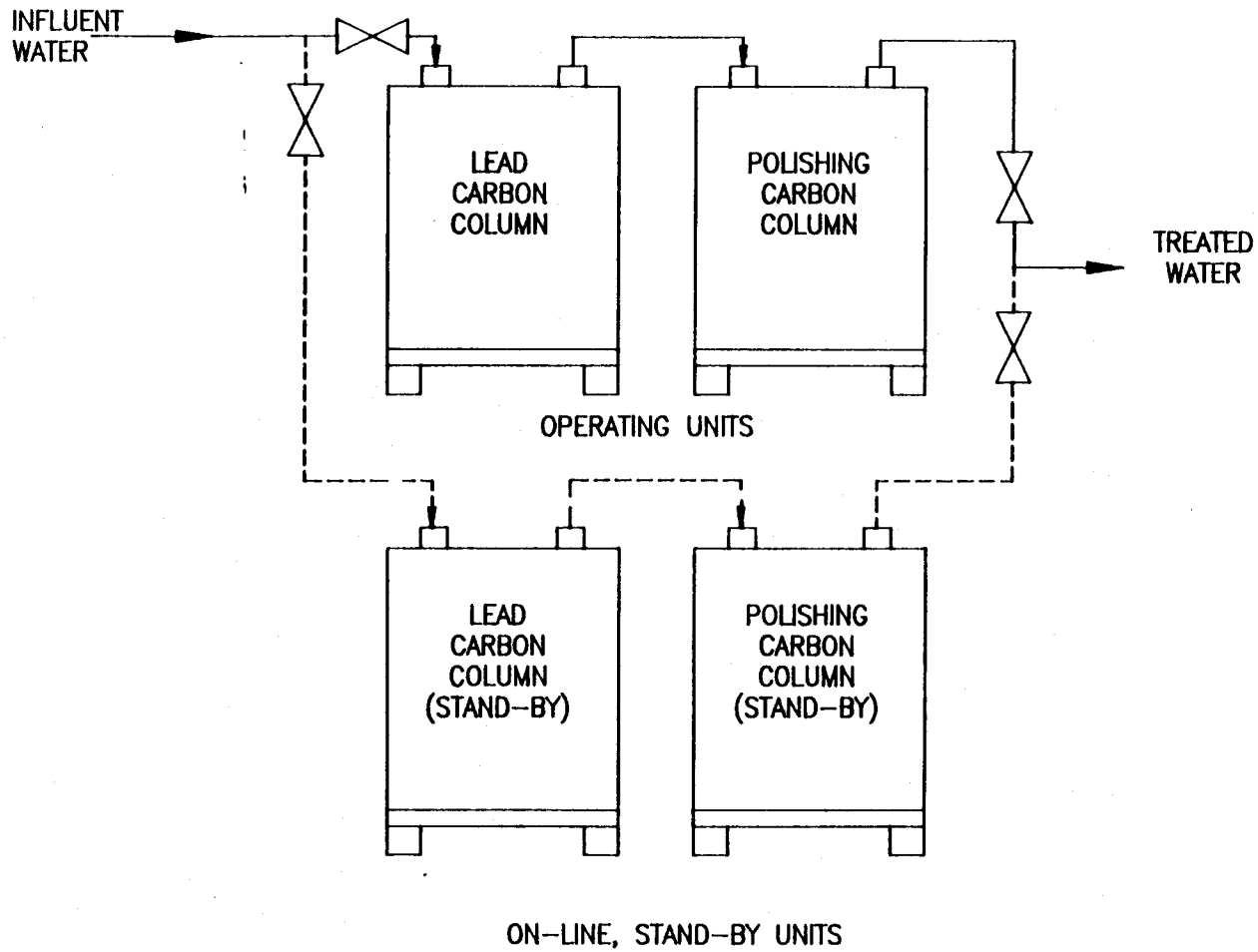


FIGURE 4-8

CARBON ADSORPTION TREATMENT UNIT

Effectiveness

GAC adsorption systems have been shown to remove VOCs from contaminated water to levels that comply with the ARARs. The EPA (*Federal Register*, Vol. 52, No. 130, page 25698) has designated carbon adsorption a "Best Available Technology" for the removal of seven specific VOCs from drinking water which includes common chlorinated solvents. This assumes that vinyl chloride, methylene chloride, and acetone are not present at the proposed South Walnut Creek Basin surface water collection locations since these compounds are not readily adsorbed from solution using activated carbon. The surface water quality data presented in Appendix B indicates that these compounds were detected at levels above ARARs only at stations SW-56, SW-60 and SW-101. It is proposed, however, that surface water from these stations be collected at the downstream station SW-61 where vinyl chloride, methylene chloride and acetone have always been estimated below detection limits and/or were also present in the associated laboratory blanks. The absence of these VOCs at SW-61 may be due to laboratory artifact (i.e., not actually present at the upstream stations), dilution, and/or volatilization.

The probability of equipment failure will be minimized in this system because of the redundancy of having standby lead and polishing adsorption units in parallel to the operating units, each of which could treat the design flow. Two additional stock units on site add to the system reliability. Appropriate safety measures required when moving and installing large equipment will be complied with during installation. The operation and maintenance of the system will be by personnel who are trained in the handling of hazardous and radioactive wastes. Wet activated carbon preferentially removes oxygen from the air. Therefore, any time personnel are working in confined areas where oxygen may be depleted, appropriate sampling and work procedures for potentially low-oxygen spaces will be followed, including all applicable federal and state requirements.

The operators of the GAC system will not be exposed to VOC-laden carbon because the use of the containerized and transportable carbon contactors allows removal and regeneration/replacement of the exhausted carbon at a remote carbon reactivation site. Carbon will not be handled at the site. Transporting

the entire exhausted carbon column to the regeneration facility ensures operators are protected from the carbon, and the operators need only follow routine safety procedures which are appropriate to handling heavy equipment.

The exhausted carbon is generally regenerated through a thermal treatment process which strips the volatile organics from the carbon. The organics are subsequently destroyed via incineration. During this regeneration process, a small quantity of ash may be generated which requires disposal at a landfill. Thus, this process can be considered an alternative to land disposal since the carbon is continuously recycled.

GAC adsorption treatment in sealed, fixed-bed contactor vessels does not produce any waste streams or vapor emissions. The safety of nearby communities should not be adversely affected and the risk of harm to the environment should not be increased. This treatment process will effectively remove many of the target organic contaminants from the surface water. Treated water will be monitored at the effluent and also at an intermediate point in the system to ensure contaminants are below the ARAR concentrations before being released to South Walnut Creek during implementation of the process.

Implementability

GAC adsorption is a proven technology for reducing many VOCs from water. Testing performed by Calgon (Rockwell International, 1988b) demonstrated that activated carbon can remove VOCs to meet ARARs. A second carbon unit connected in series with the lead unit would serve as a polishing unit and will ensure removal of the VOCs to these levels. The removal of suspended solids in a pretreatment step is required to prevent fouling of the carbon. The carbon columns can be easily shipped and readily installed. The system should be ready to operate at full capacity after initial adjustments and test runs. Carbon services that provide rental and regeneration of carbon columns are common and offer an alternative to a capital purchase. A high degree of public acceptance is anticipated for GAC adsorption based on its BDAT classification, and the minimal generation of treatment residuals. These services are readily available and cost effective for an interim action.

Costs

It is estimated that the carbon usage rate will be 0.6 pounds per 1,000 gallons of surface water, based on breakthrough of 1,1-DCA. This assumes that vinyl chloride, methylene chloride, and acetone are not present at SW-61. Based on a maximum flow rate of 60 gpm, the annual consumption of carbon will be approximately 20,000 pounds. The cost of a 20,000-pounds-per-year carbon service is $50,000. This includes the rental and regeneration of 10 carbon columns, each containing 2,000 pounds of activated carbon. The cost of round-trip shipping is estimated at $3,000 per column. It is assumed that the exhausted carbon columns will be shipped as a manifested hazardous waste.

Using the preceding information, the assumed capital cost for installing a carbon adsorption system is $70,600, and the assumed annual operating cost is $170,300 as shown in Table 4-10. Costs for pretreatment of the influent for removal of suspended solids are not considered in Table 4-10. Total cost (present worth) of the GAC adsorption system based on 10 percent simple interest, a 30-year duration of operation, and no salvage value, is estimated to be approximately $1,676,000.

4.4.3.2 Ultraviolet (UV) Peroxide Oxidation

Description

The UV/peroxide treatment unit, as designed by one manufacturer, consists of an 360-gallon, stainless-steel oxidation chamber which provides for a surface water retention time range of 4 to 8 minutes at a peak system flowrate of 60 gpm (Figure 4-9).

The oxidation chamber contains UV radiation lamps which are mounted horizontally in quartz sheaths. A hydrogen peroxide feed system is used to inject approximately 50 mg/ℓ (per ppm of organic contaminants) of a 50 percent H_2O_2 solution into the surface water feed line. The surface water/peroxide mixture then passes

TABLE 4-10

ASSUMED COSTS FOR GRANULAR ACTIVATED CARBON TREATMENT SYSTEM

Item		Capital Cost (Dollars)	Annual Cost (Dollars)
A.	EQUIPMENT		
Quantity	Item		
1	Process Piping and Pump	3,000	
1	Trailer	44,000	
B.	OPERATION AND MAINTENANCE		
	[1]Activated Carbon Service		$ 50,000
	[2]Shipping		30,000
	[3]Power		1,800
	[4]Operation and Maintenance		55,600
	[5]GAC Analysis		4,500
	SUBTOTAL	$ 47,000	$ 141,900
C.	ENGINEERING AND CONTINGENCY		
	Design at 25% of Total Capital Cost	$ 11,800	
	Construction Management at 5% of Total Capital Cost	2,400	
	Contingency at 20%	9,400	28,400
	TOTAL	$ 70,600	$ 170,300

PRESENT WORTH

Present Worth Factor (PWF) =	9.427 (30 years, 10%i for annual costs)
$ 170,300/year x 9.427 =	$ 1,605,400
1990 Capital Cost =	70,600
	$ 1,676,000

1 Annual GAC service costs are based on rental and regeneration of ten 2,000-pound carbon columns at $ 5,000 per column.

2 Shipping costs are based on 10 round trip column shipments per year at $3,000 per round-trip shipment.

3 Power costs are based on one 4-hp pump @ $0.07/kwh. (Conversion factor: 0.7457 kilowatts/horsepower)

4 Operation and maintenance costs based on 77 manhours of labor per month @ $60/hour.

5 Annual GAC analysis costs for radioactivity testing are based on analysis before and after each unit is in service at $225 per analysis.

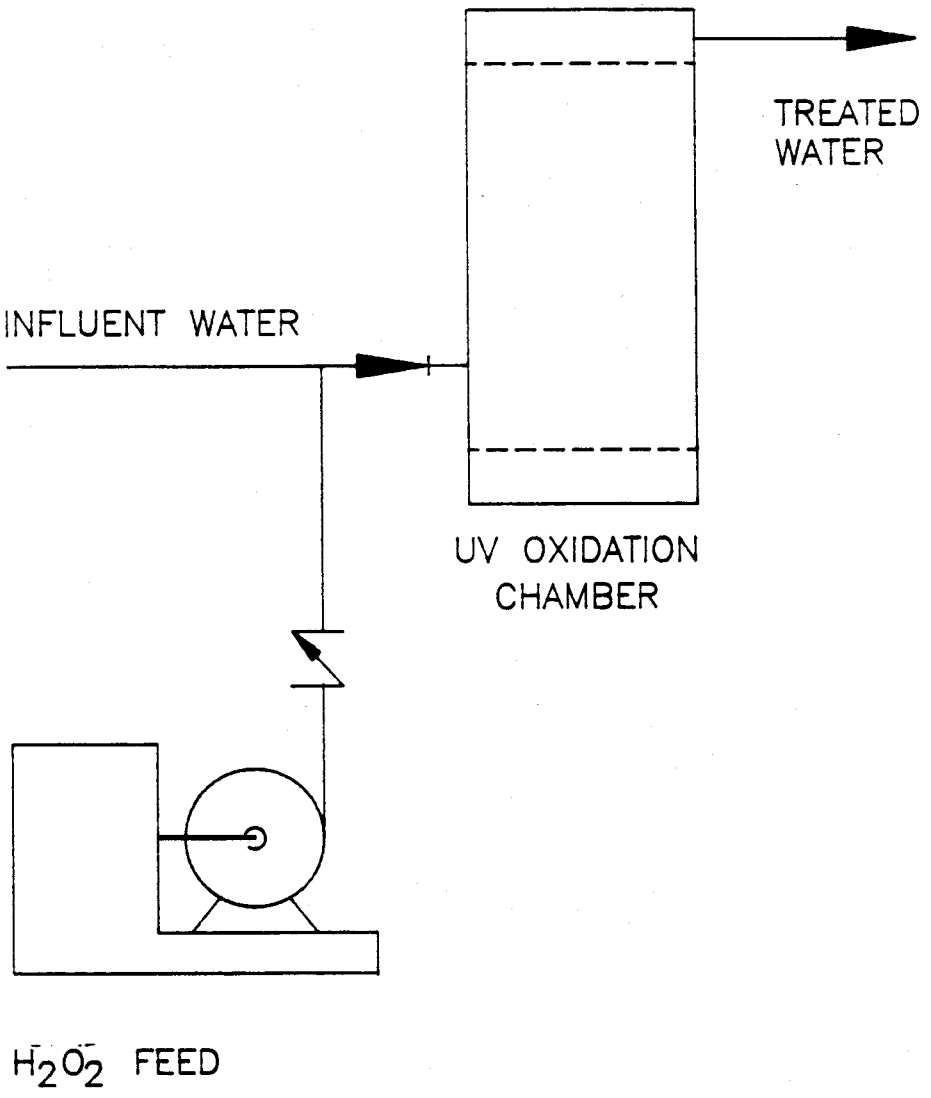


FIGURE 4-9

UV/PEROXIDE SYSTEM

through an in-line static mixer before entering the bottom of the oxidation chamber. The water then flows through the reaction chamber, passing the UV lamps, before it exits the top of the oxidation chamber.

Effectiveness

The UV/peroxide system is capable of removing VOCs from the surface water to levels below the ARARs. A technology evaluation of a demonstration unit was conducted by the EPA's Risk Reduction Laboratory in Cincinnati, Ohio (EPA, 1990a). Ground-water treatment experiments were performed in which residence time, ozone and hydrogen peroxide dosages, radiation intensity and influent pH were altered to evaluate the technology. The demonstration unit achieved VOC removals greater than 90 percent. These results indicate that the UV/peroxide treatment process is likely capable of achieving the effluent criteria for all of the volatile organics listed in Table 4-1. However, the volatile organics may not be completely oxidized to carbon dioxide, water, and chloride, and unintended organic degradation products may be produced.

The system requires periodic UV lamp replacement and routine maintenance, and with such maintenance, the unit expected to have long-term reliability. The risk of failure of the system at any time is highly unlikely. However, because surface water is expected to have widely varying concentrations of organics,it will be difficult to ensure adequate peroxide dosage for complete organic destruction and to prevent the appearance of excess peroxide in the effluent. While the presence of ferrous iron and manganese can impede the effectiveness of the UV/peroxide treatment system due to the precipitation of these metals, a manufacturer has indicated that this will not be a problem at the iron and manganese concentrations expected. However, should precipitation problems arise, appropriate pre-treatment and post-treatment will be implemented to correct this problem.

The UV/peroxide oxidation system will destroy VOCs present in contaminated South Walnut Creek Basin surface water and thus represents an alternative to land disposal. The system itself will not produce treatment residuals. Some support unit operations (i.e., pre-treatment) for the UV/peroxide oxidation system, however, may require residual waste management.

During operation of the UV/peroxide oxidation treatment unit, the use of hydrogen peroxide, a strong oxidizer, will require that operators be aware of this potential hazard. The H_2O_2 bulk storage tank will be properly vented to assure no pressure buildup and minimize handling exposure. Existing DOE and EG&G health and safety guidelines at the RFP and project-specific SOPs regarding operator safety while working with strong oxidizers will be followed. UV lamps operate utilizing high voltage, and thus caution must be used when working with the system and during the periodic replacement of the UV lamps.

The safety of nearby communities should not be adversely affected, and the risk of harm to the environment should not be increased as this treatment process will effectively destroy the contaminants. Treated water will be monitored to ensure contaminants are within regulatory guidelines before being released to the environment.

Implementability

UV/peroxide oxidation is a technology for the complete destruction and detoxification of hazardous organic compounds in aqueous solutions. Although the technology is relatively new and has had limited application in the field, SARA requires EPA to prefer remedial actions that significantly and permanently reduce the toxicity, mobility, or volume of hazardous wastes by employing innovative technologies that result in the destruction or detoxification of the wastes. The equipment necessary to construct a UV Peroxide system is not "off-the-shelf", but must be designed for each individual application. The equipment components and materials necessary to construct a system are readily available, however.

Demonstrated performance of the UV/peroxide ground-water treatment system has been somewhat limited due to the relatively new development of the process. However, there are six UV/peroxide units currently operational or on-line and ready for operation. One of these units is located at Rocketdyne's Santa Susana facility in southern California. Pilot-scale operations were performed on ground water containing VOCs (TCA, TCE, etc.) at system flow rates of approximately 20 to 40 gpm. Results from the pilot scale testing were favorable, and a UV/peroxide ground-water treatment unit has been purchased, set up, and site tested.

Another UV/peroxide ground-water treatment system, located locally, was visited and appeared to be a low-maintenance, highly effective ground-water treatment unit. This system was treating ground water with TCA concentrations significantly lower than those found at the 881 Hillside (approximately 7 ppb). However, the same UV treatment process had initially and effectively treated ground water with much higher concentrations.

Operating and maintenance requirements for the UV/peroxide treatment system are relatively minor. The system will require up to 500 kW of power, a high electrical power consumption requirement relative to other treatment processes, and 12,200 pounds/year of 50 percent H_2O_2 solution for normal operation. Routine maintenance of the equipment is required and the UV lamps will require replacement approximately every six months. All four system UV lamps can be exchanged in about an hour. Influent pretreatment for suspended solids removal is required to prevent fouling of the oxidation chamber. Also, influent pre- and post-treatment for removal of iron and manganese may be necessary as discussed above. The system will require careful observation to ensure the system is operating properly, although system alarms will notify operators if a problem does occur.

Public acceptance of UV/peroxide oxidation should be favorable based on removal efficiencies observed to date. The attribute of mineralizing VOCs present in surface water (i.e., converting them to carbon dioxide and water) should also receive a favorable response. Treatability testing on contaminated South Walnut Creek Basin surface water may be necessary to win public approval since it is still a relatively new technology.

Costs

Assumed costs for the UV/peroxide ground-water treatment unit are shown in Table 4-11. Costs for pre- and post-treatment of the influent for reasons discussed above are not considered in Table 4-11. The capital cost for the UV/peroxide surface water treatment system is approximately $672,800. Operational costs are $214,600 per year and include procurement of hydrogen peroxide, power utilization, labor, and lamp

TABLE 4-11

ASSUMED COSTS FOR UV PEROXIDE OXIDATION TREATMENT SYSTEM

		Capital Cost (Dollars)	Annual Cost (Dollars)
A.	EQUIPMENT		
Quantity	Item		
1	UV Peroxide Oxidation Treatment Unit	420,000	
2	Trailers	44,000	
B.	OPERATING AND MAINTENANCE COSTS[1]		
	[2]Hydrogen Peroxide		6,400
	[3]Power		102,200
	[4]Lamp Replacement		9,000
	[5]Operation and Maintenance		61,200
	SUBTOTAL	464,000	178,800
C.	ENGINEERING AND CONTINGENCY		
	Design at 20% of Total Capital Cost	92,800	
	Construction Management at 5% of Total Capital Cost	23,200	
	Contingency at 20%	92,800	35,800
	TOTAL	672,800	214,600

PRESENT WORTH

Present Worth Factor (PWF) =	9.427	(30 years, 10%i for annual costs)
$214,600/year x 9.427 =	$2,022,700	
1990 Capital Cost =	672,800	
	$2,695,500	

1 Operating costs based upon a flowrate of 60 gpm, 8 hr/d.

2 $0.52/lb x 12,200 lb/yr

3 500 KW 8 hr/d @ $0.07/KWh

4 2 times/year

5 85 hours per month @ $60/hour

replacement. Operational costs are based on a system flow rate of 60 gpm, 24 hours per day. Assuming a 10 percent interest rate and a 30 year operating life, the present worth of the system is $2,695,500.

4.4.3.3 Air Stripping with Off-Gas Treatment

Description

During air stripping, VOCs are transferred from the water to a continuously flowing airstream which is in direct contact with the water (Figure 4-10). Influent contaminated surface water will enter the top of a 32-inch diameter, 34-foot air stripping column and subsequently contact clean air supplied through the bottom of the column (column sizes are approximate). Appropriate air-to-water flow rates will be utilized to provide for the optimum (99+ percent) transfer of the contaminants from the surface water to the air stream. The treated surface water will then be pumped through a 2000-pound liquid phase carbon treatment polishing unit (identical to the one described in Section 4.4.3.1). The air stripper emissions will be heated above dew point and then passed through a vapor phase carbon system to remove the organics before being released to the environment. The vapor phase carbon unit will contain 2,000 pounds of carbon.

Effectiveness

The use of an air stripper is a highly effective method of removing hazardous VOCs from water. The efficiency of the process is well documented. The Environmental Protection Agency (*Federal Register*, Vol. 52, No. 130, page 25698) has designated packed tower aeration along with granular activated carbon, as a BDAT for the removal of VOCs from drinking water.

An air stripper coupled with liquid- and vapor-phase carbon adsorption is a proven system that has a dependable record of use. It is expected that this treatment process, with proper maintenance, will provide the desired level of contaminant removal to meet the ARARs.

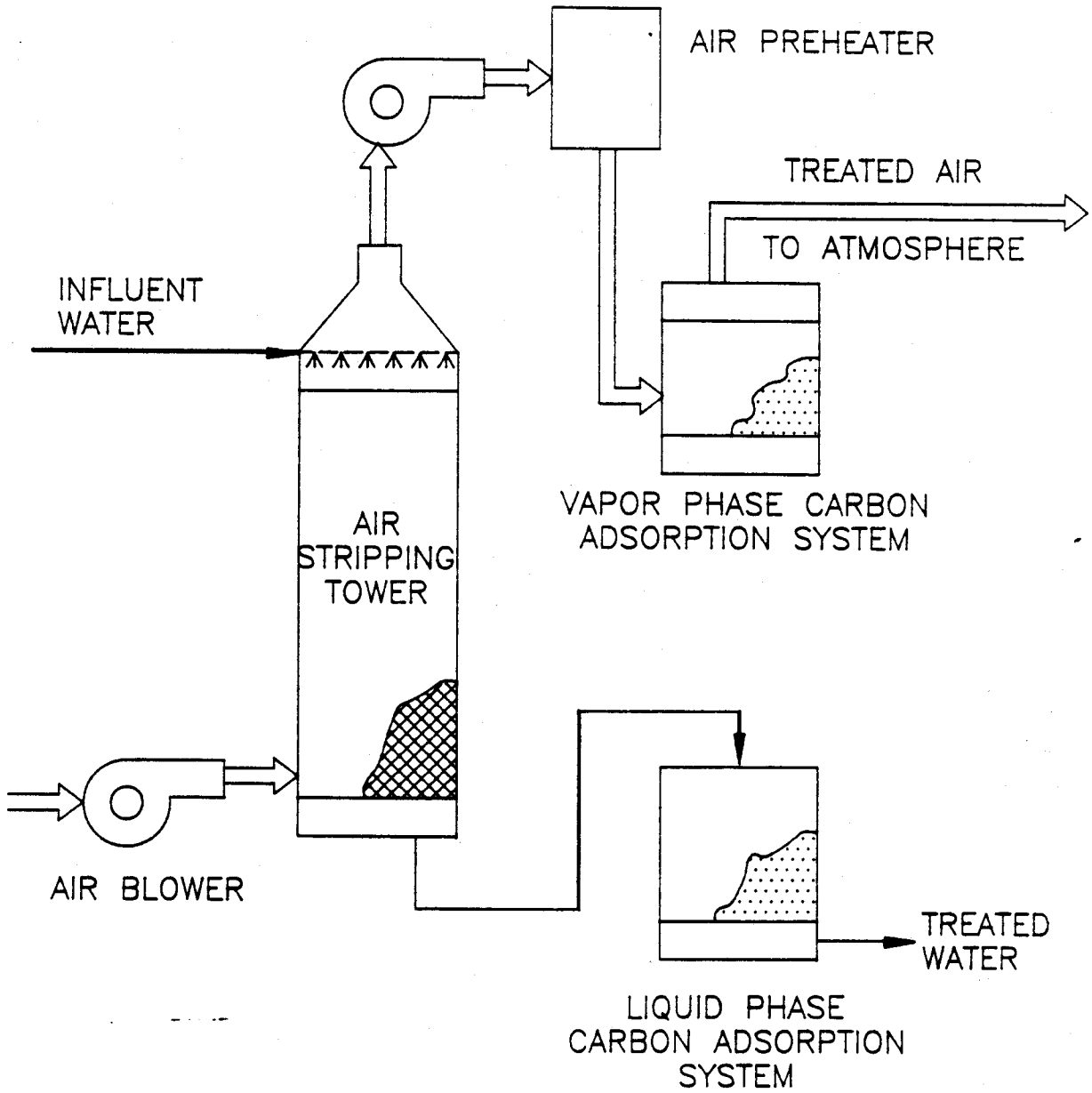


FIGURE 4-10

AIR STRIPPING WITH VAPOR PHASE
AND LIQUID PHASE CARBON ADSORPTION

The system is sized for the intended maximum flow of 60 gpm and includes two vapor-phase carbon units -- one installed and one stock. The on-site stock unit adds to system reliability. All appropriate safety measures required when moving and installing large equipment will be complied with during installation. The operation and maintenance of the system will be performed by personnel properly trained in the handling of hazardous and radioactive wastes. Wet activated carbon preferentially removes oxygen from the air. Therefore, any time personnel are working in confined areas where oxygen may be depleted, appropriate sampling and work procedures for potentially low-oxygen spaces will be followed, including all applicable federal and state requirements.

The operators of the system will not be exposed to VOC-laden carbon from the vapor-phase or liquid-phase carbon units because the use of containerized and transportable carbon contactors allows removal and regeneration/replacement of the exhausted carbon at a remote carbon reactivation site. Carbon will not be handled at the site. Transporting the entire exhausted carbon column itself to the regeneration facility ensures operators are protected from the carbon itself and need only follow routine safety procedures when handling heavy equipment.

The exhausted carbon is generally regenerated through a thermal treatment process which strips the VOCs from the carbon. The organics are subsequently destroyed via incineration. During this regeneration process, a small quantity of ash may be generated which requires disposal at a landfill. Thus, this process can be considered an alternative to land disposal since the carbon is continuously recycled. However, if the spent liquid-phase carbon is determined to be a mixed waste, then it would require land disposal at a facility permitted to accept mixed wastes. The vapor-phase carbon adsorption system will remove the organics from the air stripper emissions before being released to the environment. Therefore, the vapor-phase carbon adsorption system will eliminate the impact of any air stripper emissions on the public health. The safety of nearby communities should not be adversely affected and the risk of harm to the environment should not be increased. Treated water and air will be monitored to ensure that contaminant levels are below ARARs.

Implementability

The air stripper will remove greater than 99 percent of the contaminants in the surface water. Because the air stripper performance is sensitive to changes in flow and contaminant concentrations, a liquid-phase carbon adsorption unit is in series with the air stripper to enhance system performance and to ensure that the treated effluent meets ARARs for VOCs. Based on a flow rate of 60 gpm, 24 hours per day, liquid phase carbon usage will be approximately 11 pounds/day, and each 2000-pound carbon unit will require replacement approximately every six months. Vapor phase carbon usage will be approximately 10 pounds/day, and each 2000-pound carbon unit will require replacement approximately every six months.

Operation of the treatment process is relatively simple, requiring occasional cleaning of the air stripping column and replacement of carbon. The air stripper will require cleaning to remove scale buildup on the packing material in order to maintain optimum removal efficiency. Effluent from the cleaning operation will require treatment in the Building 374 Process Waste Treatment System. The removal of suspended solids in a pretreatment step is required to prevent fouling of the carbon and liquid phase adsorber. Transportation and regeneration of the liquid-phase and vapor-phase carbon units at a remote carbon reactivation site will be required. The air stripping with off-gas treatment system for remediating VOC-contaminated surface water is available commercially and could be implemented quickly. No difficulties are anticipated during the installation and startup of this treatment system.

Air stripping with liquid and vapor-phase GAC adsorption should receive a high degree of public acceptance due to its proven track record and classification as a BDAT.

Costs

Assumed costs for the air stripping ground-water treatment system are shown in Table 4-12. Costs for pretreatment of the influent for removal of suspended solids are not considered in Table 4-12. The total capital cost for the system is $114,800. Operational costs are approximately $139,900 and include the cost of carbon

TABLE 4-12

ASSUMED COSTS FOR AIR STRIPPING WITH VAPOR AND LIQUID PHASE GRANULAR ACTIVATED CARBON

Item		Capital Cost (Dollars)	Annual Cost (Dollars)
A.	EQUIPMENT		
Quantity	Item		
1	Air Stripper Column	35,000	
2	Trailer	44,000	
1	Preheater	3,000	
B.	OPERATING AND MAINTENANCE COSTS[1]		
	[2]GAC Service		38,100
	[3]Shipping		15,000
	[4]Power		1,200
	[5]Operation and Maintenance		61,200
	[6]GAC Analysis		1,100
	SUBTOTAL	$82,000	$116,600
C.	ENGINEERING AND CONTINGENCY		
	Design at 15% of Total Capital Cost	12,300	
	Construction Management at 5% of Total Capital Cost	4,100	
	Contingency at 20%	16,400	23,300
	TOTAL	114,800	139,900

PRESENT WORTH

Present Worth Factor (PWF) =	9.427 (30 years, 10%i for annual costs)
$139,900/year x 9.427 =	$1,318,800
1990 Capital Cost =	114,800
	$1,433,600

1 Operating costs based upon a flowrate of 60 gpm, 8 hr/d.

2 Activated carbon service costs are based on rental and regeneration of five 2,000-pound columns at $7,600 per column

3 Shipping costs are based on 5 round-trip column shipments per year @ $3,000 per round-trip shipment

4 8 hp, 8 hr/d @ $0.07/KWh. (Conversion factor: 0.7457 kilowatts/horsepower)

5 85 hours per month @ $60/hour

6 Annual GAC analysis costs for radioactivity testing are based on analysis before and after each liquid- and vapor-phase unit is in service at $225 per analysis.

SECTION 5

COMPARATIVE ANALYSIS

5.1 INTRODUCTION

This section summarizes the evaluated surface water collection and treatment technologies, and presents a tabular comparison of the evaluation results (Table 5-1). A recommendation is made for a preferred surface water IM/IRA using the comparative analysis.

5.2 COMPARISON OF TECHNOLOGIES

Collection of surface water by diversion at the sources was established in Section 4 as the only reasonable alternative for collection of contaminated South Walnut Creek Basin surface waters in OU 2 and is, therefore, the preferred collection technique for the IM/IRA. On the other hand, several technologies for surface water treatment were considered. These technologies include chemical treatment/cross-flow membrane filtration ("cross-flow membrane filtration" is used for brevity) and granular media filtration with polymer addition for suspended solids removal; cross-flow membrane filtration and ion exchange for radionuclide and metals removal; and GAC, UV/peroxide oxidation and air stripping with liquid- and vapor-phase GAC for VOC removal.

The cross-flow membrane filtration technology is the preferred method for removal of radionuclides and metals because it is the most likely treatment technology that will remove these constituents from the South Walnut Creek Basin surface water and generate an effluent that is protective of public health and the environment. This is a result of adsorption of radionuclides and metals on a ferric hydroxide floc as described in Section 4.4.2. It is noted that cross-flow membrane filtration and granular media filtration with polymer addition are both effective technologies for removal of suspended solids. However, because cross-flow membrane filtration is the preferred technology for radionuclide and metal removal, additional surface water

TABLE 5-1

COMPARATIVE ANALYSIS OF TECHNOLOGIES

Technologies and Assumed Present Worth	Effectiveness	Implementability	Comments
Surface Water Collection			
1. Collection at Sources $341,100	Collection at the source will minimize downgradient contaminant transport which otherwise may contribute to contamination of retention Ponds B-5 and C-2. High flow events will transport dilute concentrations of contaminants downgradient.	Easily constructed using conventional equipment. Worker and public health and safety must be ensured through monitoring and dust control measures during construction.	Effectiveness outweighs difficulties in implementation.
Suspended Solids Removal			
1. Cross-Flow Membrane Filtration $2,833,500	Should reduce TSS to less than 1 mg/l. Proven technology. Likely to meet ARAR for U and evidence suggests ARAR for Pu will also be met.	Reliable based on performance at other installations. Readily available and skid mounted for easy installation. Solids must be removed from backwash water. Reasonably simple O&M.	Also removes dissolved heavy metals and radionuclides.
2. Grandular Media Filtration $946,700	Should reduce TSS to less than 1 mg/l. Proven technology.	Same as for cross-flow membrane filtration.	Less likely to meet ARARs, no benefit derived for removal of dissolved radionuclides and metals.
Radionuclide and Metals Removal			
1. Cross-Flow Membrane Filtration $2,833,500	see above	see above	see above

TABLE 5-1 (cont.)

COMPARATIVE ANALYSIS OF TECHNOLOGIES

Technologies and Assumed Present Worth	Effectiveness	Implementability	Comments
2. Ion Exchange $717,900	Likely to meet ARAR for U; however, meeting ARAR for Pu is uncertain.	Conventional technology, readily available, and easily installed. If regeneration is required, secondary waste generation with increased operational complexity and cost.	Upstream suspended solids removal necessary which may remove Pu to achieve ARAR. Will remove heavy metals.
Organic Contaminant Removal			
1. Activated Carbon $1,676,000	Will meet ARARs for organics provided methylene chloride, acetone, and vinyl chloride are not above ARAR.	Conventional technology, readily available, and easily installed. Upstream radionuclide removal will allow regeneration of carbon in lieu of disposal as a mixed waste. Effective for variable flow and organic loading.	Data suggest vinyl chloride, methylene chloride, and acetone will not be present above ARAR.
2. Air Stripping $1,433,600	Will meet ARARs for organics provided acetone is not above ARAR. Methylene chloride and vinyl chloride, if present, are more readily adsorbed on off-gas carbon than liquid-phase carbon. Will not remove semi-volatiles or highly water soluble organics (acetone, butanone).	Conventional technology, readily available, but installation and operation more complex than liquid-phase activated carbon. Off-gas carbon will be necessary to eliminate transfer of contaminants to the atmosphere. Downstream liquid-phase carbon necessary to achieve compliance with ARARs for organics because of variable organic loading.	Operationally more complex than liquid-phase carbon. Data suggest acetone unlikely to be present above ARAR.
3. UV/Peroxide $2,695,500	Should meet ARARs for all identified organics.	Readily available off-the-shelf units. Less proven technology than air stripping or activated carbon. Effective operation may be difficult with variable organic loading. More costly than air stripping or activated carbon.	Technology of choice for Operable Unit No. 1 IM/IRA; however, influent flow and organic concentration should be relatively constant for that application.

pretreatment for suspended solids removal is not required. Granular media filtration with polymer addition is thus eliminated from consideration in the IM/IRA. At this time, ion exchange cannot be considered a reliable technology for the removal of plutonium and americium because there is no supporting data on its removal efficiency. Moreover, plutonium and americium will likely be colloidal in nature and less apt to readily exchange with ions on the resin surface. The cross-flow membrane filtration system is also reliable, readily procurable, and easily installed.

GAC is the treatment technology of choice for removal of VOCs. GAC is a proven technology that is reliable, easy to operate, and the most cost effective of the three technologies examined. This technology is not suitable for removal of vinyl chloride, methylene chloride, or acetone. However, as discussed in Section 4, these constituents are not expected, in the influent to the treatment system, above their respective ARAR levels. In the event that the field-scale treatability study indicates that vinyl chloride, methylene chloride or acetone are present at concentration levels not appropriate for liquid-phase GAC adsorption, modifications to or replacement of the liquid-phase GAC system will be considered at that time. Although UV/peroxide can oxidize all of these contaminants, effective operation is likely to be difficult with changing organic loadings from a surface water system (i.e., process control). In addition, UV/peroxide is substantially more costly to install and operate than the other organic removal technologies. Air stripping is a viable VOC treatment technology for the South Walnut Creek Basin Surface Water IM/IRA. This process, however, is much more complex by design than liquid-phase GAC, which makes it more difficult to operate and has a higher probability of system downtime. Finally, the cost of air stripping with liquid and vapor-phase adsorption is roughly equal to that for liquid-phase GAC.

Radionuclides and metals will be removed upstream of the GAC unit. The GAC should, therefore, not become a mixed waste and will be suitable for regeneration at any facility that accepts spent carbon for regeneration. This will provide for the ultimate destruction of the contaminants consistent with guidance in the NCP, which requires consideration of remedial alternatives that include an alternative that removes or destroys hazardous substances.

SECTION 6

PROPOSED IM/IRA

6.1 SUMMARY

The preferred South Walnut Creek Basin Surface Water IM/IRA consists of the following components:

1. Surface water collection by diversion at the sources; and
2. Treatment of surface water by chemical treatment/cross-flow membrane filtration ("cross-flow membrane filtration" is used for brevity) followed by liquid-phase GAC treatment.

6.1.1 Surface Water Collection

Figure 4-3 shows the locations of the surface water diversion and collection systems proposed in this alternative. The collection systems are denoted CS-59, CS-61, and CS-132. Collected surface water is automatically transferred to the treatment system by pipeline.

Flows at stations SW-56, SW-60, SW-101, and SW-133 will be collected at the downsteam station SW-61 by a new surface water diversion weir and pump station. The weir will serve to divert up to 37.5 gpm (14 gpm average annual withdrawal rate) from the drainage. Contaminated surface water will be diverted upstream of the weir into a 1,000-gallon precast concrete sump provided with a screen, where large debris is separated from the flow. This screen will require manual cleaning to remove debris. Water will be pumped from the manhole to the treatment facility. When the inflow into the sump exceeds the pumping rate, the excess flow will return through overflow piping to the drainage below the weir.

The seep flow from SW-59 will be isolated from the South Walnut Creek drainage and collected separately from CS-61 using a 500-gallon, precast concrete sump. The sump and installed pump will be designed to collect and transfer the design flow of 4.5 gpm (1 gpm average annual withdrawal rate). Flows

in excess of 4.5 gpm will be discharged to South Walnut Creek, via an overflow pipe, to the drainage. The overflow will enter South Walnut Creek upgradient of CS-61 and will either be collected by or allowed to pass CS-61, depending on whether the creek flow is less than or greater than the 37.5 gpm design flow for CS-61. Upper South Walnut Creek flow will be collected at SW-132 by a new surface water diversion weir and pump station. The weir will serve to divert up to 18 gpm (5 gpm average annual withdrawal rate) from the drainage. Contaminated water will be diverted into a 1000-gallon precast concrete sump. Flow in excess of the design flow (18 gpm) will be permitted to overflow the diversion weir.

The design flow and annual average withdrawal rates for the South Walnut Creek drainage (i.e., CS-59, CS-61, and CS-132) are 60 gpm and 20 gpm, respectively. It is proposed that all surface waters collected and treated in this IM/IRA will be discharged to South Walnut Creek, just downgradient of CS-132.

6.1.2 Surface Water Treatment

The surface water collected will be treated using cross-flow membrane filtration (for suspended solids and radionuclide removal), followed by liquid-phase activated carbon (for organics removal) (Figure 6-1). The respective units and appurtenances will be housed in three 48-foot trailers to protect weather- or temperature-sensitive components. Fire protection within the trailers will be provided by two wall-mounted, 25-pound, dry chemical-type fire extinguishers. The trailers and all treatment units are constructed of non-combustibles. Other than minimal files and records, no combustible materials will be maintained within the trailers. External water pipes will be above ground and heat traced to protect against freezing. All tanks, piping and sumps will be equipped with secondary containment to comply with 6 CCR 1007-3 and 40 CFR 264.193.

Major components of the treatment system include:

Exterior to the Trailers

- (1) 10,000-gallon equalization tank
- piping
- associated pumps, gages, and valves

Interior to Trailer 1

- main chemical reaction system
- solids dewatering system

Interior to Trailer 2

- filtration system
- process instrumentation system
- neutralization system

Interior to Trailer 3

- (2) 60-inch carbon units
- (2) 60-inch standby carbon units
- associated plastic (PVC) piping and valves

As the flows from the different sources are expected to vary, the equalization tank will ensure a somewhat constant flow and loading through the treatment system. The treatment system is designed to run continuously at a maximum flow rate of 60 gpm. At peak flow, this tank will provide approximately three hours of equalization detention time. The average annual influent flow rate, however, is estimated at approximately 20 gpm. Surface water collected during periods of these lower influent flow rates will be allowed to accumulate in the equalization tank and then treated at the system design flow rates.

6.1.2.1 Suspended Solids and Radionuclide Removal

When the treatment is initiated, the water will be pumped from the surge tanks to Trailer 1, and subsequently to Trailer 2, which contain all equipment, tanks, pumps, piping, valves, and instrumentation for cross-flow membrane filtration. The system consists of totally integrated, skid-mounted and automatically controlled units for maximum reliability and minimum operator surveillance. The system is divided into various systems as described below.

Main Reaction System

Radionuclides and heavy metals will be precipitated and/or adsorbed from solution in the main reaction system. The reaction system will include two 1200-gallon tanks sized to ensure complete precipitation or adsorption of radionuclides prior to gravity flow to the filtration system. Chemical metering pumps, controlled by pH or Oxidation Reduction Potential (ORP) monitor/controllers, will ensure that optimum reaction conditions are maintained automatically. The tank will be agitated with a heavy duty electric mixer. The equipment provided in the main reaction system will be as follows:

- (2) 1200-gallon, RFP reaction tanks;
- (2) heavy-duty mixer;
- (2) pH monitors/controllers; and
- (2) chemical metering pump(s).

Ferric sulfate will be introduced to the first tank in a liquid solution. However, a system will be provided to dissolve the powdered chemical reagent, for controlled introduction into the main reaction section. In the powdered chemical make-up system, a covered tank will be periodically filled with water, and powdered ferric sulfate will be added manually in a prescribed amount. A mixer will be provided to assure that the reagent is completely dissolved before it is delivered by a metering pump to the main reaction system.

Lime will be added to the second tank as a slurry to raise the pH. The elevated pH will cause precipitation of the iron as ferric hydroxide and create conditions conducive to the adsorption of uranium and plutonium. The lime slurry will be prepared by filling a tank with water and then manually adding a prescribed quantity of lime to the tank through a chute. The mixture will be well agitated with a heavy-duty mixer. The system will be provided with a dust control hood, filter, and fan.

The above peripheral equipment includes:

- (2) 250-gallon, heavy-duty plastic tanks;
- (2) heavy-duty, rim-mounted mixers;
- (1) slurry recirculation pump and piping (lime); and
- level control switches and alarms, to be integrated electronically with the main system panel.

Filtration System

The ferric hydroxide and suspended solids in the reaction section are removed from the water and concentrated in the filtration system.

The main components of the filtration system are:

- (1) 3000-gallon, Fiberglass-Reinforced Plastic (FRP) concentration tank;
- (2) 30-HP, 700-GPM recirculation pump;
- (28) cross-flow membrane filtration modules; and
- (1) piped-in-place membrane cleaning system.

The concentration tank will be made of fiberglass reinforced epoxy equipped with appropriate baffles and liquid level controls. The recirculation pump will be stainless steel for corrosion resistance and rated at 100 feet of head. The pump will be provided with water-flushed double mechanical seals.

The treated water will be filtered through tubular (1" diameter) filtration membranes made of fluorocarbon polymer, and arranged in trains of 10-tube modules piped in series, supported on accessible horizontal racks. Each module will be 6-feet long and 7-inches in diameter, with a separate outlet for clean effluent. A flow indicating and totalizing meter will be provided on the effluent line. Manifolds will be provided to collect the effluent and direct it by gravity to the neutralization system. The metal/radionuclide suspension will be concentrated to a 2 to 5 percent slurry in the concentration tank, from which it will be periodically pumped to the slurry holding tank and filter press in the slurry dewatering system. The slurry removal rate will be adjusted manually to maintain the desired solids concentration in the filtration section. All piping and valves in contact with the water being treated will be heavy-duty, corrosion-resistant plastic.

Neutralization System

A skid-mounted neutralization system will be provided to adjust the effluent pH to the conditions required for discharge or recycle. The neutralization system will be sized to receive and treat the effluent from the membrane filters. The neutralized effluent will leave the system by gravity. The equipment and components of the neutralization system are as follows:

- (1) 1500-gallon, heavy-duty plastic tank;
- (1) heavy-duty rim-mounted mixer;
- (1) metering pump for acid; and

- (1) separate control panel containing:

  1 pH monitor/controller

  1 pH recorder

  pH out-of-specification alarm

  electrical switches and contactors.

Process Instrumentation System

A central control panel with a National Electrical Manufacturer's Association (NEMA) 4 rating will be provided to house all controls, electrical switches and disconnects, and motor starters. The main items will include the following:

- pH and ORP monitor/controllers/alarms;
- Indicator lights, switches and alarms for major components;
- Motor starters and circuit breakers for all pumps;
- Seal water alarms;
- Level controls and alarms; and
- Effluent flow indicator/totalizer.

All wiring and controls will meet applicable national electrical codes.

Solid Dewatering System

The solids dewatering system will include a 4-cubic-foot filter press using an air-operated slurry feed pump to feed concentrated waste slurry from the concentration tank to the filter press. The filter press will dewater the solid to 35 to 50 percent solids. Based on the preliminary sizing, it is expected that the press will be emptied once every five days. The filtrate produced by the filter press will also be directed back to the

concentration tank or the feed sump for reprocessing. The filter press sludge cake is collected safely and with minimal worker exposure. An air blowdown system automatically removes the sludge cake from the press. The cake then falls through sludge cake chutes mounted under the filter press (elevated) and into drums. Sheeting will be placed around the transfer equipment and drums for splash protection.

6.1.2.2 Organic Contaminant Removal

Organic contaminant removal by GAC is a considerably simpler process. After cross-flow membrane filtration, the surface water will be pumped through two GAC columns in series, operated in downflow fixed-bed mode (Figure 6-1). Two additional GAC columns will be in stock. Each carbon column is 60 inches in diameter and 87 inches high and contains 2000 pounds of carbon. Based on a flow rate of 60 gpm, the hydraulic loading to each column will be approximately 3 gpm/ft^2. Empty bed contact time for each column will be approximately 18 minutes. The columns are of stainless steel construction and will be interconnected by flexible pipe with 2-inch camlock hose connections. Once the column is drained of water, the unit is a shipping container for returning the carbon for regeneration.

6.1.2.3 Effluent Discharge

Following treatment, the water will continuously discharge to South Walnut Creek just downgradient of CS-134. Samples will be collected and analyzed twice per week. In the unlikely event of off-specification processing or treatment process failure, the treatment system discharge will at most return the drainage to its pre-IM/IRA condition. In addition, detention, treatment, and monitoring at Pond B-5 provides a downgradient safeguard.

6.2 OPERATION AND MAINTENANCE

6.2.1 Surface Water Collection

The collection systems are relatively maintenance free. Manholes, sumps, and backwater pools will require periodic cleaning to remove accumulated solids. Pumps will also require routine inspection and maintenance.

6.2.2 Cross-Flow Membrane Filtration

The cross-flow membrane filtration system's instrumentation and controls will monitor and automatically adjust chemical feed rates. System level switches will automatically operate the feed and process pumps to allow for the continuous flow of surface water through the system. Interlocks and alarms will automatically shut down the system if critical components are operating outside the design limits. Therefore, the system will be capable of processing surface water with only minimal operator attention. However, operator attention required for the system, estimated at less than two hours per shift, will include these tasks:

1. Maintaining appropriate solids concentration in the concentration tank by adjusting the amount of waste slurry feed to the dewatering section;
2. Replenishing chemicals as needed;
3. Routine cleaning and calibration of pH or ORP probes; and
4. Periodically initiating the cleaning cycle and changing the cleaning solution. Typically, a cleaning cycle takes less than 1 hour and is carried out once every 40 to 80 hours of system operation.

The filtration system includes a cleaning loop to provide for rapid convenient in-place cleaning of the membrane surface. This includes two 500-gallon polypropylene tanks, an all-plastic cleaning pump (5 HP, 100 gpm at 80 feet of head) and appropriate valves and piping so that the periodic cleaning procedure can be carried out conveniently and quickly. Actual operating experience will determine the cleaning frequency

required for optimum performance of the system. During the cleaning procedure, fresh water is used to flush the waste slurry from the modules back to the concentration tank, and a cleaning solution (usually a strong acid) is circulated through the modules with the cleaning pump for a few minutes. Finally, the cleaning solution is flushed from the modules with clean water. Provision is made to reprocess the cleaning solution as part of the normal waste stream so that only clean effluent leaves the system.

6.2.3 Activated Carbon

Operation and maintenance of the GAC system is also relatively simple. To completely utilize the carbon, the columns will be arranged in series, allowing the lead column to become fully exhausted for subsequent regeneration while the second (polishing) column ensures effluent quality. Periodic samples will be taken from the effluent of each unit, and when the lead unit effluent exceeds chemical-specific ARARs, the lead carbon column will be removed, the polishing (second) column will become the lead column, and a stock carbon column will be put in service as the polishing unit. This is expected to occur every three weeks. The carbon column with the exhausted carbon will then be shipped to an off-site location for regeneration.

6.3 ADDITIONAL DOCUMENTS

In addition to this IM/IRA Plan, EG&G will also be preparing the following documents:

- Site Specific Health and Safety Plan (SSHSP) for construction and operation of the IM/IRA;
- Community Relations Plan (CRP);
- detailed design plans and specifications;
- detailed "as-built" drawings incorporating all field changes to accurately reflect the constructed surface water collection and treatment system; and
- an Operation and Maintenance Manual (O&M) for the IM/IRA.

The SSHSP and O&M Manual will be prepared after the IM/IRA design is finalized since these documents provide project-specific procedures for construction and operating activities. The CRP will be available for public comment on 30 January 1991 and will be implemented in August 1991.

6.4 TREATABILITY STUDIES

A preferred surface water treatment system for the proposed IM/IRA has been selected in spite of several informational constraints. First, it is uncertain, although unlikely based on the available data, that methylene chloride, vinyl chloride, and acetone are present within South Walnut Creek Basin surface waters. Second, limited treatment technology performance data currently exist for removal of plutonium and americium from natural waters. This is particularly true in the case of ion exchange. Finally, the physical state of plutonium and americium (i.e., dissolved vs. colloidal) in surface waters is not completely understood, nor have the radionuclides that contribute to the gross alpha and beta activity been defined. The selected treatment system is the logical choice given the available surface water quality data, literature information regarding plutonium and americium chemistry and treatment processes for their removal, and best engineering judgement.

However, treatability studies are appropriate to confirm the selection of the preferred treatment system or to provide the basis for selection of an alternative system should the preferred system be judged to not perform adequately.

The DOE will conduct bench- and field-scale treatability studies to determine the effectiveness of cross-flow membrane filtration, GAC, ion exchange and other technologies in treating South Walnut Creek Basin surface waters. Objectives of the bench-scale study include determination of applicability of the treatment technology, quantification of major operating parameters, evaluation of performance relative to meeting chemical-specific ARARs and reevaluation of capital and operating costs. GAC will be tested using a field treatment unit which will be deployed in the northwest portion of the East Trenches Areas for treatment of

surface water from stations SW-59, SW-61, and SW-132. The initial operational unit of the field unit is expected to be installed and started up in the Spring 1991. Because this first unit (the GAC system) will be used primarily to demonstrate organic contaminant removal efficiencies, it will not be expected to attain chemical-specific ARARs for metals and radionuclides by itself. Additional units will be added over a several month period to evaluate metals and radionuclides removal. Operation of this field-scale facility will include testing and modification of the original equipment as well as the addition of support equipment and/or alternative treatment elements. A summary report of the treatability study findings will be submitted to the regulatory agencies upon completion of the program. The results of these tests and the bench-scale treatability studies may indicate that it is not practicable to attain all ARARs for the Surface Water IM/IRA. Final performance requirements for the IM/IRA will require approval by the regulatory agencies.

SECTION 7

ENVIRONMENTAL EFFECTS OF THE PROPOSED INTERIM REMEDIAL ACTION

The proposed surface water IM/IRA, and potential subsequent environmental and human health effects resulting from this action, are evaluated in this chapter. Environmental impacts to air quality, water quality, terrestrial features (including wildlife and wetlands), archaeology and historic sites, and short- and long-term land productivity are discussed in Sections 7.1, 7.2, 7.3, 7.4 and 7.5, respectively. Human health exposure risks from installation, routine operations, and accidents are analyzed in detail in Sections 7.6 and 7.7. These analyses evaluate the risks to workers involved in the IM/IRA, to other RFP site employees, and to the general public. The commitment of resources (material/human), transportation impacts and cumulative impacts are discussed in Sections 7.8 through 7.10.

7.1 AIR QUALITY

There are three potential air quality impacts associated with the proposed OU 2 IM/IRA to selectively collect and treat surface water within the South Walnut Creek Basin OU 2 from surface seeps and surface water monitoring stations. These are:

1. Potential VOCs released from exposed contaminated liquids during construction activities (i.e., sump installation, trench excavation) or at surface water collection, storage, and treatment locations, as part of normal operations or accident conditions.
2. Fugitive dusts and fossil fuel consumption related exhausts resulting from activities such as excavation, construction, operations, maintenance, and monitoring.
3. Water treatment process off-gassing released to the environment as part of normal operations or accident conditions.

Air quality impacts from VOCs released during construction activities (e.g., excavation) will be minimal when compared to the normal operational activity at the Rocky Flats Plant. The "Phase II RFI/RIFS Workplan" for OU 2 shows VOCs have been detected in the South Walnut Creek Basin soils and include acetone (up to 500 ppb), and bis(2-ethylhexyl) phthalate (4,600 ppb) (EG&G, 1990a). Table A-10 in Appendix A presents the

test results for VOCs compiled as part of this report. Due to their isolated occurrence, and the limited amount of excavation planned, the amount of VOCs released during this construction activity are not likely to cause measurable changes in the ambient air quality. Based on sample analyses to date, VOC concentrations in soils at South Walnut Creek are insignificant. Consequently, normal construction activities and excavation for sump installation, buried pipeline/utilities and preparation of the pad area for the treatment system may not release VOCs to the atmosphere. Preliminary characterization, based on the Phase I RI Report, indicates the presence of elevated concentrations of semi-volatile organic chemicals (phthalates) in the soil. Any airborne releases of semi-volatile organic chemicals will be from fugitive dusts associated with construction activities and will be controlled as discussed below.

Dust associated with construction and operational activities will be controlled as specified in the Environmental Restoration's Health and Safety Program Plan (ERHSPP). The ERHSPP addresses the minimum health and safety requirements for outside contractors as dictated by the ER Department and the Health Safety (HS) Department. The ERHSPP is in final form and is currently undergoing a final review by EPA and CDH. The ERHSPP outlines the requirements for a project-specific or Site Specific Health and Safety Plan (SSHSP) that identifies construction tasks, potential hazards, and the steps to control hazards. The SSHSP will be prepared in accordance with guidelines set forth in the ERHSPP, and will be completed after the IM/IRA design is finalized since this Plan provides procedures for specific IM/IRA construction and operating activities. The SSHSP must be approved by the ER and HS Departments, and will be reviewed by EPA and CDH.

Upon approval of the SSHSP, the outside contractor is briefed and assigned an RFP construction engineer. This engineer is responsible for construction management and implementation of the SSHSP by the contractor. The HS Department will then issue a renewable one-week permit, conditional on the workers being briefed and understanding the health and safety concerns of the construction effort. The construction is monitored by the HS Department for contractor adherence to the SSHSP.

In addition to these requirements, the ER Department has developed wind speed and dust control shut-down limits as guidelines for the 881 Hillside IM/IRA. Similar project document guidelines will also be required for construction of the South Walnut Creek Basin IM/IRA at OU 2.

Dermal exposure, inhalation, and inadvertent ingestion of airborne radioactivity and VOCs on fugitive dusts is analyzed in Section 7.6, "Personnel Exposure-Routine Operations". Pollution from engine emissions, fugitive dust generation by vehicles and particulates from tire wear are analyzed separately in Section 7.9, "Transportation Impacts".

Collected contaminated surface water will be processed through the proposed cross-flow membrane filtration system and activated carbon system facility. Due to the low VOC concentrations in the surface water, the proposed treatment system will not produce measurable VOC emissions; therefore, no changes in the levels of these gases in the ambient air off site is expected. The need for periodic membrane cleaning will require the use of a small amount of sodium hypochlorite (NaOHCl). This could occur once every 2 to 4 weeks and will not impact off-site air quality.

The cross-flow membrane filtration system incorporated into the water treatment system to remove suspended solids, dissolved metals, and radionuclides may not contribute to emissions during normal operations or back flushing operations. Mixing of chemicals for water pretreatment or strong acids or bases used for hardware cleaning operations may contribute to odors within the confines of the water treatment trailers and should be controlled by adequate ventilation. These odors will not be noticeable from outside the treatment facility area, nor will they be a hazard to workers in the trailers under normal circumstances. Spills of chemicals that might be involved in accident conditions will be administratively controlled by actions specified in the Operational Safety Analysis (OSA).

The OSA addresses health and safety concerns originating from routine site operations. It is similar to the SSHSP in that health, safety, and environmental hazards are identified and evaluated for control. This

analysis is also reviewed by and must be approved by the HS Department. Training is required prior to operation with oversight and monitoring by the HS Department.

Operation and maintenance of the GAC system are simpler than for the cross-flow membrane filtration system. The GAC columns, containing exhausted carbon, will be shipped to an off-site location for regeneration. Spills of liquids associated with the operation of the GAC columns will be limited to the effluent exiting the cross-flow membrane filtration system, which will have removed many of the constituents of concern. The effluent water from the membrane filtration treatment system may contain some amount of VOCs. Effluent concentration requirements are contained in Table 4-1, Basis for Design of Surface Water Treatment.

7.2 WATER QUALITY

The proposed IM/IRA will reduce the contaminant loading to South Walnut Creek. Surface water runoff entering excavated areas and exceeding the design capacities of the system may create soil entrainment (sediment transport) by surface runoff ending in open waters on site. The amount of water exceeding the design capacity of the collection system should be minimal.

Some excavation will occur in soils that are expected to have measurable levels of semi-volatile organic chemicals, primarily phthalates. Because phthalates adsorb onto the soil particles and thus are not transferred from soil to water in measurable quantities, surface water runoff should not cause a water quality concern as long as erosion control measures are applied to all soils excavated during remedial action. The IM/IRA construction specifications will include post-excavation erosion control measures. Techniques may include, but not be limited to fiber composite nets, grouted riprock, hydromulching, and seeding.

South Walnut Creek Basin soils within OU 2 are contaminated with plutonium and americium (Rockwell International, 1989a). Prior to construction work for the surface water contamination cleanup, surveys will be

performed to detect any presence of elevated radioactive contamination. Elevated radioactive contamination will be handled in accordance with the SSHSP procedures.

For the cross-flow membrane filtration system, the greatest potential for negative water quality impacts results from chemicals involved in the pretreatment of the waste stream and concentrated acids or bases utilized periodically for descaling of equipment. Handling of the concentrated cleaning chemicals will be governed by an OSA, as will the precautions for handling the dewatered solids generated in the water treatment process.

Dewatered solids will be handled as a low-level mixed waste. This will require solidification at an existing RFP facility to meet the transportation and disposal requirements. The solidified waste will be disposed of at the Nevada Test Site or similar facility after it is sampled and analyzed to determine compliance with recently promulgated RCRA land ban restrictions.

The volume of waste will not be a major addition to those wastes already processed at the RFP. The collection, transport, and treatment of the dewatered solids will be in accordance with standard Plant operating procedures and does not present a significant hazard to on-site or off-site water quality.

The GAC adsorption system will provide even less prospects for negative impact to water quality on site than the cross-flow membrane filtration system. The carbon columns will be fully self-contained and hold approximately 2,000 pounds of carbon. The units are shipped to an off-site location for regeneration. Approximately one gallon of water per 3 to 4 pounds of carbon (500 gallons) could be spilled during unit changeout of the carbon column. This possibility is mitigated by the use of secondary containment which captures all of the potentially spilled water. The net effect is that there will be no spill during carbon column changeout. Procedures will be established for the safe changeout of the exhausted GAC columns. The transport of the exhausted GAC columns will be in accordance with standard Plant and project-specific operating procedures and presents a negligible hazard to on-site or off-site water quality.

7.3 TERRESTRIAL IMPACTS

Terrestrial environment features that may be negatively impacted by the proposed IM/IRA include animal life, plant life, and land forms (including wetlands). These negative impacts are expected to be minimal, because of the disturbance to the areas of concern caused by the Plant's construction and operation during the past 37 years. These past disturbances have left the 903 Pad with an asphalt pad cap and the East Trenches Area has surface evidence of burial trenches. The effects of the IM/IRA will not significantly impact the already-disturbed areas. Numerous species of animal and plant life have been identified at the RFP. No animals are classified as rare or endangered (DOE, 1980).

Rocky Flats flora have been identified through an on-site inventory by Dr. W.A. Weber, et. al., (Weber, 1974), from the University of Colorado. The inventory revealed 327 species of vascular plants, 25 lichens, 16 bryophytes, and one macroscopic green algae. None are threatened or endangered.

The proposed site for the treatment facility trailers is in the northwest section of the East Trenches Area, north of IHSS-110. Leveling, either by the addition of clean fill material or grading, will cause minimal adverse impact to the area. Construction activities could be potentially locally destructive to the vegetation and ground-dwelling rodents, reptiles and invertebrates, but this impact is expected to be minimal. None of the potentially affected vertebrates, invertebrates or vegetation in the disturbed areas are threatened or endangered. No critical habitats are known in the study area. The proposed IM/IRA will have minimal negative impact to South Walnut Creek.

Two surface water collection points (SW-59 and SW-61) that feed South Walnut Creek were observed in April 1990. Flows were recorded at 37.3 GPM for SW-61 and at 4.5 GPM for SW-59. A third surface water collection point, designated as SW-132, is expected to produce 18 GPM. Diversion of water from SW-59, SW-61 and SW-132, processing the water through the proposed treatment plant, and re-introducing the water just downgradient of SW-132 should have no impact on the water resources management of South Walnut Creek.

The proposed IM/IRA is not expected to have an adverse effect on linear wetlands. In 1989, EG&G authorized the preparation of a wetlands assessment for the entire Rocky Flats Plant site (EG&G, 1990b). This report identified 107 acres of areal wetlands and 84,970 feet of linear wetlands within the Rocky Flats Plant site. South Walnut Creek is identified as one of six ephemeral streams traversing the property and is considered relatively important as part of the site drainage system. The proposed action, as it impacts wetlands, will not be discernible from current stream management.

No wetlands impact is expected from treating water prior to reintroduction into South Walnut Creek. The proposed action calls for withdrawal of up to 37.5 gpm of contaminated surface water from station SW-61, 4.5 gpm from SW-59, and 18 gpm from SW-132. Water from these collection points will be diverted into properly sized sumps and piped to a treatment plant equalization tank to provide the treatment plant with a constant feedstock. Water from the treatment plant will be reintroduced into South Walnut Creek immediately downstream of CS-132. Water diverted from the sources would be removed from the surface water system for no more than 3-4 hours at 60 GPM and for no more than 48 hours at very low flows.

As mentioned earlier, treated water from the treatment system will be discharged into South Walnut Creek, just downgradient of CS-61 (the surface water collection system of SW-61). The South Walnut Creek basin contains a series of five on-channel reservoirs. The last pond in the series, Pond B-5, discharges directly into South Walnut Creek. Water volume is managed by these ponds and is discharged directly to South Walnut Creek in accordance with the Plant's NPDES Permit. Discharged water follows the South Walnut Creek drainage north to the natural Walnut Creek drainage. Surface water flow in Walnut Creek near the property boundary is currently being diverted around Great Western Reservoir, which is a drinking water source for the City of Broomfield, and is then returned to the natural drainage channel. Due to the ephemeral nature of South Walnut Creek, no impact to wetlands is anticipated as a result of the proposed action to treat surface water.

Although no long-term impact to wetlands is anticipated, it is possible that construction activities could adversely affect a few wetlands plants during ditch modifications or sump installation. Replacement of any

destroyed wetland plants will follow the completion of construction, resulting in no net impact to wetlands at the RFP.

7.4 ARCHAEOLOGY AND HISTORIC SITES

The 903 Pad, Mound and East Trenches Areas have been highly disturbed over a number of years. Due to this disturbance and the topographic position of the subject area, the State Office of Archaeology and Historic Preservation has determined that this action will not impact cultural resources (Burney, 1989).

An archaeological and historical survey of the RFP was conducted between July 18 and August 22, 1988, which determined two sites have potential eligibility to the National Register of Historic Places. However, insufficient information currently exists to make this determination. These two sites are located northwest and southwest of the investigation area, and will not be disturbed by the proposed action (Burney, 1989).

7.5 SHORT- AND LONG-TERM LAND PRODUCTIVITY

Land within OU 2 is currently undeveloped and will remain so for the foreseeable future as part of the Rocky Flats Plant. OU 2 lies within the Rocky Flats Plant security boundaries and is not accessible to the general public.

7.6 PERSONNEL EXPOSURES - ANALYSIS METHODOLOGY

The effects of personnel exposures to hazardous chemicals have been estimated in terms of increased risks of either developing cancer (carcinogenic risk) or some other adverse health effect due to the exposure (noncarcinogenic risk). Analyses were done separately for those directly involved in remedial actions (workers), other RFP personnel not directly involved in remedial actions (site employees), and off-site individuals (general public). Detailed risk assessment calculations are provided in Appendix G.

Airborne contaminant concentrations at the receptor (site employees, general public) locations were estimated using the Gaussian Plume Equation of Pasquill as modified by Gifford (1961) for ground-level concentrations at the centerline of the plume. Assuming a ground-level release, the equation becomes:

$$\chi/Q = (\pi \sigma_y \sigma_z u)^{-1}$$

Where:

χ	=	air concentration, mg/m^3 or ci/m^3
Q	=	emission rate, mg/sec or ci/sec
u	=	wind speed, m/sec
σ_y	=	horizontal dispersion coefficient, m
σ_z	=	vertical dispersion coefficient, m

The dispersion coefficient value is a function of the downwind distance, whether the contaminant emission is a long-term (construction, operation) or a short-term (accident source), and the prevailing meteorological conditions (Pasquill Stability Class). Long-term dispersion coefficients were calculated using Briggs formulas for open country conditions (Gifford, 1976), Pasquill Stability Class D (prevalent condition per RFP EIS), and average annual downwind directional frequencies. Short-term dispersion coefficients were calculated using formulas developed by Slade (1968), Pasquill Stability Class F, and no wind directional averaging.

The toxicity assessment (intake and risk) for carcinogenic and noncarcinogenic effects of chemicals was performed in accordance with the EPA's Risk Assessment Guidance for Superfund Sites (EPA, 1989). EPA's Integrated Risk Information System (IRIS) was utilized as the primary source for toxicity information (RFDs and slope factors). EPA's Health Effects Assessment Summary Tables for the fourth quarter of FY 1990 (EPA, 1990b) were used as a secondary source of information. For organic chemicals, inhalation toxicity values (RFDs, slope factors) were estimated using the oral pathway values in those instances where inhalation values were not available. It would be expected that the toxicity values for both pathways would be similar due to similar absorption efficiencies for organic materials.

Estimates of carcinogenic risks were calculated for each of the organic chemicals identified in Table 4-1, and the individual risks summed for a total carcinogenic risk. The carcinogenic risks are considered to be

cumulative for the entire period of exposure and the calculations yield an estimate for the lifetime increased risk of cancer.

Noncarcinogenic risks are considered "threshold" events. That is, no effect is observed below a given exposure. The potential for increased health effects are expressed in terms of the non-cancer hazard quotient, which equals the exposure level divided by the reference dose (noncarcinogenic toxicity value). The EPA methodology assumes that a quotient value of less than one is unlikely to result in adverse health effects, even for sensitive population groups. Generally, the greater the quotient value above unity, the greater the level of concern. Chronic or subchronic reference dose values were utilized in the non-cancer hazard quotient calculation, depending on the potential duration of the exposure.

Exposures to site employees and members of the general public were analyzed based on a single, hypothetical individual for each exposure category. Site employees were assumed to be assigned, eight hours a day for the duration of the release, to whatever building would receive the greatest average airborne exposure. For the proposed action, the nearest occupied locations resulting in the greatest exposure to other site personnel include Building 988, 995, and the Gate 9 guard post (inner guard post on east access road). The analysis of the impact to the general public assumed a single individual would remain at the point of highest exposure (due east at Plant boundary) accessible to the general public for each pathway, twenty-four hours per day, for the entire duration of the release. These calculations provide an upper bound for the increased risks to an individual from each of these groups. During the remedial action, it is unlikely that any worker, site employee, or member of the general public would exceed or even approach the risks estimated for their respective group.

In calculations of the estimated increased risks to members of the general public from hazardous chemicals, the impacts on infants and young children were calculated separately from those on adult members of the population. Infants and young children differ from adults in the rate of uptake of the hazardous chemicals and in body weight. Both of these factors influence the calculations of increased risk. To assess noncarcinogenic risks, non-cancer hazard quotients were estimated for both children and adults. The numbers

quoted in the text of this document are those for the group with the greatest increased risk or concern. Carcinogenic risks to a member of the general public were estimated assuming exposure for the entire length of the release, which was conservatively assumed to be thirty years. Two exposure categories were considered: 1) the member of the public is already an adult when the project starts; and 2) the individual is assumed to be a child for the first five years of remedial action and an adult for the remaining 25 years. The numbers in the report represent whichever analysis yielded the highest increased risk of cancer.

The intake of radioactive materials has been assessed by calculating total intake by individuals and converting that to Committed Effective Dose Equivalent (CEDE) using the exposure-to-dose conversion factors for inhalation (Table 2.1 of EPA, 1988). Internal Dose Conversion Factors for Calculation of Dose to the Public, Part 2 (DOE, 1988a), was used to assess dose to the public. The calculated exposure values are then compared with the applicable DOE limits for each receptor group. DOE Order 5480.11 (DOE, 1988b) establishes a limit of 5 rem (effective dose equivalent) per year for occupational workers. DOE Order 5400.5 (DOE, 1990b) incorporates a Clean Air Act (CAA) limit of 10 mrem (effective dose equivalent) per year for members of the public from routine airborne emissions and a dose limit of 100 mrem per year from all exposure modes.

7.7 PERSONNEL EXPOSURES - ROUTINE OPERATIONS

7.7.1 Worker Exposure Risks

Workers involved in the installation of collection facilities and those involved in operation of the facilities associated with the remedial action may experience increased risks through several pathways:

1. Airborne exposure to VOCs near construction activities, equipment installation, or within the facility.
2. Dermal exposure to organic and inorganic chemicals or radioactive materials, especially during construction activities.

3. Inhalation of organic chemicals, inorganic chemicals, or radioactive materials on fugitive dust, especially those generated during construction activities.

Airborne Exposures to VOCs

It is proposed that the treatment facility be located in the East Trenches Area, northwest of IHSS-110. Associated piping and utilities will be located, to the degree possible, to avoid soils contaminated with VOCs. There will be monitoring to assess possible exposures to VOCs during these construction activities. Protective measures appropriate for the level of VOCs detected will be specified in the SSHSP to protect the workers. The potential for chronic or routine exposure of workers to VOCs resulting from operations and maintenance tasks will be small. OSA procedures will be established to control potential hazards to workers.

The treatment facility trailers will be ventilated to prevent the buildup of VOC vapors in the work environment. The process reaction, concentration, and neutralization tanks will be equipped with hinged covers to minimize the introduction of VOC vapors into the work area. The filtration, dewatering, and carbon adsorption units are closed systems and thus will not act as VOC vapor sources. Periodic (every 1 to 3 days) removal of dewatered solids (sludge) from the dewatering equipment will be necessary. This will require opening of the filter press housing and potential short-term exposure to VOC vapors. Facility ventilation and OSA procedures will provide appropriate personnel protection. The wet consistency of the sludge will preclude potential aerosolization of radioactive particulates and associated exposure from inhalation. The dewatered solids will be handled as a low-level mixed waste. Outdoor operational tasks, such as maintenance of the surface water collection system, will be performed in accordance with the appropriate OSA.

Activities that might lead to nonroutine exposures, such as opening tanks or other maintenance operations, will be of short duration and will not lead to chronic exposures. Monitoring these activities will be necessary, however, to determine that adequate protective measures were used to assure that workers were not exposed to VOC levels exceeding appropriate limits for the individual chemicals.

Dermal Exposures

As with airborne exposures, potential dermal exposures will be controlled with the implementation of SSHSP and OSA procedures. Potential levels of protection from splashing and contact with contaminants include the use of gloves, protective clothing, goggles, and hoods.

During construction activities for the proposed action, there will be little or no potential for dermal contact with soil contaminated with VOCs. The treatment facility will be constructed in the East Trenches Area, northwest of IHSS-110, where VOC contamination levels are anticipated to be low. The piping for the water treatment facility will be routed through uncontaminated soil to the extent possible. Any excavated soil from designated IHSSs will be treated as a RCRA mixed waste until determined otherwise. Inorganic chemicals and radioactive materials identified in the work areas are not readily absorbed through the skin and would result in a negligible exposure pathway.

Personal protective measures may be necessary during some routine operations activities where there is a potential for contact with contaminated water (e.g., routine water sampling or solids removal in the treatment facility). If such measures are necessary for the protection of the workers, they will be specified in the OSA for those activities.

Inhalation of Fugitive Dust

Fugitive dusts are likely to be generated during construction activities for the water collection and treatment facilities. The Phase II Sampling Plan (EG&G, 1990a) includes soil sampling in the areas of interest, but the results are not yet available. For this reason, the surface soil conditions have been estimated using available soil samples from the Phase I RI/FS (Rockwell, 1987a). Where soil samples were not available, the nearest soil samples located between the area of interest and the most likely source of contamination have been used.

The soil sample results indicate that the only organic chemical of concern in soil above the water table is bis-(2-ethylhexyl)phthalate. Acetone and methylene chloride were reported but are suspected to be laboratory contaminant artifacts. Consequently, it is the only significant organic chemical contributing to carcinogenic and noncarcinogenic effects from the fugitive dust pathway. The radioactive contaminants of concern from the fugitive dust pathway include plutonium and americium. The contaminant levels in the surface soils for CS-59, CS-61, CS-132, and the treatment facility are based on data from the nearest available borehole.

Dust control measures will be specified in the SSHSP to limit inhalation exposures to workers involved in construction activities. These measures will be derived from the PPCD. Even if workers were to be exposed to the maximum dust loading permitted by OSHA regulations for nuisance dust during the entire period of construction activities, the effects of either fugitive radioactive material or phthalates would be insignificant.

The contaminated surface water collection stations will have surface piping routed to the treatment facility. Consequently, transfer of contaminated surface water by tanker truck will not be required and will not result in a fugitive dust source term during operations. Occasional travel to the surface water collection stations will be required for maintenance or surveillance purposes. While some fugitive dust may be generated in the wake of the vehicle, it is not expected to be a significant exposure pathway for the vehicle operator or other construction personnel.

7.7.2 Site Employee Exposure Risks

Other workers at the RFP site could be exposed to low levels of VOC vapors released during normal operation and to fugitive dust generated during installation and operation of the facilities associated with the proposed action.

Although the vent on the feed equalization tank (see Figure 6-1) on the water treatment facility will have an activated charcoal filter attached, in order to estimate an upper bound to personnel exposure, a calculation

was performed to determine the potential VOC releases from the vent without a filter attached. Since that tank is the largest single tank in which untreated water is collected, it was chosen as the tank which, if unfiltered, could lead to the greatest exposures to other site employees or the public. Any other tanks, sumps, or pump vents would lead to lower exposures and lower risks. In the calculation, it was assumed that the liquid in the tank was at the contamination levels listed in Table 4-1 and that the vapor in the tanks had reached equilibrium with the liquids. It was further assumed that the vapors are displaced by in-flowing liquids at an average rate of 60 GPM, the design processing rate. That is, it is assumed that the average liquid inflow must equal the processing flowrate, but no credit was taken for water being removed from the tank. Under these circumstances, the maximum total cancer risk and total non-cancer hazard quotient would be very low.

There will be dust generated during the construction of the water collection facilities as well as the water treatment facility. Although dust suppression measures will be implemented in accordance with the PPCD and SSHSP, the following conservative analysis, which assumes no dust suppression measures and high estimates of areal disturbance and construction time, has been used to estimate health risks from dust generation. The dust generation rate was estimated using the construction generation rate of 1.2 tons per acre per month (average soil moisture conditions) from AP-42 (EPA, 1985). AP-42 is an EPA document for estimating source terms for air pollutant emissions. It was assumed that the project would create dust over an average area of one acre for two months. This multiplication led to a calculated average generation rate of 4.2×10^{-4} kg of dust per second. To be conservative in calculating the exposure of site employees, it was assumed that all the dust was generated at the surface water collection stations, since this would produce the maximum exposure to personnel at Buildings 988 and 995. The approach utilized to estimate surface contamination levels contributing to fugitive dust has been discussed in the fugitive dust portion of Section 7.7.1 of this report. Using a wind direction weighted dispersion factor (X/Q) from CS-134 to Buildings 988 and 995 of 2.43×10^{-4} seconds per cubic meter, it is estimated that an individual assigned to the buildings for the full sixty-day duration of the construction activities would receive a maximum dose of 0.4 mrem CEDE from radioactive materials in the fugitive dust. The corresponding incremental cancer risk and non-cancer hazard quotient due to the presence of phthalates and metals in the dust were calculated to equal 3×10^{-6} and 4×10^{-3}, respectively.

As noted previously, the only potential fugitive dust source term associated with interim action operation is occasional travel to the surface water collection stations for maintenance or surveillance purposes. Due to the infrequent nature and short duration of any travel to the collection stations, chronic exposures to other site personnel from fugitive dust are not anticipated.

7.7.3 Risks to Members of the Public[1]

Members of the public could be exposed to the same sources of risk as described in the previous section for other RFP site workers. The airborne concentration of the fugitive dust would be less for members of the public because of the greater dispersion distance from the source.

The public may be exposed to fugitive dust containing phthalates, and plutonium generated during the construction phase of this action. The maximum dose to a member of the general public from radioactive contaminants present in dust generated during construction activities would be about 2×10^{-3} mrem CEDE. This is very low and well within airborne exposure limits of 10 mrem per year to any member of the general public (DOE, 1990b). The maximum incremental cancer risk to a member of the public due to phthalate and metal contamination within the dust was calculated to be negligible during construction, with a value of 6×10^{-8}. The corresponding non-cancer hazard quotient was calculated to equal 8×10^{-5} for construction activities. As discussed in Section 7.7.2, some fugitive dust may be generated in the wake of vehicles traveling to the water collection stations during normal operations for maintenance or surveillance activities. Due to the infrequent nature and short duration of this travel and the distance to the plant boundary (approximately 1 mile), any public exposure is expected to be insignificant.

As discussed in section 7.7.2, potential VOC releases from the feed equalization tank were analyzed to provide an upper bound on the risks from releases from other, unfiltered tanks. Using the same

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[1] Throughout this report, the term "general public" has a special and very restricted meaning. In order to estimate the maximum exposure or risk to any individual outside of the RFP site, all estimates are based on exposure to a person at the site boundary location having the highest average airborne concentration who remains there for 24 hours each day, 365 days each year, for the duration of the operation or the remedial action.

assumptions as described in section 7.7.2, the maximum cancer risk and non-cancer hazard quotient for a member of the public would be very low.

7.8 PERSONNEL EXPOSURE - ACCIDENT

Any accidents that may occur during the construction phase of the proposed action are those typical of small excavation or construction activities. The SSHSP will identify appropriate precautions and responsibilities for each job. Workers will be familiar with the SSHSP and a copy of it will be available at the work site. No credible accident during construction would lead to exposure of either workers, site employees, or members of the public to levels greater than those resulting from the severe accident case analyzed below.

During operation, accidents that could impact either workers or members of the public would include fires or major spills of contaminated material. Spills of untreated water within the treatment facility would create the potential for short duration airborne VOCs. Uptake of contaminants by workers involved in the cleanup would be controlled by following safety precautions specified in the OSA. Any airborne VOC releases through ventilation systems that could lead to exposures of other RFP employees (site employees) or the general public would be less than the tank rupture discussed later in this section.

The initiation and propagation of fire within the treatment facility is a credible accident. The facility trailers are equipped with chemical fire extinguishers; however, the trailers will not normally be occupied once operations become routine. Any VOC releases would be bounded by the severe accident case since concentrated VOCs would be contained within the activated charcoal columns which are closed components and filled with water. Solids which are in the filter press housing or which have been removed and placed in metal containers constitute a potential radioactive material source term. A fire would have to both dry out and aerosolize the solids as well as breach the metal containment to result in a radioactive release. Since the solids are inorganic and in a sludge form containing 60 to 70 percent water and are within metal containers, and the trailer is the only major combustible material present, it is concluded that the fire duration and intensity would be insufficient to result in a radioactive material release resulting in any significant impacts.

If any workers were present during an accident involving the rupture of the inlet tank, the danger of traumatic injury would be a greater concern than intake of hazardous chemicals or radioactivity. The radioactive materials present in the water are not volatile, nor are they readily absorbed through the skin, so they do not present an ingestion hazard to the workers at the scene of the incident. The organic chemicals are low in concentration and would not volatilize immediately. Thus, while the airborne concentration levels near the tank would be higher than off-site or other on-site locations, the workers would be aware of the incident and would either evacuate or take protective actions, thus limiting their total exposure to the hazardous material.

7.9 COMMITMENT OF RESOURCES

The scope of the proposed IM/IRA is small and the resources (material/human) for construction and operation of this surface water treatment system will likewise be relatively small. No significant commitments of valuable resources are involved.

With the exception of the land area, all of the materials for construction and operation of the water treatment system will be irrevocably and irretrievably committed to the implementation of the remedial action. Most of these resources are normally consumed at the Plant at a rate which makes the requirements of the remedial action insignificant. The water pretreatment chemicals and cleaning solutions are already in use at the RFP. The chemicals for the cross-flow membrane treatment system and the carbon canisters are all readily available from off-site sources. Process chemicals, cleaning agents, and carbon will all be available within the Denver metropolitan area.

7.10 TRANSPORTATION IMPACTS

Human health impacts normally incident to transportation include vehicle emissions in addition to possible traumatic injuries and fatalities resulting from vehicular operations.

Normal transportation produces engine emissions, fugitive dust generated by vehicular traffic on unpaved surfaces, and particulate from tire wear. The table below presents an estimate of emission rates for the operation of a typical truck.

TRUCK EMISSIONS RATE

Pollutant	Emission Rate (lbs/100 gal. fuel)
Hydrocarbons	13.1
NOx	286.0
SOx	31.2
CO	123.5
TSP	17.7

The impacts on health resulting from transportation during the proposed action includes the potential for both pollution- and accident-related impacts. The table below presents estimates of risks resulting from truck transportation (Rao, 1982).

HEALTH EFFECTS PER KILOMETER

Source	Mode	* LCFs	Injuries	Fatalities
Pollutants	Truck	1.0 E-7		
Accidents	Truck	5.1 E-7	3.0 E-8	

* LCF = Latent Cancer Fatality

Uncertainties are associated with pollution emission rates and atmospheric dispersion behavior. To compensate for these uncertainties, the analysis used conservative estimates for determining pollution health effects. The tabulated accident impacts are average values over all population zones (urban, suburban, rural) and are derived from nationwide Department of Transportation (DOT) statistics.

The proposed action will involve transportation activities during the construction phase as well as during subsequent operations. All construction shipments are anticipated to be made mostly by truck and will

originate within the Denver metropolitan area (within a 50-mile radius of the Plant site). Materials to be brought on site include the treatment systems, storage tanks, piping, concrete, and associated equipment. The delivery of these materials will require several truckloads over the construction period, followed by routine maintenance travel between collection areas and the treatment facilities (estimated at less than 50 miles per week). The resulting transportation impacts will be small as seen from the tabulated emissions and health effects estimates. To place transportation impacts to the general public in perspective, it is observed that approximately 60,000 round-trip truck shipments (one-way distance of 50 miles) would be required to result in one additional latent cancer fatality (LCF). An average of 210,000 truck shipments would be required to result in one additional traumatic fatality. The increase in site travel during construction may be noticeable but will be of short duration. Outside the Plant boundary, the increase will not be noticeable.

Treatment of contaminated surface water from OU 2 will result in an incremental increase in site pickup and deliveries of spent carbon columns and replacement units and chemicals for the pretreatment of water for the cross-flow membrane treatment system. Deliveries will be spread out over the course of the year and will be handled by one of the existing Plant chemical suppliers. The very small number of shipments involved for both the carbon columns and the cross-flow membrane treatment system will result in an insignificant impact to human health.

Off-site transportation impacts associated with the shipment of solidified filter sludge to a mixed waste disposal site, such as the Nevada Test Site, will be very low as determined in DOE (1990b). Relatively low concentrations of contaminants, the physical form of the waste, disposal site waste acceptance criteria, and compliance with DOT packaging and transport requirements all contribute to very low health effects from incident-free shipment and accident events.

Operational activities will also include periodic inspection of the collection system to remove debris or other obstacles, as well as routine inspection of the pipeline collection system providing direct feed to the water treatment facility. This will require vehicular travel to each collection station area, which is estimated to total

10 to 15 miles per week. Impact to human health (latent cancer fatalities from vehicular pollution) will be negligible.

7.11 CUMULATIVE IMPACTS

Routine processing of the surface water collected from the surface seeps and drainages will result in some additional solid wastes being generated from the site. Generation of filter press cake by the cross-flow membrane filtration system is estimated to be a maximum of 70 cubic yards annually. The filter cake will be treated on site and shipped to the Nevada Test Site or similar facility for final disposal. The annual production rate of the semisolid will average much lower. All gaseous releases will be undetectable off site. None of the materials that may be released are expected to be concentrated by any natural process.

The drying of the semisolid sludge waste from the treatment system will require an increase in Plant solidification operations to dry and package the waste for transport to a final disposal site. Neither the drying nor packaging requirement will add significantly compared to the current workload of the facility. Radionuclide accumulation in the sludge is not expected to exceed exempt quantities by weight, so that shipment of the sludge is not expected to cause any special concern or require unusual controls.

It is estimated that four workers will be involved in routine operation and maintenance of the surface water collection and treatment facility. This will have negligible impact on the workload of Plant personnel. In routine operations, these workers will not be exposed to any levels of chemicals or waste stream pollutants that would restrict them from other assignments at the RFP.

Construction activities will result in increased vehicular traffic, engine emissions, and the number of workers. The number of personnel required for the proposed action will be a small increase to the assumed yearly additional construction loading.

SECTION 8

ENVIRONMENTAL EFFECTS OF THE ALTERNATIVES

The preferred alternative and the proposed action for this interim remedial action is to gather contaminated surface water from a series of point sources, transfer the collected water via pipeline, and process the water through a water treatment system. The preferred treatment system consists of a cross-flow membrane treatment system for removal of radionuclides and metals, followed by a carbon column system for removal of VOCs. The treated water will then be returned to South Walnut Creek.

Several alternatives to the proposed IM/IRA were evaluated for environmental effects. The alternatives included: 1) no action; 2) surface water collection at Pond B-5 and 3) ion exchange, granular media filtration with polymer addition, UV peroxide oxidation, and air stripping. The alternative of surface water collection at Pond B-5 has been eliminated based on the potential of generation of additional contamination and additional volumes of water requiring treatment (See Section 4-1). Each remaining alternative is evaluated in regard to environmental quality, personnel exposure and transportation impacts. Following the alternative evaluation, Table 8-1 compares the potential impact of the proposed action with the alternatives.

8.1 ENVIRONMENTAL EFFECTS OF NO ACTION

Although the no action alternative is in direct conflict with the IAG reached among DOE, EPA, and the State of Colorado, it is discussed herein.

8.1.1 Environmental Quality

The No Action alternative would not involve any short-term impact to the environment or the work force/general population and would eliminate the need for off-site transportation activities. However, it would not contain nor remove any radionuclides, VOCs or inorganic contaminants. The No Action alternative would pose a long-term release risk to the general public and would require remedial actions in the future.

The No Action alternative would require that the current quarterly site monitoring be continued. Because the monitoring is a part of the existing plant environmental monitoring program, the impact on plant operations and the surrounding community would be effectively zero. However, because off-site migration may occur in the future, the No Action alternative is unacceptable.

8.1.2 Personnel Exposure

The No Action alternative will have minimal impact on current workers at the site or at adjacent sites. Workers would still be required to collect quarterly sampling, which would present no additional impact above current impact levels. The sources of hazardous materials would neither be removed nor controlled. However, the possibility of releasing contaminated water off-site would increase over time. The site would then be a source of public exposure in the long term.

8.1.3 Transportation

Since no remedial action would occur under this alternative, there would be no on-site or off-site transportation activities associated with this alternative or related impacts to workers or the general public.

8.2 ENVIRONMENTAL EFFECTS OF ALTERNATIVE 2

8.2.1 Environmental Quality

A variety of treatment technologies were investigated as alternatives to the proposed OU 2 IM/IRA. These included granular media filtration with polymer addition for suspended solids removal and ion exchange for metals and radionuclide removal. In addition, UV peroxide oxidation and air stripping with off-gas treatment were examined for organic contaminant removal. Ion exchange and UV peroxide systems are proposed for treatment of contaminated ground water at the 881 Hillside Area which contain constituents which are similar to the OU 2 surface water contaminants. However, with regard to ion exchange, plutonium is not a ground

water contaminant at the 881 Hillside Area, and ion exchange (or other inorganic treatment technologies) are not proven technologies for removal of plutonium for natural water. There is no appreciable difference in environmental impacts of the alternative organic contaminant treatment technologies. The cross-flow membrane filtration system is the only proven system for removal of the targeted radionuclides.

8.2.2 Personnel Exposure

The use of alternate treatment technologies would have little impact on the personnel exposure associated with surface water cleanup. The contaminants in the water remain the same and the removal techniques are essentially similar with respect to personnel exposure a risk.

8.2.3 Transportation

The selection of one of the other alternative treatment technologies may require different transportation requirements, dependent on the rate of water treated and the contaminants to be removed. The ion exchange columns utilize resin beads that may require periodic replacement. Using a UV peroxide treatment process would reduce transportation impacts primarily due to elimination of some of the by-product materials produced by the process. Overall, the transportation impact for this alternative is minimal.

8.3 SUMMARY

The impacts of the alternatives are judged to be small. The potential impacts associated with the proposed action and each of the identified alternatives are presented in Table 8-1-A and B.

TABLE 8-1-A

SUMMARY COMPARISON OF POTENTIAL IMPACTS OF PROPOSED ACTION AND ALTERNATIVES - RADIONUCLIDE TREATMENT

Impact Category	Alternatives		
	Proposed Action	No Action	Contact Filtration/ Ion Exchange
ENVIRONMENTAL IMPACTS			
Excavation	Negligible	None	Negligible
Topographical Deformation (Permanent)	Treatment Facility	None	Treatment Facility
Endangered Species	Negligible	None	Negligible
Wetlands	Negligible	None	Negligible
Cultural Impacts	Negligible	None	Negligible
Archaeological Impacts	Negligible	None	Negligible
Transportation	Limited	None	Limited
LONG-TERM CONSIDERATIONS			
Remedical Action Period (Institutional Control)	30 years	Not Applicable	30 years
VOC Contaminant Removal	No	No	No
Radionuclide Removal	Yes	No	Possibly, but unproven
Inorganic Contaminant Removal	Yes	No	Yes
EXPOSURE OF GENERAL PUBLIC			
Construction	Negligible	None	Negligible
Routine	Negligible	Future Release Risk	Negligible
Accident	Negligible	None	Negligible

TABLE 8-1-B

SUMMARY COMPARISON OF POTENTIAL IMPACTS OF PROPOSED ACTION AND ALTERNATIVES - ORGANIC TREATMENT

Impact Category	Proposed Action	Alternatives	
	Activated Carbon Columns	No Action	UV Peroxide Oxide or Air Stripping
ENVIRONMENTAL IMPACTS			
Excavation	Negligible	None	Negligible
Topographical Deformation (permanent)	Treatment Facility	None	Treatment Facility
Endangerment Species Impact	Negligible	None	Negligible
Wetlands Impact	Negligible	None	Negligible
Cultural Impacts	None	Negligible	None
Archaeological Impacts	Negligible	None	Negligible
Transportation	Limited	None	Limited
LONG-TERM CONSIDERATIONS			
Remedial Action Period (Institutional Control)	30 years	Not Applicable	30 years
VOC Contaminant Removal	Yes	No	Yes
Radionuclide Removal	No	No	No
Inorganic Contaminant Removal	No	No	No
EXPOSURE OF GENRAL PUBLIC			
Construction	Negligible	None	Negligible
Routine	Negligible	Future Release Risk	Negligible
Accident	Negligible	None	Negligible

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SECTION 9

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APPENDIX A

DATA TABLES

OPERABLE UNIT NO. 2

TABLE A-1

BACKGROUND GROUND-WATER (SECOND QUARTER 1989)
TOLERANCE INTERVAL UPPER LIMITS
OR MAXIMUM DETECTED VALUE

Analyte	Units	Rocky Flats Alluvium (11 Samples)	Colluvium (2 Samples)	Valley Fill Alluvium (8 Samples)	Weathered Claystone (4 Samples)	Weathered Sandstone (2 Samples)	Unweathered Sandstone (7 Samples)
Dissolved Metals							
Aluminum	mg/l	ND	ND	ND	ND	ND	0.327*
Antimony	mg/l	ND	ND	ND	ND	ND	ND
Arsenic	mg/l	ND	ND	ND	ND	ND	0.0186*
Barium	mg/l	ND	ND	ND	ND	ND	ND
Beryllium	mg/l	ND	ND	ND	ND	ND	ND
Cadmium	mg/l	ND	ND	ND	ND	ND	ND
Calcium	mg/l	85	76.8*	138	73.4*	65.7*	64.6
Cesium	mg/l	ND	ND	ND	ND	ND	ND
Chromium	mg/l	ND	ND	ND	ND	0.0122*	ND
Cobalt	mg/l	ND	ND	ND	ND	ND	ND
Copper	mg/l	ND	ND	ND	ND	ND	ND
Iron	mg/l	0.266*	ND	0.94*	ND	ND	ND
Lead	mg/l	ND	ND	ND	ND	ND	ND
Lithium	mg/l	ND	0.172*	0.028	.031*	0.0106*	ND
Magnesium	mg/l	5.79*	15.3*	26.57	45.3*	9.41*	ND
Manganese	mg/l	0.365	0.088*	0.686*	0.126*	0.292*	0.0182*
Mercury	mg/l	ND	ND	0.003*	.008*	ND	ND
Molybdenum	mg/l	0.0136*	ND	ND	0.015*	0.015*	0.112*
Nickel	mg/l	0.0432*	ND	ND	ND	ND	ND
Potassium	mg/l	7.73*	ND	ND	ND	ND	21.89*
Selenium	mg/l	ND	ND	0.0114*	ND	ND	0.041*
Silver	mg/l	ND	ND	ND	ND	ND	ND
Sodium	mg/l	13.4	98.7*	88	36.9*	25.6*	599
Strontium	mg/l	0.159*	ND	ND	ND	ND	0.451*
Thallium	mg/l	ND	ND	ND	0.01*	ND	ND
Tin	mg/l	ND	ND	ND	ND	ND	
Vanadium	mg/l	ND	ND	ND	ND	ND	ND
Zinc	mg/l	0.141*	ND	0.0212*	0.107*	ND	0.564

TABLE A-1 (cont.)

BACKGROUND GROUND-WATER (SECOND QUARTER 1989)
TOLERANCE INTERVAL UPPER LIMITS
OR MAXIMUM DETECTED VALUE

Analyte	Units	Rocky Flats Alluvium (11 Samples)	Colluvium (2 Samples)	Valley Fill Alluvium (8 Samples)	Weathered Claystone (4 Samples)	Weathered Sandstone (2 Samples)	Unweathered Sandstone (7 Samples)
Other							
Total Dissolved Solids	mg/l	352	520*	947	320*	170*	1761
Carbonate	mg/l	ND	ND	ND	ND	ND	49
Bicarbonate	mg/l	436	470*	719	400*	140*	412
Chloride	mg/l	15.6	20*	40.29	11*	15*	607
Sulfate	mg/l	45.1	86*	150	44*	16*	950
Nitrate	mg/l	2.98	0.18*	0.69*	0.58*	1.6*	0.610
Cyanide	mg/l	.0038*	ND	ND	0.0036*	ND	ND
pH	----	8.6 (5.98)	7.4* (7.1)**	8.68 (6.12)	8.2* (7.4)**	7.5* (7.2)**	10.57 (7.43)
Dissolved Radionuclides							
Gross Alpha	pCi/l	12.543	27*	13.515	12*	7*	13*
Gross Beta	pCi/l	14.570	12*	18.530	7*	2*	15*
Uranium 233, 234	pCi/l	1.647	11*	6.481	5.8*	1.1*	12.936
Uranium 235	pCi/l	0.000	0.3*	0.232	0.2*	0*	0.135
Uranium 238	pCi/l	0.195	7.7*	5.084	3.2	0.6*	3.3507
Strontium 89, 90	pCi/l	0.552	0.1*	0.878	0.1	-0.1*	0.2*
Plutonium 239, 240	pCi/l	0.009	0*	0.012	0.03	0.01*	0.000
Americium 241	pCi/l	0.000	0*	0.012	0	0.01*	0.019
Cesium 137	pCi/l	0.603	0.2*	0.776	0.4	0.3*	0.7*
Tritium	pCi/l	309	100*	505	100	100*	731

* - Maximum Detected Value
** - Minimum Detected Value
ND - Not Detected at Contract Required Detection Limit
() - Tolerance Internal Lower Limit for Two-Sided Parameter

TABLE A-2

BACKGROUND SURFACE WATER (SECOND QUARTER 1989)
TOLERANCE INTERVAL UPPER LIMITS
OR MAXIMUM DETECTED VALUE

Analyte	Units	Round 1 (7 samples)** Total	Dissolved
Metals			
Aluminum	mg/l	0.916*	0.485*
Antimony	mg/l	ND	ND
Arsenic	mg/l	ND	ND
Barium	mg/l	ND	ND
Beryllium	mg/l	ND	ND
Cadmium	mg/l	ND	ND
Calcium	mg/l	85.01	85.92
Cesium	mg/l	1.00*	ND
Chromium	mg/l	ND	ND
Cobalt	mg/l	ND	ND
Copper	mg/l	ND	ND
Iron	mg/l	3.17	1.78*
Lead	mg/l	ND	0.006*
Lithium	mg/l	ND	ND
Magnesium	mg/l	12.48	12.82
Manganese	mg/l	0.636	0.368*
Mercury	mg/l	0.001	0.001
Molybdenum	mg/l	ND	ND
Nickel	mg/l	ND	ND
Potassium	mg/l	ND	ND
Selenium	mg/l	ND	ND
Silver	mg/l	0.001*	ND
Sodium	mg/l	47.36	46.22
Strontium	mg/l	0.382	0.40
Thallium	mg/l	ND	ND
Tin	mg/l	ND	ND
Vanadium	mg/l	ND	ND
Zinc	mg/l	0.027	0.032*

TABLE A-2 (cont.)

BACKGROUND SURFACE WATER (SECOND QUARTER 1989)
TOLERANCE INTERVAL UPPER LIMITS
OR MAXIMUM DETECTED VALUE

Analyte	Units	Round 1 (7 samples)** Total	Dissolved
Other			
Total Dissolved Solids	mg/l	271.16	NA
Carbonate	mg/l	ND	NA
Bicarbonate	mg/l	296.97	NA
Chloride	mg/l	106.9	NA
Sulfate	mg/l	48.82	NA
Nitrate	mg/l	2.69	NA
Cyanide	mg/l	ND	NA
pH	----	8.69 (6.60)	NA
Radionuclides			
Gross Alpha	pCi/l	7.74	4.38
Gross Beta	pCi/l	9.89	8.80
Uranium 233, 234	pCi/l	1.45	1.40
Uranium 235	pCi/l	0.133	0.133
Uranium 238	pCi/l	0.803	0.957
Strontium 89, 90	pCi/l	2.04	1.398
Plutonium 239, 240	pCi/l	0.018	ND
Americium 241	pCi/l	0.042	0.013
Cesium 137	pCi/l	0.599	0.472
Tritium	pCi/l	258	NA

NA - Not Analyzed
ND - Not Detected
() - Tolerance Interval Lower Limit for Two-Sided Parameter
* - Maximum Detected Value
** - At Stations SW-104 and SW-80, most total and a few dissolved constituents were uncharacteristically high relative to the other data. To be conservative, these data are not included in computation of the tolerance interval.

TABLE A-3

BACKGROUND SEDIMENT
TOLERANCE INTERVAL UPPER LIMITS
OR MAXIMUM DETECTED VALUE

FEBRUARY 1989

Analyte	Units	Upper Limit (9 Samples)
Total Metals		
Aluminum	mg/kg	24789
Antimony	mg/kg	ND
Arsenic	mg/kg	13.0*
Barium	mg/kg	182*
Beryllium	mg/kg	ND
Cadmium	mg/kg	ND
Calcium	mg/kg	72551
Cesium	mg/kg	ND
Chromium	mg/kg	43.38
Cobalt	mg/kg	ND
Copper	mg/kg	22.0*
Iron	mg/kg	28308
Lead	mg/kg	39.502
Lithium	mg/kg	ND
Magnesium	mg/kg	4110*
Manganese	mg/kg	372.20
Mercury	mg/kg	ND
Molybdenum	mg/kg	ND
Nickel	mg/kg	29.9*
Potassium	mg/kg	ND
Selenium	mg/kg	ND
Silver	mg/kg	6.8*
Sodium	mg/kg	ND
Strontium	mg/kg	175*
Thallium	mg/kg	ND
Tin	mg/kg	ND
Vanadium	mg/kg	50.2*
Zinc	mg/kg	92.688

TABLE A-3 (cont.)

BACKGROUND SEDIMENT
TOLERANCE INTERVAL UPPER LIMITS
OR MAXIMUM DETECTED VALUE

FEBRUARY 1989

Analyte	Units	Upper Limit (9 Samples)
Other		
Nitrate	mg/kg	ND
pH	----	9.03 (8.77)
Total Radionuclides		
Gross Alpha	pCi/gm	60
Gross Beta	pCi/gm	50
Uranium 233, 234	pCi/gm	1.669
Uranium 235	pCi/gm	0.176
Uranium 238	pCi/gm	1.755
Strontium 89, 90	pCi/gm	1.390
Plutonium 239, 240	pCi/gm	0.096
Americium 241	pCi/gm	0.029
Cesium 137	pCi/gm	1.578
Tritium	pCi/ml	0.408

ND - Not Detected
* - Maximum Detected Value
() - Tolerance Interval Lower Limit for Two-Sided Parameter

TABLE A-4

BACKGROUND GEOLOGIC MATERIALS
TOLERANCE INTERVAL UPPER LIMITS
OR MAXIMUM DETECTED VALUE
1989

Analyte	Units	Rocky Flats Alluvium (70 Samples)	Colluvium (28 Samples)	Weathered Claystone (17 Samples)	Weathered Sandstone (4 Samples)
Total Metals					
Aluminum	mg/kg	25312	21663	13495	10300*
Antimony	mg/kg	ND	ND	16.2*	ND
Arsenic	mg/kg	15.86	7.7	15.05	3.6*
Barium	mg/kg	155.8	345.8	240.1	165*
Beryllium	mg/kg	11.27	17.75	11.8	2.2*
Cadmium	mg/kg	3.2*	1.8*	ND	ND
Calcium	mg/kg	43079	20811	10183	5940*
Cesium	mg/kg	ND	274*	ND	ND
Chromium	mg/kg	37.9	26.8	16.57	10.7*
Cobalt	mg/kg	18.2*	15.9*	29.7*	20.5*
Copper	mg/kg	20.03	26.7	30.62	19.6*
Iron	mg/kg	22916	29991	41295	12300*
Lead	mg/kg	18.04	26.4	34.5	13.4*
Lithium	mg/kg	44.4	32.1	33.37	7.0*
Magnesium	mg/kg	4425	6151	4896	2520*
Manganese	mg/kg	422.9	545.1	656	305*
Mercury	mg/kg	0.58*	0.44*	0.35*	0.27*
Molybdenum	mg/kg	38.65	32.78	33.68	11.2*
Nickel	mg/kg	43.27	35.4	56.95	14.3*
Potassium	mg/kg	3336	2789	1400*	ND
Selenium	mg/kg	ND	ND	ND	ND
Silver	mg/kg	40.9*	33.5*	18.7*	12.7*
Sodium	mg/kg	ND	3680*	ND	ND
Strontium	mg/kg	226*	111.1	144.42	69.2*
Thallium	mg/kg	ND	ND	ND	ND
Tin	mg/kg	338*	441*	274*	268*
Vanadium	mg/kg	54.67	58.2	47.7	22.2*
Zinc	mg/kg	52.64	98.1	106.7	79.9*

TABLE A-4 (cont.)

BACKGROUND GEOLOGIC MATERIALS
TOLERANCE INTERVAL UPPER LIMITS
OR MAXIMUM DETECTED VALUE
1989

Analyte	Units	Rocky Flats Alluvium (70 Samples)	Colluvium (28 Samples)	Weathered Claystone (17 Samples)	Weathered Sandstone (4 Samples)
Other					
Sulfide	mg/kg	13*	5*	5*	2*
Nitrate	mg/kg	4.3*	4.274	2.0*	1.9*
pH	----	9.64 (6.06)	9.48 (6.96)	10.14 (7.04)	9.2* (8.0)**
Total Radionuclides					
Gross Alpha	pCi/gm	37.108	51.710	52.302	37
Gross Beta	pCi/gm	36.886	35.135	35.743	29
Uranium 233, 234	pCi/gm	1.491	1.759	1.985	0.8
Uranium 235	pCi/gm	0.087	0.169	0.258	0.1
Uranium 238	pCi/gm	1.353	1.675	1.643	1.0
Strontium 89, 90	pCi/gm	0.768	0.776	0.786	0.4
Plutonium 239, 240	pCi/gm	0.017	0.023	0.020	0.01
Americium 241	pCi/gm	0.018	NR	NR	NR
Cesium 137	pCi/gm	0.082	0.113	ND	0.0
Tritium	pCi/ml	0.410	0.299	0.322	0.39

ND - Not Detected
NR - Data Not Received
* - Maximum Detected Value
** - Minimum Detected Value
() - Tolerance Interval Lower Limit for Two-Sided Parameter

TABLE A-5

VOLATILE ORGANIC COMPOUNDS DETECTED IN
UNCONFINED GROUND WATER
SECOND QUARTER 1989

Matrix	Well	Date Sampled	Carbon Tetra-chloride (ug/l)	Tetra-chloro-ethene (ug/l)	Trichloro-ethene (ug/l)	Chloro-form (ug/l)	Methylene Chloride (ug/l)	1,1-Di-Chloro-ethane (ug/l)	1,1-Di-Chloro-ethene (ug/l)	Vinyl Chloride (ug/l)	Acetone (ug/l)	Carbon Disulfide (ug/l)	Total-1,2-Dichloro-ethene (ug/l)	Toluene (ug/l)
Rocky Flats Alluvium	33-86	5/04/89	Dry											
	39-86	5/08/89												
	41-86	5/10/89												
	42-86	5/08/89	1,100	300	190	21J								
	43-86	5/04/89	Dry											
	10-87	5/02/89	Dry											
	15-87	5/01/89	1,100J	190	120	21			5J					
	17-87	5/03/89	47J	160R	17	4J								
	19-87	5/04/89	Dry											
	24-87	5/09/89	Dry											
	26-87	5/09/89	Dry											
	27-87	5/10/89	15	31	4J	3J								
	32-87	5/09/89	Dry											
	33-87	5/09/89	Dry											
	35-87	5/09/89	Dry											
Colluvium	63-86	4/13/89	Dry											
	67-86	5/09/89	Dry											
	29-87	4/24/89												
	44-87	4/13/89	Dry											
Valley Fill Alluvium	35-86	5/03/89			11			59	13	470			3J	
	36-86	5/04/89												
	37-86	5/03/89		30R										
	64-86	5/31/89		8J										
	65-86	4/13/89									2J			
	66-86	6/02/89				26	1J					3J		
	21-87	5/03/89												

TABLE A-5 (cont.)

VOLATILE ORGANIC COMPOUNDS DETECTED IN
UNCONFINED GROUND WATER
SECOND QUARTER 1989

Matrix	Well	Date Sampled	Carbon Tetra-chloride (ug/l)	Tetra-chloro-ethene (ug/l)	Trichloro-ethene (ug/l)	Chloro-form (ug/l)	Methylene Chloride (ug/l)	1,1-Di-Chloro-ethane (ug/l)	1,1-Di-Chloro-ethene (ug/l)	Vinyl Chloride (ug/l)	Acetone (ug/l)	Carbon Disulfide (ug/l)	Total-1,2-Dichloro-ethene (ug/l)	Toluene (ug/l)
Weathered Claystone	1-71	5/01/89	690J	69	230	200			5J					
	2-71	5/01/89		8	440	7		8						
	1-74	5/03/89		45,000	1,800									
	3-74	5/08/89	1,100	50	25	11J								
Weathered Sandstone	62-86	4/17/89									2JB			
	9-87	5/01/89												
	11-87	5/02/89	Dry											
	12-87	5/02/89	Dry											
	14-87	4/24/89	160J	4J	68	16								
	23-87	5/03/89		74R										
	25-87	5/08/89	290	840	120	5J								
	36-87	5/08/89	610	350E	12,000	290E			22J					2J

J - Value estimated below detection limit
E - Value estimated
R - Value rejected by data validation
B - Compound also detected in associated blank.

TABLE A-6

VOLATILE ORGANIC COMPOUNDS DETECTED
IN GROUND WATER
MAXIMUM CONCENTRATIONS[1]

Matrix	Well	Carbon Tetra-chloride[2] (ug/l)	Tetra-chloro-ethene (ug/l)	Trichloro-ethene (ug/l)	Chloro-form	Methylene Chloride	1,1-Di-Chloro-ethane (ug/l)	1,1-Di-Chloro-ethene (ug/l)	Vinyl Chloride (ug/l)	Acetone (ug/l)	Carbon Disulfide (ug/l)	Total-1,2-Dichloro- (ug/l)
Rocky Flats Alluvium	33-86	Dry										
	39-86		845	418								
	41-86		160	3JB		6JB				17		7
	42-86	4835	3200	1400	107		320	26		5J		17
	43-86	6		8								
	10-87	Dry										
	15-87	4305	900	510	42			5J		1300B		
	17-87	47J	160R	83	4J	15				9JB		
	19-87	Dry										
	24-87	Dry								19JB		
	26-87	Dry				5JB				31		
	27-87	15	44	4J	3J	3JB						
	32-87		95	44	2JB			33		6JB		
	33-87	Dry										
	35-87	Dry										
Colluvium	63-86	Dry										
	67-86	Dry										
	29-87		99	4J		26B				9JB		
	44-87	Dry										
Valley Fill Alluvium	35-86	12		19	340	36	62	48	930			1600
	36-86			6								
	37-86		30R									
	64-86		8J									
	65-86					8				2J	3J	
	66-86				26	23					3J	
	21-87		49									
Weathered Claystone	1-71	4800	800	2000	1525	14	535	5J				346
	2-71	40	8	28800	410	12	28	10				92
	1-74		528000	18000	38	5J	20	90		6JB		15
	3-74	1885	1080	812	45	56J		22		84JB		15
Weathered Sandstone	62-86	2J								2JB		
	9-87					10				7JB		
	11-87	605	28	1090	129			4J				
	12-87	58	57	3570	17	9						
	14-87	404	4J	109	23	7		1J		26		
	23-87		74R	4JB	3JB	8				3JB		
	25-87	835	840	258	6JB	13JB				110B		
	36-87	3673	4654	221860	5427	119		1044		38		

TABLE A-8 (cont.)

VOLATILE ORGANIC COMPOUNDS DETECTED
IN GROUND WATER
MAXIMUM CONCENTRATIONS[1]

Matrix	Well	Toluene (ug/l)	1,2-Di-Chloro-ethane (ug/l)	1,1,1-Tri-Chloro-ethane (ug/l)	2-hexa-none (ug/l)
Rocky Flats Alluvium	33-86				
	39-86				
	41-86				
	42-86	4JB			
	43-86				
	10-87				
	15-87				
	17-87	12			
	19-87				
	24-87				
	26-87				
	27-87	3JB			
	32-87			56	
	33-87				
	35-87			32	
Colluvium	63-86				
	67-86				
	29-87				
	44-87				
Valley Fill Alluvium	35-86				
	36-86				
	37-86				
	64-86				
	65-86				
	66-86				
	21-87				
Weathered Claystone	1-71		400	2892	
	2-71			24	47
	1-74			16	
	3-74			22	
Weathered Sandstone	62-86				
	9-87				
	11-87			301	
	12-87				
	14-87				
	23-87				
	25-87				
	36-87			1472	975

TABLE A-6 (cont.)

VOLATILE ORGANIC COMPOUNDS DETECTED
IN GROUND WATER
MAXIMUM CONCENTRATIONS[1]

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[1] Data obtained from the 1987, 1988, 1989 field investigations

[2] A carbon tetrachloride concentration value of 2292 ppb was reported for Well No. 39-86 (4 May 1988). This datum is suspect due to problems observed in the analytical laboratory during the first half of 1988. All other ground-water concentration data obtained from the 1987, 1988, and 1989 field investigations (9 data points) show "non-detect" concentration values for carbon tetrachloride at Well No. 39-86.

J Value estimated below detection limit

E Value estimated

R Value rejected by data validation

B Compound also detected in associated blank

TABLE A-7

INORGANICS ABOVE BACKGROUND IN GROUND WATER[1]

Analyte	Number of Results Above Background[2]	Number of Results	Range of Background Concentration[3] (mg/l)	Maximum Concentration[4] (mg/l)
Bicarbonate	45	257	140-719	530
Chloride	172	257	11-607	819
Cyanide	0	62	ND-0.038	ND
Nitrate	164	255	0.18-2.98	15.5
Sulfate	114	257	16-950	1157
Total Dissolved Solids	193	257	170-1761	3219

ND Not detected at contract required detection limit

1 Concentration data obtained from the 1987, 1988, and 1989 field investigations.

2 Compared to background value for appropriate lithologies, listed in Table A-1.

3 Range of maximum values for different classes of ground water.

4 Reported when maximum concentration is above background.

TABLE A-8

DISSOLVED METALS ABOVE BACKGROUND IN GROUND WATER[1]

Analyte	Number of Results Above Background[2]	Number of Results	Range of Background Concentration[3] (mg/l)	Maximum Concentration[4] (mg/l)
Aluminum	119	253	ND-0.327	4.75
Antimony	18	248	ND-ND	0.12
Arsenic	9	247	ND-0.0186	0.007
Barium	215	253	ND-ND	0.93
Cadmium	1	249	ND-ND	0.006
Calcium	161	253	64.6-138	408
Cesium	0	248	ND-ND	ND
Chromium	54	253	ND-0.0122	0.1223
Copper	93	253	ND-ND	0.84
Iron	131	253	ND-0.94	4.35
Lead	15	247	ND-ND	0.04
Lithium	7	60	ND-0.172	0.22
Magnesium	164	253	ND-45.3	136
Manganese	103	253	0.0182-0.686	4.37
Mercury	1	245	ND-0.008	0.013
Molybdenum	41	253	ND-0.112	0.192
Nickel	51	253	ND-0.0432	1.7
Potassium	92	245	ND-21.89	44.5
Selenium	39	246	ND-0.091	0.39
Silver	7	253	ND-ND	0.13
Sodium	117	253	25.6-599	405
Strontium	266	253	ND-0.451	7.7
Thallium	0	240	ND-0.01	0.01
Vanadium	9	253	ND-ND	0.10
Zinc	65	253	ND-0.564	2.70

ND Not detected at contract required detection limit.

1 Concentration data obtained from the 1987, 1988, and 1989 field investigations.

2 Compared to background value for appropriate lithologies, listed in Table A-1.

3 Range of maximum values for different classes of ground water.

4 Reported when maximum concentration is above background.

TABLE A-9

DISSOLVED RADIONUCLIDES ABOVE BACKGROUND IN GROUND WATER[1]

Analyte	Number of Results Above Background[2]	Number of Results	Range of Background Concentration[3] (mg/l)	Maximum Concentration[4] (mg/l)
Gross Alpha	42	179	7-27	250
Gross Beta	46	180	2-18.53	372
Uranium 233,234	62	151	1.1-12.94	34
Uranium 235	62	148	0-0.232	1.7
Uranium 238	73	151	0.6-7.7	28
Strontium 89,90	3	153	0.1-0.878	5.0
Plutonium 239, 240	3	153	0-0.012	0.52
Americium 241	6	153	0-0.019	0.83
Cesium 137	0	3	0.2-0.776	0.3

1 Concentration data obtained from the 1987, 1988, and 1989 field investigations.

2 Compared to background value for appropriate lithologies, listed in Table A-1.

3 Range of maximum values for different classes of ground water.

4 Reported when maximum concentration is above background.

TABLE A-10

VOLATILE ORGANIC COMPOUNDS DETECTED IN SOILS[1]

	Borehole Number	Vinyl Chloride (ug/kg)	Chloro-Ethane (ug/kg)	Methylene Chloride (ug/kg)	Acetone (ug/kg)	Carbon Disulfide (ug/kg)	1,1-Di-Chloro-Ethene (ug/kg)	1,1-Di-Chloro-Ethane (ug/kg)	Total 1,2-Di Chloro-Ethene (ug/kg)	Chloro-Form (ug/kg)	1,2-Di-Chloro-Ethane (ug/kg)	2-Butanone (ug/kg)
903 Pad-Rocky Flats Alluvium	BH2287				48JB							
	BH2387			6J	120B							
	BH2987			11J	430B							
	BH3087			31.6B	230B							33J
903 Pad - Colluvium	BH2487				43.1B							
	BH2587		7J	46.9B	1100B							210J
	BH2687			20B	23							
	BH2787			7J	140B							
	BH2887			12J	70B					17J		
903 Pad - Sandstone	BH2987			10J	430B							
903 Pad - Claystone	BH2287			9J	78B							
	BH2387			9J	150B							
	BH2487			19B	60B							
	BH2587			150JB	1100B					130J		150J
	BH2687			8J	120							
	BH2787			6J	170B							
	BH2887				11JB	58						
	BH3087			9J	200B							16J
Mound - Rocky Flats Alluvium	BH3187			17J	100			32			6J	
	BH3287			9J	120			29				
	BH3387				190							
	BH3487				500							
	BH3587				480							
	BH3687			11J	53							
	BH3787			37.4	48JB							
	BH3887			12J	120B							
Mound - Sandstone	BH3387			15J	320						10J	
	BH3487				130							
Mound - Claystone	BH3187			9J	110					5J		
	BH3287				170					19J		
	BH3587				280							
	BH3687			8J	64							
	BH3787			17JB	150B							
East Trenches Rocky Flats Alluvium	BH3987				220					140		
	BH4087				140							
	BH4187				210							
	BH4287				71							
	BH4387			20J	360							150
	BH4487			11J	160B							
	BH4587											
	BH4687			5J	210B							

TABLE A-10 (cont.)

VOLATILE ORGANIC COMPOUNDS DETECTED IN SOILS[1]

	Borehole Number	Vinyl Chloride (ug/kg)	Chloro-Ethane (ug/kg)	Methylene Chloride (ug/kg)	Acetone (ug/kg)	Carbon Disulfide (ug/kg)	1,1-Di-Chloro-Ethene (ug/kg)	1,1-Di-Chloro-Ethane (ug/kg)	Total 1,2-Di Chloro-Ethene (ug/kg)	Chloro-Form (ug/kg)	1,2-Di-Chloro-Ethane (ug/kg)	2-Butanone (ug/kg)
East Trenches Rocky Flats Alluvium	BH478[7]			7J	820B	140B					21J	
	BH488[7]			11B	220B						8J	
	BH498[7]			7JB	710B						23J	
	BH508[7]				1000B							
	BH518[7]			6JB	1700B						24J	
	BH528[7]			6JB	51B						7J	
	BH538[7]			11J	2000B						30	
	BH548[7]			147JB	1600B						120	
	BH558[7]			8JB	1200B						100	
	BH568[7]			4B	120B							
East Trenches Sandstone	BH398[7]				140							58
	BH428[7]					140				6J		
	BH448[7]					180B						
	BH458[7]											
	BH518[7]					6JB	72B				8J	
	BH568[7]					26	110B					
East Trenches Claystone	BH398[7]											72
	BH408[7]											
	BH418[7]									7J		
	BH438[7]			210	180							
	BH458[7]											
	BH468[7]			7J	270B							
	BH478[7]			12JB	770B						100	
	BH488[7]				1200B							
	BH498[7]			7JB	120B						34	
	BH508[7]				1000B						110	
	BH528[7]			15JB	94B						26	
	BH538[7]			9JB	2400B						16J	
	BH548[7]			15JB	460B						20J	
	BH558[7]			8JB	620B						78	
	BH578[7]			36B	260B						10J	100

TABLE A-10 (cont.)

VOLATILE ORGANIC COMPOUNDS DETECTED IN SOILS[1]

	Borehole Number	1,1,1-Tri-Chloro-Ethane (ug/kg)	Carbon Tetra-Chloride (ug/kg)	Tri-Chloro-Ethene (ug/kg)	1,1,2-Trichloro-Ethane (ug/kg)	Tetra-Chloro-Ethene (ug/kg)	1,1,2,2-Tetra-Chloro-Ethene (ug/kg)	Toluene (ug/kg)	Ethyl Benzene (ug/kg)	Styrene (ug/kg)	Total Xylenes (ug/kg)	1,3-Di-Chloro-Propene (ug/kg)
903 Pad-Rocky Flats Alluvium	BH2287											
	BH2387											
	BH2987											
	BH3087									17J		
903 Pad - Colluvium	BH2487											
	BH2587			7000		10000		640	780		3300	
	BH2687											
	BH2787											
	BH2887		100	15J		84						
903 Pad - Sandstone	BH2987	5J										
903 Pad - Claystone	BH2287											
	BH2387											
	BH2487											
	BH2587	180J		16000		3800		330	290		480	
	BH2687											
	BH2787											
	BH2887			5J		14J						6J
	BH3087											
Mound - Rocky Flats Alluvium	BH3187					20J		7J				
	BH3287											
	BH3387											
	BH3487											
	BH3587							7J				
	BH3687							7J				
	BH3787											6J
	BH3887											
Mound - Sandstone	BH3387											
	BH3487											
Mound - Claystone	BH3187											
	BH3287											
	BH3587											
	BH3687											
	BH3787											
East Trenches Rocky Flats Alluvium	BH3987											
	BH4087											
	BH4187								125			
	BH4287											
	BH4387	130										
	BH4487											
	BH4587											
	BH4687	190										

TABLE A-10 (cont.)

VOLATILE ORGANIC COMPOUNDS DETECTED IN SOILS[1]

	Borehole Number	1,1,1-Tri-Chloro-Ethane (ug/kg)	Carbon Tetra-Chloride (ug/kg)	Tri-Chloro-Ethene (ug/kg)	1,1,2-Trichloro-Ethane (ug/kg)	Tetra-Chloro-Ethene (ug/kg)	1,1,2,2-Tetra-Chloro-Ethene (ug/kg)	Toluene (ug/kg)	Ethyl Benzene (ug/kg)	Styrene (ug/kg)	Total Xylenes (ug/kg)	1,3-Di-Chloro-Propene (ug/kg)
East Trenches Rocky Flats Alluvium	BH4787	13J										
	BH4887											
	BH4987											
	BH5087											
	BH5187											
	BH5287											
	BH5387											
	BH5487											
	BH5587											
	BH5687											
East Trenches Sandstone	BH3987											
	BH4287											
	BH4487											
	BH4587											
	BH5187											
	BH5687											
East Trenches Claystone	BH3987											
	BH4087											
	BH4187		34									
	BH4387											
	BH4587	180										
	BH4687											
	BH4787						21J					
	BH4887											
	BH4987											
	BH5087											
	BH5287											
	BH5387											
	BH5487											
	BH5587											
	BH5787	110	150	27	62		25					

B - Compound also detected in associated blank. Value estimated below detection limit

[1] Concentration data obtained from 1987, 1988 and 1989 field investigations

TABLE A-11

SEMI-VOLATILE ORGANIC COMPOUNDS DETECTED IN SOILS[1]

Borehole Number	N-Nitroso-phenylamine (µg/kg)	di-n-Butyl Phthalate (µg/kg)	bis (2-Ethylhexyl) Phthalate (µg/kg)
903 Pad Rocky Flats Alluvium:			
BH2287	35J	97J	820
BH2387			2300
BH2987			840B
BH3087			
		3400	3100
903 Pad Colluvium:			
BH2487	36J	690J	3300B
BH2587		63J	1900B
BH2687		150J	4200J
BH2787			340
BH2887	51J	61J	3400
903 Pad Sandstone:			
BH2987			
903 Pad Claystone:			
BH2287	89J		
BH2387			
BH2487		640B	2600B
BH2587		56J	830B
BH2687		160J	800
BH2787			220J
BH2887			2100
BH3087			1800B
Mound Rocky Flats Alluvium:			
BH3187			490
BH3287			310J
BH3387			530
BH3487		50J	450
BH3587		92J	680
BH3687		83J	480
BH3787		170J	8700B
BH3887		73J	4600
Mound Sandstone:			
BH3387			450
BH3487		35J	220J
Mound Claystone:			
BH3187	40J		430
BH3287			9J
BH3587			320J
BH3687		38J	360
BH3787		41J	550

[1] Concentration data obtained from the 1987 field investigations concentrations reflect maximum values for the stated borehole.

TABLE A-11 (continued)

SEMI-VOLATILE ORGANIC COMPOUNDS DETECTED IN SOILS

Borehole Number	N-Nitroso-phenylamine (µg/kg)	di-n-Butyl Phthalate (µg/kg)	bis (2-Ethylhexyl) Phthalate (µg/kg)
East Trenches Rocky Flats Alluvium:			
BH3987	33J		360
BH4087			260J
BH4187			380
BH4287		170J	500
BH4387		49J	630
BH4487	40JB		380B
BH4587			880
BH4687			250J
BH4787	120JB	260JB	1000B
BH4887		42JB	670B
BH4987	48J	68JB	1100B
BH5087		49JB	610B
BH5187	52J	120JB	620B
BH5287	370B	120JB	650B
BH5387	38JB	44JB	1300B
BH5487	250JB	90JB	1200B
BH5587		94JB	1200B
BH5687		50JB	1100B
East Trenches Sandstone:			
BH3987			250J
BH4287		39J	520
BH4487		38JB	920B
BH4587			220J
BH5187		86JB	720B
BH5687	42JB	47JB	1000B
East Trenches Claystone:			
BH3987	37JB		250J
BH4087			200J
BH4187			190J
BH4387		34JB	730B
BH4587			190J
BH4687			350
BH4787		59JB	1100B
BH4887		42JB	560B
BH4987			580B
BH5087		55JB	690B
BH5287	280JB	84JB	680B
BH5387		58JB	670B
BH5487		34JB	650B
BH5587		80JB	1000B
BH5787	140J		1000B

TABLE A-12

TOTAL METALS ABOVE BACKGROUND IN SOILS[1]

Analyte	Number of Results Above Background[2]	Number of Results	Range of Background Concentration[3] (mg/kg)	Maximum Concentration[4] (mg/kg)
Aluminum	2	204	10300-25312	70600
Antimony	1	204	ND-16.2	24
Arsenic	35	204	3.6-15.86	37
Barium	6	204	155.8-345.8	1899
Beryllium	0	204	2.2-17.75	1.7
Cadmium	58	204	ND-3.2	6.2
Calcium	31	204	5990-43079	25400
Cesium	0	24	ND-274	ND
Chromium	3	204	10.7-37.9	58
Cobalt	1	204	15.9-29.7	33.1
Copper	1	204	19.6-30.62	25
Iron	7	204	12300-41295	42700
Lead	2	204	13.4-34.5	45.6
Lithium	0	20	7.0-44.4	12.71
Magnesium	2	204	2520-6151	5260
Manganese	14	204	305-659	3540
Mercury	1	204	0.27-0.58	114
Molybdenum	0	15	11.2-38.65	ND
Nickel	4	204	14.3-56.95	36.1
Potassium	3	204	ND-3336	4170
Selenium	1	204	ND-ND	1.5
Silver	0	211	12.7-40.9	ND
Sodium	2	211	ND-3680	1400
Strontium	0	211	69.2-226	184
Thallium	0	211	ND-ND	ND
Tin	0	12	268-338	ND
Vanadium	10	211	22.2-58.2	108
Zinc	2	211	52.69-106.7	58

ND Not detected
1 Concentration data obtained from the 1987, 1988, and 1989 field investigations.
2 Compared to background value for appropriate lithologies, listed in Table A-4.
3 Range of maximum values for different geologic materials.
4 Reported when maximum concentration is above background.

TABLE A-13

TOTAL RADIONUCLIDES ABOVE BACKGROUND IN SOILS[1]

Analyte	Number of Results Above Background[2]	Number of Results	Range of Background Concentration[3] (pCi/gm)	Maximum Concentration[4] (pCi/gm)
Gross Alpha	12	227	37-52.302	480
Gross Beta	5	227	29-36.886	37
Uranium 233,234	7	225	0.8-1.985	3.4
Uranium 235	0	0	0.087-0.258	-
Uranium 238	13	227	1.0-1.675	3.9
Strontium 89,90	10	227	0.4-0.786	1.1
Plutonium 239,240	112	227	0.01-0.020	94
Americium 241	118	227	NR-0.018	22
Cesium 137	42	227	0.0-0.113	3.1
Tritium (pCi/ml)	11	227	0.299-0.410	0.69
Radium 226	0	9	0.9-1.3	-
Radium 228	0	9	1.1-2.5	-

NR Not reported

1 Concentration data obtained from the 1987, 1988, and 1989 field investigations.

2 Compared to background value for appropriate lithologies, listed in Table A-3.

3 Range of maximum values for different geologic materials.

4 Reported when maximum concentration is above background.

TABLE A-14

VOLATILE ORGANIC COMPOUNDS DETECTED IN SEDIMENTS[1]

Sediment Station Number	Chloro-methane (ug/kg)	Vinyl Chloride (ug/kg)	Chloro-Ethane (ug/kg)	Methylene Chloride (ug/kg)	Acetone (ug/kg)	Carbon Disulfide (ug/kg)	Chloro-Ethene (ug/kg)	1,1-Di-Chloro-Ethane (ug/kg)	1,1-Di-Chloro-Ethene (ug/kg)	Total 1,2-Di Chloro-Form (ug/kg)	1,2-Di-Chloro-Ethane (ug/kg)	2-Butanone (ug/kg)
SD011				15B	167							12
SD012					39		5J					
SD013					47B							
SD025				3JB								
SD026				3JB								
SD027				22B	5JB							
SD028				11B	8JB							
SD029	6J			11B	1B							
SD030	19J			16JB	220B	6J				1B		
SD031				8B	8JB							

Sediment Station Number	1,1,1-Tri-Chloro-Ethane (ug/kg)	Carbon Tetra-Chloride (ug/kg)	Tri-Chloro-Ethene (ug/kg)	1,1,2-Trichloro-Ethane (ug/kg)	Tetra-Chloro-Ethene (ug/kg)	1,1,2,2-Tetra-Chloro-Ethane (ug/kg)	Toluene (ug/kg)	Ethyl Benzene (ug/kg)	Styrene (ug/kg)	Total Xylenes (ug/kg)	1,3-Di-Chloro-Propene (ug/kg)
SD011					39		1J	1J		7J	
SD012			4J								
SD013											
SD025			5J								
SD026			3J								
SD027											
SD028											
SD029							2J				
SD030			7J				6J				
SD031			8								

B Compound also detected in associated blankJ - Value estimated below detection

[1] Concentration data obtained from the 1986, 1987, 1988 and 1989 field investigations

TABLE A-15

TOTAL METALS ABOVE BACKGROUND SEDIMENTS[1]

Analyte	Number of Results Above Background[2]	Number of Results	Background Concentration (mg/kg)	Maximum Concentration[3] (mg/kg)
Aluminum	1	25	24789	24800
Antimony	3	25	ND	24.5
Arsenic	0	24	13.0	4.6
Barium	4	25	182	300
Beryllium	20	25	ND	15.5
Cadmium	6	25	ND	2.3
Calcium	6	25	72551	132000
Cesium	0	25	ND	ND
Chromium	0	25	43.38	26.8
Cobalt	1	25	ND	12
Copper	5	25	22.0	40.4
Iron	2	25	28308	28900
Lead	3	25	39.502	66.4
Lithium	11	24	ND	27.8
Magnesium	4	25	4110	5970
Manganese	4	25	372.20	1390
Mercury	1	20	ND	0.72
Molybdenum	6	25	ND	10.3
Nickel	1	25	29.9	34
Potassium	8	25	ND	5180
Selenium	1	25	ND	21.3
Silver	9	25	6.8	48.9
Sodium	5	25	ND	670
Strontium	1	25	175	179
Thallium	1	25	ND	8.5
Tin	9	25	ND	1080
Vanadium	2	25	50.2	58.4
Zinc	10	25	92.688	735

ND Not detected

1 Concentration data obtained from the 1986, 1987, 1988, and 1989 field investigations.

2 Compared to background values listed in Table A-3.

3 Reported when maximum concentration is above background.

TABLE A-16

TOTAL RADIONUCLIDES ABOVE BACKGROUND IN SEDIMENTS[1]

Analyte	Number of Results Above Background[2]	Number of Results	Background Concentration[3] (pCi/gm)	Maximum Concentration[3] (pCi/gm)
Gross Alpha	3	12	60	77
Gross Beta	0	12	50	46
Uranium 233,234	1	12	1.669	2.1
Uranium 235	1	12	0.176	0.2
Uranium 238	1	12	1.735	2.7
Strontium 89,90	0	12	1.390	0.5
Plutonium 239,240	8	12	0.096	0.85
Americium 241	0	3	0.029	0.02
Cesium 137	1	11	1.578	0.3
Tritium (pCi/ml)	0	12	0.408	0.18
Radium 226	1	4	1.0	1.3
Radium 228	0	4	2.1	1.4

1 Concentration data obtained from the 1986, 1987, 1988, and 1989 field investigations.

2 Compared to background values listed in Table A-3.

3 Reported when maximum concentration is above background.

APPENDIX B

SURFACE WATER SAMPLING RESULTS

OPERABLE UNIT NO. 2

APPENDIX B-1

SURFACE WATER SAMPLING RESULTS

VOLATILE ORGANIC COMPOUNDS

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethene ug/l	1,1-Di-chloro ethane ug/l
SW-050	/ /	DRY								
SW-050	07/21/87	NR	NR	NR	NR	NR	NR	NR	140	NR
SW-050	06/27/88	10 U	10 U	10 U	10 U	2 JB	4 JB	5 U	5 U	5 U
SW-050	06/27/88	Insufficient Sample or Volatile Organic Analysis not requested.								
SW-050	04/17/89	DRY								
SW-050	05/10/89	DRY								
SW-050	06/27/89	10 U V	10 U V	10 U V	10 U V	5 U V	10 U V	5 U V	5 U V	5 U V
SW-050	07/18/89	10 U V	10 U V	10 U V	10 U V	5 U V	1 JB R	5 U V	5 U V	5 U V
SW-050	08/11/89	DRY								
SW-050	09/12/89	DRY								
SW-050	10/04/89	DRY								
SW-050	11/03/89	DRY								
SW-050	12/01/89	DRY								
SW-050	01/05/90	DRY								
SW-050	02/02/90	DRY								
SW-050	03/17/90	DRY								
SW-051	07/21/87	NR	NR	NR	NR	NR	NR	NR	101	NR
SW-051	06/23/88	DRY								
SW-051	04/17/89	DRY								
SW-051	05/10/89	DRY								
SW-051	06/27/89	10 U V	10 U V	10 U V	10 U V	5 U V	10 U V	5 U B	5 U V	5 U V
SW-051	07/18/89	DRY								
SW-051	08/11/89	DRY								
SW-051	09/12/89	DRY								
SW-051	10/04/89	DRY								
SW-051	11/03/89	DRY								
SW-051	12/01/89	DRY								
SW-051	01/05/90	DRY								
SW-051	02/02/90	DRY								
SW-052	07/21/87	NR	NR	NR	NR	NR	NR	NR	73	NR
SW-052	06/23/88	10 U	10 U	10 U	10 U	6 B	7 JB	5 U	5 U	5 U
SW-052	04/17/89	DRY								
SW-052	05/10/89	DRY								
SW-052	06/09/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Total-1,2-Dichloro ethene ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Brome dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-050	/ /	DRY								
SW-050	07/21/87	5 U	84	5 U	NR	5 U	1005	NR	NR	NR
SW-050	06/27/88	NR	6	5 U	10 U	1 J	9	10 U	5 U	5 U
SW-050	06/27/88	Insufficient Sample or Volatile Organic Analysis not requested.								
SW-050	04/17/89	DRY								
SW-050	05/10/89	DRY								
SW-050	06/27/89	5 U V	8 V	5 U V	10 U V	5 U V	2 J A	10 U V	5 U V	5 U V
SW-050	07/18/89	5 U V	6 V	5 U V	10 U V	5 U V	10 V	10 U V	5 U V	5 U V
SW-050	08/11/89	DRY								
SW-050	09/12/89	DRY								
SW-050	10/04/89	DRY								
SW-050	11/03/89	DRY								
SW-050	12/01/89	DRY								
SW-050	01/05/90	DRY								
SW-050	02/02/90	DRY								
SW-050	03/17/90	DRY								
SW-051	07/21/87	5 U	5 U	5 U	NR	5 U	282	NR	NR	NR
SW-051	06/23/88	DRY								
SW-051	04/17/89	DRY								
SW-051	05/10/89	DRY								
SW-051	06/27/89	5 U V	4 J A	5 U V	10 U V	5 U V	46 V	10 U V	5 U V	5 U V
SW-051	07/18/89	DRY								
SW-051	08/11/89	DRY								
SW-051	09/12/89	DRY								
SW-051	10/04/89	DRY								
SW-051	11/03/89	DRY								
SW-051	12/01/89	DRY								
SW-051	01/05/90	DRY								
SW-051	02/02/90	DRY								
SW-052	07/21/87	5 U	5 U	5 U	NR	5 U	5 U	NR	NR	NR
SW-052	06/23/88	NR	2 J	5 U	10 U	1 J	3 J	10 U	5 U	5 U
SW-052	04/17/89	DRY								
SW-052	05/10/89	DRY								
SW-052	06/09/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Tri chloro ethene ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-pentanone ug/l	2-Hexanone ug/l
SW-050	/ /	DRY								
SW-050	07/21/87	NR	40	NR	5 U	NR	NR	NR	NR	NR
SW-050	06/27/88	5 U	13	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-050	06/27/88	Insufficient Sample or Volatile Organic Analysis not requested.								
SW-050	04/17/89	DRY								
SW-050	05/10/89	DRY								
SW-050	06/27/89	5 U V	9 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U R
SW-050	07/18/89	5 U V	8 V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U R
SW-050	08/11/89	DRY								
SW-050	09/12/89	DRY								
SW-050	10/04/89	DRY								
SW-050	11/03/89	DRY								
SW-050	12/01/89	DRY								
SW-050	01/05/90	DRY								
SW-050	02/02/90	DRY								
SW-050	03/17/90	DRY								
SW-051	07/21/87	NR	17	NR	5 U	NR	NR	NR	NR	NR
SW-051	06/23/88	DRY								
SW-051	04/17/89	DRY								
SW-051	05/10/89	DRY								
SW-051	06/27/89	5 U V	5 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U R
SW-051	07/18/89	DRY								
SW-051	08/11/89	DRY								
SW-051	09/12/89	DRY								
SW-051	10/04/89	DRY								
SW-051	11/03/89	DRY								
SW-051	12/01/89	DRY								
SW-051	01/05/90	DRY								
SW-051	02/02/90	DRY								
SW-052	07/21/87	NR	5 U	NR	5 U	NR	NR	NR	NR	NR
SW-052	06/23/88	5 U	9	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-052	04/17/89	DRY								
SW-052	05/10/89	DRY								
SW-052	06/09/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALIFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethane ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-050	/ /	DRY						
SW-050	07/21/87	65	NR	NR	NR	NR	NR	NR
SW-050	06/27/88	50	5 U	5 U	5 U	5 U	5 U	5 U
SW-050	06/27/88	Insufficient Sample or Volatile Organic Analysis not requested.						
SW-050	04/17/89	DRY						
SW-050	05/10/89	DRY						
SW-050	06/27/89	15 V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-050	07/18/89	19 V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-050	08/11/89	DRY						
SW-050	09/12/89	DRY						
SW-050	10/04/89	DRY						
SW-050	11/03/89	DRY						
SW-050	12/01/89	DRY						
SW-050	01/05/90	DRY						
SW-050	02/02/90	DRY						
SW-050	03/17/90	DRY						
SW-051	07/21/87	44	NR	NR	NR	NR	NR	NR
SW-051	06/23/88	DRY						
SW-051	04/17/89	DRY						
SW-051	05/10/89	DRY						
SW-051	06/27/89	9 V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-051	07/18/89	DRY						
SW-051	08/11/89	DRY						
SW-051	09/12/89	DRY						
SW-051	10/04/89	DRY						
SW-051	11/03/89	DRY						
SW-051	12/01/89	DRY						
SW-051	01/05/90	DRY						
SW-051	02/02/90	DRY						
SW-052	07/21/87	5 U	NR	NR	NR	NR	NR	NR
SW-052	06/23/88	28	5 U	5 U	5 U	5 U	5 U	5 U
SW-052	04/17/89	DRY						
SW-052	05/10/89	DRY						
SW-052	06/09/89	DRY						

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethene ug/l	1,1-Di-chloro ethane ug/l
SW-052	07/07/89	DRY								
SW-052	08/11/89	DRY								
SW-052	09/20/89	DRY								
SW-052	10/04/89	DRY								
SW-052	11/03/89	DRY								
SW-052	12/01/89	DRY								
SW-052	01/05/90	DRY								
SW-052	02/02/90	DRY								
SW-052	03/17/90	DRY								
SW-055	07/21/87	NR	NR	NR	NR	NR	NR	NR	50	NR
SW-055	07/21/87	Insufficient Sample or Volatile Organic Analysis not requested.								
SW-055	06/22/88	10 U	10 U	2 J	10 U	5 B	5 JB	5 U	5 U	5 U
SW-055	04/17/89	10 U A	10 U A	10 U A	10 U A	5 U A	5 J A	5 U A	5 U A	5 U A
SW-055	05/25/89	Data not yet received								
SW-055	06/28/89	10 U V	10 U V	10 U V	10 U V	5 U V	10 U V	5 U V	5 U V	5 U V
SW-055	07/18/89	10 U V	10 U V	10 U V	10 U V	5 U V	1 JB R	5 U V	5 U V	5 U V
SW-055	08/16/89	10 U V	10 U V	10 U V	10 U V	1 JB A	3 JB A	5 U V	5 U V	5 U V
SW-055	09/20/89	10 U	10 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U
SW-055	10/19/89	10 U	10 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U
SW-055	11/09/89	10 U	10 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U
SW-055	12/07/89	Data not yet received								
SW-055	01/16/90	Data not yet received								
SW-055	02/23/90	Data not yet received								
SW-055	03/15/90	Data not yet received								
SW-057	07/21/87	NR	NR	NR	NR	NR	NR	NR	40	NR
SW-057	06/23/88	DRY								
SW-057	04/17/89	DRY								
SW-057	05/10/89	DRY								
SW-057	06/09/89	DRY								
SW-057	07/07/89	DRY								
SW-057	08/11/89	DRY								
SW-057	09/16/89	DRY								
SW-057	10/04/89	DRY								
SW-057	11/03/89	DRY								

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DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Total-1,2-Dichloro ethene ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Bromo dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-052	07/07/89	DRY								
SW-052	08/11/89	DRY								
SW-052	09/28/89	DRY								
SW-052	10/04/89	DRY								
SW-052	11/03/89	DRY								
SW-052	12/01/89	DRY								
SW-052	01/05/90	DRY								
SW-052	02/02/90	DRY								
SW-052	03/17/90	DRY								
SW-055	07/21/87	5 U	5 U	5 U	NR	5 U	5 U	NR	NR	NR
SW-055	07/21/87	Insufficient Sample or Volatile Organic Analysis not requested.								
SW-055	06/22/88	NR	5 U	5 U	10 U	5 U	5 U	10 U	5 U	5 U
SW-055	04/17/89	5 U A	5 U A	5 U A	10 U R	5 U A	5 U A	10 U A	5 U A	5 U A
SW-055	05/25/89	Data not yet received								
SW-055	06/28/89	5 U V	5 U V	5 U V	10 U V	5 U V	5 U V	10 U V	5 U V	5 U V
SW-055	07/18/89	5 U V	5 U V	5 U V	10 U V	5 U V	5 U V	10 U V	5 U V	5 U V
SW-055	08/16/89	5 U V	5 U V	5 U V	10 U V	5 U V	5 U V	10 U V	5 U V	5 U V
SW-055	09/20/89	5 U	5 U	5 U	10 U	5 U	5 U	10 U	5 U	5 U
SW-055	10/19/89	11	5 U	5 U	10 U	5 U	5 U	10 U	5 U	5 U
SW-055	11/09/89	5 U	5 U	5 U	10 U	5 U	5 U	10 U	5 U	5 U
SW-055	12/07/89	Data not yet received								
SW-055	01/16/90	Data not yet received								
SW-055	02/23/90	Data not yet received								
SW-055	03/15/90	Data not yet received								
SW-057	07/21/87	5 U	5 U	5 U	NR	5 U	5 U	NR	NR	NR
SW-057	06/23/88	DRY								
SW-057	04/17/89	DRY								
SW-057	05/10/89	DRY								
SW-057	06/09/89	DRY								
SW-057	07/07/89	DRY								
SW-057	08/11/89	DRY								
SW-057	09/16/89	DRY								
SW-057	10/04/89	DRY								
SW-057	11/03/89	DRY								

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Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Tri chloro ethane ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-penta none ug/l	2-Hexanone ug/l
SW-052	07/07/89	DRY								
SW-052	08/11/89	DRY								
SW-052	09/20/89	DRY								
SW-052	10/04/89	DRY								
SW-052	11/03/89	DRY								
SW-052	12/01/89	DRY								
SW-052	01/05/90	DRY								
SW-052	02/02/90	DRY								
SW-052	03/17/90	DRY								
SW-055	07/21/87	NR	5 U	NR	5 U	NR	NR	NR	NR	NR
SW-055	07/21/87	Insufficient Sample or Volatile Organic Analysis not requested.								
SW-055	06/22/88	5 U	87	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-055	04/17/89	5 U A	44 A	5 U A	5 U A	5 U A	5 U A	5 U A	10 U A	10 U A
SW-055	05/25/89	Data not yet received								
SW-055	06/28/89	5 U V	19 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U R
SW-055	07/18/89	5 U V	19 V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U R
SW-055	08/16/89	5 U V	28 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-055	09/20/89	5 U	24	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-055	10/19/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-055	11/09/89	5 U	65	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-055	12/07/89	Data not yet received								
SW-055	01/16/90	Data not yet received								
SW-055	02/23/90	Data not yet received								
SW-055	03/15/90	Data not yet received								
SW-057	07/21/87	NR	5 U	NR	5 U	NR	NR	NR	NR	NR
SW-057	06/23/88	DRY								
SW-057	04/17/89	DRY								
SW-057	05/10/89	DRY								
SW-057	06/09/89	DRY								
SW-057	07/07/89	DRY								
SW-057	08/11/89	DRY								
SW-057	09/16/89	DRY								
SW-057	10/04/89	DRY								
SW-057	11/03/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not,been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethene ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-052	07/07/89	DRY						
SW-052	08/11/89	DRY						
SW-052	09/28/89	DRY						
SW-052	10/04/89	DRY						
SW-052	11/03/89	DRY						
SW-052	12/01/89	DRY						
SW-052	01/05/90	DRY						
SW-052	02/02/90	DRY						
SW-052	03/17/90	DRY						
SW-055	07/21/87	5 U	NR	NR	NR	NR	NR	NR
SW-055	07/21/87	Insufficient Sample or Volatile Organic Analysis not requested.						
SW-055	06/22/88	2 J	5 U	1 J	5 U	5 U	5 U	5 U
SW-055	04/17/89	5 U A	5 U *	5 U A	5 U A	5 U A	5 U A	5 U A
SW-055	05/25/89	Data not yet received						
SW-055	06/28/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-055	07/18/89	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-055	08/16/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-055	09/20/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U
SW-055	10/19/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U
SW-055	11/09/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U
SW-055	12/07/89	Data not yet received						
SW-055	01/16/90	Data not yet received						
SW-055	02/23/90	Data not yet received						
SW-055	03/15/90	Data not yet received						
SW-057	07/21/87	5 U	NR	NR	NR	NR	NR	NR
SW-057	06/23/88	DRY						
SW-057	04/17/89	DRY						
SW-057	05/10/89	DRY						
SW-057	06/09/89	DRY						
SW-057	07/07/89	DRY						
SW-057	08/11/89	DRY						
SW-057	09/16/89	DRY						
SW-057	10/04/89	DRY						
SW-057	11/03/89	DRY						

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethane ug/l	1,1-Di-chloro ethene ug/l
SW-057	12/01/89	DRY								
SW-057	01/05/90	DRY								
SW-057	02/02/90	DRY								
SW-057	03/17/90	DRY								
SW-058	07/21/87	NR	NR	NR	NR	NR	NR	NR	5 U	NR
SW-058	06/23/88	10 U	10 U	10 U	10 U	6 B	7 JB	5 U	5 U	5 U
SW-058	04/17/89	DRY								
SW-058	05/10/89	DRY								
SW-058	06/28/89	10 U V	10 U V	10 U V	10 U V	2 JB A	11 A	2 J A	5 U V	5 U V
SW-058	07/14/89	DRY								
SW-058	08/11/89	DRY								
SW-058	09/20/89	DRY								
SW-058	10/04/89	DRY								
SW-058	11/20/89	DRY								
SW-058	12/01/89	DRY								
SW-058	01/05/90	DRY								
SW-058	02/02/90	DRY								
SW-077	06/22/88	10 U	10 U	10 U	10 U	6 B	3 JB	5 U	6	1 J
SW-077	03/30/89	DRY								
SW-077	05/11/89	DRY								
SW-077	06/27/89	10 U V	10 U V	10 U V	10 U V	5 U V	12 A	3 J A	5 U V	5 U V
SW-077	07/18/89	DRY								
SW-077	08/16/89	10 U V	10 U V	10 U V	10 U V	5 U V	2 JB A	5 U V	5 U V	5 U V
SW-077	09/20/89	DRY								
SW-077	10/04/89	DRY								
SW-077	11/09/89	DRY								
SW-077	12/01/89	DRY								
SW-077	01/05/90	DRY								
SW-077	02/02/90	DRY								
SW-077	03/16/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Total-1,2-Dichloro ethene ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Bromo dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-057	12/01/89	DRY								
SW-057	01/05/90	DRY								
SW-057	02/02/90	DRY								
SW-057	03/17/90	DRY								
SW-058	07/21/87	5 U	5 U	5 U	NR	5 U	5 U	NR	NR	NR
SW-058	06/23/88	NR	9	5 U	10 U	5 U	6	10 U	5 U	5 U
SW-058	04/17/89	DRY								
SW-058	05/10/89	DRY								
SW-058	06/28/89	5 U V	2 J A	5 U B	10 U R	5 U V	1 J A	10 U V	5 U B	5 U V
SW-058	07/14/89	DRY								
SW-058	08/11/89	DRY								
SW-058	09/20/89	DRY								
SW-058	10/04/89	DRY								
SW-058	11/20/89	DRY								
SW-058	12/01/89	DRY								
SW-058	01/05/90	DRY								
SW-058	02/02/90	DRY								
SW-077	06/22/88	NR	68	5 U	10 U	9	5 U	10 U	5 U	5 U
SW-077	03/30/89	DRY								
SW-077	05/11/89	DRY								
SW-077	06/27/89	6 V	3 J A	5 U V	10 U R	5 U V	5 U V	10 U V	5 U V	5 U V
SW-077	07/18/89	DRY								
SW-077	08/16/89	5 U V	5 U V	5 U V	10 U V	5 U V	5 U V	10 U V	5 U V	5 U V
SW-077	09/20/89	DRY								
SW-077	10/04/89	DRY								
SW-077	11/09/89	DRY								
SW-077	12/01/89	DRY								
SW-077	01/05/90	DRY								
SW-077	02/02/90	DRY								
SW-077	03/16/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Tri chloro ethane ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-penta none ug/l	2-Hexanone ug/l
SW-057	12/01/89	DRY								
SW-057	01/05/90	DRY								
SW-057	02/02/90	DRY								
SW-057	03/17/90	DRY								
SW-058	07/21/87	NR	5 U	NR	5 U	NR	NR	NR	NR	NR
SW-058	06/23/88	5 U	8	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-058	04/17/89	DRY								
SW-058	05/10/89	DRY								
SW-058	06/28/89	5 U V	5 U V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U R	10 U R
SW-058	07/14/89	DRY								
SW-058	08/11/89	DRY								
SW-058	09/20/89	DRY								
SW-058	10/04/89	DRY								
SW-058	11/20/89	DRY								
SW-058	12/01/89	DRY								
SW-058	01/05/90	DRY								
SW-058	02/02/90	DRY								
SW-077	06/22/88	5 U	2500	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-077	03/30/89	DRY								
SW-077	05/11/89	DRY								
SW-077	06/27/89	5 U V	47 A	5 U V	5 U V	5 U A	5 U V	5 U V	10 U R	10 U R
SW-077	07/18/89	DRY								
SW-077	08/16/89	5 U V	5 U V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-077	09/20/89	DRY								
SW-077	10/04/89	DRY								
SW-077	11/09/89	DRY								
SW-077	12/01/89	DRY								
SW-077	01/05/90	DRY								
SW-077	02/02/90	DRY								
SW-077	03/16/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethene ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-057	12/01/89	DRY						
SW-057	01/05/90	DRY						
SW-057	02/02/90	DRY						
SW-057	03/17/90	DRY						
SW-058	07/21/87	5 U	NR	NR	NR	NR	NR	NR
SW-058	06/23/88	14	5 U	5 U	5 U	5 U	5 U	5 U
SW-058	04/17/89	DRY						
SW-058	05/10/89	DRY						
SW-058	06/28/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-058	07/14/89	DRY						
SW-058	08/11/89	DRY						
SW-058	09/20/89	DRY						
SW-058	10/04/89	DRY						
SW-058	11/20/89	DRY						
SW-058	12/01/89	DRY						
SW-058	01/05/90	DRY						
SW-058	02/02/90	DRY						
SW-077	06/22/88	41	5 U	5 U	5 U	5 U	5 U	5 U
SW-077	03/30/89	DRY						
SW-077	05/11/89	DRY						
SW-077	06/27/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-077	07/18/89	DRY						
SW-077	08/16/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-077	09/20/89	DRY						
SW-077	10/04/89	DRY						
SW-077	11/09/89	DRY						
SW-077	12/01/89	DRY						
SW-077	01/05/90	DRY						
SW-077	02/02/90	DRY						
SW-077	03/16/90	Data not yet received						

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 53

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethene ug/l	1,1-Di-chloro ethane ug/l
SW-053	07/21/87	NR	NR	NR	NR	NR	NR	NR	5 U	NR
SW-053	06/23/88	10 U	10 U	10 U	10 U	6 B	9 JB	5 U	5 U	5 U
SW-053	06/23/88	Insufficient Sample or Volatile Organic Analysis not requested.								
SW-053	04/05/89	10 U V	10 U V	10 U V	10 U V	5 B A	8 JB A	2 J A	5 U V	5 U V
SW-053	05/23/89	10 U V	10 U V	10 U V	10 U V	9 B A	10 U V	5 U V	5 U V	5 U V
SW-053	06/26/89	10 U A	10 U A	10 U A	10 U A	5 U A	11 A	5 U A	5 U A	5 U A
SW-053	07/19/89	DRY								
SW-053	08/15/89	10 U V	10 U V	10 U V	10 U V	5 U V	3 J A	5 U V	5 U V	5 U V
SW-053	09/20/89	10 U	10 U	10 U	10 U	5 U	4 JB	5 U	5 U	5 U
SW-053	10/12/89	10 U	10 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U
SW-053	11/07/89	Data not yet received								
SW-053	12/15/89	Data not yet received								
SW-053	01/17/90	Data not yet received								
SW-053	02/13/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 53

Station Number	Date Sampled	Total-1,2-Dichloro ethene ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Bromo dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-053	07/21/87	5 U	5 U	5 U	NR	5 U	5 U	NR	NR	NR
SW-053	06/23/88	NR	5 U	5 U	10 U	5 U	5 U	10 U	5 U	5 U
SW-053	06/23/88	Insufficient Sample or Volatile Organic Analysis not requested.								
SW-053	04/05/89	27 V	5 U V	5 U V	10 U R	5 U V	5 U V	10 U V	5 U V	5 U V
SW-053	05/23/89	5 U V	5 U V	5 U V	10 U V	5 U V	5 U V	10 U V	5 U V	5 U V
SW-053	06/26/89	27 A	5 U A	5 U A	10 U R	5 U A	5 U A	10 U A	5 U A	5 U A
SW-053	07/19/89	DRY								
SW-053	08/15/89	5 U V	5 U V	5 U V	10 U V	5 U V	5 U V	10 U V	5 U V	5 U V
SW-053	09/20/89	5 U	5 U	5 U	10 U	5 U	5 U	10 U	5 U	5 U
SW-053	10/12/89	42	5 U	5 U	10 U	5 U	5 U	10 U	5 U	5 U
SW-053	11/07/89	Data not yet received								
SW-053	12/15/89	Data not yet received								
SW-053	01/17/90	Data not yet received								
SW-053	02/13/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 53

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Tri chloro ethane ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-penta none ug/l	2-Hexanone ug/l
SW-053	07/21/87	NR	5 U	NR	5 U	NR	NR	NR	NR	NR
SW-053	06/23/88	5 U	2 J	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-053	08/23/88	Insufficient Sample or Volatile Organic Analysis not requested.								
SW-053	04/05/89	5 U V	13 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-053	05/23/89	5 U V	2 J A	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-053	06/26/89	5 U A	5 U A	5 U A	5 U A	5 U A	5 U A	5 U A	10 U R	10 U R
SW-053	07/19/89	DRY								
SW-053	08/15/89	5 U V	5 U V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-053	09/20/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-053	10/12/89	5 U	1 J	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-053	11/07/89	Data not yet received								
SW-053	12/15/89	Data not yet received								
SW-053	01/17/90	Data not yet received								
SW-053	02/13/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 53

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethane ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-053	07/21/87	5 U	NR	NR	NR	NR	NR	NR
SW-053	06/23/88	5 U	5 U	2 J	5 U	5 U	5 U	5 U
SW-053	06/23/88	Insufficient Sample or Volatile Organic Analysis not requested.						
SW-053	04/05/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-053	05/23/89	5 U V	5 U V	2 J A	5 U A	5 U A	5 U A	5 U A
SW-053	06/26/89	5 U A	5 U A	5 U A	5 U A	5 U A	5 U	5 U
SW-053	07/19/89	DRY						
SW-053	08/15/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-053	09/20/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U
SW-053	10/12/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U
SW-053	11/07/89	Data not yet received						
SW-053	12/15/89	Data not yet received						
SW-053	01/17/90	Data not yet received						
SW-053	02/13/90	Data not yet received						

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethene ug/l	1,1-Di-chloro ethane ug/l
SW-056	07/21/87	NR	NR	NR	NR	NR	NR	NR	143	NR
SW-056	06/30/88	10 U	10 U	10 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U
SW-056	04/13/89	50 U A	50 U A	9 J A	50 U A	29 A	130 A	25 U A	25 U A	25 U A
SW-056	05/11/89	10 U V	10 U V	9 J A	10 U V	1 J A	10 U V	5 U V	1 J A	5 V
SW-056	06/07/89	10 U V	10 U V	15 V	10 U V	5 U V	10 U V	5 U V	1 J A	4 J A
SW-056	07/12/89	20 U	20 U	12 J	20 U	36 B	10 JB	10 U	10 U	6 J
SW-056	08/09/89	Data not yet received								
SW-056	09/14/89	20 U	20 U	20 U	20 U	10 U	20 U	10 U	10 U	10 U
SW-056	10/18/89	Data not yet received								
SW-056	11/15/89	Data not yet received								
SW-056	12/19/89	Data not yet received								
SW-056	01/25/90	Data not yet received								
SW-056	02/22/90	Data not yet received								
SW-056	03/21/90	Data not yet received								
SW-060	07/21/87	NR	NR	NR	NR	NR	NR	NR	5 U	NR
SW-060	11/11/87	10 U	10 U	10 U	10 U	44	10 U	5 U	5 U	5 U
SW-060	07/01/88	10 U	10 U	10 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U
SW-060	03/16/89	10 U V	10 U V	2 J A	10 U V	4 JB A	10 U V	5 U V	5 U V	5 U V
SW-060	03/16/89	10 U V	10 U V	10 U V	10 U V	3 JB A	3 J V	5 U V	5 U V	5 U V
SW-060	05/15/89	10 U V	10 U V	10 U V	10 U V	5 U V	10 U V	5 U V	5 U V	5 U V
SW-060	05/15/89	10 U V	10 U V	10 U V	10 U V	8 B A	10 U V	5 U V	5 U V	5 U V
SW-060	06/09/89	10 U V	10 U V	10 U V	10 U V	5 U V	10 U V	5 U V	5 U V	5 U V
SW-060	07/06/89	10 U V	10 U V	10 U V	10 U V	11 V	10 U V	5 U V	5 U V	5 U V
SW-060	08/03/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	10/03/89	10 U	10 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U
SW-060	11/06/89	Data not yet received								
SW-060	11/06/89	Data not yet received								
SW-060	12/06/89	Data not yet received								
SW-060	01/23/90	Data not yet received								
SW-060	02/09/90	Data not yet received								
SW-060	03/12/90	Data not yet received								
SW-061	07/22/87	NR	NR	NR	NR	NR	NR	NR	5 U	NR

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Total-1,2-Dichloro ethene ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Bromo dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-056	07/21/87	5 U	5 U	5 U	NR	5 U	5 U	NR	NR	NR
SW-056	06/30/88	NR	5.0 U	5.0 U	10 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U
SW-056	04/13/89	25 U A	25 U A	25 U A	50 U R	25 U A	25 U A	50 U A	25 U A	25 U A
SW-056	05/11/89	5 U V	5 U V	5 U V	10 U V	9 V	3 J A	10 U R	5 U V	5 U V
SW-056	06/07/89	5 U V	5 U V	5 U V	10 U V	9 V	3 J A	10 U V	5 U V	5 U V
SW-056	07/12/89	10 U	10 U	10 U	20 U	8 J	3 J	20 U	10 U	10 U
SW-056	08/09/89	Data not yet received								
SW-056	09/14/89	10 U	10 U	10 U	20 U	10 U	10 U	20 U	10 U	10 U
SW-056	10/18/89	Data not yet received								
SW-056	11/15/89	Data not yet received								
SW-056	12/19/89	Data not yet received								
SW-056	01/25/90	Data not yet received								
SW-056	02/22/90	Data not yet received								
SW-056	03/21/90	Data not yet received								
SW-060	07/21/87	5 U	5 U	5 U	NR	5 U	173	NR	NR	NR
SW-060	11/11/87	5 U	10	5 U	10 U	5 U	145	10 U	5 U	5 U
SW-060	07/01/88	NR	5.0 U	5.0 U	10 U	5.0 U	46.5	10 U	5.0 U	5.0 U
SW-060	03/16/89	5 U V	14 V	5 U V	10 U V	5 U V	88 A	10 U V	5 U V	5 U V
SW-060	03/16/89	5 U V	12 V	5 U V	10 U V	5 U V	75 A	10 U V	5 U V	5 U V
SW-060	05/15/89	5 U V	9 V	5 U V	10 U V	12 V	92 V	10 U V	5 U V	5 U V
SW-060	05/15/89	5 U V	5 U V	5 U V	10 U V	5 U V	65 B V	10 U V	5 U V	5 U V
SW-060	06/09/89	5 U V	5 V	5 U V	10 U V	5 U V	74 V	10 U V	5 U V	5 U V
SW-060	07/06/89	5 U V	2 J A	5 U V	10 U V	5 U V	18 V	10 U V	5 U V	5 U V
SW-060	08/03/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	10/03/89	5 U	1 J	5 U	10 U	5 U	21	10 U	5 U	5 U
SW-060	11/06/89	Data not yet received								
SW-060	11/06/89	Data not yet received								
SW-060	12/06/89	Data not yet received								
SW-060	01/23/90	Data not yet received								
SW-060	02/09/90	Data not yet received								
SW-060	03/12/90	Data not yet received								
SW-061	07/22/87	5 U	5 U	5 U	NR	33	5 U	NR	NR	NR

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank M = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Trichloro ethane ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-pentanone ug/l	2-Hexanone ug/l
SW-056	07/21/87	NR	50	NR	5 U	NR	NR	NR	NR	NR
SW-056	06/30/88	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U
SW-056	04/13/89	25 U A	120 A	25 U A	25 U A	25 U A	25 U A	25 U A	50 U A	50 U A
SW-056	05/11/89	5 U V	140 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-056	06/07/89	5 U V	130 V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U V
SW-056	07/12/89	10 U	140	10 U	10 U	10 U	10 U	10 U	20 U	20 U
SW-056	08/09/89	Data not yet received								
SW-056	09/14/89	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
SW-056	10/18/89	Data not yet received								
SW-056	11/15/89	Data not yet received								
SW-056	12/19/89	Data not yet received								
SW-056	01/25/90	Data not yet received								
SW-056	02/22/90	Data not yet received								
SW-056	03/21/90	Data not yet received								
SW-060	07/21/87	NR	5 U	NR	5 U	NR	NR	NR	NR	NR
SW-060	11/11/87	5 U	25	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-060	07/01/88	5.0 U	12.3	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U
SW-060	03/16/89	5 U V	15 V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U V
SW-060	03/16/89	5 U V	12 V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U V
SW-060	05/15/89	5 U V	31 V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U V
SW-060	05/15/89	5 U V	20 V	5 U V	5 U V	5 U A	5 U V	5 U R	10 U V	10 U V
SW-060	06/09/89	5 U V	13 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-060	07/06/89	5 U V	3 J A	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U R
SW-060	08/03/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	10/03/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-060	11/06/89	Data not yet received								
SW-060	11/06/89	Data not yet received								
SW-060	12/06/89	Data not yet received								
SW-060	01/23/90	Data not yet received								
SW-060	02/09/90	Data not yet received								
SW-060	03/12/90	Data not yet received								
SW-061	07/22/87	NR	6	NR	5 U	NR	NR	NR	NR	NR

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethane ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-056	07/21/87	72	NR	NR	NR	NR	NR	NR
SW-056	06/30/88	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
SW-056	04/13/89	190	25 U A	25 U A	25 U A	25 U A	25 U A	25 U A
SW-056	05/11/89	200	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-056	06/07/89	190 V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-056	07/12/89	280	10 U	10 U	10 U	10 U	10 U	10 U
SW-056	08/09/89	Data not yet received						
SW-056	09/14/89	10 U	10 U	10 U	10 U	10 U	10 U	10 U
SW-056	10/18/89	Data not yet received						
SW-056	11/15/89	Data not yet received						
SW-056	12/19/89	Data not yet received						
SW-056	01/25/90	Data not yet received						
SW-056	02/22/90	Data not yet received						
SW-056	03/21/90	Data not yet received						
SW-060	07/21/87	5 U	NR	NR	NR	NR	NR	NR
SW-060	11/11/87	5 U	5 U	11	5 U	5 U	5 U	5 U
SW-060	07/01/88	10.3	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
SW-060	03/16/89	14 V	5 U V	1 J A	5 U V	5 U V	5 U V	5 U V
SW-060	03/16/89	11 V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-060	05/15/89	35 V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-060	05/15/89	23 V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-060	06/09/89	18 V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-060	07/06/89	3 J A	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-060	08/03/89	Data not yet received						
SW-060	09/11/89	Data not yet received						
SW-060	09/11/89	Data not yet received						
SW-060	10/03/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U
SW-060	11/06/89	Data not yet received						
SW-060	11/06/89	Data not yet received						
SW-060	12/06/89	Data not yet received						
SW-060	01/23/90	Data not yet received						
SW-060	02/09/90	Data not yet received						
SW-060	03/12/90	Data not yet received						
SW-061	07/22/87	5 U	NR	NR	NR	NR	NR	NR

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethane ug/l	1,1-Di-chloro ethane ug/l
SW-061	11/11/87	10 U	10 U	10 U	10 U	20	10 U	5 U	5 U	5 U
SW-061	07/01/88	10 U	10 U	10 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U
SW-061	03/20/89	Data not yet received								
SW-061	05/15/89	10 U V	10 U V	2 J A	10 U V	5 U V	10 U V	5 U V	5 U V	5 U V
SW-061	06/09/89	10 U V	10 U V	2 J A	10 U V	5 U V	3 JB A	5 U V	5 U V	1 J A
SW-061	07/06/89	10 U V	10 U V	4 J A	10 U V	2 J A	10 U V	5 U V	5 U V	2 J A
SW-061	08/03/89	Data not yet received								
SW-061	09/11/89	Data not yet received								
SW-061	10/03/89	10 U	10 U	10 U	10 U	9 B	10 U	5 U	5 U	5 U
SW-061	10/20/89	DRY								
SW-061	11/06/89	Data not yet received								
SW-061	12/06/89	Data not yet received								
SW-061	01/23/90	Data not yet received								
SW-061	02/09/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-101	06/30/88	10 U	10 U	10 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U
SW-101	04/13/89	Data not yet received								
SW-101	05/11/89	10 U V	10 U V	10 U V	10 U V	3 J A	10 U V	5 U V	5 U V	5 U V
SW-101	06/07/89	10 U V	10 U V	10 U V	10 U V	5 U V	10 U V	5 U V	5 U V	5 U V
SW-101	07/12/89	10 U	10 U	10 U	10 U	2 J	10 U	5 U	5 U	5 U
SW-101	08/09/89	10 U V	10 U V	10 U V	10 U V	3 JB A	65 A	5 U V	5 U V	5 U V
SW-101	09/14/89	10 U	10 U	10 U	10 U	4 JB	10 U	5 U	5 U	5 U
SW-101	10/18/89	Data not yet received								
SW-101	11/15/89	Data not yet received								
SW-101	12/19/89	Data not yet received								
SW-101	01/25/90	Data not yet received								
SW-101	02/22/90	Data not yet received								
SW-101	03/21/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Total-1,2-Dichloro ethene ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Bromo dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-061	11/11/87	5 U	15	5 U	10 U	5 U	6	10 U	5 U	5 U
SW-061	07/01/88	NR	5.0 U	5.0 U	10 U	5.0 U	7.9	10 U	5.0 U	5.0 U
SW-061	03/20/89	Data not yet received								
SW-061	05/15/89	5 U V	3 J A	5 U V	10 U V	5 V	22 V	10 U V	5 U V	5 U V
SW-061	06/09/89	5 U V	3 J A	5 U V	10 U V	5 U V	33 V	10 U V	5 U V	5 U V
SW-061	07/06/89	5 U V	2 J A	5 U V	10 U V	5 U V	7 V	10 U V	5 U V	5 U V
SW-061	08/03/89	Data not yet received								
SW-061	09/11/89	Data not yet received								
SW-061	10/03/89	5 U	1 J	5 U	10 U	5 U	11	10 U	5 U	5 U
SW-061	10/20/89	DRY								
SW-061	11/06/89	Data not yet received								
SW-061	12/06/89	Data not yet received								
SW-061	01/23/90	Data not yet received								
SW-061	02/09/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-101	06/30/88	NR	79	5.0 U	10 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U
SW-101	04/13/89	Data not yet received								
SW-101	05/11/89	5 U V	53 V	5 U V	10 U V	5 U V	5 U V	10 U R	2 J A	5 U V
SW-101	06/07/89	5 U V	66 V	5 U V	10 U V	5 U V	5 U V	10 U V	2 J A	5 U V
SW-101	07/12/89	5 U	67	5 U	10 U	5 U	5 U	10 U	2 J	5 U
SW-101	08/09/89	5 U V	57 V	5 U V	10 U R	5 U V	5 U V	10 U V	2 J A	5 U V
SW-101	09/14/89	5 U	38	5 U	10 U	5 U	5 U	10 U	2 J	5 U
SW-101	10/18/89	Data not yet received								
SW-101	11/15/89	Data not yet received								
SW-101	12/19/89	Data not yet received								
SW-101	01/25/90	Data not yet received								
SW-101	02/22/90	Data not yet received								
SW-101	03/21/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Tri chloro ethane ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-pento none ug/l	2-Hexenone ug/l
SW-061	11/11/87	5 U	70	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-061	07/01/88	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U
SW-061	03/20/89	Data not yet received								
SW-061	05/15/89	5 U V	15 V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U V
SW-061	06/09/89	5 U V	12 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-061	07/06/89	5 U V	3 J A	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U R
SW-061	08/03/89	Data not yet received								
SW-061	09/11/89	Data not yet received								
SW-061	10/03/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-061	10/20/89	DRY								
SW-061	11/06/89	Data not yet received								
SW-061	12/06/89	Data not yet received								
SW-061	01/23/90	Data not yet received								
SW-061	02/09/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-101	06/30/88	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U
SW-101	04/13/89	Data not yet received								
SW-101	05/11/89	5 U V	5 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-101	06/07/89	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U V
SW-101	07/12/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-101	08/09/89	5 U V	5 U V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U R
SW-101	09/14/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-101	10/18/89	Data not yet received								
SW-101	11/15/89	Data not yet received								
SW-101	12/19/89	Data not yet received								
SW-101	01/25/90	Data not yet received								
SW-101	02/22/90	Data not yet received								
SW-101	03/21/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank M = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethane ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-061	11/11/87	5 U	5 U	12	5 U	5 U	5 U	5 U
SW-061	07/01/88	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
SW-061	03/20/89	Data not yet received						
SW-061	05/15/89	10 V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-061	06/09/89	11 V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-061	07/06/89	2 J A	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-061	08/03/89	Data not yet received						
SW-061	09/11/89	Data not yet received						
SW-061	10/03/89	1 J	5 U	5 U	5 U	5 U	5 U	5 U
SW-061	10/20/89	DRY						
SW-061	11/06/89	Data not yet received						
SW-061	12/06/89	Data not yet received						
SW-061	01/23/90	Data not yet received						
SW-061	02/09/90	Data not yet received						
SW-061	03/12/90	Data not yet received						
SW-061	03/12/90	Data not yet received						
SW-101	06/30/88	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
SW-101	04/13/89	Data not yet received						
SW-101	05/11/89	14 V	5 U V	4 J A	5 U A	5 U A	5 U A	5 U A
SW-101	06/07/89	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-101	07/12/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U
SW-101	08/09/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-101	09/14/89	2 J	5 U	5 U	5 U	5 U	5 U	5 U
SW-101	10/18/89	Data not yet received						
SW-101	11/15/89	Data not yet received						
SW-101	12/19/89	Data not yet received						
SW-101	01/25/90	Data not yet received						
SW-101	02/22/90	Data not yet received						
SW-101	03/21/90	Data not yet received						

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 59

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethene ug/l	1,1-Di-chloro ethane ug/l
SW-059	07/21/87	NR	NR	NR	NR	NR	NR	NR	133	NR
SW-059	07/01/88	10 U	10 U	10 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U
SW-059	03/20/89	50 U V	50 U V	50 U V	50 U V	20 JB A	50 U V	25 U V	9 J A	25 U V
SW-059	05/11/89	50 U V	50 U V	50 U V	50 U V	5 J A	50 U V	25 U V	7 J V	6 J V
SW-059	06/08/89	10 U V	10 U V	10 U V	10 U V	2 JB A	3 J A	5 U V	3 J A	2 J A
SW-059	07/06/89	10 U V	10 U V	10 U V	10 U V	9 B A	13 B A	5 U V	4 J A	3 J A
SW-059	08/10/89	Data not yet received								
SW-059	09/18/89	10 U	10 U	10 U	10 U	4 JB	3 JB	5 U	3 J	2 J
SW-059	10/03/89	10 U	10 U	10 U	10 U	5 U	10 U	5 U	4 J	5 U
SW-059	11/06/89	Data not yet received								
SW-059	12/06/89	Data not yet received								
SW-059	01/23/90	Data not yet received								
SW-059	02/09/90	Data not yet received								
SW-059	03/12/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALIFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 59

Station Number	Date Sampled	Total-1,2-Dichloro ethene ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Bromo dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-059	07/21/87	5 U	40	5 U	NR	5 U	605	NR	NR	NR
SW-059	07/01/88	NR	18.7	5.0 U	10 U	9.3	187	10 U	5.0 U	5.0 U
SW-059	03/20/89	25 U V	82 V	25 U V	50 U V	42 A	430 V	50 U V	25 U V	25 U V
SW-059	05/11/89	25 U V	66 V	25 U V	50 U V	36 V	310	50 U R	25 U V	25 U V
SW-059	06/08/89	5 U V	20 V	5 U V	10 U V	15 V	200 V	10 U V	5 U V	5 U V
SW-059	07/06/89	56 V	26 V	5 U V	10 U R	10 V	190 V	10 U V	5 U V	5 U V
SW-059	08/10/89	Data not yet received								
SW-059	09/18/89	5 U	23	5 U	10 U	9	190	10 U	5 U	5 U
SW-059	10/03/89	5 U	25	5 U	10 U	5 U	160	10 U	5 U	5 U
SW-059	11/06/89	Data not yet received								
SW-059	12/06/89	Data not yet received								
SW-059	01/23/90	Data not yet received								
SW-059	02/09/90	Data not yet received								
SW-059	03/12/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 59

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Tri chloro ethane ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-pentanone ug/l	2-Hexanone ug/l
SW-059	07/21/87	NR	62	NR	5 U	NR	NR	NR	NR	NR
SW-059	07/01/88	5.0 U	49	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U
SW-059	03/20/89	25 U V	260 V	25 U V	25 U V	25 U A	25 U V	25 U V	50 U V	50 U V
SW-059	05/11/89	25 U V	180 V	25 U V	25 U V	25 U A	25 U V	25 U V	50 U V	50 U V
SW-059	06/08/89	5 U V	60 V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U V
SW-059	07/06/89	5 U V	55 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U R	10 U R
SW-059	08/10/89	Data not yet received								
SW-059	09/18/89	5 U	63	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-059	10/03/89	5 U	52	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-059	11/06/89	Data not yet received								
SW-059	12/06/89	Data not yet received								
SW-059	01/23/90	Data not yet received								
SW-059	02/09/90	Data not yet received								
SW-059	03/12/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 59

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethene ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-059	07/21/87	60	NR	NR	NR	NR	NR	NR
SW-059	07/01/88	45	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
SW-059	03/20/89	270 V	25 U V	25 U A	25 U A	25 U A	25 U A	25 U A
SW-059	05/11/89	170 V	25 U V	25 U A	25 U A	25 U A	25 U A	25 U A
SW-059	06/08/89	57 V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-059	07/06/89	56 V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-059	08/10/89	Data not yet received						
SW-059	09/18/89	53	5 U	5 U	5 U	5 U	5 U	5 U
SW-059	10/03/89	43	5 U	5 U	5 U	5 U	5 U	5 U
SW-059	11/06/89	Data not yet received						
SW-059	12/06/89	Data not yet received						
SW-059	01/23/90	Data not yet received						
SW-059	02/09/90	Data not yet received						
SW-059	03/12/90	Data not yet received						

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 63

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethene ug/l	1,1-Di-chloro ethane ug/l
SW-063	07/24/87	NR	NR	NR	NR	NR	NR	NR	5 U	NR
SW-063	07/06/88	10 U	10 U	10 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U
SW-063	03/28/89	DRY								
SW-063	05/12/89	DRY								
SW-063	06/21/89	DRY								
SW-063	07/19/89	DRY								
SW-063	08/11/89	DRY								
SW-063	09/15/89	DRY								
SW-063	10/04/89	DRY								
SW-063	11/03/89	DRY								
SW-063	12/01/89	DRY								
SW-063	01/05/90	DRY								
SW-063	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 63

Station Number	Date Sampled	Total-1,2-Dichloro ethene ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Bromo dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-063	07/24/87	5 U	5 U	5 U	NR	5 U	5 U	NR	NR	NR
SW-063	07/06/88	NR	13	5.0 U	10 U	5.0 U	17	10 U	5.0 U	5.0 U
SW-063	03/28/89	DRY								
SW-063	05/12/89	DRY								
SW-063	06/21/89	DRY								
SW-063	07/19/89	DRY								
SW-063	08/11/89	DRY								
SW-063	09/15/89	DRY								
SW-063	10/04/89	DRY								
SW-063	11/03/89	DRY								
SW-063	12/01/89	DRY								
SW-063	01/05/90	DRY								
SW-063	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 63

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Tri chloro ethene ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-pentanone ug/l	2-Hexanone ug/l
SW-063	07/24/87	NR	5 U	NR	5 U	NR	NR	NR	NR	NR
SW-063	07/06/88	5.0 U	10	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	10 U
SW-063	03/28/89	DRY								
SW-063	05/12/89	DRY								
SW-063	06/21/89	DRY								
SW-063	07/19/89	DRY								
SW-063	08/11/89	DRY								
SW-063	09/15/89	DRY								
SW-063	10/04/89	DRY								
SW-063	11/03/89	DRY								
SW-063	12/01/89	DRY								
SW-063	01/05/90	DRY								
SW-063	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 63

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethane ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-063	07/24/87	5 U	NR	NR	NR	NR	NR	NR
SW-063	07/06/88	1.0 J	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
SW-063	03/28/89	DRY						
SW-063	05/12/89	DRY						
SW-063	06/21/89	DRY						
SW-063	07/19/89	DRY						
SW-063	08/11/89	DRY						
SW-063	09/15/89	DRY						
SW-063	10/04/89	DRY						
SW-063	11/03/89	DRY						
SW-063	12/01/89	DRY						
SW-063	01/05/90	DRY						
SW-063	02/02/90	DRY						

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 64

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethene ug/l	1,1-Di-chloro ethane ug/l
SW-064	07/22/87	NR	NR	NR	NR	NR	NR	NR	5 U	NR
SW-064	07/07/88	10 U	10 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U
SW-064	03/30/89	DRY								
SW-064	05/22/89	10 U V	10 U V	10 U V	10 U V	9 B A	2 J A	5 U V	5 U V	5 U V
SW-064	06/27/89	10 U V	10 U V	10 U V	10 U V	5 U V	5 J A	6 V	5 U V	5 U V
SW-064	07/19/89	DRY								
SW-064	08/11/89	DRY								
SW-064	09/20/89	DRY								
SW-064	10/04/89	DRY								
SW-064	11/09/89	DRY								
SW-064	12/01/89	DRY								
SW-064	01/05/90	DRY								
SW-064	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 64

Station Number	Date Sampled	Total-1,2-Dichloro ethene ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Bromo dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-064	07/22/87	5 U	5 U	5 U	NR	5 U	5 U	NR	NR	NR
SW-064	07/07/88	NR	5 U	5 U	10 U	5 U	5 U	10 U	5 U	5 U
SW-064	03/30/89	DRY								
SW-064	05/22/89	5 U V	27 V	5 U V	10 U V	5 U V	3 J A	10 U V	5 U V	5 U V
SW-064	06/27/89	5 U V	1 J A	5 U V	10 U R	5 U V	5 U V	10 U V	5 U V	5 U V
SW-064	07/19/89	DRY								
SW-064	08/11/89	DRY								
SW-064	09/20/89	DRY								
SW-064	10/04/89	DRY								
SW-064	11/09/89	DRY								
SW-064	12/01/89	DRY								
SW-064	01/05/90	DRY								
SW-064	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 64

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Tri chloro ethane ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-penta none ug/l	2-Hexanone ug/l
SW-064	07/22/87	NR	20	NR	5 U	NR	NR	NR	NR	NR
SW-064	07/07/88	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-064	03/30/89	DRY								
SW-064	05/22/89	5 U V	16 V	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-064	06/27/89	5 U V	12 A	5 U V	5 U V	5 U A	5 U V	5 U V	10 U R	10 U R
SW-064	07/19/89	DRY								
SW-064	08/11/89	DRY								
SW-064	09/20/89	DRY								
SW-064	10/04/89	DRY								
SW-064	11/09/89	DRY								
SW-064	12/01/89	DRY								
SW-064	01/05/90	DRY								
SW-064	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 64

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethane ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-064	07/22/87	5 U	NR	NR	NR	NR	NR	NR
SW-064	07/07/88	5 U	5 U	5 U	5 U	5 U	5 U	5 U
SW-064	03/30/89	DRY						
SW-064	05/22/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-064	06/27/89	5 U V	5 U V	5 U A	5 U A	5 U A	5 U A	5 U A
SW-064	07/19/89	DRY						
SW-064	08/11/89	DRY						
SW-064	09/20/89	DRY						
SW-064	10/04/89	DRY						
SW-064	11/09/89	DRY						
SW-064	12/01/89	DRY						
SW-064	01/05/90	DRY						
SW-064	02/02/90	DRY						

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 103

Station Number	Date Sampled	Chloro methane ug/l	Bromo methane ug/l	Vinyl Chloride ug/l	Chloro ethane ug/l	Methylene Chloride ug/l	Acetone ug/l	Carbon Disulfide ug/l	1,1-Di-chloro ethene ug/l	1,1-Di-chloro ethane ug/l
SW-103	07/11/88	10 U	10 U	10 U	10 U	5 U	10 U	5 U	5 U	5 U
SW-103	03/23/89	10 U V	10 U V	10 U V	10 U V	5 U V	10 U V	5 U V	5 U V	5 U V
SW-103	05/25/89	Data not yet received								
SW-103	06/15/89	10 U V	10 U V	10 U V	10 U V	5 U V	2 JB A	5 U V	5 U V	5 U V
SW-103	07/13/89	10 U V	10 U V	10 U V	10 U V	9 B A	10 U V	5 U V	5 U V	5 U V
SW-103	08/02/89	10 U V	10 U V	10 U V	10 U V	5 B A	10 U V	5 U V	5 U V	5 U V
SW-103	09/07/89	Data not yet received								
SW-103	10/03/89	10 U	10 U	10 U	10 U	9 B	10 U	5 U	5 U	5 U
SW-103	11/03/89	Data not yet received								
SW-103	12/06/89	Data not yet received								
SW-103	01/18/90	Data not yet received								
SW-103	02/12/90	Data not yet received								
SW-103	03/22/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 103

Station Number	Date Sampled	Total-1,2-Dichloro ethane ug/l	Chloroform ug/l	1,2-Di-chloro ethane ug/l	2-Butanone ug/l	1,1,1-Tri chloro ethane ug/l	Carbon Tetra chloride ug/l	Vinyl Acetate ug/l	Bromo dichloro methane ug/l	1,2-Di-chloro propane ug/l
SW-103	07/11/88	NR	5 U	5 U	10 U	5 U	9	10 U	5 U	5 U
SW-103	03/23/89	5 U V	5 U V	5 U V	10 U V	5 U V	10 V	10 U V	5 U V	5 U V
SW-103	05/25/89	Data not yet received								
SW-103	06/15/89	5 U V	5 U V	5 U V	10 U V	5 U V	7 V	10 U V	5 U V	5 U V
SW-103	07/13/89	5 U V	5 U V	5 U V	10 U V	5 U V	8 V	10 U V	5 U V	5 U V
SW-103	08/02/89	5 U V	5 U V	5 U V	10 U V	5 U V	7 V	10 U V	5 U V	5 U V
SW-103	09/07/89	Data not yet received								
SW-103	10/03/89	5 U	5 U	5 U	10 U	5 U	5 U	10 U	5 U	5 U
SW-103	11/03/89	Data not yet received								
SW-103	12/06/89	Data not yet received								
SW-103	01/18/90	Data not yet received								
SW-103	02/12/90	Data not yet received								
SW-103	03/22/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 103

Station Number	Date Sampled	Cis-1,3-Dichloro propene ug/l	Trichloro ethene ug/l	Dibromo chloro methane ug/l	1,1,2-Tri chloro ethene ug/l	Benzene ug/l	Trans-1,3-Dichloro propene ug/l	Bromoform ug/l	4-Methyl-2-penta none ug/l	2-Hexanone ug/l
SW-103	07/11/88	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-103	03/23/89	5 U V	2 J A	5 U V	5 U V	5 U A	5 U V	5 U V	10 U V	10 U V
SW-103	05/25/89	Data not yet received								
SW-103	06/15/89	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U V
SW-103	07/13/89	5 U V	1 J A	5 U V	5 U V	5 U V	5 U V	5 U R	10 U V	10 U R
SW-103	08/02/89	5 U V	1 J A	5 U V	5 U V	5 U V	5 U V	5 U V	10 U V	10 U V
SW-103	09/07/89	Data not yet received								
SW-103	10/03/89	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U
SW-103	11/03/89	Data not yet received								
SW-103	12/06/89	Data not yet received								
SW-103	01/18/90	Data not yet received								
SW-103	02/12/90	Data not yet received								
SW-103	03/22/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Volatile Organic Sampling Results

STATION 103

Station Number	Date Sampled	Tetra chloro ethene ug/l	1,1,2,2-Tetrachloro ethane ug/l	Toluene ug/l	Chloro benzene ug/l	Ethyl benzene ug/l	Styrene ug/l	Total Xylenes ug/l
SW-103	07/11/88	2 J	5 U	5 U	5 U	5 U	5 U	5 U
SW-103	03/23/89	3 J A	5 U V	5 U B	5 U A	5 U A	5 U A	5 U A
SW-103	05/25/89	Data not yet received						
SW-103	06/15/89	1 J A	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-103	07/13/89	2 J A	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-103	08/02/89	2 J V	5 U V	5 U V	5 U V	5 U V	5 U V	5 U V
SW-103	09/07/89	Data not yet received						
SW-103	10/03/89	1 J	5 U	5 U	5 U	5 U	5 U	5 U
SW-103	11/03/89	Data not yet received						
SW-103	12/06/89	Data not yet received						
SW-103	01/18/90	Data not yet received						
SW-103	02/12/90	Data not yet received						
SW-103	03/22/90	Data not yet received						

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

APPENDIX B-2

SURFACE WATER SAMPLING RESULTS

DISSOLVED METALS

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-050	/ /	DRY								
SW-050	07/21/87	0.2 U	NR	NR	0.26	NR	NR	147	NR	0.01 U
SW-050	06/27/88	.282	.040 U	.010 U	.200	.005 U	.005 U	112	NR	.010 U
SW-050	06/27/88	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-050	04/17/89	DRY								
SW-050	05/10/89	DRY								
SW-050	06/27/89	.200 U V	.0600 U A	.0100 U A	.200 U V	.0050 U A	.0050 U A	120 A	1U V	.0100 U V
SW-050	07/18/89	.320 A	.0600 U V	.0100 U V	.255 V	.0050 U V	.0050 U V	116 V	1U V	.0100 U V
SW-050	08/11/89	DRY								
SW-050	09/12/89	DRY								
SW-050	10/04/89	DRY								
SW-050	11/03/89	DRY								
SW-050	12/01/89	DRY								
SW-050	01/05/90	DRY								
SW-050	02/02/90	DRY								
SW-050	03/17/90	DRY								
SW-051	07/21/87	0.2 U	NR	NR	0.21	NR	NR	103	NR	0.01 U
SW-051	06/23/88	DRY								
SW-051	04/17/89	DRY								
SW-051	05/10/89	DRY								
SW-051	06/27/89	.200 U V	.0600 U A	.0100 U V	.200 U V	.0050 U V	.0050 U A	98.60 A	1U V	.0100 U V
SW-051	07/18/89	DRY								
SW-051	08/11/89	DRY								
SW-051	09/12/89	DRY								
SW-051	10/04/89	DRY								
SW-051	11/03/89	DRY								
SW-051	12/01/89	DRY								
SW-051	01/05/90	DRY								
SW-051	02/02/90	DRY								
SW-052	07/21/87	0.2 U	NR	NR	0.2 U	NR	NR	110	NR	0.01 U
SW-052	06/23/88	.899	.040 U	.010 U	.20 U	.005 U	.005 U	91.5	NR	.010 U
SW-052	04/17/89	DRY								
SW-052	05/10/89	DRY								
SW-052	06/09/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-050	/ /	DRY								
SW-050	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	9.6	0.495	NR	0.04 U
SW-050	06/27/88	.050 U	.0279	.114	.005 U	NR	8.53	.0429	.0002 U	NR
SW-050	06/27/88	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-050	04/17/89	DRY								
SW-050	05/10/89	DRY								
SW-050	06/27/89	.0500 U V	.0250 U V	.100 U A	.0050 U R	.100 U A	8.43 V	.148 V	.0002 U V	.100 U A
SW-050	07/18/89	.0500 U V	.0250 U A	.552 A	.0050 U A	.100 U V	8.11 V	.161 V	.0002 V	.100 U V
SW-050	08/11/89	DRY								
SW-050	09/12/89	DRY								
SW-050	10/04/89	DRY								
SW-050	11/03/89	DRY								
SW-050	12/01/89	DRY								
SW-050	01/05/90	DRY								
SW-050	02/02/90	DRY								
SW-050	03/17/90	DRY								
SW-051	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	7.9	0.015 U	NR	0.04 U
SW-051	06/23/88	DRY								
SW-051	04/17/89	DRY								
SW-051	05/10/89	DRY								
SW-051	06/27/89	.0500 U V	.0250 U V	.100 U A	.0050 U R	.100 U A	7.54 V	.0150 U R	.0002 U V	.100 U A
SW-051	07/18/89	DRY								
SW-051	08/11/89	DRY								
SW-051	09/12/89	DRY								
SW-051	10/04/89	DRY								
SW-051	11/03/89	DRY								
SW-051	12/01/89	DRY								
SW-051	01/05/90	DRY								
SW-051	02/02/90	DRY								
SW-052	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	13.7	0.296	NR	0.04 U
SW-052	06/23/88	.050 U	.026	.58	.005 U	NR	13.6	.0181	.0002 U	NR
SW-052	04/17/89	DRY								
SW-052	05/10/89	DRY								
SW-052	06/09/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Zinc (Zn), diss. mg/l
SW-050	/ /	DRY
SW-050	07/21/87	0.02 U
SW-050	06/27/88	.0361
SW-050	06/27/88	Insufficient Sample or Dissolved Metals Analysis not requested.
SW-050	04/17/89	DRY
SW-050	05/10/89	DRY
SW-050	06/27/89	.0200 U V
SW-050	07/18/89	.0200 U A
SW-050	08/11/89	DRY
SW-050	09/12/89	DRY
SW-050	10/04/89	DRY
SW-050	11/03/89	DRY
SW-050	12/01/89	DRY
SW-050	01/05/90	DRY
SW-050	02/02/90	DRY
SW-050	03/17/90	DRY
SW-051	07/21/87	0.02 U
SW-051	06/23/88	DRY
SW-051	04/17/89	DRY
SW-051	05/10/89	DRY
SW-051	06/27/89	.0200 U V
SW-051	07/18/89	DRY
SW-051	08/11/89	DRY
SW-051	09/12/89	DRY
SW-051	10/04/89	DRY
SW-051	11/03/89	DRY
SW-051	12/01/89	DRY
SW-051	01/05/90	DRY
SW-051	02/02/90	DRY
SW-052	07/21/87	0.02 U
SW-052	06/23/88	.0365
SW-052	04/17/89	DRY
SW-052	05/10/89	DRY
SW-052	06/09/89	DRY

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-052	07/07/89	DRY								
SW-052	08/11/89	DRY								
SW-052	09/28/89	DRY								
SW-052	10/04/89	DRY								
SW-052	11/03/89	DRY								
SW-052	12/01/89	DRY								
SW-052	01/05/90	DRY								
SW-052	02/02/90	DRY								
SW-052	03/17/90	DRY								
SW-055	07/21/87	0.2 U	NR	NR	0.24	NR	NR	126	NR	0.01 U
SW-055	07/21/87	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-055	06/22/88	.796	.040 U	.010 U	.315	.005 U	.005 U	132	NR	.010 U
SW-055	04/17/89	.200 U V	.0600 U A	.0100 U V	.213 V	.0050 U A	.0050 U V	91.70 V	1U V	.0100 U A
SW-055	05/25/89	Data not yet received								
SW-055	06/28/89	.200 U V	.0600 U A	.0100 U A	.224 V	.0050 U A	.0050 U A	109 A	1U V	.0100 U V
SW-055	07/18/89	.200 U A	.0600 U V	.0100 U V	.315 V	.0050 U V	.0050 U V	128 V	1U V	.0100 U V
SW-055	08/16/89	.200 U A	.0600 U V	.0100 U R	.302 V	.0050 U V	.0050 U A	129 V	1U V	.0100 U V
SW-055	09/20/89	.200 U R	.0600 U V	.0100 U V	.343 V	.0050 U R	.0050 U A	145 A	1U R	.0100 U A
SW-055	10/19/89	.0300 U V	.500 U A	.0020 U V	.252 V	.0020 U R	.0040 U A	117 V	.0010 U V	.0200 U A
SW-055	11/09/89	.200 U	.0600 U	.0100 U	.273	.0050 U	.0050 U	121	1U	.0100 U
SW-055	12/07/89	Data not yet received								
SW-055	01/16/90	Data not yet received								
SW-055	02/23/90	Data not yet received								
SW-055	03/15/90	Data not yet received								
SW-057	07/21/87	0.2 U	NR	NR	0.6	NR	NR	156	NR	0.01 U
SW-057	06/23/88	DRY								
SW-057	04/17/89	DRY								
SW-057	05/10/89	DRY								
SW-057	06/09/89	DRY								
SW-057	07/07/89	DRY								
SW-057	08/11/89	DRY								
SW-057	09/16/89	DRY								
SW-057	10/04/89	DRY								
SW-057	11/03/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-052	07/07/89	DRY								
SW-052	08/11/89	DRY								
SW-052	09/20/89	DRY								
SW-052	10/04/89	DRY								
SW-052	11/03/89	DRY								
SW-052	12/01/89	DRY								
SW-052	01/05/90	DRY								
SW-052	02/02/90	DRY								
SW-052	03/17/90	DRY								
SW-055	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	19.7	0.022	NR	0.04 U
SW-055	07/21/87	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-055	06/22/88	.050 U	.025 U	1.06	.005 U	NR	27.3	.24	.0002 U	NR
SW-055	04/17/89	.0500 U V	.0250 U A	.128 A	.0050 U A	.0795 A	20 V	.374 V	.0002 U A	.0201
SW-055	05/25/89	Data not yet received								
SW-055	06/28/89	.0500 U V	.0250 U A	.100 U A	.0050 U V	.100 U A	18.10 V	.0740 V	.0002 U V	.100 U A
SW-055	07/18/89	.0500 U V	.0250 U A	.100 U A	.0050 U A	.155 V	26.40 V	.470 V	.0002 U V	.100 U V
SW-055	08/16/89	.0500 U V	.0250 U A	.100 U A	.0030 U A	.179 A	26.30 V	.303 V	.0002 U V	.100 U V
SW-055	09/20/89	.0500 U V	.0250 U V	.100 U A	.0050 U A	.116 A	28.30 V	.262 A	.0003 V	.100 U A
SW-055	10/19/89	.0200 U V	.0200 U A	.0554 A	.0020 U A	.175 A	23.20 V	.245 V	.0002 U A	.500 U A
SW-055	11/09/89	.0500 U	.0250 U	.100 U	.0050 U	.161	25.70	.260	.0002 U	.100 U
SW-055	12/07/89	Data not yet received								
SW-055	01/16/90	Data not yet received								
SW-055	02/23/90	Data not yet received								
SW-055	03/15/90	Data not yet received								
SW-057	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	21.9	0.301	NR	0.04 U
SW-057	06/23/88	DRY								
SW-057	04/17/89	DRY								
SW-057	05/10/89	DRY								
SW-057	06/09/89	DRY								
SW-057	07/07/89	DRY								
SW-057	08/11/89	DRY								
SW-057	09/16/89	DRY								
SW-057	10/04/89	DRY								
SW-057	11/03/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Nickel (Ni), diss. mg/l	Potassium (K), diss. mg/l	Selenium (Se), diss. mg/l	Silver (Ag), diss. mg/l	Sodium (Na), diss. mg/l	Strontium (Sr), diss. mg/l	Thallium (Tl), diss. mg/l	Tin (Sn), diss. mg/l	Vanadium (V), diss. mg/l
SW-052	07/07/89	DRY								
SW-052	08/11/89	DRY								
SW-052	09/20/89	DRY								
SW-052	10/04/89	DRY								
SW-052	11/03/89	DRY								
SW-052	12/01/89	DRY								
SW-052	01/05/90	DRY								
SW-052	02/02/90	DRY								
SW-052	03/17/90	DRY								
SW-055	07/21/87	0.04 U	NR	NR	0.01 U	35.2	0.73	NR	NR	0.05 U
SW-055	07/21/87	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-055	06/22/88	.040 U	5 U	.005 U	.010 U	71.6	.918	.010 U	NR	.050 U
SW-055	04/17/89	.0400 U V	5U *	.0050 U A	.0100 U V	41.90 V	1U A	.0100 U R	.100 U V	.0500 U V
SW-055	05/25/89	Data not yet received								
SW-055	06/20/89	.0400 U A	5U A	.0050 U R	.0100 U A	34.20 V	1U V	.0100 U A	.100 U A	.0500 U V
SW-055	07/18/89	.0400 U V	5U A	.0050 U R	.0100 U A	63.90 V	1U V	.0400 U R	.100 U V	.0500 U V
SW-055	08/16/89	.0400 U V	5U A	.0050 U A	.0100 U A	55.40 A	1U V	.100 U R	.100 U V	.0500 U R
SW-055	09/20/89	.0400 U R	5U A	.0050 U R	.0100 U A	88.50 A	1U R	.0400 U A	.100 U A	.0500 U A
SW-055	10/19/89	.0200 U R	2.42 A	.0020 U A	.0300 U R	66.80 V	.789 V	.0030 U V	1U A	.0100 U V
SW-055	11/09/89	.0400 U	5U	.0050 U	.0100 U	68.60	1U	.0100 U	.100 U	.0500 U
SW-055	12/07/89	Data not yet received								
SW-055	01/16/90	Data not yet received								
SW-055	02/23/90	Data not yet received								
SW-055	03/15/90	Data not yet received								
SW-057	07/21/87	0.04 U	NR	NR	0.01 U	20.7	0.79	NR	NR	0.05 U
SW-057	06/23/88	DRY								
SW-057	04/17/89	DRY								
SW-057	05/10/89	DRY								
SW-057	06/09/89	DRY								
SW-057	07/07/89	DRY								
SW-057	08/11/89	DRY								
SW-057	09/16/89	DRY								
SW-057	10/04/89	DRY								
SW-057	11/03/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Zinc (Zn), diss. mg/l
SW-052	07/07/89	DRY
SW-052	08/11/89	DRY
SW-052	09/28/89	DRY
SW-052	10/04/89	DRY
SW-052	11/03/89	DRY
SW-052	12/01/89	DRY
SW-052	01/05/90	DRY
SW-052	02/02/90	DRY
SW-052	03/17/90	DRY
SW-055	07/21/87	0.14
SW-055	07/21/87	Insufficient Sample or Dissolved Metals Analysis not requested.
SW-055	06/22/88	.536
SW-055	04/17/89	1.26 V
SW-055	05/25/89	Data not yet received
SW-055	06/28/89	.551 V
SW-055	07/18/89	.290 A
SW-055	08/16/89	.989 V
SW-055	09/20/89	.893 A
SW-055	10/19/89	.881 A
SW-055	11/09/89	1.10
SW-055	12/07/89	Data not yet received
SW-055	01/16/90	Data not yet received
SW-055	02/23/90	Data not yet received
SW-055	03/15/90	Data not yet received
SW-057	07/21/87	0.02 U
SW-057	06/23/88	DRY
SW-057	04/17/89	DRY
SW-057	05/10/89	DRY
SW-057	06/09/89	DRY
SW-057	07/07/89	DRY
SW-057	08/11/89	DRY
SW-057	09/16/89	DRY
SW-057	10/04/89	DRY
SW-057	11/03/89	DRY

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-057	12/01/89	DRY								
SW-057	01/05/90	DRY								
SW-057	02/02/90	DRY								
SW-057	03/17/90	DRY								
SW-058	07/21/87	0.2 U	NR	NR	0.2 U	NR	NR	113	NR	0.01 U
SW-058	06/23/88	.20 U	.040 U	.010 U	.236	.005 U	.005 U	106	NR	.010 U
SW-058	04/17/89	DRY								
SW-058	05/10/89	DRY								
SW-058	06/28/89	.200 U A	.0600 U V	.0100 U V	.204 V	.0050 U A	.0050 U V	101 B	.100 U V	.0100 U V
SW-058	07/14/89	DRY								
SW-058	08/11/89	DRY								
SW-058	09/20/89	DRY								
SW-058	10/04/89	DRY								
SW-058	11/20/89	DRY								
SW-058	12/01/89	DRY								
SW-058	01/05/90	DRY								
SW-058	02/02/90	DRY								
SW-077	06/22/88	.669	.040 U	.010 U	.255	.005 U	.005 U	110	NR	.010 U
SW-077	03/30/89	DRY								
SW-077	05/11/89	DRY								
SW-077	06/27/89	.200 U A	.0600 U A	.0100 U R	.200 U V	.0050 U V	.0050 U B	116 V	.100 U V	.0100 U A
SW-077	07/18/89	DRY								
SW-077	08/16/89	.200 U A	.0600 U V	.0100 U R	.200 U V	.0050 U V	.0050 U B	72.30 V	1U V	.0100 U V
SW-077	09/20/89	DRY								
SW-077	10/04/89	DRY								
SW-077	11/09/89	DRY								
SW-077	12/01/89	DRY								
SW-077	01/05/90	DRY								
SW-077	02/02/90	DRY								
SW-077	03/16/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-057	12/01/89	DRY								
SW-057	01/05/90	DRY								
SW-057	02/02/90	DRY								
SW-057	03/17/90	DRY								
SW-058	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	13.8	0.031	NR	0.04 U
SW-058	06/23/88	.050 U	.025 U	.10 U	.005 U	NR	18.90	.0819	.0002 U	NR
SW-058	04/17/89	DRY								
SW-058	05/10/89	DRY								
SW-058	06/28/89	.0500 U V	.0250 U A	.100 U A	.0050 U A	.100 U V	11.50 V	.0150 U V	.0002 U V	.100 U V
SW-058	07/14/89	DRY								
SW-058	08/11/89	DRY								
SW-058	09/20/89	DRY								
SW-058	10/04/89	DRY								
SW-058	11/20/89	DRY								
SW-058	12/01/89	DRY								
SW-058	01/05/90	DRY								
SW-058	02/02/90	DRY								
SW-077	06/22/88	.050 U	.025 U	1.48	.0126	NR	22.6	1.64	.0002 U	NR
SW-077	03/30/89	DRY								
SW-077	05/11/89	DRY								
SW-077	06/27/89	.0500 U V	.0250 U V	.100 U A	.0050 U A	.100 U V	23.90 V	.0525 V	.0002 U V	.100 U V
SW-077	07/18/89	DRY								
SW-077	08/16/89	.0500 U V	.0250 U A	.100 U A	.0030 U A	.100 U V	13.70 V	.256 V	.0003 V	.100 U V
SW-077	09/20/89	DRY								
SW-077	10/04/89	DRY								
SW-077	11/09/89	DRY								
SW-077	12/01/89	DRY								
SW-077	01/05/90	DRY								
SW-077	02/02/90	DRY								
SW-077	03/16/90	Data not yet received								

VALUE QUALIFIERS: NR - Analyte not reported U - Analyzed but not detected * - Holding time not met E - Estimated value
J - Present below detection limit B - Present in laboratory blank N - Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Nickel (Ni), diss. mg/l	Potassium (K), diss. mg/l	Selenium (Se), diss. mg/l	Silver (Ag), diss. mg/l	Sodium (Na), diss. mg/l	Strontium (Sr), diss. mg/l	Thallium (Tl), diss. mg/l	Tin (Sn), diss. mg/l	Vanadium (V), diss. mg/l
SW-057	12/01/89	DRY								
SW-057	01/05/90	DRY								
SW-057	02/02/90	DRY								
SW-057	03/17/90	DRY								
SW-058	07/21/87	0.04 U	NR	NR	0.01 U	11.6	0.59	NR	NR	0.05 U
SW-058	06/23/88	.040 U	5 U	.005 U	.010 U	15.60	.718	.10 U	NR	.080 U
SW-058	04/17/89	DRY								
SW-058	05/10/89	DRY								
SW-058	06/28/89	.0400 U V	5U R	.0050 U B	.0100 U V	9.26 B	.478 V	.0100 U A	.100 U V	.0500 U B
SW-058	07/14/89	DRY								
SW-058	08/11/89	DRY								
SW-058	09/20/89	DRY								
SW-058	10/04/89	DRY								
SW-058	11/20/89	DRY								
SW-058	12/01/89	DRY								
SW-058	01/05/90	DRY								
SW-058	02/02/90	DRY								
SW-077	06/22/88	.040 U	5 U	.005 U	.010 U	54.1	.562	.010 U	NR	.050 U
SW-077	03/30/89	DRY								
SW-077	05/11/89	DRY								
SW-077	06/27/89	.0400 U V	5U A	.0134 V	.0100 U B	43.40 V	.591 A	.0100 U R	.100 U V	.0500 U V
SW-077	07/18/89	DRY								
SW-077	08/16/89	.0400 U V	9.04 V	.0500 U V	.0100 U A	23.60 A	1U V	.0100 U R	.100 U V	.0500 U R
SW-077	09/20/89	DRY								
SW-077	10/04/89	DRY								
SW-077	11/09/89	DRY								
SW-077	12/01/89	DRY								
SW-077	01/05/90	DRY								
SW-077	02/02/90	DRY								
SW-077	03/16/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Zinc (Zn), diss. mg/l	
SW-057	12/01/89	DRY	
SW-057	01/05/90	DRY	
SW-057	02/02/90	DRY	
SW-057	03/17/90	DRY	
SW-058	07/21/87	0.02 U	
SW-058	06/23/88	.0256	
SW-058	04/17/89	DRY	
SW-058	05/10/89	DRY	
SW-058	06/28/89	.0209	A
SW-058	07/14/89	DRY	
SW-058	08/11/89	DRY	
SW-058	09/20/89	DRY	
SW-058	10/04/89	DRY	
SW-058	11/20/89	DRY	
SW-058	12/01/89	DRY	
SW-058	01/05/90	DRY	
SW-058	02/02/90	DRY	
SW-077	06/22/88	.0671	
SW-077	03/30/89	DRY	
SW-077	05/11/89	DRY	
SW-077	06/27/89	.0286	A
SW-077	07/18/89	DRY	
SW-077	08/16/89	.0354	A
SW-077	09/20/89	DRY	
SW-077	10/04/89	DRY	
SW-077	11/09/89	DRY	
SW-077	12/01/89	DRY	
SW-077	01/05/90	DRY	
SW-077	02/02/90	DRY	
SW-077	03/16/90	Data not yet received	

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 53

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-053	07/21/87	0.2 U	NR	NR	0.2 U	NR	NR	80.0	NR	0.01 U
SW-053	06/23/88	.245	.040 U	.010 U	.325	.005 U	.005 U	115	NR	.010 U
SW-053	06/23/88	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-053	04/05/89	.200 U	.0600 U	.0100 U	.200 U	.0050 U	.0050 U	88.00	1U	.0100 U
SW-053	05/23/89	.200 U V	.0600 U A	.0100 U A	.200 U V	.0050 U V	.0050 U R	104 A	1U V	.0100 U A
SW-053	06/26/89	.200 U A	.0600 U V	.0100 U A	.200 U V	.0050 U A	.0050 U V	119 V	.100 U V	.0100 U V
SW-053	07/19/89	DRY								
SW-053	08/15/89	.200 U A	.0600 U V	.0100 U A	.228 V	.0050 U V	.0050 U A	140 V	1U V	.0100 U V
SW-053	09/20/89	.200 U R	.133 A	.0100 U V	.207 V	.0050 U A	.0050 U V	127 A	1U R	.0100 U A
SW-053	10/12/89	.200 U A	.0600 U V	.0100 U V	.200 U V	.0050 U V	.0050 U V	137 V	2.50 U V	.0100 U V
SW-053	11/07/89	Data not yet received								
SW-053	12/15/89	Data not yet received								
SW-053	01/17/90	Data not yet received								
SW-053	02/13/90	Data not yet received								

VALUE QUALIFIERS: NR - Analyte not reported U - Analyzed but not detected * - Holding time not met E - Estimated value
J - Present below detection limit B - Present in laboratory blank M - Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Metals Sampling Results

STATION 53

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-053	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	26.4	0.087	NR	0.04 U
SW-053	06/23/88	.050 U	.0274	.23	.005 U	NR	32.2	.706	.0002 U	NR
SW-053	06/23/88	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-053	04/05/89	.0500 U	.0250 U	.780	.0050 U	NR	24.70	.378	.0002 U	NR
SW-053	05/23/89	.0500 U A	.0250 U A	2.66 A	.0050 U A	.0232 A	27.70 A	.587 A	.0002 U V	.0100 U A
SW-053	06/26/89	.0500 U V	.0250 U A	.673 V	.0050 U A	.100 U V	30.50 V	.458 V	.0002 U V	.100 U V
SW-053	07/19/89	DRY								
SW-053	08/15/89	.0500 U V	.0250 U A	8.54 V	.0030 U A	.100 U V	26.40 V	.538 V	.0002 U V	.100 U V
SW-053	09/20/89	.0500 U V	.0250 U V	3.69 A	.0050 U A	.100 U R	21.50 V	.436 A	.0002 U V	.100 U A
SW-053	10/12/89	.0500 U V	.0250 U V	2.78 V	.0030 U A	.100 U V	24.30 V	.406 A	.0002 U V	.100 U V
SW-053	11/07/89	Data not yet received								
SW-053	12/15/89	Data not yet received								
SW-053	01/17/90	Data not yet received								
SW-053	02/13/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 53

Station Number	Date Sampled	Nickel (Ni), diss. mg/l	Potassium (K), diss. mg/l	Selenium (Se), diss. mg/l	Silver (Ag), diss. mg/l	Sodium (Na), diss. mg/l	Strontium (Sr), diss. mg/l	Thallium (Tl), diss. mg/l	Tin (Sn), diss. mg/l	Vanadium (V), diss. mg/l
SW-053	07/21/87	0.04 U	NR	NR	0.01 U	113	0.69	NR	NR	0.05 U
SW-053	06/23/88	.040 U	6.36	.005 U	.010 U	20.30	.817	.10 U	NR	.050 U
SW-053	06/23/88	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-053	04/05/89	.0400 U	5U	.0050 U	.0100 U	19.20	NR	.0100 U	NR	.0500 U
SW-053	05/23/89	.0400 U R	5U A	.0050 U R	.0100 U A	19.60 V	1U V	.0100 U R	.100 U A	.0500 U A
SW-053	06/26/89	.0400 U V	5U V	.0050 U A	.0100 U V	17.40 V	.789 V	.0100 U V	.100 U V	.0500 U V
SW-053	07/19/89	DRY								
SW-053	08/15/89	.0400 U V	5U V	.0050 U V	.0100 U A	14.30	1U V	.100 U R	.100 U V	.0500 U V
SW-053	09/20/89	.0400 U R	5U R	.0050 U R	.0100 U A	15.40 A	1U R	.0100 U A	.100 U A	.0500 U A
SW-053	10/12/89	.0400 U V	5U R	.0050 U A	.0100 U V	17.50 V	.746 A	.0100 U A	.100 U V	.0500 U V
SW-053	11/07/89	Data not yet received								
SW-053	12/15/89	Data not yet received								
SW-053	01/17/90	Data not yet received								
SW-053	02/13/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 53

Station Number	Date Sampled	Zinc (Zn), diss. mg/l
SW-053	07/21/87	0.02 U
SW-053	06/23/88	.0368
SW-053	06/23/88	Insufficient Sample or Dissolved Metals Analysis not requested.
SW-053	04/05/89	.0200 U
SW-053	05/23/89	.0200 U R
SW-053	06/26/89	.0371 A
SW-053	07/19/89	DRY
SW-053	08/15/89	.0200 U R
SW-053	09/20/89	.0200 U A
SW-053	10/12/89	.0204 A
SW-053	11/07/89	Data not yet received
SW-053	12/15/89	Data not yet received
SW-053	01/17/90	Data not yet received
SW-053	02/13/90	Data not yet received

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-056	07/21/87	0.2 U	NR	NR	0.22	NR	NR	137	NR	0.01 U
SW-053	06/30/88	0.200 U	0.060 U	0.010 U	0.200 U	0.005 U	0.005 U	128	NR	0.010 U
SW-056	04/13/89	.200 U V	.0600 U A	.0100 U R	.235 V	.0053 A	.0060 U R	133 V	1U V	.0100 U A
SW-056	05/11/89	.200 U R	.0600 U A	.0100 U V	.209 V	.0050 U A	.0050 U R	109 V	1U V	.0100 U V
SW-056	06/07/89	.200 U A	.0600 U V	.0100 U A	.200 U A	.0050 U V	.0050 U V	115 A	.100 U V	.0100 U V
SW-056	07/12/89	Data not yet received								
SW-056	08/09/89	.200 U	.0600 U	.0100 U	.232	.0050 U	.0050 U	121	1U	.0100 U
SW-056	09/14/89	.200 U R	.0600 U A	.0100 U V	.211 V	.0050 U A	.0050 U V	109 A	1U A	.0100 U R
SW-056	10/18/89	Data not yet received								
SW-056	11/15/89	Data not yet received								
SW-056	12/19/89	Data not yet received								
SW-056	01/25/90	Data not yet received								
SW-056	02/22/90	Data not yet received								
SW-056	03/21/90	Data not yet received								
SW-060	07/21/87	0.2 U	NR	NR	0.2 U	NR	NR	114	NR	0.01 U
SW-060	11/11/87	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-060	07/01/88	0.200 U	0.060 U	0.010 U	0.200 U	0.005 U	0.005 U	105	NR	0.010 U
SW-060	03/16/89	.200 U R	.0600 U R	.0100 U A	.200 U A	.0050 U A	.0050 U R	90.60 V	1U V	.0100 U R
SW-060	03/16/89	.200 U R	.0600 U A	.0100 U V	.200 U A	.0050 U A	.0050 U R	84.30 V	1U V	.0100 U V
SW-060	05/15/89	.200 U R	.0600 U V	.0100 U V	.200 U V	.0050 U A	.0050 U R	70.90 V	1U V	.0100 U V
SW-060	05/15/89	.200 U R	.0600 U V	.0100 U A	.200 U V	.0050 U A	.0050 U R	70.70 V	1U V	.0100 U V
SW-060	06/09/89	.200 U V	.0600 U V	.0100 U V	.200 U A	.0050 U A	.0050 U R	94.30 A	1U V	.0100 U R
SW-060	07/06/89	.200 U A	.0600 U V	.0100 U A	.200 V	.0050 U V	.0050 U V	113 V	1U V	.0100 U V
SW-060	08/03/89	.200 U V	.0600 U A	.0100 U V	.200 U V	.0050 U R	.0050 U V	98.90 V	1U V	.0100 U V
SW-060	09/11/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	10/03/89	.0300 U V	.500 U V	.0020 U V	.186 V	.0020 U V	.0040 U V	99.40 V	.0010 U V	.0200 U V
SW-060	11/06/89	Data not yet received								
SW-060	11/06/89	Data not yet received								
SW-060	12/06/89	Data not yet received								
SW-060	01/23/90	Data not yet received								
SW-060	02/09/90	Data not yet received								
SW-060	03/12/90	Data not yet received								
SW-061	07/22/87	0.2 U	NR	NR	0.2 U	NR	NR	30.1	NR	0.01 U

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-056	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	21.1	0.227	NR	0.04 U
SW-056	06/30/88	0.050 U	0.025 U	0.100 U	0.005 U	NR	23	0.015 U	0.0007	NR
SW-056	04/13/89	.0500 U V	.0250 U A	.137 A	.0050 U V	.0183 V	21.10 V	.643 A	.0004 V	.0245 A
SW-056	05/11/89	.0500 U A	.0250 U A	.100 U V	.0250 U A	.0100 U V	19.30 V	.165 V	.0002 U R	.0100 U V
SW-056	06/07/89	.0500 U V	.0250 U A	.100 U A	.0050 U A	.100 U R	18.80 A	.438 A	.0002 U V	.100 U V
SW-056	07/12/89	Data not yet received								
SW-056	08/09/89	.0500 U	.0250 U	.100 U	.0050 U	.100 U	22	.550	.0002 U	.100 U
SW-056	09/14/89	.0500 U V	.0250 U V	.100 U V	.0050 U A	.100 U V	19.40 V	.484 V	.0002 U V	.100 U V
SW-056	10/18/89	Data not yet received								
SW-056	11/15/89	Data not yet received								
SW-056	12/19/89	Data not yet received								
SW-056	01/25/90	Data not yet received								
SW-056	02/22/90	Data not yet received								
SW-056	03/21/90	Data not yet received								
SW-060	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	17.2	0.015 U	NR	0.04 U
SW-060	11/11/87	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-060	07/01/88	0.050 U	0.025 U	0.100 U	0.005 U	NR	17	0.015 U	0.0002 U	NR
SW-060	03/16/89	.0500 U A	.0250 U V	.100 U V	.0050 U A	.100 U V	15.30 V	.0150 U A	.0002 U V	.100 U V
SW-060	03/16/89	.0500 U A	.0250 U V	.100 U V	.0050 U A	.100 U V	14.60 V	.0150 U A	.0002 U V	.100 U V
SW-060	05/15/89	.0500 U A	.0250 U A	.100 U A	.0050 U A	.0100 U V	12.60 V	.0246 V	.0002 U R	.0100 U V
SW-060	05/15/89	.0500 U A	.0250 U R	.100 U R	.0050 U A	.0100 U V	12.70 V	.0240 V	.0002 U R	.0100 U V
SW-060	06/09/89	.0500 U R	.0250 U R	.100 U V	.0050 U V	.100 U V	13.70 A	.0245 V	.0002 U V	.100 U V
SW-060	07/06/89	.0500 U V	.0250 U A	.100 U A	.0050 U V	.100 U A	16 V	.0150 U V	.0002 U A	.100 U A
SW-060	08/03/89	.0500 U V	.0250 U R	.100 U V	.0050 U A	.100 U V	16.80	.0150 U A	.0002 U V	.100 U V
SW-060	09/11/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	10/03/89	.0200 U V	.0200 U V	.0302 A	.0054 A	.0200 B	16.50 V	.0100 U A	.0002 U A	.500 U V
SW-060	11/06/89	Data not yet received								
SW-060	11/06/89	Data not yet received								
SW-060	12/06/89	Data not yet received								
SW-060	01/23/90	Data not yet received								
SW-060	02/09/90	Data not yet received								
SW-060	03/12/90	Data not yet received								
SW-061	07/22/87	0.05 U	0.025 U	0.18	NR	NR	5.0 U	0.047	NR	0.04 U

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
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DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Nickel (Ni), diss. mg/l	Potassium (K), diss. mg/l	Selenium (Se), diss. mg/l	Silver (Ag), diss. mg/l	Sodium (Na), diss. mg/l	Strontium (Sr), diss. mg/l	Thallium (Tl), diss. mg/l	Tin (Sn), diss. mg/l	Vanadium (V), diss. mg/l
SW-056	07/21/87	0.04 U	NR	NR	0.01 U	60.5	0.67	NR	NR	0.05 U
SW-056	06/30/88	0.040 U	5.0 U	0.005 U	0.010 U	58	0.8	0.010 U	NR	0.050 U
SW-056	04/13/89	.0400 U R	5U A	.0050 U A	.0100 U V	53.70 V	1U V	.0100 U R	.100 U V	.0500 U V
SW-056	05/11/89	.0400 U R	5U R	.0050 U A	.0100 U A	53 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-056	06/07/89	.0400 U A	5U A	.0050 U A	.0100 U A	49.70 V	.574 A	.0100 U A	.100 U V	.0500 U V
SW-056	07/12/89	Data not yet received								
SW-056	08/09/89	.0400 U	5U	.0050 U	.0100 U	57.60	1U	.0100 U	.100 U	.0500 U
SW-056	09/14/89	.0400 U R	5U R	.0050 U A	.0100 U A	47.20 V	1U V	.0100 U V	.100 U V	.0500 U V
SW-056	10/18/89	Data not yet received								
SW-056	11/15/89	Data not yet received								
SW-056	12/19/89	Data not yet received								
SW-056	01/25/90	Data not yet received								
SW-056	02/22/90	Data not yet received								
SW-056	03/21/90	Data not yet received								
SW-060	07/21/87	0.04 U	NR	NR	0.01 U	36.8	0.58	NR	NR	0.05 U
SW-060	11/11/87	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-060	07/01/88	0.040 U	5.0 U	0.005 U	0.010 U	26	0.6	0.010 U	NR	0.050 U
SW-060	03/16/89	.0400 U A	5U A	.0050 U A	.0100 U A	30 V	.544 V	.0100 U A	.100 U V	.0500 U V
SW-060	03/16/89	.0400 U A	5U A	.0050 U A	.0100 U A	29.50 V	.509 V	.0100 U A	.100 U V	.0500 U V
SW-060	05/15/89	.0400 U R	5U R	.0050 U A	.0100 U A	30.20 V	1U V	.0400 U A	.100 U V	.0500 U V
SW-060	05/15/89	.0400 U R	5U R	.0050 U A	.0100 U A	30.80 V	1U V	.0400 U A	.100 U V	.0500 U V
SW-060	06/09/89	.0400 U A	5U A	.0050 U A	.0100 U A	26.80 V	1U V	.0100 U A	.100 U V	.0500 U A
SW-060	07/06/89	.0400 U A	5U V	.0050 U R	.0100 U R	27.20 V	1U A	.0500 U R	.100 U A	.0500 U V
SW-060	08/03/89	.0400 U V	5U V	.0050 U A	.0100 U V	33.10 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-060	09/11/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	10/03/89	.0200 U V	.589 A	.0020 U V	.0300 U U	29.30 V	.547 V	.0030 U R	1 V	.0100 U V
SW-060	11/06/89	Data not yet received								
SW-060	11/06/89	Data not yet received								
SW-060	12/06/89	Data not yet received								
SW-060	01/23/90	Data not yet received								
SW-060	02/09/90	Data not yet received								
SW-060	03/12/90	Data not yet received								
SW-061	07/22/87	0.04 U	NR	NR	0.01 U	17.9	0.02 U	NR	NR	0.05 U

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
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DATA VALIDATION QUALIFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Zinc (Zn), diss. mg/l	
SW-056	07/21/87	0.27	
SW-056	06/30/88	0.020	
SW-056	04/13/89	.0241	A
SW-056	05/11/89	.0200 U	R
SW-056	06/07/89	.0993	A
SW-056	07/12/89	Data not yet received	
SW-056	08/09/89	.0200 U	
SW-056	09/14/89	.0357	A
SW-056	10/18/89	Data not yet received	
SW-056	11/15/89	Data not yet received	
SW-056	12/19/89	Data not yet received	
SW-056	01/25/90	Data not yet received	
SW-056	02/22/90	Data not yet received	
SW-056	03/21/90	Data not yet received	
SW-060	07/21/87	0.59	
SW-060	11/11/87	Insufficient Sample or Dissolved Metals Analysis not requested.	
SW-060	07/01/88	0.400	
SW-060	03/16/89	.373	V
SW-060	03/16/89	.363	V
SW-060	05/15/89	.248	A
SW-060	05/15/89	.195	A
SW-060	06/09/89	.400	V
SW-060	07/06/89	.161	A
SW-060	08/03/89	.158	V
SW-060	09/11/89	Data not yet received	
SW-060	09/11/89	Data not yet received	
SW-060	10/03/89	.238	V
SW-060	11/06/89	Data not yet received	
SW-060	11/06/89	Data not yet received	
SW-060	12/06/89	Data not yet received	
SW-060	01/23/90	Data not yet received	
SW-060	02/09/90	Data not yet received	
SW-060	03/12/90	Data not yet received	
SW-061	07/22/87	0.05	

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
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DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-061	11/11/87	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-061	07/01/88	0.200 U	0.060 U	0.010 U	0.200 U	0.005 U	0.005 U	94	NR	0.010 U
SW-061	03/20/89	.200 U V	.0600 U R	.0100 U V	.200 U V	.0050 U R	.0050 U R	27 V	1U V	.0100 U V
SW-061	05/15/89	.200 U R	.0600 U A	.0100 U V	.200 U V	.0050 U A	.0050 U R	60.10 V	1U V	.0100 U V
SW-061	06/09/89	.200 U V	.0600 U V	.0100 U A	.200 U A	.0050 U A	.0050 U R	87.40 A	1U V	.0100 U R
SW-061	07/06/89	.200 U A	.0600 U V	.0100 U V	.200 U V	.0050 U V	.0050 U V	90.90 V	1U V	.0100 U V
SW-061	08/03/89	.200 U V	.0600 U A	.0100 U V	.200 U A	.0050 U V	.0050 U V	87.10 V	1U V	.0100 U R
SW-061	09/11/89	Data not yet received								
SW-061	10/03/89	.0300 U V	.500 U V	.0020 U V	.163 V	.0020 U V	.0040 U V	86.50 V	.0010 U V	.0200 U V
SW-061	10/20/89	DRY								
SW-061	11/06/89	Data not yet received								
SW-061	12/06/89	Data not yet received								
SW-061	01/23/90	Data not yet received								
SW-061	02/09/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-101	06/30/88	0.200 U	0.060 U	0.010 U	0.200 U	0.005 U	0.005 U	12	NR	0.010 U
SW-101	04/13/89	Data not yet received								
SW-101	05/11/89	.200 U R	.0600 U A	.0100 U V	.200 U V	.0050 U A	.0050 U R	9.37 V	1U V	.0100 U A
SW-101	06/07/89	.200 U A	.0600 U V	.0100 U V	.200 U A	.0050 U V	.0050 U V	10.10 A	.100 U V	.0100 U V
SW-101	07/12/89	Data not yet received								
SW-101	08/09/89	Data not yet received								
SW-101	09/14/89	.200 U V	.0600 U A	.0100 U V	.200 U V	.0050 U A	.0050 U V	7.72 A	1U A	.0100 U R
SW-101	10/18/89	Data not yet received								
SW-101	11/15/89	Data not yet received								
SW-101	12/19/89	Data not yet received								
SW-101	01/25/90	Data not yet received								
SW-101	02/22/90	Data not yet received								
SW-101	03/21/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-061	11/11/87	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-061	07/01/88	0.050 U	0.025 U	0.100 U	0.005 U	NR	18	0.015 U	0.0002 U	NR
SW-061	03/20/89	.0500 U A	.0250 U V	.100 U V	.0050 U A	.100 U V	5.61 V	.0167 V	.0002 U V	.100 U V
SW-061	05/15/89	.0500 U A	.0250 U A	.100 U R	.0050 U A	.0100 U V	11.20 V	.0382 V	.0002 U R	.0100 U V
SW-061	06/09/89	.0500 U R	.0250 U R	.100 U V	.0050 U A	.100 U V	14.40 A	.0345 V	.0002 U V	.100 U V
SW-061	07/06/89	.0500 U V	.0250 U A	.100 U A	.0050 U A	.100 U A	16.60 V	.0310 V	.0002 U A	.100 U A
SW-061	08/03/89	.0500 U V	.0250 U R	.100 U R	.0050 U A	.100 U V	16.20 V	.0615 V	.0002 U V	.100 U V
SW-061	09/11/89	Data not yet received								
SW-061	10/03/89	.0200 U V	.0200 U V	.123 A	.0020 U V	.0200 A	16.40 V	.0507 V	.0002 U A	.500 U V
SW-061	10/20/89	DRY								
SW-061	11/06/89	Data not yet received								
SW-061	12/06/89	Data not yet received								
SW-061	01/23/90	Data not yet received								
SW-061	02/09/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-101	06/30/88	0.050 U	0.025 U	0.2	0.005 U	NR	5.0 U	0.015 U	0.0007	NR
SW-101	04/13/89	Data not yet received								
SW-101	05/11/89	.0500 U A	.0250 U R	.100 U R	.0250 U A	.0100 U V	5U V	.0150 U V	.0002 U R	.0100 U V
SW-101	06/07/89	.0500 U V	.0250 U A	.115 A	.0050 U A	.100 U R	5U A	.0150 U A	.0002 U V	.100 U V
SW-101	07/12/89	Data not yet received								
SW-101	08/09/89	Data not yet received								
SW-101	09/14/89	.0500 U V	.0250 U V	.100 U V	.0050 U A	.100 U V	5U V	.0150 U V	.0002 U V	.100 U V
SW-101	10/18/89	Data not yet received								
SW-101	11/15/89	Data not yet received								
SW-101	12/19/89	Data not yet received								
SW-101	01/25/90	Data not yet received								
SW-101	02/22/90	Data not yet received								
SW-101	03/21/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Nickel (Ni), diss. mg/l	Potassium (K), diss. mg/l	Selenium (Se), diss. mg/l	Silver (Ag), diss. mg/l	Sodium (Na), diss. mg/l	Strontium (Sr), diss. mg/l	Thallium (Tl), diss. mg/l	Tin (Sn), diss. mg/l	Vanadium (V), diss. mg/l
SW-061	11/11/87	Insufficient Sample or Dissolved Metals Analysis not requested.								
SW-061	07/01/88	0.040 U	5.0 U	0.005 U	0.010 U	30	0.7	0.010 U	NR	0.050 U
SW-061	03/20/89	.0400 U R	5U A	.0050 U A	.0100 U V	43.50 V	.201 V	.0100 U R	.100 U V	.0600 U V
SW-061	05/15/89	.0400 U R	5U A	.0050 A	.0100 U A	30.50 V	1U V	.0400 U A	.100 U V	.0500 U V
SW-061	06/09/89	.0400 U A	5U A	.0050 U V	.0100 U A	29 V	1U V	.0100 U V	.100 U V	.0500 U A
SW-061	07/06/89	.0400 U A	5U V	.0050 U R	.0100 U R	28.50 V	1U A	.0100 U R	.100 U A	.0500 U V
SW-061	08/03/89	.0400 U V	5U V	.0050 U A	.0100 U V	32.20 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-061	09/11/89	Data not yet received								
SW-061	10/03/89	.0200 U V	1.12 A	.0020 U V	.0300 U V	30.80 V	.517 V	.0030 U V	1U V	.0100 U V
SW-061	10/20/89	DRY								
SW-061	11/06/89	Data not yet received								
SW-061	12/06/89	Data not yet received								
SW-061	01/23/90	Data not yet received								
SW-061	02/09/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-101	06/30/88	0.040 U	5.0 U	0.005 U	0.010 U	7	0.200 U	0.010 U	NR	0.050 U
SW-101	04/13/89	Data not yet received								
SW-101	05/11/89	.0400 U R	5U R	.0050 U A	.0100 U A	5.65 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-101	06/07/89	.0400 U V	5U A	.0050 U V	.0100 U A	5.76 V	.100 U V	.0100 U V	.100 U V	.0500 U V
SW-101	07/12/89	Data not yet received								
SW-101	08/09/89	Data not yet received								
SW-101	09/14/89	.0400 U R	5U R	.0050 U A	.0100 U A	5U V	1U V	.0100 U V	.100 U V	.0500 U V
SW-101	10/18/89	Data not yet received								
SW-101	11/15/89	Data not yet received								
SW-101	12/19/89	Data not yet received								
SW-101	01/25/90	Data not yet received								
SW-101	02/22/90	Data not yet received								
SW-101	03/21/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Zinc (Zn), diss. mg/l		
SW-061	11/11/87	Insufficient Sample or Dissolved Metals Analysis not requested.		
SW-061	07/01/88	0.100		
SW-061	03/20/89	.0664		A
SW-061	05/15/89	.0200		A
SW-061	06/09/89	.181		V
SW-061	07/06/89	.0200	U	A
SW-061	08/03/89	.0837		V
SW-061	09/11/89	Data not yet received		
SW-061	10/03/89	.0347		A
SW-061	10/20/89	DRY		
SW-061	11/06/89	Data not yet received		
SW-061	12/06/89	Data not yet received		
SW-061	01/23/90	Data not yet received		
SW-061	02/09/90	Data not yet received		
SW-061	03/12/90	Data not yet received		
SW-061	03/12/90	Data not yet received		
SW-101	06/30/88	0.010		
SW-101	04/13/89	Data not yet received		
SW-101	05/11/89	.0200	U	R
SW-101	06/07/89	.0267		A
SW-101	07/12/89	Data not yet received		
SW-101	08/09/89	Data not yet received		
SW-101	09/14/89	.0315		A
SW-101	10/18/89	Data not yet received		
SW-101	11/15/89	Data not yet received		
SW-101	12/19/89	Data not yet received		
SW-101	01/25/90	Data not yet received		
SW-101	02/22/90	Data not yet received		
SW-101	03/21/90	Data not yet received		

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 59

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-059	07/21/87	0.2 U	NR	NR	0.2 U	NR	NR	122	NR	0.01 U
SW-059	07/01/88	0.200 U	0.060 U	0.010 U	0.200 U	0.005 U	0.005 U	108	NR	0.010 U
SW-059	03/20/89	.200 U R	.0600 U A	.0100 U A	.200 U V	.0050 U R	.0050 U R	112 V	1U V	.0100 U R
SW-059	05/11/89	.200 U R	.0600 U A	.0100 U V	.200 U V	.0050 U R	.0050 U R	88.30 V	1U V	.0100 U V
SW-059	06/08/89	.200 U A	.0600 U A	.0100 U R	.200 U V	.0050 U A	.0050 U V	109 V	.100 U V	.0100 U V
SW-059	07/06/89	.200 U A	.0600 U A	.0100 U R	.200 U V	.0050 U V	.0050 U V	114 V	.100 U V	.0100 U R
SW-059	08/10/89	Data not yet received								
SW-059	09/18/89	.200 U V	.0600 U A	.0100 U V	.200 V	.0050 U A	.0050 U V	118 V	1U V	.0100 U V
SW-059	10/03/89	.0300 U R	.500 U V	.0020 U V	.162 V	.0020 U V	.0040 U V	100 V	.0010 U V	.0200 U V
SW-059	11/06/89	Data not yet received								
SW-059	12/06/89	Data not yet received								
SW-059	01/23/90	Data not yet received								
SW-059	02/09/90	Data not yet received								
SW-059	03/12/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 59

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-059	07/21/87	0.05 U	0.025 U	0.1 U	NR	NR	24.4	0.015 U	NR	0.04 U
SW-059	07/01/88	0.050 U	0.025 U	0.100 U	0.005 U	NR	20	0.015 U	0.0002 U	NR
SW-059	03/20/89	.0500 U V	.0250 U V	.100 U V	.0250 U A	.100 U V	29.10 V	.0194 A	.0007 A	.100 U V
SW-059	05/11/89	.0500 U A	.0250 U A	.123 V	.0250 U A	.0142 V	23.20 V	.0369 V	.0002 U R	.0100 U V
SW-059	06/08/89	.0500 U V	.0200 A	.100 U A	.0050 U R	.100 U A	20.30 V	.0150 U A	.0002 U V	.100 U V
SW-059	07/06/89	.0500 U V	.0250 U V	.100 U A	.0050 U A	.100 U V	22.80 V	.0461 V	.0002 U V	.100 U V
SW-059	08/10/89	Data not yet received								
SW-059	09/18/89	.0500 U V	.0250 U V	.100 U V	.0050 U V	.100 U A	25.30 V	.0150 U A	.0002 U V	.100 U A
SW-059	10/03/89	.0200 U V	.0200 U V	.0361 A	.0020 U V	.0250 A	21.70 V	.0100 U V	.0002 U A	.500 U V
SW-059	11/06/89	Data not yet received								
SW-059	12/06/89	Data not yet received								
SW-059	01/23/90	Data not yet received								
SW-059	02/09/90	Data not yet received								
SW-059	03/12/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 59

Station Number	Date Sampled	Nickel (Ni), diss. mg/l	Potassium (K), diss. mg/l	Selenium (Se), diss. mg/l	Silver (Ag), diss. mg/l	Sodium (Na), diss. mg/l	Strontium (Sr), diss. mg/l	Thallium (Tl), diss. mg/l	Tin (Sn), diss. mg/l	Vanadium (V), diss. mg/l
SW-059	07/21/87	0.04 U	NR	NR	0.01 U	38.2	0.73	NR	NR	0.05 U
SW-059	07/01/88	0.040 U	5.0 U	0.005 U	0.010 U	28	0.7	0.010 U	NR	0.050 U
SW-059	03/20/89	.0400 U V	5U A	.0050 U A	.0100 U V	36.90 V	1.17 V	.0100 U R	.100 U V	.0500 U V
SW-059	05/11/89	.0400 U R	5U R	.0050 U A	.0100 U A	38.30 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-059	06/08/89	.0400 U V	5U R	.0050 U A	.0100 U V	32.10 V	.614 A	.0100 U V	.100 U V	.0500 U V
SW-059	07/06/89	.0400 U V	5U R	.0050 U A	.0100 U A	31.40 V	.644 A	.0100 U A	.100 U V	.0500 U V
SW-059	08/10/89	Data not yet received								
SW-059	09/18/89	.0400 U R	5U R	.0050 U R	.0100 U V	35.40 V	1U A	.0400 U V	.100 U A	.0500 U V
SW-059	10/03/89	.0200 U V	.750 A	.0020 U V	.0300 U V	30.40 V	.642 V	.0030 U V	1U V	.0100 U V
SW-059	11/06/89	Data not yet received								
SW-059	12/06/89	Data not yet received								
SW-059	01/23/90	Data not yet received								
SW-059	02/09/90	Data not yet received								
SW-059	03/12/90	Data not yet received								

VALUE QUALIFIERS: NR - Analyte not reported U - Analyzed but not detected * - Holding time not met E - Estimated value
J - Present below detection limit B - Present in laboratory blank N - Batch spike not in 80-120% range

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water
Dissolved Metals Sampling Results

STATION 59

Station Number	Date Sampled	Zinc (Zn), dim. mg/l	
SW-059	07/21/87	0.31	
SW-059	07/01/88	0.200	
SW-059	03/20/89	.626	A
SW-059	05/11/89	.0200	A
SW-059	06/08/89	.119	V
SW-059	07/06/89	.0763	V
SW-059	08/10/89	Data not yet received	
SW-059	09/18/89	.232	V
SW-059	10/03/89	.106	V
SW-059	11/06/89	Data not yet received	
SW-059	12/06/89	Data not yet received	
SW-059	01/23/90	Data not yet received	
SW-059	02/09/90	Data not yet received	
SW-059	03/12/90	Data not yet received	

VALUE QUALIFIERS: NR - Analyte not reported U - Analyzed but not detected * - Holding time not met E - Estimated value
J - Present below detection limit B - Present in laboratory blank N - Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Metals Sampling Results

STATION 63

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-063	07/24/87	0.2 U	NR	NR	0.2 U	NR	NR	112	NR	0.01 U
SW-063	07/06/88	0.033	0.500 U	0.003	0.104	0.002 U	0.004 U	93.0	NR	0.020 U
SW-063	03/28/89	DRY								
SW-063	05/12/89	DRY								
SW-063	06/21/89	DRY								
SW-063	07/19/89	DRY								
SW-063	08/11/89	DRY								
SW-063	09/15/89	DRY								
SW-063	10/04/89	DRY								
SW-063	11/03/89	DRY								
SW-063	12/01/89	DRY								
SW-063	01/05/90	DRY								
SW-063	02/02/90	DRY								

VALUE QUALIFIERS: NR - Analyte not reported U - Analyzed but not detected * - Holding time not met E - Estimated value
J - Present below detection limit B - Present in laboratory blank N - Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Metals Sampling Results

STATION 63

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-063	07/24/87	0.05 U	0.025 U	0.1 U	NR	NR	34.0	0.393	NR	0.04 U
SW-063	07/06/88	0.020 U	0.020 U	0.062	0.005	NR	32.2	0.412	0.0002 U	NR
SW-063	03/28/89	DRY								
SW-063	05/12/89	DRY								
SW-063	06/21/89	DRY								
SW-063	07/19/89	DRY								
SW-063	08/11/89	DRY								
SW-063	09/15/89	DRY								
SW-063	10/04/89	DRY								
SW-063	11/03/89	DRY								
SW-063	12/01/89	DRY								
SW-063	01/05/90	DRY								
SW-063	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 63

Station Number	Date Sampled	Nickel (Ni), diss. mg/l	Potassium (K), diss. mg/l	Selenium (Se), diss. mg/l	Silver (Ag), diss. mg/l	Sodium (Na), diss. mg/l	Strontium (Sr), diss. mg/l	Thallium (Tl), diss. mg/l	Tin (Sn), diss. mg/l	Vanadium (V), diss. mg/l
SW-063	07/24/87	0.04 U	NR	NR	0.01 U	110	1.07	NR	NR	0.05 U
SW-063	07/06/88	0.020 U	1.54	0.005 U	0.030 U	102	1.25	0.300 U	NR	0.010 U
SW-063	03/28/89	DRY								
SW-063	05/12/89	DRY								
SW-063	06/21/89	DRY								
SW-063	07/19/89	DRY								
SW-063	08/11/89	DRY								
SW-063	09/15/89	DRY								
SW-063	10/04/89	DRY								
SW-063	11/03/89	DRY								
SW-063	12/01/89	DRY								
SW-063	01/05/90	DRY								
SW-063	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 63

Station Number	Date Sampled	Zinc (Zn), diss. mg/l
SW-063	07/24/87	0.03
SW-063	07/06/88	0.020
SW-063	03/28/89	DRY
SW-063	05/12/89	DRY
SW-063	06/21/89	DRY
SW-063	07/19/89	DRY
SW-063	08/11/89	DRY
SW-063	09/15/89	DRY
SW-063	10/04/89	DRY
SW-063	11/03/89	DRY
SW-063	12/01/89	DRY
SW-063	01/05/90	DRY
SW-063	02/02/90	DRY

VALUE QUALIFIERS: NR - Analyte not reported U - Analyzed but not detected * - Holding time not met E - Estimated value
J - Present below detection limit B - Present in laboratory blank N - Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Metals Sampling Results

STATION 64

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-064	07/22/87	0.2 U	NR	NR	0.2 U	NR	NR	45.8	NR	0.01 U
SW-064	07/07/88	0.049	0.500 U	0.002 U	0.106	0.002 U	0.004 U	57.5	NR	0.020 U
SW-064	03/30/89	DRY								
SW-064	05/22/89	.200 U V	.0600 U A	.0100 U R	.200 U V	.0050 U V	.0050 U R	63.10	1U A	.0100 U A
SW-064	06/27/89	.200 U A	.0600 U A	.0100 U R	.200 U V	.0050 U V	.0050 U V	71.60 V	.100 U V	.0100 U R
SW-064	07/19/89	DRY								
SW-064	08/11/89	DRY								
SW-064	09/20/89	DRY								
SW-064	10/04/89	DRY								
SW-064	11/09/89	DRY								
SW-064	12/01/89	DRY								
SW-064	01/05/90	DRY								
SW-064	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 64

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-064	07/22/87	0.05 U	0.025 U	0.1 U	NR	NR	54.2	0.015 U	NR	0.04 U
SW-064	07/07/88	0.020 U	0.020 U	0.059	0.004 U	NR	48.8	0.074	0.0002 U	NR
SW-064	03/30/89	DRY								
SW-064	05/22/89	.0500 U V	.0250 U A	.100 U A	.0050 U A	.0946 A	45.30	.0364 A	.0002 U V	.0100 U A
SW-064	06/27/89	.0500 U V	.0250 U V	.100 U A	.0050 U A	.100 U V	51.80 V	.0290 V	.0002 U V	.100 U V
SW-064	07/19/89	DRY								
SW-064	08/11/89	DRY								
SW-064	09/20/89	DRY								
SW-064	10/04/89	DRY								
SW-064	11/09/89	DRY								
SW-064	12/01/89	DRY								
SW-064	01/05/90	DRY								
SW-064	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 64

Station Number	Date Sampled	Nickel (Ni), diss. mg/l	Potassium (K), diss. mg/l	Selenium (Se), diss. mg/l	Silver (Ag), diss. mg/l	Sodium (Na), diss. mg/l	Strontium (Sr), diss. mg/l	Thallium (Tl), diss. mg/l	Tin (Sn), diss. mg/l	Vanadium (V), diss. mg/l
SW-064	07/22/87	0.04 U	NR	NR	0.01 U	103	1.10	NR	NR	0.06 U
SW-064	07/07/88	0.020 U	1.38	0.005 U	0.030 U	106	1.02	0.300 U	NR	0.010 U
SW-064	03/30/89	DRY								
SW-064	05/22/89	.0400 U A	5U V	.0130 V	.0100 U V	110	1.14 V	.0400 U A	.100 U A	.0500 U V
SW-064	06/27/89	.0400 U V	5U R	.0050 U V	.0100 U A	106 V	1.17 A	.0100 U A	.100 U V	.0500 U V
SW-064	07/19/89	DRY								
SW-064	08/11/89	DRY								
SW-064	09/20/89	DRY								
SW-064	10/04/89	DRY								
SW-064	11/09/89	DRY								
SW-064	12/01/89	DRY								
SW-064	01/05/90	DRY								
SW-064	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 64

Station Number	Date Sampled	Zinc (Zn), diss. mg/l	
SW-064	07/22/87	0.02 U	
SW-064	07/07/88	0.021	
SW-064	03/30/89	DRY	
SW-064	05/22/89	.0200 U	R
SW-064	06/27/89	.0320	A
SW-064	07/19/89	DRY	
SW-064	08/11/89	DRY	
SW-064	09/20/89	DRY	
SW-064	10/04/89	DRY	
SW-064	11/09/89	DRY	
SW-064	12/01/89	DRY	
SW-064	01/05/90	DRY	
SW-064	02/02/90	DRY	

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 103

Station Number	Date Sampled	Aluminum (Al), diss. mg/l	Antimony (Sb), diss. mg/l	Arsenic (As), diss. mg/l	Barium (Ba), diss. mg/l	Beryllium (Be), diss. mg/l	Cadmium (Cd), diss. mg/l	Calcium (Ca), diss. mg/l	Cesium (Cs), diss. mg/l	Chromium (Cr), diss. mg/l
SW-103	07/11/88	0.035	0.500 U	0.002 U	0.168	0.002 U	0.004 U	99.6	NR	0.020 U
SW-103	03/23/89	.200 U V	.0600 U R	.0100 U R	.200 U V	.0050 U R	.0050 U V	115 E	1U V	.0100 U R
SW-103	05/25/89	Data not yet received								
SW-103	06/15/89	.200 U R	.0600 U A	.0100 U A	.200 V	.0050 U R	.0050 U A	121 V	1U V	.0100 U V
SW-103	07/13/89	.200 U V	.0600 U A	.0100 U A	.200 U V	.0050 U V	.0050 U V	118 V	1U V	.0100 U V
SW-103	08/02/89	.200 U A	.0600 U V	.0100 U V	.200 U V	.0050 U V	.0050 U V	112 V	1U V	.0100 U V
SW-103	09/07/89	Data not yet received								
SW-103	10/03/89	.0300 U R	.500 U V	.0020 U V	.151 V	.0020 U V	.0040 U V	101 V	.0010 U V	.0200 U V
SW-103	11/03/89	Data not yet received								
SW-103	12/06/89	Data not yet received								
SW-103	01/18/90	Data not yet received								
SW-103	02/12/90	Data not yet received								
SW-103	03/22/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 103

Station Number	Date Sampled	Cobalt (Co), diss. mg/l	Copper (Cu), diss. mg/l	Iron (Fe), diss. mg/l	Lead (Pb), diss. mg/l	Lithium (Li), diss. mg/l	Magnesium (Mg), diss. mg/l	Manganese (Mn), diss. mg/l	Mercury (Hg), diss. mg/l	Molybdenum (Mo), diss. mg/l
SW-103	07/11/88	0.020 U	0.020 U	0.061	0.004 U	NR	11.0	0.010 U	0.0002 U	NR
SW-103	03/23/89	.0500 U V	.0250 U R	.156 A	.0050 U R	.0100 U A	12.30 V	.0189 A	.0007 A	.0100 U A
SW-103	05/25/89	Data not yet received								
SW-103	06/15/89	.0500 U V	.0250 U V	.100 U V	.0050 U V	.100 U A	SU V	.0150 U R	.0005 A	.100 U A
SW-103	07/13/89	.0500 U V	.0250 U A	.100 U V	.0050 U A	.100 U A	12.60 V	.0462 V	.0002 U V	.100 U A
SW-103	08/02/89	.0500 U V	.0250 U R	.100 U R	.0050 U V	.100 U V	12.20 V	.0696 V	.0002 U R	.100 U V
SW-103	09/07/89	Data not yet received								
SW-103	10/03/89	.0200 U V	.0200 U V	.0853 A	.0020 U V	.0160 A	11.70 V	.0730 V	.0002 U A	.500 U V
SW-103	11/03/89	Data not yet received								
SW-103	12/06/89	Data not yet received								
SW-103	01/18/90	Data not yet received								
SW-103	02/12/90	Data not yet received								
SW-103	03/22/90	Data not yet received								

VALUE QUALIFIERS: NR - Analyte not reported U - Analyzed but not detected * - Holding time not met E - Estimated value
J - Present below detection limit B - Present in laboratory blank M - Batch spike not in 80-120% range

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Metals Sampling Results

STATION 103

Station Number	Date Sampled	Nickel (Ni), diss. mg/l	Potassium (K), diss. mg/l	Selenium (Se), diss. mg/l	Silver (Ag), diss. mg/l	Sodium (Na), diss. mg/l	Strontium (Sr), diss. mg/l	Thallium (Tl), diss. mg/l	Tin (Sn), diss. mg/l	Vanadium (V), diss. mg/l
SW-103	07/11/88	0.020 U	0.853	0.005 U	0.030 U	11.3	0.395	0.300 U	NR	0.010 U
SW-103	03/23/89	.0400 U A	5U A	.0050 U A	.0100 U V	12.70 A	.420 A	.0100 U A	.100 U A	.0500 U R
SW-103	05/25/89	Data not yet received								
SW-103	06/15/89	.0400 U A	5U R	.0050 U V	.0100 U A	5U V	1U A	.0400 U A	.100 U A	.0500 U V
SW-103	07/13/89	.0400 U A	5U V	.0050 U A	.0100 U A	14.20 V	1U A	.0100 U A	.100 U A	.0500 U A
SW-103	08/02/89	.0400 U V	5U V	.0050 U A	.0100 U R	12.50 V	1U V	.0100 U A	.100 U V	.0500 U A
SW-103	09/07/89	Data not yet received								
SW-103	10/03/89	.0200 U V	.547 A	.0020 U V	.0300 U V	13.30 V	.421 V	.0030 U B	1U V	.0100 U V
SW-103	11/03/89	Data not yet received								
SW-103	12/06/89	Data not yet received								
SW-103	01/10/90	Data not yet received								
SW-103	02/12/90	Data not yet received								
SW-103	03/22/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Metals Sampling Results

STATION 103

Station Number	Date Sampled	Zinc (Zn), diss. mg/l
SW-103	07/11/88	0.024
SW-103	03/23/89	.0200 U A
SW-103	05/25/89	Data not yet received
SW-103	06/15/89	.0200 U V
SW-103	07/13/89	.0200 U V
SW-103	08/02/89	.0200 U V
SW-103	09/07/89	Data not yet received
SW-103	10/03/89	.0270 A
SW-103	11/03/89	Data not yet received
SW-103	12/06/89	Data not yet received
SW-103	01/18/90	Data not yet received
SW-103	02/12/90	Data not yet received
SW-103	03/22/90	Data not yet received

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

APPENDIX B-3

SURFACE WATER SAMPLING RESULTS

TOTAL METALS

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-050	/ /	DRY								
SW-050	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-050	06/27/88	15.6	.040 U	.010 U	.489	.005 U	.005 U	118	NR	.0282
SW-050	06/27/88	Insufficient Sample or Total Metals Analysis not requested.								
SW-050	04/17/89	DRY								
SW-050	05/10/89	DRY								
SW-050	06/27/89	7.84 V	.0600 U A	.0100 U A	.317 V	.0050 U A	.0050 U A	122 A	1U V	.0148 A
SW-050	07/18/89	11.90 A	.0600 U V	.0100 U A	.350 V	.0050 U V	.0050 U V	123 V	1U V	.0169 A
SW-050	08/11/89	DRY								
SW-050	09/12/89	DRY								
SW-050	10/04/89	DRY								
SW-050	11/03/89	DRY								
SW-050	12/01/89	DRY								
SW-050	01/05/90	DRY								
SW-050	02/02/90	DRY								
SW-050	03/17/90	DRY								
SW-051	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-051	06/23/88	DRY								
SW-051	04/17/89	DRY								
SW-051	05/10/89	DRY								
SW-051	06/27/89	2.25 V	.0600 U A	.0100 U V	.209 V	.0050 U V	.0050 U A	104 A	1U V	.0100 U V
SW-051	07/18/89	DRY								
SW-051	08/11/89	DRY								
SW-051	09/12/89	DRY								
SW-051	10/04/89	DRY								
SW-051	11/03/89	DRY								
SW-051	12/01/89	DRY								
SW-051	01/05/90	DRY								
SW-051	02/02/90	DRY								
SW-052	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-052	06/23/88	4.29	.040 U	.010 U	.2 U	.005 U	.005 U	96.2	NR	.010 U
SW-052	04/17/89	DRY								
SW-052	05/10/89	DRY								
SW-052	06/09/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank M = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Cobalt (Co), total mg/l	Copper (Cu), total mg/l	Iron (Fe), total mg/l	Lead (Pb), total mg/l	Lithium (Li), total mg/l	Magnesium (Mg), total mg/l	Manganese (Mn), total mg/l	Mercury (Hg), total mg/l	Molybdenum (Mo), total mg/l
SW-050	/ /	DRY								
SW-050	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-050	06/27/88	.050 U	.0378	21.8	.0384	NR	13.9	.259	.0002 U	NR
SW-050	06/27/88	Insufficient Sample or Total Metals Analysis not requested.								
SW-050	04/17/89	DRY								
SW-050	05/10/89	DRY								
SW-050	06/27/89	.0500 U V	.0250 U A	14 A	.0179 V	.100 U A	11.70 V	.061 V	.0002 V	.100 U A
SW-050	07/18/89	.0500 U V	.0250 U V	16.70 A	.0177 A	.100 U V	12.30 V	.457 V	.0002 U V	.100 U V
SW-050	08/11/89	DRY								
SW-050	09/12/89	DRY								
SW-050	10/04/89	DRY								
SW-050	11/03/89	DRY								
SW-050	12/01/89	DRY								
SW-050	01/05/90	DRY								
SW-050	02/02/90	DRY								
SW-050	03/17/90	DRY								
SW-051	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-051	06/23/88	DRY								
SW-051	04/17/89	DRY								
SW-051	05/10/89	DRY								
SW-051	06/27/89	.0500 U V	.0250 U V	2 B	.0050 U B	.100 U B	8.19 V	.0284 V	.0002 U V	.100 U A
SW-051	07/18/89	DRY								
SW-051	08/11/89	DRY								
SW-051	09/12/89	DRY								
SW-051	10/04/89	DRY								
SW-051	11/03/89	DRY								
SW-051	12/01/89	DRY								
SW-051	01/05/90	DRY								
SW-051	02/02/90	DRY								
SW-052	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-052	06/23/88	.050 U	.025 U	3	.0389	NR	14.5	.0301	.0002 U	NR
SW-052	04/17/89	DRY								
SW-052	05/10/89	DRY								
SW-052	06/09/89	DRY								

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J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-050	/ /	DRY								
SW-050	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-050	06/27/88	.0654	5 U	.005 U	.010 U	13	.416	.010 U	NR	.0601
SW-050	06/27/88	Insufficient Sample or Total Metals Analysis not requested.								
SW-050	04/17/89	DRY								
SW-050	05/10/89	DRY								
SW-050	06/27/89	.0400 U R	5U A	.0050 U R	.0100 U A	8.64 V	1U V	.0100 U V	.100 A	.0500 U V
SW-050	07/18/89	.0400 U V	5U A	.0050 U R	.0100 U R	8.85 V	1U V	.0100 U R	.100 U V	.0500 U V
SW-050	08/11/89	DRY								
SW-050	09/12/89	DRY								
SW-050	10/04/89	DRY								
SW-050	11/03/89	DRY								
SW-050	12/01/89	DRY								
SW-050	01/05/90	DRY								
SW-050	02/02/90	DRY								
SW-050	03/17/90	DRY								
SW-051	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-051	06/23/88	DRY								
SW-051	04/17/89	DRY								
SW-051	05/10/89	DRY								
SW-051	06/27/89	.0400 U R	5U R	.0050 U A	.0100 U A	8.40 V	1U V	.0100 U A	.100 U A	.0500 U V
SW-051	07/18/89	DRY								
SW-051	08/11/89	DRY								
SW-051	09/12/89	DRY								
SW-051	10/04/89	DRY								
SW-051	11/03/89	DRY								
SW-051	12/01/89	DRY								
SW-051	01/05/90	DRY								
SW-051	02/02/90	DRY								
SW-052	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-052	06/23/88	.040 U	5 U	.005 U	.010 U	41.4	.440	.100 U	NR	.050 U
SW-052	04/17/89	DRY								
SW-052	05/10/89	DRY								
SW-052	06/09/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Zinc (Zn), total mg/l
SW-050	/ /	DRY
SW-050	07/21/87	Insufficient Sample or Total Metals Analysis not requested.
SW-050	06/27/88	.0902
SW-050	06/27/88	Insufficient Sample or Total Metals Analysis not requested.
SW-050	04/17/89	DRY
SW-050	05/10/89	DRY
SW-050	06/27/89	.0509 A
SW-050	07/18/89	.110 A
SW-050	08/11/89	DRY
SW-050	09/12/89	DRY
SW-050	10/04/89	DRY
SW-050	11/03/89	DRY
SW-050	12/01/89	DRY
SW-050	01/05/90	DRY
SW-050	02/02/90	DRY
SW-050	03/17/90	DRY
SW-051	07/21/87	Insufficient Sample or Total Metalm Analysis not requested.
SW-051	06/23/88	DRY
SW-051	04/17/89	DRY
SW-051	05/10/89	DRY
SW-051	06/27/89	.0200 U A
SW-051	07/18/89	DRY
SW-051	08/11/89	DRY
SW-051	09/12/89	DRY
SW-051	10/04/89	DRY
SW-051	11/03/89	DRY
SW-051	12/01/89	DRY
SW-051	01/05/90	DRY
SW-051	02/02/90	DRY
SW-052	07/21/87	Insufficient Sample or Total Metals Analysis not requested.
SW-052	06/23/88	.0239
SW-052	04/17/89	DRY
SW-052	05/10/89	DRY
SW-052	06/09/89	DRY

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-052	07/07/89	DRY								
SW-052	08/11/89	DRY								
SW-052	09/28/89	DRY								
SW-052	10/04/89	DRY								
SW-052	11/03/89	DRY								
SW-052	12/01/89	DRY								
SW-052	01/05/90	DRY								
SW-052	02/02/90	DRY								
SW-052	03/17/90	DRY								
SW-055	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-055	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-055	06/22/88	.20 U	.040 U	.010 U	.310	.005 U	.005 U	127	NR	.010 U
SW-055	04/17/89	6.40 V	.0600 U A	.0100 U V	.307 V	.0069 A	.0050 U A	104 V	1U V	.0127 A
SW-055	05/25/89	Data not yet received								
SW-055	06/28/89	28.30 V	.0600 U A	.0100 U A	.573 V	.0050 U A	.0050 U A	107 A	1U V	.0288 A
SW-055	07/18/89	14.70 A	.0600 U V	.0100 U A	.492 V	.0050 U V	.0050 U V	156 V	1U V	.0113 A
SW-055	08/16/89	.267 A	.0600 U V	.0100 U R	.308 V	.0050 U V	.0050 U A	128 V	1U V	.0100 U V
SW-055	09/20/89	.200 U A	.0600 U A	.0100 U V	.346 V	.0050 U R	.0050 U V	142 A	1U R	.0100 U A
SW-055	10/19/89	.548 V	.500 U A	.0024 A	.269 V	.0020 U R	.0040 U A	118 V	.0010 U V	.0200 U A
SW-055	11/09/89	.222	.0600 U	.0100 U	.295	.0050 U	.0050 U	127	1U	.0100 U
SW-055	12/07/89	Data not yet received								
SW-055	01/16/90	Data not yet received								
SW-055	02/23/90	Data not yet received								
SW-055	03/15/90	Data not yet received								
SW-057	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-057	06/23/88	DRY								
SW-057	04/17/89	DRY								
SW-057	05/10/89	DRY								
SW-057	06/09/89	DRY								
SW-057	07/07/89	DRY								
SW-057	08/11/89	DRY								
SW-057	09/16/89	DRY								
SW-057	10/04/89	DRY								
SW-057	11/03/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Cobalt (Co), total mg/l	Copper (Cu), total mg/l	Iron (Fe), total mg/l	Lead (Pb), total mg/l	Lithium (Li), total mg/l	Magnesium (Mg), total mg/l	Manganese (Mn), total mg/l	Mercury (Hg), total mg/l	Molybdenum (Mo), total mg/l
SW-052	07/07/89	DRY								
SW-052	08/11/89	DRY								
SW-052	09/28/89	DRY								
SW-052	10/04/89	DRY								
SW-052	11/03/89	DRY								
SW-052	12/01/89	DRY								
SW-052	01/05/90	DRY								
SW-052	02/02/90	DRY								
SW-052	03/17/90	DRY								
SW-055	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-055	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-055	06/22/88	.05 U	.025 U	.102	.005 U	NR	26.6	.205	.0002 U	NR
SW-055	04/17/89	.0500 U V	.0295 A	6.20 V	.0155 V	.0831 A	21.10 V	.464 V	.0005 A	.0275 A
SW-055	05/25/89	Data not yet received								
SW-055	06/28/89	.0500 U V	.0570 V	26.70 A	.0576 V	.104 A	26.40 V	.771 V	.0002 U V	.100 U A
SW-055	07/18/89	.0500 U V	.0292 V	13.10 A	.0273 A	.172 V	31.10 V	.954 V	.0002 U V	.100 U V
SW-055	08/16/89	.0500 U V	.0250 U A	.186 A	.0030 U A	.180 A	26.10 V	.363 V	.0002 U V	.100 U V
SW-055	09/20/89	.0500 U V	.0250 U V	.187 A	.0050 U A	.132 A	27.90 V	.267 A	.0006 V	.100 U A
SW-055	10/19/89	.0200 U V	.0200 U A	.774 V	.0045 A	3.20 A	24.10 V	.280 V	.0002 U A	.500 U A
SW-055	11/09/89	.0500 U	.0250 U	.264	.0050 U	.165	27.50	.290	.0003	.100 U
SW-055	12/07/89	Data not yet received								
SW-055	01/16/90	Data not yet received								
SW-055	02/23/90	Data not yet received								
SW-055	03/15/90	Data not yet received								
SW-057	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-057	06/23/88	DRY								
SW-057	04/17/89	DRY								
SW-057	05/10/89	DRY								
SW-057	06/09/89	DRY								
SW-057	07/07/89	DRY								
SW-057	08/11/89	DRY								
SW-057	09/16/89	DRY								
SW-057	10/04/89	DRY								
SW-057	11/03/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-052	07/07/89	DRY								
SW-052	08/11/89	DRY								
SW-052	09/28/89	DRY								
SW-052	10/04/89	DRY								
SW-052	11/03/89	DRY								
SW-052	12/01/89	DRY								
SW-052	01/05/90	DRY								
SW-052	02/02/90	DRY								
SW-052	03/17/90	DRY								
SW-055	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-055	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-055	06/22/88	.040 U	5 U	.0075	.010 U	73.8	.879	.100 U	NR	.050 U
SW-055	04/17/89	.0400 U R	5U A	.0050 U A	.0100 U V	42.30 V	1U A	.0100 U V	.100 U V	.0500 U V
SW-055	05/25/89	Data not yet received								
SW-055	06/28/89	.0400 U A	7.26 A	.0050 U R	.0100 U A	36.60 V	1U V	.0100 U A	.141 A	.0852 V
SW-055	07/18/89	.0400 U V	6.32 V	.0050 U R	.0100 U A	69.60 V	1U V	.0100 U R	.100 U V	.0500 U V
SW-055	08/16/89	.0400 U V	5U A	.0050 U A	.0100 U A	57.20 A	1U V	.100 U R	.100 U V	.0500 U R
SW-055	09/20/89	.0400 U R	5U A	.0050 U R	.0100 U A	86.90 A	1U R	.0400 U V	.100 U A	.0500 U A
SW-055	10/19/89	.0200 U R	2.31 A	.0020 U A	.0300 U R	67.40 V	.812 V	.0030 U A	1U A	.0100 U V
SW-055	11/09/89	.0400 U	5U	.0050 U	.0100 U	74.20	1U	.0200 U	.100 U	.0500 U
SW-055	12/07/89	Data not yet received								
SW-055	01/16/90	Data not yet received								
SW-055	02/23/90	Data not yet received								
SW-055	03/15/90	Data not yet received								
SW-057	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-057	06/23/88	DRY								
SW-057	04/17/89	DRY								
SW-057	05/10/89	DRY								
SW-057	06/09/89	DRY								
SW-057	07/07/89	DRY								
SW-057	08/11/89	DRY								
SW-057	09/16/89	DRY								
SW-057	10/04/89	DRY								
SW-057	11/03/89	DRY								

VALUE QUALIFIERS: NR = Analyte not reported; U = Analyzed but not detected; * = Holding time not met; E = Estimated value; J = Present below detection limit; B = Present in laboratory blank; N = Batch spike not in 80-120% range

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Zinc (Zn), total mg/l	
SW-052	07/07/89	DRY	
SW-052	08/11/89	DRY	
SW-052	09/28/89	DRY	
SW-052	10/04/89	DRY	
SW-052	11/03/89	DRY	
SW-052	12/01/89	DRY	
SW-052	01/05/90	DRY	
SW-052	02/02/90	DRY	
SW-052	03/17/90	DRY	
SW-055	07/21/87	Insufficient Sample or Total Metals Analysis not requested.	
SW-055	07/21/87	Insufficient Sample or Total Metals Analysis not requested.	
SW-055	06/22/88	.341	
SW-055	04/17/89	2.30	V
SW-055	05/25/89	Data not yet received	
SW-055	06/28/89	2.84	V
SW-055	07/18/89	1.93	A
SW-055	08/16/89	.944	V
SW-055	09/20/89	.976	A
SW-055	10/19/89	1.01	A
SW-055	11/09/89	1.32	
SW-055	12/07/89	Data not yet received	
SW-055	01/16/90	Data not yet received	
SW-055	02/23/90	Data not yet received	
SW-055	03/15/90	Data not yet received	
SW-057	07/21/87	Insufficient Sample or Total Metals Analysis not requested.	
SW-057	06/23/88	DRY	
SW-057	04/17/89	DRY	
SW-057	05/10/89	DRY	
SW-057	06/09/89	DRY	
SW-057	07/07/89	DRY	
SW-057	08/11/89	DRY	
SW-057	09/16/89	DRY	
SW-057	10/04/89	DRY	
SW-057	11/03/89	DRY	

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-057	12/01/89	DRY								
SW-057	01/05/90	DRY								
SW-057	02/02/90	DRY								
SW-057	03/17/90	DRY								
SW-058	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-058	06/23/88	.419	.040 U	.010 U	.214	.005 U	.005 U	111	NR	.010 U
SW-058	04/17/89	DRY								
SW-058	05/10/89	DRY								
SW-058	06/28/89	.550 V	.0600 U V	.0100 U B	.212 V	.0050 U B	.0050 U V	97.90 V	.100 U V	.0100 U V
SW-058	07/14/89	DRY								
SW-058	08/11/89	DRY								
SW-058	09/20/89	DRY								
SW-058	10/04/89	DRY								
SW-058	11/20/89	DRY								
SW-058	12/01/89	DRY								
SW-058	01/05/90	DRY								
SW-058	02/02/90	DRY								
SW-077	06/22/88	.0002 U	.00004 U	.00001 U	.0003	.005 U	.005 U	.109	NR	.00001 U
SW-077	03/30/89	DRY								
SW-077	05/11/89	DRY								
SW-077	06/27/89	1.17 V	.0600 U B	.0100 U B	.214 V	.0050 U A	.0050 U V	118U V	.100 U V	.0100 U R
SW-077	07/18/89	DRY								
SW-077	08/16/89	2.37 V	.0600 U V	.0100 U B	.200 U V	.0050 U V	.0050 U B	72.30 V	1U V	.0100 U V
SW-077	09/20/89	DRY								
SW-077	10/04/89	DRY								
SW-077	11/09/89	DRY								
SW-077	12/01/89	DRY								
SW-077	01/05/90	DRY								
SW-077	02/02/90	DRY								
SW-077	03/16/90	Data not yet received								

VALUE QUALIFIERS: NR - Analyte not reported U - Analyzed but not detected * - Holding time not met E - Estimated value
J - Present below detection limit B - Present in laboratory blank N - Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Cobalt (Co), total mg/l	Copper (Cu), total mg/l	Iron (Fe), total mg/l	Lead (Pb), total mg/l	Lithium (Li), total mg/l	Magnesium (Mg), total mg/l	Manganese (Mn), total mg/l	Mercury (Hg), total mg/l	Molybdenum (Mo), total mg/l
SW-057	12/01/89	DRY								
SW-057	01/05/90	DRY								
SW-057	02/02/90	DRY								
SW-057	03/17/90	DRY								
SW-058	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-058	06/23/88	.050 U	.025 U	.489	.005 U	NR	20.1	.11	.0002 U	NR
SW-058	04/17/89	DRY								
SW-058	05/10/89	DRY								
SW-058	06/28/89	.0500 U V	.0321 A	.842 V	.0050 U V	.100 U V	11.30 V	.0457 V	.0002 U V	.100 U V
SW-058	07/14/89	DRY								
SW-058	08/11/89	DRY								
SW-058	09/20/89	DRY								
SW-058	10/04/89	DRY								
SW-058	11/20/89	DRY								
SW-058	12/01/89	DRY								
SW-058	01/05/90	DRY								
SW-058	02/02/90	DRY								
SW-077	06/22/88	.00005 U	.00003 U	.0001 U	.005 U	NR	.0229	.0016	.0002 U	NR
SW-077	03/30/89	DRY								
SW-077	05/11/89	DRY								
SW-077	06/27/89	.0500 U V	.0250 U V	2.54 A	.0136 A	.100 U V	24.50 V	.404 V	.0002 U V	.100 U V
SW-077	07/18/89	DRY								
SW-077	08/16/89	.0500 U V	.0250 U A	2.72 V	.0060 U A	.100 U V	14 V	.261 V	.0002 U V	.100 U V
SW-077	09/20/89	DRY								
SW-077	10/04/89	DRY								
SW-077	11/09/89	DRY								
SW-077	12/01/89	DRY								
SW-077	01/05/90	DRY								
SW-077	02/02/90	DRY								
SW-077	03/16/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-057	12/01/89	DRY								
SW-057	01/05/90	DRY								
SW-057	02/02/90	DRY								
SW-057	03/17/90	DRY								
SW-058	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-058	06/23/88	.040 U	5 U	.005 U	.010 U	16.7	.765	.010 U	NR	.050 U
SW-058	04/17/89	DRY								
SW-058	05/10/89	DRY								
SW-058	06/28/89	.0400 U V	5U R	.0050 U A	.0100 U V	8.5B V	.468 V	.0100 U A	.100 U B	.0500 U V
SW-058	07/14/89	DRY								
SW-058	08/11/89	DRY								
SW-058	09/20/89	DRY								
SW-058	10/04/89	DRY								
SW-058	11/20/89	DRY								
SW-058	12/01/89	DRY								
SW-058	01/05/90	DRY								
SW-058	02/02/90	DRY								
SW-077	06/22/88	.00004 U	.0050 U	.005 U	.00001 U	.0592	.0006	.00001 U	NR	.00005 U
SW-077	03/30/89	DRY								
SW-077	05/11/89	DRY								
SW-077	06/27/89	.0400 U V	5U A	.0126 V	.0100 U A	44.10 V	.603 A	.0100 U A	.100 U V	.0500 U V
SW-077	07/18/89	DRY								
SW-077	08/16/89	.0400 U V	8.77 V	.0050 U V	.0100 U A	24.50 A	1U V	.0100 U R	.100 U V	.0500 U A
SW-077	09/20/89	DRY								
SW-077	10/04/89	DRY								
SW-077	11/09/89	DRY								
SW-077	12/01/89	DRY								
SW-077	01/05/90	DRY								
SW-077	02/02/90	DRY								
SW-077	03/16/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Zinc (Zn), total mg/l
SW-057	12/01/89	DRY
SW-057	01/05/90	DRY
SW-057	02/02/90	DRY
SW-057	03/17/90	DRY
SW-058	07/21/87	Insufficient Sample or Total Metals Analysis not requested.
SW-058	06/23/88	.020 U
SW-058	04/17/89	DRY
SW-058	05/10/89	DRY
SW-058	06/28/89	.0544 A
SW-058	07/14/89	DRY
SW-058	08/11/89	DRY
SW-058	09/20/89	DRY
SW-058	10/04/89	DRY
SW-058	11/20/89	DRY
SW-058	12/01/89	DRY
SW-058	01/05/90	DRY
SW-058	02/02/90	DRY
SW-077	06/22/88	.00003
SW-077	03/30/89	DRY
SW-077	05/11/89	DRY
SW-077	06/27/89	.218 V
SW-077	07/18/89	DRY
SW-077	08/16/89	.0521 A
SW-077	09/20/89	DRY
SW-077	10/04/89	DRY
SW-077	11/09/89	DRY
SW-077	12/01/89	DRY
SW-077	01/05/90	DRY
SW-077	02/02/90	DRY
SW-077	03/16/90	Data not yet received

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 53

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-053	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-053	06/23/88	2.35	.040 U	.010 U	.26	.005 U	.005 U	117	NR	.010 U
SW-053	06/23/88	Insufficient Sample or Total Metals Analysis not requested.								
SW-053	04/05/89	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW-053	05/23/89	.666 V	.0600 U A	.0100 U A	.234 V	.0050 U V	.0050 U A	116 A	1U V	.0100 U A
SW-053	06/26/89	6.62 V	.0600 U V	.0200 U V	.448 V	.0055 V	.0050 U A	146 V	.100 U V	.0100 U V
SW-053	07/19/89	DRY								
SW-053	08/15/89	.200 U A	.0600 U V	.0100 U A	.232 V	.0050 U V	.0050 U A	140 V	1U V	.0100 U V
SW-053	09/20/89	.200 U R	.0600 U A	.0100 U V	.244 V	.0050 U R	.0050 U V	142 A	1U R	.0100 U A
SW-053	10/12/89	.400 A	.0600 U V	.0100 U A	.218 V	.0050 U V	.0050 U V	146 V	2.50 U V	.0100 U V
SW-053	11/07/89	Data not yet received								
SW-053	12/15/89	Data not yet received								
SW-053	01/17/90	Data not yet received								
SW-053	02/13/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 53

Station Number	Date Sampled	Cobalt (Co), total mg/l	Copper (Cu), total mg/l	Iron (Fe), total mg/l	Lead (Pb), total mg/l	Lithium (Li), total mg/l	Magnesium (Mg), total mg/l	Manganese (Mn), total mg/l	Mercury (Hg), total mg/l	Molybdenum (Mo), total mg/l
SW-053	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-053	06/23/88	.050 U	.025 U	5.95	.0623	NR	31	.712	.0002 U	NR
SW-053	06/23/88	Insufficient Sample or Total Metals Analysis not requested.								
SW-053	04/05/89	NR	NR	NR	.0050 U	NR	NR	NR	NR	NR
SW-053	05/23/89	.0500 U A	.0250 U A	8.62 A	.0050 U A	.0240 A	28.10 A	.651 A	.0002 U V	.0100 U A
SW-053	06/26/89	.0500 U V	.0299 A	22.30 V	.0200 U V	.100 U V	31.30 V	.719 V	.0002 U V	.100 U V
SW-053	07/19/89	DRY								
SW-053	08/15/89	.0500 U V	.0250 U A	5.64 V	.0030 U A	.100 U V	27.20 V	.501 V	.0002 U V	.100 U V
SW-053	09/20/89	.0500 U V	.0250 U V	5.06 V	.0050 U V	.100 U R	24.60 V	.474 A	.0007 V	.100 U A
SW-053	10/12/89	.0500 U V	.0250 U A	5.47 V	.0030 U R	.100 U V	26.20 V	.467 A	.0002 U V	.100 U V
SW-053	11/07/89	Data not yet received								
SW-053	12/15/89	Data not yet received								
SW-053	01/17/90	Data not yet received								
SW-053	02/13/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 53

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-053	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-053	06/23/88	.040 U	5 U	.005 U	.010 U	17.6	.802	.010 U	NR	.050 U
SW-053	06/23/88	Insufficient Sample or Total Metals Analysis not requested.								
SW-053	04/05/89	NR	NR	NR	NR	NR	NR	NR	NR	NR
SW-053	05/23/89	.0400 U R	5U A	.0250 U R	.0100 U A	20.90 V	1U V	.0100 U R	.100 U A	.0500 U A
SW-053	06/26/89	.0400 U V	5U A	.0050 U A	.0100 U V	17.10 V	.847 V	.0100 U R	.109 V	.0500 U V
SW-053	07/19/89	DRY								
SW-053	08/15/89	.0400 U V	5U V	.0050 U V	.0100 U A	14.70	1U V	.100 U R	.100 U V	.0500 U R
SW-053	09/20/89	.0400 U A	5U R	.0050 U R	.0100 U A	16.80 A	1U R	.0100 U A	.100 U A	.0500 U A
SW-053	10/12/89	.0400 U V	5U R	.0050 U A	.0100 U V	18.40 V	.796 A	.0100 U A	.100 U V	.0500 U V
SW-053	11/07/89	Data not yet received								
SW-053	12/15/89	Data not yet received								
SW-053	01/17/90	Data not yet received								
SW-053	02/13/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 53

Station Number	Date Sampled	Zinc (Zn), total mg/l		
SW-053	07/21/87	Insufficient Sample or Total Metals Analysis not requested.		
SW-053	06/23/88	.0252		
SW-053	06/23/88	Insufficient Sample or Total Metals Analysis not requested.		
SW-053	04/05/89	NR		
SW-053	05/23/89	.0200	U	R
SW-053	06/26/89	.121		V
SW-053	07/19/89	DRY		
SW-053	08/15/89	.0200	U	R
SW-053	09/20/89	.0269		A
SW-053	10/12/89	.0288		A
SW-053	11/07/89	Data not yet received		
SW-053	12/15/89	Data not yet received		
SW-053	01/17/90	Data not yet received		
SW-053	02/13/90	Data not yet received		

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-056	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-056	06/30/88	5.3	0.060 U	0.010 U	0.3	0.005 U	0.005 U	130	NR	0.010 U
SW-056	04/13/89	25.40 V	.0600 U A	.0100 U A	.244 V	.0121 A	.0050 U A	23 V	1U V	.0366 V
SW-056	05/11/89	11.50 V	.0600 U V	.0100 U A	.384 V	.0050 U A	.0050 U R	152 V	1U V	.0149 A
SW-056	06/07/89	.304 A	.0600 U A	.0100 U A	.293 A	.0060 U A	.0050 U V	138 A	.100 U V	.0100 U V
SW-056	07/12/89	1.19 V	.0600 U V	.0100 U V	.244 V	.0050 U V	.0050 U A	130 A	1U R	.0100 U V
SW-056	08/09/89	4.40 A	.0600 U A	.0100 U A	.286 V	.0050 U R	.0050 U V	126 V	1U V	.0100 U R
SW-056	09/14/89	.637 V	.0600 U A	.0100 U V	.209 V	.0050 U A	.0050 U R	106 A	1U A	.0100 U R
SW-056	10/18/89	Data not yet received								
SW-056	11/15/89	Data not yet received								
SW-056	12/19/89	Data not yet received								
SW-056	01/25/90	Data not yet received								
SW-056	02/22/90	Data not yet received								
SW-056	03/21/90	Data not yet received								
SW-060	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-060	11/11/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-060	07/01/88	0.200 U	0.060 U	0.010 U	0.200 U	0.005 U	0.005 U	106	NR	0.010 U
SW-060	03/16/89	.200 U A	.0600 U R	.0100 U A	.200 U A	.0060 U A	.0050 U R	90.80 V	1U V	.0100 U R
SW-060	03/16/89	.200 U R	.0600 U R	.0100 U A	.200 U A	.0050 U A	.0050 U V	92.20 V	1U V	.0100 U R
SW-060	05/15/89	.200 U R	.0600 U V	.0100 U V	.200 U V	.0050 U A	.0050 U R	71.20 V	1U V	.0100 U V
SW-060	05/15/89	.200 U R	.0600 U V	.0100 U V	.200 U V	.0050 U A	.0050 U R	70.20 V	1U V	.0100 U V
SW-060	06/09/89	.282 A	.0611 A	.0100 U V	.200 U A	.0050 U A	.0050 U R	94 A	1U V	.0100 U R
SW-060	07/06/89	1.89 V	.0600 U V	.0100 U A	.218 V	.0050 U V	.0050 U V	120 V	1U V	.0100 U V
SW-060	08/03/89	.296 V	.0600 U R	.0100 U V	.200 U V	.0050 U R	.0050 U V	101 V	1U V	.0100 U V
SW-060	09/11/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	10/03/89	.0300 U R	.500 U V	.0020 U V	.179 V	.0020 U V	.0040 U V	95 B	.0010 U V	.0200 U V
SW-060	11/06/89	Data not yet received								
SW-060	11/06/89	Data not yet received								
SW-060	12/06/89	Data not yet received								
SW-060	01/23/90	Data not yet received								
SW-060	02/09/90	Data not yet received								
SW-060	03/12/90	Data not yet received								
SW-061	07/22/87	Insufficient Sample or Total Metals Analysis not requested.								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Cobalt (Co), total mg/l	Copper (Cu), total mg/l	Iron (Fe), total mg/l	Lead (Pb), total mg/l	Lithium (Li), total mg/l	Magnesium (Mg), total mg/l	Manganese (Mn), total mg/l	Mercury (Hg), total mg/l	Molybdenum (Mo), total mg/l
SW-056	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-056	06/30/88	0.050 U	0.025 U	3.0	0.005 U	NR	24	.70	0.0002 U	NR
SW-056	04/13/89	.0500 U V	.0472 A	21.70 A	.0336 V	.0235 V	6.89 V	.260 A	.0003 V	.0465 A
SW-056	05/11/89	.0500 U A	.0250 U A	12.10 V	.0149 V	.0167 V	22.30 V	.879 V	.0002 U R	.0100 U V
SW-056	06/07/89	.0500 U V	.0326 A	8.88 A	.0124 V	.100 U R	20.70 A	.947 A	.0002 U V	.100 U V
SW-056	07/12/89	.0500 U R	.0250 U A	1.90 V	.0050 U A	.100 U R	22.30 A	.544 V	.0002 U V	.100 U V
SW-056	08/09/89	.0500 U V	.0250 U V	3.82 A	.0138 A	.100 U V	22.60 V	.645 V	.0004 V	.100 U V
SW-056	09/14/89	.0500 U V	.0250 U V	.486 V	.0050 U A	.100 U V	18.90 V	.475 V	.0002 U V	.100 U V
SW-056	10/10/89	Data not yet received								
SW-056	11/15/89	Data not yet received								
SW-056	12/19/89	Data not yet received								
SW-056	01/25/90	Data not yet received								
SW-056	02/22/90	Data not yet received								
SW-056	03/21/90	Data not yet received								
SW-060	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-060	11/11/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-060	07/01/88	0.050 U	0.025 U	0.100 U	0.005 U	NR	17	0.015 U	0.0002 U	NR
SW-060	03/16/89	.0500 U A	.0250 U V	.100 U A	.0050 U A	.100 U V	15.50 V	.0154 A	.0002 U V	.100 U V
SW-060	03/16/89	.0500 U A	.0250 U V	.100 U A	.0050 U A	.100 U V	15.90 V	.0150 U A	.0002 U V	.100 U V
SW-060	05/15/89	.0500 U A	.0250 U R	.100 U V	.0050 U R	.0100 U V	12.80 V	.0258 V	.0002 U R	.0100 U V
SW-060	05/15/89	.0500 U A	.0250 U R	.100 U V	.0050 U A	.0100 U V	12.80 V	.0222 V	.0002 U R	.0100 U V
SW-060	06/09/89	.0500 U R	.0250 U R	.564 V	.0050 U A	.152 V	13.80 A	.0373 V	.0002 U V	.100 U V
SW-060	07/06/89	.0500 U V	.0250 U A	1.52 V	.0050 U A	.100 U A	16.40 V	.0266 V	.0002 U A	.100 U A
SW-060	08/03/89	.0500 U V	.0250 U R	.187 V	.0050 U A	.100 U V	17.10 V	.0150 U A	.0002 U V	.100 U V
SW-060	09/11/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	10/03/89	.0200 U V	.0200 U V	.0855 A	.0020 U V	.0200 B	15.70 V	.0100 U B	.0002 U A	.500 U V
SW-060	11/06/89	Data not yet received								
SW-060	11/06/89	Data not yet received								
SW-060	12/06/89	Data not yet received								
SW-060	01/23/90	Data not yet received								
SW-060	02/09/90	Data not yet received								
SW-060	03/12/90	Data not yet received								
SW-061	07/22/87	Insufficient Sample or Total Metals Analysis not requested.								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-056	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-056	06/30/88	0.040 U	5.0 U	0.005 U	0.010 U	55	0.8	0.010 U	NR	0.050 U
SW-056	04/13/89	.0400 U A	6.05 A	.0250 U A	.0100 U V	7.48 V	1U V	.0100 U R	.100 U V	.0758 V
SW-056	05/11/89	.0400 U R	5U A	.0050 U A	.0100 U R	56.80 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-056	06/07/89	.0400 U A	5U A	.0050 U A	.0100 U A	51.60 V	.641 A	.0100 U A	.100 U V	.0500 U V
SW-056	07/12/89	.0400 U V	5U R	.0050 U R	.0100 U A	55.10 A	1U R	.0400 U V	.100 U V	.0500 U A
SW-056	08/09/89	.0400 U V	5U V	.0050 U A	.0100 U A	58.20 V	1U V	.0400 U V	.100 U V	.0500 U A
SW-056	09/14/89	.0400 U R	5U R	.0050 U A	.0100 U A	48.10 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-056	10/18/89	Data not yet received								
SW-056	11/15/89	Data not yet received								
SW-056	12/19/89	Data not yet received								
SW-056	01/25/90	Data not yet received								
SW-056	02/22/90	Data not yet received								
SW-056	03/21/90	Data not yet received								
SW-060	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-060	11/11/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-060	07/01/88	0.040 U	5.0 U	0.005 U	0.010 U	28	0.6	0.010 U	NR	0.050 U
SW-060	03/16/89	.0400 U A	5U A	.0050 U A	.0100 U A	30.70 V	.545 V	.0100 U A	.100 U V	.0500 U V
SW-060	03/16/89	.0400 U A	5U A	.0050 U A	.0100 U A	31.30 V	.564 V	.0100 U A	.100 U V	.0500 U V
SW-060	05/15/89	.0400 U R	5U R	.0050 U A	.0100 U A	30.60 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-060	05/15/89	.0400 U R	5U R	.0050 U A	.0100 U A	30.30 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-060	06/09/89	.0400 U A	5U A	.0050 U A	.0100 U A	28.30 V	1U V	.0100 U A	.100 U V	.0500 U R
SW-060	07/06/89	.0400 U A	5U V	.0050 U R	.0100 U R	27 V	1U A	.0100 U R	.100 U A	.0500 U V
SW-060	08/03/89	.0400 U V	5U V	.0050 U A	.0100 U V	32.20 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-060	09/11/89	Data not yet received								
SW-060	09/11/89	Data not yet received								
SW-060	10/03/89	.0200 U V	.624 A	.0020 U V	.0300 U V	27.90 V	.520 V	.0030 U R	1U A	.0100 U V
SW-060	11/06/89	Data not yet received								
SW-060	11/06/89	Data not yet received								
SW-060	12/06/89	Data not yet received								
SW-060	01/23/90	Data not yet received								
SW-060	02/09/90	Data not yet received								
SW-060	03/12/90	Data not yet received								
SW-061	07/22/87	Insufficient Sample or Total Metals Analysis not requested.								

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Surface Water

Total Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Zinc (Zn), total mg/l	
SW-056	07/21/87	Insufficient Sample or Total Metals Analysis not requested.	
SW-056	06/30/88	0.030	
SW-056	04/13/89	.201	V
SW-056	05/11/89	.0397	A
SW-056	06/07/89	.0818	A
SW-056	07/12/89	.0335	V
SW-056	08/09/89	.0952	A
SW-056	09/14/89	.108	V
SW-056	10/18/89	Data not yet received	
SW-056	11/15/89	Data not yet received	
SW-056	12/19/89	Data not yet received	
SW-056	01/25/90	Data not yet received	
SW-056	02/22/90	Data not yet received	
SW-056	03/21/90	Data not yet received	
SW-060	07/21/87	Insufficient Sample or Total Metals Analysis not requested.	
SW-060	11/11/87	Insufficient Sample or Total Metals Analysis not requested.	
SW-060	07/01/88	0.400	
SW-060	03/16/89	.396	V
SW-060	03/16/89	.479	V
SW-060	05/15/89	.318	A
SW-060	05/15/89	.300	A
SW-060	06/09/89	.556	V
SW-060	07/06/89	.550	A
SW-060	08/03/89	.275	V
SW-060	09/11/89	Data not yet received	
SW-060	09/11/89	Data not yet received	
SW-060	10/03/89	.411	V
SW-060	11/06/89	Data not yet received	
SW-060	11/06/89	Data not yet received	
SW-060	12/06/89	Data not yet received	
SW-060	01/23/90	Data not yet received	
SW-060	02/09/90	Data not yet received	
SW-060	03/12/90	Data not yet received	
SW-061	07/22/87	Insufficient Sample or Total Metals Analysis not requested.	

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-061	11/11/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-061	07/01/88	0.200 U	0.060 U	0.010 U	0.200 U	0.005 U	0.005 U	97	NR	0.010 U
SW-061	03/20/89	1.61 V	.0600 U A	.0100 U V	.200 U V	.0050 U R	.0050 U R	27.40 V	1U V	.0100 U V
SW-061	05/15/89	.200 U R	.0600 U V	.0100 U V	.200 U V	.0050 U A	.0050 U R	61.80 V	1U V	.0100 U A
SW-061	06/09/89	.200 U A	.0600 U V	.0100 U V	.200 U A	.0050 U A	.0050 U R	84.50 A	1U V	.0100 U R
SW-061	07/06/89	.281 A	.0600 U V	.0100 U V	.200 U V	.0050 U V	.0050 U V	90.50 V	1U V	.0100 U V
SW-061	08/03/89	.311 V	.0600 U V	.0100 U V	.200 U A	.0050 U R	.0050 U V	84.30 V	1U V	.0100 U R
SW-061	09/11/89	Data not yet received								
SW-061	10/03/89	.635 V	.500 U V	.0020 U V	.170 V	.0020 U V	.0040 U V	87.10 V	.0010 U V	.0200 U V
SW-061	10/20/89	DRY								
SW-061	11/06/89	Data not yet received								
SW-061	12/06/89	Data not yet received								
SW-061	01/23/90	Data not yet received								
SW-061	02/09/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-101	06/30/88	20.0	0.060 U	0.010 U	0.200 U	0.005 U	0.005 U	19	NR	0.010 U
SW-101	04/13/89	Data not yet received								
SW-101	05/11/89	24.10 V	.0600 U A	.0100 U V	2.02 V	.0572 A	.0142 A	152 V	1U V	.212 A
SW-101	06/07/89	1.77 A	.0600 U V	.0100 U A	.200 U A	.0050 U A	.0050 U V	19.90 A	.100 U V	.0100 U V
SW-101	07/12/89	.500 A	.0600 U V	.0100 U V	.200 U A	.0050 U V	.0050 U A	7.73 A	1U R	.0100 U V
SW-101	08/09/89	2.85 V	.0600 U V	.0100 U V	.200 U V	.0050 U A	.0050 U V	11.70 V	.100 U V	.0100 U V
SW-101	09/14/89	.200 U R	.0600 U A	.0100 U V	.200 U V	.0050 U A	.0050 U R	7.94 A	1U A	.0100 U R
SW-101	10/18/89	Data not yet received								
SW-101	11/15/89	Data not yet received								
SW-101	12/19/89	Data not yet received								
SW-101	01/25/90	Data not yet received								
SW-101	02/22/90	Data not yet received								
SW-101	03/21/90	Data not yet received								

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Surface Water

Total Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Cobalt (Co), total mg/l	Copper (Cu), total mg/l	Iron (Fe), total mg/l	Lead (Pb), total mg/l	Lithium (Li), total mg/l	Magnesium (Mg), total mg/l	Manganese (Mn), total mg/l	Mercury (Hg), total mg/l	Molybdenum (Mo), total mg/l
SW-061	11/11/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-061	07/01/88	0.050 U	0.025 U	0.30	0.005 U	NR	19	0.06 U	0.0002 U	NR
SW-061	03/20/89	.0500 U A	.0250 U V	1.73 V	.0250 U A	.100 U V	5.76 V	.0489 V	.0002 U V	.100 U V
SW-061	05/15/89	.0500 U A	.0250 U R	.165 V	.0250 U A	.0100 U V	11.80 V	.0406 V	.0002 U R	.0100 U V
SW-061	06/09/89	.0500 U A	.0250 U A	.411 V	.0050 U A	.100 U V	13.80 A	.0461 V	.0002 U V	.100 U V
SW-061	07/06/89	.0500 U V	.0250 U A	.362 V	.0050 U A	.100 U A	16.50 V	.0427 V	.0002 U A	.100 U A
SW-061	08/03/89	.0500 U V	.0250 U R	.320 V	.0050 U A	.100 U V	15.50	.0985 V	.0002 U V	.100 U V
SW-061	09/11/89	Data not yet received								
SW-061	10/03/89	.0200 U V	.0200 U V	.897 V	.0036 V	.0210 A	16.50 V	.0579 V	.0002 U R	.500 U V
SW-061	10/20/89	DRY								
SW-061	11/06/89	Data not yet received								
SW-061	12/06/89	Data not yet received								
SW-061	01/23/90	Data not yet received								
SW-061	02/09/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-101	06/30/88	0.050 U	0.025 U	15.0	0.010	NR	5.0 U	.13	0.0002 U	NR
SW-101	04/13/89	Data not yet received								
SW-101	05/11/89	.132 A	.293 A	204 V	.215 A	.145 V	36.70 V	3.68 V	.0024 A	.174 V
SW-101	06/07/89	.0500 U A	.0348 A	2.31 A	.0400 U V	.100 U R	5U A	.332 A	.0002 U V	.100 U V
SW-101	07/12/89	.0500 U V	.0250 U R	.854 V	.0050 U A	.100 U R	5U A	.0290 V	.0002 U V	.100 U V
SW-101	08/09/89	.0500 U V	.0250 U A	5.20 V	.0050 U A	.100 U A	5U V	.259 V	.0002 U V	.100 U V
SW-101	09/14/89	.0500 U V	.0250 U V	.357 V	.0050 U A	.100 U V	5U V	.0150 U V	.0002 U V	.100 U V
SW-101	10/18/89	Data not yet received								
SW-101	11/15/89	Data not yet received								
SW-101	12/19/89	Data not yet received								
SW-101	01/25/90	Data not yet received								
SW-101	02/22/90	Data not yet received								
SW-101	03/21/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-061	11/11/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-061	07/01/88	0.040 U	5.0 U	0.005 U	0.010 U	32	0.60	0.010 U	NR	0.050 U
SW-061	03/20/89	.0400 U R	5U A	.0050 U A	.0100 U V	44.50 V	.205 V	.0100 U R	.100 U V	.0500 U V
SW-061	05/15/89	.0400 U R	5U A	.0059 A	.0100 U A	32.20 V	1U V	.0100 U A	.100 U V	.0500 U V
SW-061	06/09/89	.0400 U A	5U A	.0050 U A	.0100 U A	30.30 V	1U V	.0100 U A	.100 U V	.0500 U R
SW-061	07/06/89	.0400 U A	5U V	.0050 U R	.0100 U R	29 V	1U A	.0100 U R	.100 U A	.0500 U V
SW-061	08/03/89	.0400 U V	5U V	.0050 U A	.0100 U V	30.90 V	1U V	.0400 U V	.100 U V	.0500 U V
SW-061	09/11/89	Data not yet received								
SW-061	10/03/89	.0200 U V	1.27 A	.0020 U V	.0300 U V	30.60 V	.520 V	.0030 U R	1U V	.0100 U V
SW-061	10/20/89	DRY								
SW-061	11/06/89	Data not yet received								
SW-061	12/06/89	Data not yet received								
SW-061	01/23/90	Data not yet received								
SW-061	02/09/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-061	03/12/90	Data not yet received								
SW-101	06/30/88	0.040 U	5.0 U	0.005 U	0.010 U	6	0.200 U	0.010 U	NR	0.050
SW-101	04/13/89	Data not yet received								
SW-101	05/11/89	.246 A	21.50 V	.0050 U A	.0117 A	9.10 V	1U V	.0100 U A	.100 U V	.555 A
SW-101	06/07/89	.0400 U A	5U A	.0050 U V	.0100 U A	5.41 V	.100 U V	.0100 U V	.100 U V	.0500 U V
SW-101	07/12/89	.0400 U V	5U R	.0050 U R	.0100 U A	5.15 A	1U R	.0100 U V	.100 U V	.0500 U V
SW-101	08/09/89	.0400 U V	5U V	.0050 U V	.0100 U V	5U V	.100 U V	.0100 U V	.100 U V	.0500 U V
SW-101	09/14/89	.0400 U R	5U R	.0050 U A	.0100 U A	5U V	1U V	.0100 U V	.100 U V	.0500 U V
SW-101	10/18/89	Data not yet received								
SW-101	11/15/89	Data not yet received								
SW-101	12/19/89	Data not yet received								
SW-101	01/25/90	Data not yet received								
SW-101	02/22/90	Data not yet received								
SW-101	03/21/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Zinc (Zn), total mg/l		
SW-061	11/11/87	Insufficient Sample or Total Metals Analysis not requested.		
SW-061	07/01/88	0.140		
SW-061	03/20/89	.305		A
SW-061	05/15/89	.0917		A
SW-061	06/09/89	.267		V
SW-061	07/06/89	.207		A
SW-061	08/03/89	.195		V
SW-061	09/11/89	Data not yet received		
SW-061	10/03/89	.203		V
SW-061	10/20/89	DRY		
SW-061	11/06/89	Data not yet received		
SW-061	12/06/89	Data not yet received		
SW-061	01/23/90	Data not yet received		
SW-061	02/09/90	Data not yet received		
SW-061	03/12/90	Data not yet received		
SW-061	03/12/90	Data not yet received		
SW-101	06/30/88	0.100		
SW-101	04/13/89	Data not yet received		
SW-101	05/11/89	1.19		A
SW-101	06/07/89	.143		A
SW-101	07/12/89	.0200	U	A
SW-101	08/09/89	.0501		V
SW-101	09/14/89	.0200	U	A
SW-101	10/18/89	Data not yet received		
SW-101	11/15/89	Data not yet received		
SW-101	12/19/89	Data not yet received		
SW-101	01/25/90	Data not yet received		
SW-101	02/22/90	Data not yet received		
SW-101	03/21/90	Data not yet received		

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank M = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 59

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-059	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-059	07/01/88	6.3	0.060 U	0.010 U	0.200 U	0.005 U	0.005 U	122	NR	0.010 U
SW-059	03/20/89	1.21 V	.0600 U R	.0100 U A	.208 V	.0050 U R	.0050 U R	119 A	1U V	.0100 U R
SW-059	05/11/89	22.80 V	.0600 U A	.0100 U A	.331 V	.0076 A	.0050 U R	466 V	1U V	.0232 A
SW-059	06/08/89	1.23 V	.0600 U V	.0100 U R	.200 U V	.0050 U A	.0050 U V	126 V	.100 U V	.0100 U V
SW-059	07/06/89	15 V	.102 A	.0100 U A	.461 V	.0057 A	.0050 U V	235 V	.100 U V	.0147 A
SW-059	08/10/89	Data not yet received								
SW-059	09/18/89	.200 U R	.0600 U V	.0100 U V	.200 U V	.0050 U A	.0050 U V	113 V	1U V	.0100 U V
SW-059	10/03/89	.190 V	.500 U V	.0020 U V	.166 V	.0020 U V	.0040 U V	102 V	.0010 U V	.0200 U V
SW-059	11/06/89	Data not yet received								
SW-059	12/06/89	Data not yet received								
SW-059	01/23/90	Data not yet received								
SW-059	02/09/90	Data not yet received								
SW-059	03/12/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 59

Station Number	Date Sampled	Cobalt (Co), total mg/l	Copper (Cu), total mg/l	Iron (Fe), total mg/l	Lead (Pb), total mg/l	Lithium (Li), total mg/l	Magnesium (Mg), total mg/l	Manganese (Mn), total mg/l	Mercury (Hg), total mg/l	Molybdenum (Mo), total mg/l
SW-059	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-059	07/01/88	0.050 U	0.025 U	5.0	0.005 U	NR	21	0.08	0.0002 U	NR
SW-059	03/20/89	.0500 U V	.0250 U V	1.18 V	.0317 A	.100 U V	28.70 V	.0331 V	.0006 A	.100 U V
SW-059	05/11/89	.0500 U A	.0250 U A	17 V	.0196 A	.0296 V	27.70 V	.135 A	.0002 U R	.0191 V
SW-059	06/08/89	.0500 U V	.0446 A	.845 V	.0050 U A	.100 U A	20.60 V	.0459 V	.0002 U V	.100 U V
SW-059	07/06/89	.0500 U V	.0437 V	16.10 A	.0258 A	2.56 V	28.40 V	.197 V	.0002 U V	.100 U V
SW-059	08/10/89	Data not yet received								
SW-059	09/18/89	.0500 U V	.0250 U V	.100 U V	.0050 U V	.100 U A	24.50 V	.0150 U A	.0002 U V	.100 U A
SW-059	10/03/89	.0200 U V	.0200 U V	.325 V	.0020 U A	.0250 A	21.90 V	.0100 U A	.0002 U A	.500 U V
SW-059	11/06/89	Data not yet received								
SW-059	12/06/89	Data not yet received								
SW-059	01/23/90	Data not yet received								
SW-059	02/09/90	Data not yet received								
SW-059	03/12/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 59

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-059	07/21/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-059	07/01/88	0.040 U	5.0 U	0.005 U	0.010 U	29	0.7	0.010 U	NR	0.050 U
SW-059	03/20/89	.0400 U V	5U A	.0050 U A	.0100 U V	36.80 V	.763 V	.0100 U R	.100 U V	.0800 U V
SW-059	05/11/89	.0400 U R	5U A	.0160 A	.0100 U A	37.60 V	1U V	.0100 U A	.100 U V	.0584 A
SW-059	06/08/89	.0400 U V	5U A	.0050 U A	.0100 U V	31.50 V	.601 A	.0100 U A	.100 U V	.0500 U V
SW-059	07/06/89	.0400 U V	5U A	.0500 U V	.0100 U A	30.50 V	1.36 A	.0100 U A	.100 U V	.0595 V
SW-059	08/10/89	Data not yet received								
SW-059	09/18/89	.0400 U R	5U R	.0050 U R	.0100 U V	34.80 V	1U A	.0100 U A	.100 U A	.0500 U V
SW-059	10/03/89	.0200 U V	.819 A	.0020 U V	.0300 U V	30.60 V	.643 V	.0030 U R	1U V	.0100 U V
SW-059	11/06/89	Data not yet received								
SW-059	12/06/89	Data not yet received								
SW-059	01/23/90	Data not yet received								
SW-059	02/09/90	Data not yet received								
SW-059	03/12/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 59

Station Number	Date Sampled	Zinc (Zn), total mg/l	
SW-059	07/21/87	Insufficient Sample or Total Metals Analysis not requested.	
SW-059	07/01/88	0.500	
SW-059	03/20/89	.573	A
SW-059	05/11/89	1.08	A
SW-059	06/08/89	.443	V
SW-059	07/06/89	2.66	V
SW-059	08/10/89	Data not yet received	
SW-059	09/18/89	.234	V
SW-059	10/03/89	.209	V
SW-059	11/06/89	Data not yet received	
SW-059	12/06/89	Data not yet received	
SW-059	01/23/90	Data not yet received	
SW-059	02/09/90	Data not yet received	
SW-059	03/12/90	Data not yet received	

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 63

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-063	07/24/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-063	07/06/88	0.750	0.500 U	0.003	0.107	0.002 U	0.004 U	94.5	NR	0.020 U
SW-063	03/28/89	DRY								
SW-063	05/12/89	DRY								
SW-063	06/21/89	DRY								
SW-063	07/19/89	DRY								
SW-063	08/11/89	DRY								
SW-063	09/15/89	DRY								
SW-063	10/04/89	DRY								
SW-063	11/03/89	DRY								
SW-063	12/01/89	DRY								
SW-063	01/05/90	DRY								
SW-063	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 63

Station Number	Date Sampled	Cobalt (Co), total mg/l	Copper (Cu), total mg/l	Iron (Fe), total mg/l	Lead (Pb), total mg/l	Lithium (Li), total mg/l	Magnesium (Mg), total mg/l	Manganese (Mn), total mg/l	Mercury (Hg), total mg/l	Molybdenum (Mo), total mg/l
SW-063	07/24/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-063	07/06/88	0.020 U	0.020 U	1.32	0.006	NR	32.0	0.465	0.0002 U	NR
SW-063	03/28/89	DRY								
SW-063	05/12/89	DRY								
SW-063	06/21/89	DRY								
SW-063	07/19/89	DRY								
SW-063	08/11/89	DRY								
SW-063	09/15/89	DRY								
SW-063	10/04/89	DRY								
SW-063	11/03/89	DRY								
SW-063	12/01/89	DRY								
SW-063	01/05/90	DRY								
SW-063	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 63

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-063	07/24/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-063	07/06/88	0.020 U	1.61	0.011	0.030 U	98.4	1.25	0.300 U	NR	0.010 U
SW-063	03/28/89	DRY								
SW-063	05/12/89	DRY								
SW-063	06/21/89	DRY								
SW-063	07/19/89	DRY								
SW-063	08/11/89	DRY								
SW-063	09/15/89	DRY								
SW-063	10/04/89	DRY								
SW-063	11/03/89	DRY								
SW-063	12/01/89	DRY								
SW-063	01/05/90	DRY								
SW-063	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 63

Station Number	Date Sampled	Zinc (Zn), total mg/l
SW-063	07/24/87	Insufficient Sample or Total Metals Analysis not requested.
SW-063	07/06/88	0.020 U
SW-063	03/28/89	DRY
SW-063	05/12/89	DRY
SW-063	06/21/89	DRY
SW-063	07/19/89	DRY
SW-063	08/11/89	DRY
SW-063	09/15/89	DRY
SW-063	10/04/89	DRY
SW-063	11/03/89	DRY
SW-063	12/01/89	DRY
SW-063	01/05/90	DRY
SW-063	02/02/90	DRY

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 64

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-064	07/22/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-064	07/07/88	15.4	0.500 U	0.006	0.268	0.002 U	0.007	136	NR	0.041
SW-064	03/30/89	DRY								
SW-064	05/22/89	.446 V	.0600 U A	.0100 U V	.200 U V	.0050 U V	.0050 U R	68.50	1U A	.0100 U A
SW-064	06/27/89	.998 V	.0600 U A	.0100 U R	.200 U V	.0050 U V	.0050 U V	72.60 V	.100 U V	.0100 U R
SW-064	07/19/89	DRY								
SW-064	08/11/89	DRY								
SW-064	09/20/89	DRY								
SW-064	10/04/89	DRY								
SW-064	11/09/89	DRY								
SW-064	12/01/89	DRY								
SW-064	01/05/90	DRY								
SW-064	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 64

Station Number	Date Sampled	Cobalt (Co), total mg/l	Copper (Cu), total mg/l	Iron (Fe), total mg/l	Lead (Pb), total mg/l	Lithium (Li), total mg/l	Magnesium (Mg), total mg/l	Manganese (Mn), total mg/l	Mercury (Hg), total mg/l	Molybdenum (Mo), total mg/l
SW-064	07/22/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-064	07/07/88	0.020 U	0.041	17.1	0.004 U	NR	56.7	0.368	0.0002 U	NR
SW-064	03/30/89	DRY	;							
SW-064	05/22/89	.0500 U V	.0250 U A	.920 V	.0050 U A	.0925 A	44.80	.0515 V	.0002 U V	.0100 U A
SW-064	06/27/89	.0500 U V	.0250 U V	1.07 A	.0050 U A	.100 U V	53.60 V	.0643 V	.0002 U V	.100 U V
SW-064	07/19/89	DRY								
SW-064	08/11/89	DRY								
SW-064	09/20/89	DRY								
SW-064	10/04/89	DRY								
SW-064	11/09/89	DRY								
SW-064	12/01/89	DRY								
SW-064	01/05/90	DRY								
SW-064	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 64

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-064	07/22/87	Insufficient Sample or Total Metals Analysis not requested.								
SW-064	07/07/88	0.023	3.42	0.010 U	0.030 U	110	1.36	0.300 U	NR	0.033
SW-064	03/30/89	DRY								
SW-064	05/22/89	.0400 U R	5U V	.0115 V	.0100 U V	107	1.14 V	.0400 U A	.100 U A	.0500 U A
SW-064	06/27/89	.0400 U V	5U R	.0050 U A	.0100 U A	99.30 V	1.20 A	.0100 U A	.100 U V	.0500 U V
SW-064	07/19/89	DRY								
SW-064	08/11/89	DRY								
SW-064	09/20/89	DRY								
SW-064	10/04/89	DRY								
SW-064	11/09/89	DRY								
SW-064	12/01/89	DRY								
SW-064	01/05/90	DRY								
SW-064	02/02/90	DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 64

Station Number	Date Sampled	Zinc (Zn), total mg/l		
SW-064	07/22/87	Insufficient Sample or Total Metals Analysis not requested.		
SW-064	07/07/88	0.126		
SW-064	03/30/89	DRY		
SW-064	05/22/89	.0200	U	R
SW-064	06/27/89	.0779		V
SW-064	07/19/89	DRY		
SW-064	08/11/89	DRY		
SW-064	09/20/89	DRY		
SW-064	10/04/89	DRY		
SW-064	11/09/89	DRY		
SW-064	12/01/89	DRY		
SW-064	01/05/90	DRY		
SW-064	02/02/90	DRY		

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 103

Station Number	Date Sampled	Aluminum (Al), total mg/l	Antimony (Sb), total mg/l	Arsenic (As), total mg/l	Barium (Ba), total mg/l	Beryllium (Be), total mg/l	Cadmium (Cd), total mg/l	Calcium (Ca), total mg/l	Cesium (Cs), total mg/l	Chromium (Cr), total mg/l
SW-103	07/11/88	0.766	0.500 U	0.002 U	0.174	0.002 U	0.004 U	99.0	NR	0.020 U
SW-103	03/23/89	169 V	.0600 U R	.0448 A	4.23 V	.0214 R	.0241 V	903 E	1.11 V	.172 R
SW-103	05/25/89	Data not yet received								
SW-103	06/15/89	2.11 V	.0600 U A	.0311 A	.831 V	.0050 U R	.0050 U A	279 V	1U V	.0370 A
SW-103	07/13/89	14.30 V	.0600 U A	.0103 A	.441 V	.0050 U V	.0050 U V	208 V	1U V	.0100 U A
SW-103	08/02/89	25.60 V	.0600 U V	.0149 V	.718 V	.0050 U V	.0050 U V	258 V	1U V	.0217 A
SW-103	09/07/89	Data not yet received								
SW-103	10/03/89	2.60 V	.500 U V	.0020 U V	.215 V	.0020 U V	.0040 U V	109 V	.0010 U V	.0200 U V
SW-103	11/03/89	Data not yet received								
SW-103	12/06/89	Data not yet received								
SW-103	01/18/90	Data not yet received								
SW-103	02/12/90	Data not yet received								
SW-103	03/22/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 103

Station Number	Date Sampled	Nickel (Ni), total mg/l	Potassium (K), total mg/l	Selenium (Se), total mg/l	Silver (Ag), total mg/l	Sodium (Na), total mg/l	Strontium (Sr), total mg/l	Thallium (Tl), total mg/l	Tin (Sn), Total mg/l	Vanadium (V), total mg/l
SW-103	07/11/88	0.020 U	0.928	0.005 U	0.030 U	11.3	0.389	0.300 U	NR	0.010 U
SW-103	03/23/89	.273 A	32.70 A	.0250 U A	.0100 U R	20.60 A	2.27 A	.0100 U A	.100 U R	.445 R
SW-103	05/25/89	Data not yet received								
SW-103	06/15/89	.0400 U A	5U A	.0050 U A	.0100 U R	5U A	1U A	.0400 U A	.100 U A	.113 A
SW-103	07/13/89	.0400 U A	5U A	.0050 U R	.0100 U A	16.30 V	1U A	.0100 U V	.100 U A	.0504 V
SW-103	08/02/89	.0400 U V	5.52 A	.0050 U A	.0100 U R	14.80 V	1U V	.0100 U A	.100 U V	.0906 A
SW-103	09/07/89	Data not yet received								
SW-103	10/03/89	.0200 U V	1.03 A	.0020 U V	.0300 U V	12.70 V	.431 V	.0030 U V	1U V	.0100 U V
SW-103	11/03/89	Data not yet received								
SW-103	12/06/89	Data not yet received								
SW-103	01/18/90	Data not yet received								
SW-103	02/12/90	Data not yet received								
SW-103	03/22/90	Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Metals Sampling Results

STATION 103

Station Number	Date Sampled	Zinc (Zn), total mg/l	
SW-103	07/11/88	0.020	U
SW-103	03/23/89	.772	A
SW-103	05/25/89	Data not yet received	
SW-103	06/15/89	.324	A
SW-103	07/13/89	.161	V
SW-103	08/02/89	.251	A
SW-103	09/07/89	Data not yet received	
SW-103	10/03/89	.0200	A
SW-103	11/03/89	Data not yet received	
SW-103	12/06/89	Data not yet received	
SW-103	01/18/90	Data not yet received	
SW-103	02/12/90	Data not yet received	
SW-103	03/22/90	Data not yet received	

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

APPENDIX B-4

SURFACE WATER SAMPLING RESULTS

TOTAL INORGANIC COMPOUNDS

Surface Water

Total Inorganic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L		Chloride MG/L		Sulfate MG/L		Total Dissolved Solids MG/L		HCO3- MG/L	
SW050	/ /	DRY									
SW050	07/21/87	4.15		59.0		21.1		510		261	
SW050	06/27/88	0.49		43.5		14.2		454		280	
SW050	06/27/88	INSUFFICIENT SAMPLE FOR INORGANIC ANALYSIS									
SW050	04/17/89	DRY									
SW050	05/10/89	DRY									
SW050	06/27/89	0.07	V	22	6	24	V	380	V	360	V
SW050	07/18/89	0.22		27		14		390		480	
SW050	08/11/89	DRY									
SW050	09/12/89	DRY									
SW050	10/04/89	DRY									
SW050	11/03/89	DRY									
SW050	12/01/89	DRY									
SW050	01/05/90	DRY									
SW050	02/02/90	DRY									
SW050	03/17/90	DRY									
SW051	07/21/87	4.90		16.9		61.0		332		436	
SW051	06/23/88	DRY									
SW051	04/17/89	DRY									
SW051	05/10/89	DRY									
SW051	06/27/89	1.8	V	32	6	24	V	360	V	290	V
SW051	07/18/89	DRY									
SW051	08/11/89	DRY									
SW051	09/12/89	DRY									
SW051	10/04/89	DRY									
SW051	11/03/89	DRY									
SW051	12/01/89	DRY									
SW051	01/05/90	DRY									
SW051	02/02/90	DRY									
SW052	07/21/87	0.20	U	25.5		73.3		461		297	
SW052	06/23/88	0.72		24.0		87.9		462		266	
SW052	04/17/89	DRY									
SW052	05/10/89	DRY									
SW052	06/09/89	DRY									
SW052	07/07/89	DRY									

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Inorganic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L		Chloride MG/L		Sulfate MG/L		Total Dissolved Solids MG/L		HCO3- MG/L	
SW052	08/11/89	DRY									
SW052	09/28/89	DRY									
SW052	10/04/89	DRY									
SW052	11/03/89	DRY									
SW052	12/01/89	DRY									
SW052	01/05/90	DRY									
SW052	02/02/90	DRY									
SW052	03/17/90	DRY									
SW055	07/21/87	0.24		34.0		37.2		452		326	
SW055	07/21/87	INSUFFICIENT SAMPLE FOR INORGANIC ANALYSIS									
SW055	06/22/88	0.18		50.5		89.4		700		454	
SW055	04/17/89	3.5	V	24	V	52	A	480	V	380	V
SW055	05/25/89	2.3	A	35	V	92	V	650	A	570	V
SW055	06/28/89	2.0	V	42	A	55	V	490	V	420	V
SW055	07/18/89	2.4		48		120		680		600	
SW055	08/16/89	5.6	V	56	V	81	V	690	A	520	V
SW055	09/20/89	5.2	A	120	V	81	V	790	A	510	V
SW055	10/19/89	5.6	V	55	V	79	V	680	A	500	A
SW055	11/09/89	5.7	V	63	V	88	A	650	A	530	A
SW055	12/07/89	4.5		63		100		710		564	
SW055	01/16/90	2.5	V	41	V	54	V	420	A	360	V
SW055	02/23/90	Data not yet received									
SW055	03/15/90	Data not yet received									
SW057	07/21/87	1.16		24.0		1.0	U	522		436	
SW057	06/23/88	DRY									
SW057	04/17/89	DRY									
SW057	05/10/89	DRY									
SW057	06/09/89	DRY									
SW057	07/07/89	DRY									
SW057	08/11/89	DRY									
SW057	09/16/89	DRY									
SW057	10/04/89	DRY									
SW057	11/03/89	DRY									
SW057	12/01/89	DRY									
SW057	01/05/90	DRY									

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Inorganic Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L		Chloride MG/L		Sulfate MG/L		Total Dissolved Solids MG/L		HCO3- MG/L	
SW057	02/02/90		DRY								
SW057	03/17/90		DRY								
SW058	07/21/87	1.42		32.0		22.0		375		270	
SW058	06/23/88	0.33		45.9		25.1		452		308	
SW058	04/17/89		DRY								
SW058	05/10/89		DRY								
SW058	06/28/89	0.60	A	30	V	30	B	440	A	310	V
SW058	07/14/89		DRY								
SW058	08/11/89		DRY								
SW058	09/20/89		DRY								
SW058	10/04/89		DRY								
SW058	11/20/89		DRY								
SW058	12/01/89		DRY								
SW058	01/05/90		DRY								
SW058	02/02/90		DRY								
SW077	06/22/88	0.10	U	55.7		64.7		574		338	
SW077	03/30/89		DRY								
SW077	05/11/89		DRY								
SW077	06/27/89	24	V	38	A	91	V	630	V	350	V
SW077	07/18/89		DRY								
SW077	08/16/89	0.06	V	33	V	100	V	450	A	220	V
SW077	09/20/89		DRY								
SW077	10/04/89		DRY								
SW077	11/09/89		DRY								
SW077	12/01/89		DRY								
SW077	01/05/90		DRY								
SW077	02/02/90		DRY								
SW077	03/16/90		Data not yet received								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Inorganic Sampling Results

STATION 53

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L			Chloride MG/L		Sulfate MG/L			Total Dissolved Solids MG/L		HCO3- MG/L	
SW053	07/21/87	0.20	U		71.5		20.3			666		483	
SW053	06/23/88	0.10	U		30.6		12.3			521		434	
SW053	06/23/88	INSUFFICIENT SAMPLE FOR INORGANIC ANALYSIS											
SW053	04/05/89	0.17		V	57	V	31		V	460	A	460	V
SW053	05/23/89	0.05	U	A	66	V	5	U	V	520	A	430	V
SW053	06/26/89	0.07		V	41	V	6		V	490	V	710	V
SW053	07/19/89	DRY											
SW053	08/15/89	0.05	U	V	57	V	33		A	570	A	470	V
SW053	09/20/89	0.05	U	A	170	V	49		V	580	A	440	V
SW053	10/12/89	0.05	U	V	61	V	27		A	510	A	480	A
SW053	11/07/89	0.05	U	V	68	V	49		A	520	A	370	V
SW053	12/15/89	0.05	U		61		43			500		456	
SW053	01/17/90	Data not yet received											
SW053	02/13/90	Data not yet received											

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Inorganic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L		Chloride MG/L		Sulfate MG/L		Total Dissolved Solids MG/L		HCO3- MG/L	
SW056	07/21/87	4.10		54.0		71.6		577		346	
SW056	06/30/88	3.47		61.9		73.7		682		425	
SW056	04/13/89	3.2	A	59	V	54	V	590	A	440	V
SW056	05/11/89	2.9	A	45	V	74	V	670	A	440	V
SW056	06/07/89	3.8	V	48	V	60	A	510	V	440	V
SW056	07/12/89	3.2	V	48	V	70	V	610	V	520	V
SW056	08/09/89	2.9	V	58	V	73	V	640	A	460	V
SW056	09/14/89	4.4	V	48	A	46	V	580	A	450	V
SW056	10/18/89	3.5	V	57	V	70	V	78	A	500	A
SW056	11/15/89	2.6	V	61	V	72	V	640	A	520	A
SW056	12/19/89	3.1	V	58	V	68	V	620	A	540	A
SW056	01/25/90		Data not yet received								
SW056	02/22/90		Data not yet received								
SW056	03/21/90		Data not yet received								
SW060	07/21/87	4.5		44.0		45.0		482		290	
SW060	11/11/87		INSUFFICIENT SAMPLE FOR INORGANIC ANALYSIS								
SW060	07/01/88	4.77		54		52		459		300	
SW060	03/16/89	4.6	A	52	A	42	A	400	A	310	V
SW060	03/16/89	4.7	A	55	A	40	A	410	A	310	V
SW060	05/15/89	3.6	V	40	V	38	A	320	A	240	V
SW060	05/15/89	3.8	V	40	V	40	A	320	A	240	V
SW060	06/09/89	3.9	V	42	V	41	V	380	V	290	V
SW060	07/06/89	4.7	V	50	V	49	V	470	A	320	V
SW060	08/03/89	3.9	V	43	V	47	A	3300	A	300	V
SW060	09/11/89	2.4	A	13	V	31	V	120	A	130	V
SW060	09/11/89	2.3	A	12	V	16	V	150	A	130	V
SW060	10/03/89	4.3	V	52	V	43	V	420	A	330	V
SW060	11/06/89	4.5	V	44	V	47	V	440	A	330	A
SW060	11/06/89	4.2	V	45	V	43	V	440	A	340	A
SW060	12/06/89	4.9		50		47		420		312	
SW060	01/23/90		Data not yet received								
SW060	02/09/90		Data not yet received								
SW060	03/12/90		Data not yet received								
SW061	07/22/87	0.25		12.0		31.1		156		83.3	
SW061	11/11/87		INSUFFICIENT SAMPLE FOR INORGANIC ANALYSIS								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Inorganic Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L			Chloride MG/L			Sulfate MG/L		Total Dissolved Solids MG/L		HCO3- MG/L	
SW061	07/01/88	4.6			50			51.4		441		235	
SW061	03/20/89	1.5		V	81		A	26	A	26	A	110	V
SW061	05/15/89	4.1		V	33		V	46	A	300	A	210	V
SW061	06/09/89	4.1		V	39		V	50	V	370	V	270	V
SW061	07/06/89	5.6		V	43		V	51	V	420	A	310	V
SW061	08/03/89	3.3		V	36		V	56	V	400	A	300	V
SW061	09/11/89	4.0		A	19		V	30	V	250	A	190	V
SW061	10/03/89	3.8		V	41		V	50	V	430	A	280	V
SW061	10/20/89				DRY								
SW061	11/06/89	3.8		V	40		V	47	V	400	A	320	A
SW061	12/06/89	3.6			36			50		380		300	
SW061	01/23/90	Data not yet received											
SW061	02/09/90	Data not yet received											
SW061	03/12/90	Data not yet received											
SW061	03/12/90	Data not yet received											
SW101	06/30/88	0.1	U		3.5			29		486		350	
SW101	04/13/89	0.05	U	A	3	U	V	16	V	180	A	47	V
SW101	05/11/89	0.11		A	3	U	V	24	V	170	A	72	V
SW101	06/07/89	0.07		V	4		V	19	A	72	V	33	V
SW101	07/12/89	0.05	U	V	4		V	22	V	82	V	18	V
SW101	08/09/89	0.05	U	V	3	U	V	18	V	74	A	25	V
SW101	09/14/89	0.05	U	V	20		A	16	V	90	A	22	V
SW101	10/18/89	0.05	U	V	3		V	20	V	620	A	31	A
SW101	11/15/89	0.05	U	V	3	U	V	29	V	58	A	6	A
SW101	12/19/89	0.05	U	A	3	U	V	17	V	54	A	32	A
SW101	01/25/90	Data not yet received											
SW101	02/22/90	Data not yet received											
SW101	03/21/90	Data not yet received											

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Inorganic Sampling Results

STATION 59

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L		Chloride MG/L		Sulfate MG/L		Total Dissolved Solids MG/L		HCO3- MG/L	
SW059	07/21/87	3.80		39.0		24.5		524		335	
SW059	07/01/88	5		51		53		499		324	
SW059	03/20/89	4.4	A	44	A	58	A	580	A	500	V
SW059	05/11/89	2.7	A	27	V	51	A	510	A	460	V
SW059	06/08/89	4.1	V	53	V	52	A	440	V	340	V
SW059	07/06/89	4.2	V	48	V	55	V	520	A	500	V
SW059	08/10/89	3.3		46		49		510		380	
SW059	09/18/89	4.3	V	39	V	60	A	510	A	410	V
SW059	10/03/89	3.9	V	51	V	45	V	210	A	400	V
SW059	11/06/89	4.2	V	44	V	46	V	460	A	370	A
SW059	12/06/89	4.2		50		46		480		384	
SW059	01/23/90	Data not yet received									
SW059	02/09/90	Data not yet received									
SW059	03/12/90	Data not yet received									

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank M = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Inorganic Sampling Results

STATION 63

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L	Chloride MG/L	Sulfate MG/L	Total Dissolved Solids MG/L	HCO3- MG/L
SW063	07/24/87	0.20 U	50.5	197	675	361
SW063	07/06/88	0.1 U	51	228	651	384
SW063	03/28/89	DRY				
SW063	05/12/89	DRY				
SW063	06/21/89	DRY				
SW063	07/19/89	DRY				
SW063	08/11/89	DRY				
SW063	09/15/89	DRY				
SW063	10/04/89	DRY				
SW063	11/03/89	DRY				
SW063	12/01/89	DRY				
SW063	01/05/90	DRY				
SW063	02/02/90	DRY				

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Inorganic Sampling Results

STATION 64

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L			Chloride MG/L		Sulfate MG/L		Total Dissolved Solids MG/L		HCO3- MG/L	
SW064	07/22/87	0.20	U		46.5		83.0		716		404	
SW064	07/07/88	0.2			0.5	U	4.0	U	680		441	
SW064	03/30/89			DRY								
SW064	05/22/89	0.05	U	A	64	V	130	A	660	A	510	V
SW064	06/27/89	0.17		V	58	A	110	V	720	V	500	V
SW064	07/19/89			DRY								
SW064	08/11/89			DRY								
SW064	09/20/89			DRY								
SW064	10/04/89			DRY								
SW064	11/09/89			DRY								
SW064	12/01/89			DRY								
SW064	01/05/90			DRY								
SW064	02/02/90			DRY								

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Inorganic Sampling Results

STATION 103

Station Number	Date Sampled	Nitrate+ Nitrite-Nitrogen MG/L		Chloride MG/L		Sulfate MG/L		Total Dissolved Solids MG/L		HCO3- MG/L	
SW103	07/11/88	5		40		59		247		251	
SW103	03/23/89	6.5	A	35	A	51	A	490	A	710	V
SW103	05/25/89	3.9	A	41	V	68	V	420	A	380	V
SW103	06/15/89	5.2	V	48	V	58	V	470	A	380	V
SW103	07/13/89	6.5	V	31	V	61	V	430	V	380	V
SW103	08/02/89	7.3	V	40	A	61	A	470	V	290	V
SW103	09/07/89	5.1	V	39	A	53	V	440	A	300	V
SW103	10/03/89	4.9	V	44	V	52	V	210	A	330	V
SW103	11/03/89	5.0	V	40	V	56	A	430	A	280	A
SW103	12/06/89	5.1		37		60		450		312	
SW103	01/18/90	Data not yet received									
SW103	02/12/90	Data not yet received									
SW103	03/22/90	Data not yet received									

VALUE QUALIFIERS: NR = Analyte not reported U = Analyzed but not detected * = Holding time not met E = Estimated value
J = Present below detection limit B = Present in laboratory blank N = Batch spike not in 80-120% range
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

APPENDIX B-5

SURFACE WATER SAMPLING RESULTS

DISSOLVED RADIOCHEMISTRY

Surface Water

Dissolved Radiochemistry Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW050	/ /		DRY										
SW050	07/21/87		***										
SW050	06/27/88	5.11 ± 3.88	5	8.28 ± 4.47	7	NR		0.575 ± 0.347	0.2	NR		NR	
SW050	06/27/88		***										
SW050	04/17/89		DRY										
SW050	05/10/89		DRY										
SW050	06/27/89		***										
SW050	07/18/89		***										
SW050	08/11/89		DRY										
SW050	09/12/89		DRY										
SW050	10/04/89		DRY										
SW050	11/03/89		DRY										
SW050	12/01/89		DRY										
SW050	01/05/90		DRY										
SW050	02/02/90		DRY										
SW050	03/17/90		DRY										
SW051	07/21/87		***										
SW051	06/23/88		DRY										
SW051	04/17/89		DRY										
SW051	05/10/89		DRY										
SW051	06/27/89		***										
SW051	07/18/89		DRY										
SW051	08/11/89		DRY										
SW051	09/12/89		DRY										
SW051	10/04/89		DRY										
SW051	11/03/89		DRY										
SW051	12/01/89		DRY										
SW051	01/05/90		DRY										
SW051	02/02/90		DRY										
SW052	07/21/87		***										
SW052	06/23/88	0.574 ± 3.77	6	0.00 ± 4.80	9	NR		0.369 ± 0.195	0.2	NR		NR	
SW052	04/17/89		DRY										
SW052	05/10/89		DRY										
SW052	06/09/89		DRY										
SW052	07/07/89		DRY										
SW052	08/11/89		DRY										

VALUE QUALIFIERS: NR - Analyte not requested or analyte data not yet received
*** - Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Radiochemistry Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW050	/ /		DRY
SW050	07/21/87		***
SW050	06/27/88	2.860	
SW050	06/27/88		***
SW050	04/17/89		DRY
SW050	05/10/89		DRY
SW050	06/27/89		***
SW050	07/18/89		***
SW050	08/11/89		DRY
SW050	09/12/89		DRY
SW050	10/04/89		DRY
SW050	11/03/89		DRY
SW050	12/01/89		DRY
SW050	01/05/90		DRY
SW050	02/02/90		DRY
SW050	03/17/90		DRY
SW051	07/21/87		***
SW051	06/23/88		DRY
SW051	04/17/89		DRY
SW051	05/10/89		DRY
SW051	06/27/89		***
SW051	07/18/89		DRY
SW051	08/11/89		DRY
SW051	09/12/89		DRY
SW051	10/04/89		DRY
SW051	11/03/89		DRY
SW051	12/01/89		DRY
SW051	01/05/90		DRY
SW051	02/02/90		DRY
SW052	07/21/87		***
SW052	06/23/88	3.720	
SW052	04/17/89		DRY
SW052	05/10/89		DRY
SW052	06/09/89		DRY
SW052	07/07/89		DRY
SW052	08/11/89		DRY

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DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW052	09/28/89		DRY										
SW052	10/04/89		DRY										
SW052	11/03/89		DRY										
SW052	12/01/89		DRY										
SW052	01/05/90		DRY										
SW052	02/02/90		DRY										
SW052	03/17/90		DRY										
SW055	07/21/87		***										
SW055	07/21/87		***										
SW055	06/22/88	2.30 ± 4.40	7	0.00 ± 5.07	9	NR		0.00 ± 0.846	1	NR		NR	
SW055	04/17/89		Data not yet received										
SW055	05/25/89		***										
SW055	06/28/89		***										
SW055	07/18/89		***										
SW055	08/16/89		***										
SW055	09/20/89		***										
SW055	10/19/89		***										
SW055	11/09/89		***										
SW055	12/07/89		***										
SW055	01/16/90		***										
SW055	02/23/90		***										
SW055	03/15/90		***										
SW057	07/21/87		***										
SW057	06/23/88		DRY										
SW057	04/17/89		DRY										
SW057	05/10/89		DRY										
SW057	06/09/89		DRY										
SW057	07/07/89		DRY										
SW057	08/11/89		DRY										
SW057	09/16/89		DRY										
SW057	10/04/89		DRY										
SW057	11/03/89		DRY										
SW057	12/01/89		DRY										
SW057	01/05/90		DRY										
SW057	02/02/90		DRY										
SW057	03/17/90		DRY										

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*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW052	09/28/89		DRY
SW052	10/04/89		DRY
SW052	11/03/89		DRY
SW052	12/01/89		DRY
SW052	01/05/90		DRY
SW052	02/02/90		DRY
SW052	03/17/90		DRY
SW055	07/21/87		***
SW055	07/21/87		***
SW055	06/22/88	5.020	
SW055	04/17/89		Data not yet received
SW055	05/25/89		***
SW055	06/28/89		***
SW055	07/18/89		***
SW055	08/16/89		***
SW055	09/20/89		***
SW055	10/19/89		***
SW055	11/09/89		***
SW055	12/07/89		***
SW055	01/16/90		***
SW055	02/23/90		***
SW055	03/15/90		***
SW057	07/21/87		***
SW057	06/23/88		DRY
SW057	04/17/89		DRY
SW057	05/10/89		DRY
SW057	06/09/89		DRY
SW057	07/07/89		DRY
SW057	08/11/89		DRY
SW057	09/16/89		DRY
SW057	10/04/89		DRY
SW057	11/03/89		DRY
SW057	12/01/89		DRY
SW057	01/05/90		DRY
SW057	02/02/90		DRY
SW057	03/17/90		DRY

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW058	07/21/87		***										
SW058	06/23/88	0.147 ± 3.73	6	0.00 ± 4.80	8	NR		1.06 ± 0.360	0.2	NR		NR	
SW058	04/17/89		DRY										
SW058	05/10/89		DRY										
SW058	06/28/89		***										
SW058	07/14/89		DRY										
SW058	08/11/89		DRY										
SW058	09/20/89		DRY										
SW058	10/04/89		DRY										
SW058	11/20/89		DRY										
SW058	12/01/89		DRY										
SW058	01/05/90		DRY										
SW058	02/02/90		DRY										
SW077	06/22/88	5.67 ± 4.81	7	0.00 ± 5.11	9	NR		0.0275 ± 0.735	1	NR		NR	
SW077	03/30/89		DRY										
SW077	05/11/89		DRY										
SW077	06/27/89		***										
SW077	07/18/89		DRY										
SW077	08/16/89		***										
SW077	09/20/89		DRY										
SW077	10/04/89		DRY										
SW077	11/09/89		DRY										
SW077	12/01/89		DRY										
SW077	01/05/90		DRY										
SW077	02/02/90		DRY										
SW077	03/16/90		***										

VALUE QUALIFIERS: NR - Analyte not requested or analyte data not yet received
*** - Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; Q - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Radiochemistry Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW058	07/21/87		***
SW058	06/23/88	4.100	
SW058	04/17/89		DRY
SW058	05/10/89		DRY
SW058	06/28/89		***
SW058	07/14/89		DRY
SW058	08/11/89		DRY
SW058	09/20/89		DRY
SW058	10/04/89		DRY
SW058	11/20/89		DRY
SW058	12/01/89		DRY
SW058	01/05/90		DRY
SW058	02/02/90		DRY
SW077	06/22/88	4.360	
SW077	03/30/89		DRY
SW077	05/11/89		DRY
SW077	06/27/89		***
SW077	07/18/89		DRY
SW077	08/16/89		***
SW077	09/20/89		DRY
SW077	10/04/89		DRY
SW077	11/09/89		DRY
SW077	12/01/89		DRY
SW077	01/05/90		DRY
SW077	02/02/90		DRY
SW077	03/16/90		***

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*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

STATION 53

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW053	07/21/87		***										
SW053	06/23/88	8.48 ± 4.74	6	0.353 ± 5.15	9	NR		1.89 ± 0.851	0.7	NR		NR	
SW053	06/23/88		***										
SW053	04/05/89	2 ± 6		7 ± 4		0.0 ± 0.4		0.20 ± 0.03		0.03 ± 0.03		NR	
SW053	05/23/89		***										
SW053	06/26/89		***										
SW053	07/19/89		DRY										
SW053	08/15/89		***										
SW053	09/20/89		***										
SW053	10/12/89		***										
SW053	11/07/89		***										
SW053	12/15/89		***										
SW053	01/17/90		***										
SW053	02/13/90		***										

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

STATION 53

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW053	07/21/87		***
SW053	06/23/88	7.260	
SW053	06/23/88		***
SW053	04/05/89	2.000	
SW053	05/23/89		***
SW053	06/26/89		***
SW053	07/19/89		DRY
SW053	08/15/89		***
SW053	09/20/89		***
SW053	10/12/89		***
SW053	11/07/89		***
SW053	12/15/89		***
SW053	01/17/90		***
SW053	02/13/90		***

VALUE QUALIFIERS: NR - Analyte not requested or analyte data not yet received
*** - Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Radiochemistry Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW056	07/21/87		***										
SW056	06/30/88	3.21 ± 4.15	6	4.84 ± 4.66	7	NR		0.00 ± 0.126	0.3	NR		NR	
SW056	04/13/89	2 ± 9		6 ± 5		0.1 ± 0.3		0.00 ± 0.01		-0.02 ± 0.03		NR	
SW056	05/11/89		***										
SW056	06/07/89		***										
SW056	07/12/89		***										
SW056	08/09/89		***										
SW056	09/14/89		***										
SW056	10/18/89		***										
SW056	11/15/89		***										
SW056	12/19/89		***										
SW056	01/25/90		***										
SW056	02/22/90		***										
SW056	03/21/90		***										
SW060	07/21/87		***										
SW060	11/11/87		***										
SW060	07/01/88	3.64 ± 3.88	6	13.2 ± 4.98	7	NR		0.00 ± 0.0851	0.2	NR		NR	
SW060	03/16/89	7 ± 8		2 ± 4		0.3 ± 0.6		0.02 ± 0.01		0.00 ± 0.01		NR	
SW060	03/16/89	4 ± 7		6 ± 4		-0.1 ± 0.4		0.02 ± 0.01		-0.01 ± 0.01		NR	
SW060	05/15/89		***										
SW060	05/15/89		***										
SW060	06/09/89		***										
SW060	07/06/89		***										
SW060	08/03/89		***										
SW060	09/11/89		***										
SW060	09/11/89		***										
SW060	10/03/89		***										
SW060	11/06/89		***										
SW060	11/06/89		***										
SW060	12/06/89		***										
SW060	01/23/90		***										
SW060	02/09/90		***										
SW060	03/12/90		***										
SW061	07/22/87		***										
SW061	11/11/87		***										
SW061	07/01/88	20.6 ± 5.74	6	43.7 ± 6.44	7	NR		0.108 ± 0.133	0.1	NR		NR	

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW056	07/21/87		***
SW056	06/30/88	7.090	
SW056	04/13/89	6.800	
SW056	05/11/89		***
SW056	06/07/89		***
SW056	07/12/89		***
SW056	08/09/89		***
SW056	09/14/89		***
SW056	10/18/89		***
SW056	11/15/89		***
SW056	12/19/89		***
SW056	01/25/90		***
SW056	02/22/90		***
SW056	03/21/90		***
SW060	07/21/87		***
SW060	11/11/87		***
SW060	07/01/88	10.260	
SW060	03/16/89	4.600	
SW060	03/16/89	5.200	
SW060	05/15/89		***
SW060	05/15/89		***
SW060	06/09/89		***
SW060	07/06/89		***
SW060	08/03/89		***
SW060	09/11/89		***
SW060	09/11/89		***
SW060	10/03/89		***
SW060	11/06/89		***
SW060	11/06/89		***
SW060	12/06/89		***
SW060	01/23/90		***
SW060	02/09/90		***
SW060	03/12/90		***
SW061	07/22/87		***
SW061	11/11/87		***
SW061	07/01/88	8.790	

VALUE QUALIFIERS: NR - Analyte not requested or analyte data not yet received
*** - Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

Surface Water

Dissolved Radiochemistry Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW061	03/20/89	4 ± 4		7 ± 3		-0.2 ± 0.4		0.01 ± 0.01		0.00 ± 0.02*		NR	
SW061	05/15/89		***										
SW061	06/09/89		***										
SW061	07/06/89		***										
SW061	08/03/89		***										
SW061	09/11/89		***										
SW061	10/03/89		***										
SW061	10/20/89		DRY										
SW061	11/06/89		***										
SW061	12/06/89		***										
SW061	01/23/90		***										
SW061	02/09/90		***										
SW061	03/12/90		***										
SW061	03/12/90		***										
SW101	06/30/88	0.00 ± 2.42	4	1.92 ± 4.07	7	NR		0.00 ± 0.0641	0.1	NR		NR	
SW101	04/13/89	0 ± 1		1 ± 2		0.2 ± 0.4		0.00 ± 0.01		-0.01 ± 0.03		NR	
SW101	05/11/89		***										
SW101	06/07/89		***										
SW101	07/12/89		***										
SW101	08/09/89		***										
SW101	09/14/89		***										
SW101	10/18/89		***										
SW101	11/15/89		***										
SW101	12/19/89		***										
SW101	01/25/90		***										
SW101	02/22/90		***										
SW101	03/21/90		***										

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW061	03/20/89	2.500	
SW061	05/15/89		***
SW061	06/09/89		***
SW061	07/06/89		***
SW061	08/03/89		***
SW061	09/11/89		***
SW061	10/03/89		***
SW061	10/20/89		DRY
SW061	11/06/89		***
SW061	12/06/89		***
SW061	01/23/90		***
SW061	02/09/90		***
SW061	03/12/90		***
SW061	03/12/90		***
SW101	06/30/88	0.617	
SW101	04/13/89	0.200	
SW101	05/11/89		***
SW101	06/07/89		***
SW101	07/12/89		***
SW101	08/09/89		***
SW101	09/14/89		***
SW101	10/18/89		***
SW101	11/15/89		***
SW101	12/19/89		***
SW101	01/25/90		***
SW101	02/22/90		***
SW101	03/21/90		***

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

STATION 59

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW059	07/21/87		***										
SW059	07/01/88	5.03 ± 4.06	6	8.24 ± 4.87	7	NR		0.0117 ± 0.0629	0.07	NR		NR	
SW059	03/20/89	16 ± 12		-2 ± 5		-0.2 ± 0.4		0.01 ± 0.01		-0.01 ± 0.02		NR	
SW059	05/11/89		***										
SW059	06/08/89		***										
SW059	07/06/89		***										
SW059	08/10/89		***										
SW059	09/18/89		***										
SW059	10/03/89		***										
SW059	11/06/89		***										
SW059	12/06/89		***										
SW059	01/23/90		***										
SW059	02/09/90		***										
SW059	03/12/90		***										

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

STATION 59

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW059	07/21/87		***
SW059	07/01/88	5.660	
SW059	03/20/89	7.500	
SW059	05/11/89		***
SW059	06/08/89		***
SW059	07/06/89		***
SW059	08/10/89		***
SW059	09/18/89		***
SW059	10/03/89		***
SW059	11/06/89		***
SW059	12/06/89		***
SW059	01/23/90		***
SW059	02/09/90		***
SW059	03/12/90		***

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

STATION 63

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW063	07/24/87		***										
SW063	07/06/88	8.25 ± 4.72	6	18.9 ± 5.62	8	NR		0.0750 ± 0.0871	0.07	NR		NR	
SW063	03/28/89		DRY										
SW063	05/12/89		DRY										
SW063	06/21/89		DRY										
SW063	07/19/89		DRY										
SW063	08/11/89		DRY										
SW063	09/15/89		DRY										
SW063	10/04/89		DRY										
SW063	11/03/89		DRY										
SW063	12/01/89		DRY										
SW063	01/05/90		DRY										
SW063	02/02/90		DRY										

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; U = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

STATION 63

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW063	07/24/87		***
SW063	07/06/88	17.790	
SW063	03/28/89		DRY
SW063	05/12/89		DRY
SW063	06/21/89		DRY
SW063	07/19/89		DRY
SW063	08/11/89		DRY
SW063	09/15/89		DRY
SW063	10/04/89		DRY
SW063	11/03/89		DRY
SW063	12/01/89		DRY
SW063	01/05/90		DRY
SW063	02/02/90		DRY

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DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

STATION 64

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW064	07/22/87		***										
SW064	07/07/88	6.34 ± 4.39	6	7.20 ± 5.33	8	NR		0.00 ± 0.201	0.3	NR		NR	
SW064	03/30/89		DRY										
SW064	05/22/89		***										
SW064	06/27/89		***										
SW064	07/19/89		DRY										
SW064	08/11/89		DRY										
SW064	09/20/89		DRY										
SW064	10/04/89		DRY										
SW064	11/09/89		DRY										
SW064	12/01/89		DRY										
SW064	01/05/90		DRY										
SW064	02/02/90		DRY										

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Surface Water

Dissolved Radiochemistry Sampling Results

STATION 64

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW064	07/22/87		***
SW064	07/07/88	15.530	
SW064	03/30/89		DRY
SW064	05/22/89		***
SW064	06/27/89		***
SW064	07/19/89		DRY
SW064	08/11/89		DRY
SW064	09/20/89		DRY
SW064	10/04/89		DRY
SW064	11/09/89		DRY
SW064	12/01/89		DRY
SW064	01/05/90		DRY
SW064	02/02/90		DRY

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DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

STATION 103

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89, 90 pCi/l	mda	Plutonium 239, 240 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW103	07/11/88	0.03 ± 0.13	10	21.7 ± 10.2	20	NR		0.00 ± 0.0877	0.1	NR		NR	
SW103	03/23/89	5 ± 8		-4 ± 4		-0.2 ± 0.4		0.01 ± 0.02		0.00 ± 0.02		NR	
SW103	05/25/89		***										
SW103	06/15/89		***										
SW103	07/13/89		***										
SW103	08/02/89		***										
SW103	09/07/89		***										
SW103	10/03/89		***										
SW103	11/03/89		***										
SW103	12/06/89		***										
SW103	01/18/90		***										
SW103	02/12/90		***										
SW103	03/22/90		***										

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DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Dissolved Radiochemistry Sampling Results

STATION 103

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW103	07/11/88	4.440	
SW103	03/23/89	3.300	
SW103	05/25/89		***
SW103	06/16/89		***
SW103	07/13/89		***
SW103	08/02/89		***
SW103	09/07/89		***
SW103	10/03/89		***
SW103	11/03/89		***
SW103	12/06/89		***
SW103	01/18/90		***
SW103	02/12/90		***
SW103	03/22/90		***

VALUE QUALIFIERS: NR - Analyte not requested or analyte data not yet received
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DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R - Rejected; A - Acceptable with qualifications; V - Valid

APPENDIX B-6

SURFACE WATER SAMPLING RESULTS

TOTAL RADIOCHEMISTRY

Surface Water

Total Radiochemistry Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89,90 pCi/l	mda	Plutonium 239 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW050	/ /		DRY										
SW050	07/21/87	26 ± 14		19 ± 49		<1.0		55 ± 7		0.0 ± 27		<110	
SW050	06/27/88	NR		NR		NR		0.928 ± 0.139	0.08	NR		829 ± 327	500
SW050	06/27/88		Data not yet received										
SW050	04/17/89		DRY										
SW050	05/10/89		DRY										
SW050	06/27/89	32 ± 8	7	24 ± 5	7	0.7 ± 0.5	0.	1.4 ± 0.1	0.	0.79 ± 0.05	0.	20 ± 220	31
SW050	07/18/89		Data not yet received										
SW050	08/11/89		DRY										
SW050	09/12/89		DRY										
SW050	10/04/89		DRY										
SW050	11/03/89		DRY										
SW050	12/01/89		DRY										
SW050	01/05/90		DRY										
SW050	02/02/90		DRY										
SW050	03/17/90		DRY										
SW051	07/21/87	58 ± 4		28 ± 8		<1		13 ± 3		0.0 ± 11		<110	
SW051	06/23/88		DRY										
SW051	04/17/89		DRY										
SW051	05/10/89		DRY										
SW051	06/27/89	11 ± 3	3	13 ± 2	3	0.0 ± 0.4	0.	0.69 ± 0.04	0.	1.0 ± 0.1	0.	-120 ± 220	31
SW051	07/18/89		DRY										
SW051	08/11/89		DRY										
SW051	09/12/89		DRY										
SW051	10/04/89		DRY										
SW051	11/03/89		DRY										
SW051	12/01/89		DRY										
SW051	01/05/90		DRY										
SW051	02/02/90		DRY										
SW052	07/21/87	114 ± 10		46 ± 15		<1		5.4 ± 1.5		0.2 ± 1.5		<110	
SW052	06/23/88	NR		NR		NR		0.595 ± 0.218	0.2	NR		0.00 ± 278	500
SW052	04/17/89		DRY										
SW052	05/10/89		DRY										
SW052	06/09/89		DRY										
SW052	07/07/89		DRY										
SW052	08/11/89		DRY										

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*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Radiochemistry Sampling Results

903-PAD AND LIP SITE

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW050	/ /		DRY
SW050	07/21/87	2.120	
SW050	06/27/88	2.640	
SW050	06/27/88		Data not yet received
SW050	04/17/89		DRY
SW050	05/10/89		DRY
SW050	06/27/89	4.500	
SW050	07/18/89		Data not yet received
SW050	08/11/89		DRY
SW050	09/12/89		DRY
SW050	10/04/89		DRY
SW050	11/03/89		DRY
SW050	12/01/89		DRY
SW050	01/05/90		DRY
SW050	02/02/90		DRY
SW050	03/17/90		DRY
SW051	07/21/87	3.200	
SW051	06/23/88		DRY
SW051	04/17/89		DRY
SW051	05/10/89		DRY
SW051	06/27/89	2.600	
SW051	07/18/89		DRY
SW051	08/11/89		DRY
SW051	09/12/89		DRY
SW051	10/04/89		DRY
SW051	11/03/89		DRY
SW051	12/01/89		DRY
SW051	01/05/90		DRY
SW051	02/02/90		DRY
SW052	07/21/87	1.770	
SW052	06/23/88	3.790	
SW052	04/17/89		DRY
SW052	05/10/89		DRY
SW052	06/09/89		DRY
SW052	07/07/89		DRY
SW052	08/11/89		DRY

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Surface Water

Total Radiochemistry Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89,90 pCi/l	mda	Plutonium 239 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW056	07/21/87	8 ± 10		18 ± 16		3.6		0.0 ± .89		0.0 ± 2.0		<110	
SW056	06/30/88	NR		NR		NR		0.170 ± 0.190	0.1	NR		0.00 ± 312	500
SW056	04/13/89	41 ± 21		22 ± 8		0.3 ± 0.5		0.20 ± 0.03		0.10 ± 0.03		110 ± 160	
SW056	05/11/89	33 ± 17		36 ± 10		-0.1 ± 0.3		0.14 ± 0.02		0.06 ± 0.02		800 ± 160	
SW056	06/07/89	200 ± 50		79 ± 16		0.3 ± 0.3		2.5 ± 0.1		0.40 ± 0.05		310 ± 220	
SW056	07/12/89	19 ± 5	21	13 ± 6	10	0.2 ± 0.4	0.	0.05 ± 0.01	0.	0.05 ± 0.01	0.	170 ± 150	25
SW056	08/09/89	Data not yet received											
SW056	09/14/89	0.4 ± 2.0	R 5	10 ± 3	R 4	0.1 ± 0.1	0.5	0.009 ± 0.004	0.003	0.005 ± 0.006	0.003	-500 ± 300	400
SW056	10/18/89	Data not yet received											
SW056	11/15/89	Data not yet received											
SW056	12/19/89	Data not yet received											
SW056	01/25/90	Data not yet received											
SW056	02/22/90	Data not yet received											
SW056	03/21/90	Data not yet received											
SW060	07/21/87	8 ± 18		33 ± 24		<1.0		0.0 ± 1.1		0.0 ± 1.2		<110	
SW060	11/11/87	***											
SW060	07/01/88	NR		NR		NR		0.185 ± 0.141	0.09	NR		0.00 ± 315	500
SW060	03/16/89	7 ± 8		3 ± 4		-0.2 ± 0.5		0.02 ± 0.01		0.01 ± 0.02		30 ± 150	
SW060	03/16/89	7 ± 8		2 ± 4		-0.1 ± 0.5		0.03 ± 0.02		0.02 ± 0.02		170 ± 160	
SW060	05/15/89	2 ± 5		6 ± 3		-0.3 ± 0.5		0.04 ± 0.02		0.00 ± 0.01		300 ± 210	
SW060	05/15/89	4 ± 5		7 ± 3		-0.3 ± 0.5		0.00 ± 0.01		0.00 ± 0.01		350 ± 210	
SW060	06/09/89	14 ± 8		9 ± 3		0.0 ± 0.4		0.02 ± 0.01		0.02 ± 0.01		50 ± 150	
SW060	07/06/89	7 ± 3		6 ± 2		0.0 ± 0.4		0.03 ± 0.02		0.03 ± 0.02		-40 ± 140	
SW060	08/03/89	Data not yet received											
SW060	09/11/89	4.0 ± .9	.8	7.5 ± 2.1	2.8	-.08 ± .36	.61	.012 ± .012	.013	NR		100 ± 220	360
SW060	09/11/89	NR		NR		.24 ± .38	.59	.008 ± .007	.007	.019 ± .012	.010	140 ± 230	370
SW060	10/03/89	Data not yet received											
SW060	11/06/89	Data not yet received											
SW060	11/06/89	Data not yet received											
SW060	12/06/89	Data not yet received											
SW060	01/23/90	Data not yet received											
SW060	02/09/90	Data not yet received											
SW060	03/12/90	Data not yet received											
SW061	07/22/87	17 ± 12		41 ± 14		<1.0		0.0 ± .82		0.0 ± 1.2		<110	
SW061	11/11/87	***											
SW061	07/01/88	NR		NR		NR		0.0654 ± 0.0795	0.07	NR		0.00 ± 315	500

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Surface Water

Total Radiochemistry Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW056	07/21/87	3.390	
SW056	06/30/88	8.970	
SW056	04/13/89	5.000	
SW056	05/11/89	7.200	
SW056	06/07/89	10.500	
SW056	07/12/89	9.000	
SW056	08/09/89		Data not yet received
SW056	09/14/89	8.090	
SW056	10/18/89		Data not yet received
SW056	11/15/89		Data not yet received
SW056	12/19/89		Data not yet received
SW056	01/25/90		Data not yet received
SW056	02/22/90		Data not yet received
SW056	03/21/90		Data not yet received
SW060	07/21/87	4.270	
SW060	11/11/87		***
SW060	07/01/88	10.570	
SW060	03/16/89	4.400	
SW060	03/16/89	6.600	
SW060	05/15/89	3.200	
SW060	05/15/89	3.300	
SW060	06/09/89	5.000	
SW060	07/06/89	5.600	
SW060	08/03/89		Data not yet received
SW060	09/11/89	2.170	
SW060	09/11/89	3.370	
SW060	10/03/89		Data not yet received
SW060	11/06/89		Data not yet received
SW060	11/06/89		Data not yet received
SW060	12/06/89		Data not yet received
SW060	01/23/90		Data not yet received
SW060	02/09/90		Data not yet received
SW060	03/12/90		Data not yet received
SW061	07/22/87	1.990	
SW061	11/11/87		***
SW061	07/01/88	9.390	

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Surface Water

Total Radiochemistry Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89,90 pCi/l	mda	Plutonium 239 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW061	03/20/89	8 ± 5		6 ± 3		-0.4 ± 0.4		0.04 ± 0.02		0.03 ± 0.02*		-60 ± 150	
SW061	05/15/89	4 ± 5		8 ± 3		-0.3 ± 0.4		0.01 ± 0.01		0.01 ± 0.01		300 ± 210	
SW061	06/09/89	11 ± 5		13 ± 3		0.1 ± 0.3		0.05 ± 0.01		0.05 ± 0.03		-30 ± 150	
SW061	07/06/89	4 ± 3		5 ± 2		-0.1 ± 0.4		0.02 ± 0.01		0.01 ± 0.01		-20 ± 140	
SW061	08/03/89	Data not yet received											
SW061	09/11/89	4.8 ± .9	.7	9.6 ± 2.1	2.5	.59 ± .44	.64	.009 ± .006	0	NR		280 ± 240	380
SW061	10/03/89	Data not yet received											
SW061	10/20/89	DRY											
SW061	11/06/89	Data not yet received											
SW061	12/06/89	Data not yet received											
SW061	01/23/90	Data not yet received											
SW061	02/09/90	Data not yet received											
SW061	03/12/90	Data not yet received											
SW061	03/12/90	Data not yet received											
SW101	06/30/88	NR		NR		NR		0.0463 ± 0.116	0.2	NR		0.00 ± 302	500
SW101	04/13/89	190 ± 70		140 ± 30		0.6 ± 0.8		0.57 ± 0.04		0.36 ± 0.10		30 ± 150	
SW101	05/11/89	780 ± 210		570 ± 100		2.2 ± 0.9		3.3 ± 0.1		0.44 ± 0.08		180 ± 150	
SW101	06/07/89	170 ± 50		110 ± 20		0.6 ± 0.6		0.71 ± 0.04		0.17 ± 0.04		60 ± 210	
SW101	07/12/89	26 ± 10	10	21 ± 5	7	0.9 ± 0.7	0.	0.37 ± 0.03	0.	0.00 ± 0.01	0.	-50 ± 150	25
SW101	08/09/89	Data not yet received											
SW101	09/14/89	-0.4 ± 0.8	R 0.8	14 ± 2	R 2	0.07 ± 0.13	0.5	0.002 ± 0.004	0.006	0.004 ± 0.008	0.01	-300 ± 300	400
SW101	10/18/89	Data not yet received											
SW101	11/15/89	Data not yet received											
SW101	12/19/89	Data not yet received											
SW101	01/25/90	Data not yet received											
SW101	02/22/90	Data not yet received											
SW101	03/21/90	Data not yet received											

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Surface Water

Total Radiochemistry Sampling Results

SOUTH WALNUT CREEK

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW061	03/20/89	2.500	
SW061	05/15/89	4.800	
SW061	06/09/89	5.800	
SW061	07/06/89	5.600	
SW061	08/03/89	Data not yet received	
SW061	09/11/89	5.060	
SW061	10/03/89	Data not yet received	
SW061	10/20/89	DRY	
SW061	11/06/89	Data not yet received	
SW061	12/06/89	Data not yet received	
SW061	01/23/90	Data not yet received	
SW061	02/09/90	Data not yet received	
SW061	03/12/90	Data not yet received	
SW061	03/12/90	Data not yet received	
SW101	06/30/88	2.188	
SW101	04/13/89	4.100	
SW101	05/11/89	6.800	
SW101	06/07/89	2.000	
SW101	07/12/89	2.200	
SW101	08/09/89	Data not yet received	
SW101	09/14/89	11.100	
SW101	10/18/89	Data not yet received	
SW101	11/15/89	Data not yet received	
SW101	12/19/89	Data not yet received	
SW101	01/25/90	Data not yet received	
SW101	02/22/90	Data not yet received	
SW101	03/21/90	Data not yet received	

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Radiochemistry Sampling Results

STATION 59

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89,90 pCi/l	mda	Plutonium 239 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW059	07/21/87	26 ± 6		28 ± 6		1.0		0.0 ± .93		0.03 ± 1.4		<110	
SW059	07/01/88	NR		NR		NR		0.00 ± 0.219	0.3	NR		0.00 ± 295	500
SW059	03/20/89	10 ± 14		9 ± 7		-0.1 ± 0.5		0.48 ± 0.04		0.20 ± 0.13		130 ± 150	
SW059	05/11/89	310 ± 140		340 ± 100		0.4 ± 0.7		0.9 ± 0.1		1.3 ± 0.1		70 ± 140	
SW059	06/08/89	Data not yet received											
SW059	07/06/89	140 ± 40		99 ± 20		-0.1 ± 0.4		3.1 ± 0.1		0.00 ± 0.01		80 ± 140	
SW059	08/10/89	Data not yet received											
SW059	09/18/89	0.7 ± 2.0	R 0.8	4 ± 3	R 8	0.1 ± 0.2	0.3	0.021 ± 0.007	0.006	-0.001 ± 0.004	0.007	-200 ± 300	400
SW059	10/03/89	Data not yet received											
SW059	11/06/89	Data not yet received											
SW059	12/06/89	Data not yet received											
SW059	01/23/90	Data not yet received											
SW059	02/09/90	Data not yet received											
SW059	03/12/90	Data not yet received											

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Radiochemistry Sampling Results

STATION 59

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW059	07/21/87	8.710	
SW059	07/01/88	9.460	
SW059	03/20/89	5.500	
SW059	05/11/89	16.600	
SW059	06/08/89		Data not yet received
SW059	07/06/89	0.200	
SW059	08/10/89		Data not yet received
SW059	09/18/89	6.800	
SW059	10/03/89		Data not yet received
SW059	11/06/89		Data not yet received
SW059	12/06/89		Data not yet received
SW059	01/23/90		Data not yet received
SW059	02/09/90		Data not yet received
SW059	03/12/90		Data not yet received

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Radiochemistry Sampling Results

STATION 63

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89,90 pCi/l	mda	Plutonium 239 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW063	07/24/87		***										
SW063	07/06/88	NR		NR		NR		0.242 ± 0.212	0.2	NR		1100 ± 306	500
SW063	03/28/89		DRY										
SW063	05/12/89		DRY										
SW063	06/21/89		DRY										
SW063	07/19/89		DRY										
SW063	08/11/89		DRY										
SW063	09/15/89		DRY										
SW063	10/04/89		DRY										
SW063	11/03/89		DRY										
SW063	12/01/89		DRY										
SW063	01/05/90		DRY										
SW063	02/02/90		DRY										

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Radiochemistry Sampling Results

STATION 63

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW063	07/24/87		***
SW063	07/06/88	20.500	
SW063	03/28/89		DRY
SW063	05/12/89		DRY
SW063	06/21/89		DRY
SW063	07/19/89		DRY
SW063	08/11/89		DRY
SW063	09/15/89		DRY
SW063	10/04/89		DRY
SW063	11/03/89		DRY
SW063	12/01/89		DRY
SW063	01/05/90		DRY
SW063	02/02/90		DRY

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Radiochemistry Sampling Results

STATION 64

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89,90 pCi/l	mda	Plutonium 239 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW064	07/22/87	34 ± 7		93 ± 16		1.5		0.1 ± 1.2		0.01 ± 1.3		<110	
SW064	07/07/88	NR		NR		NR		0.123 ± 0.229	0.2	NR		282 ± 303	500
SW064	03/30/89		DRY										
SW064	05/22/89		Data not yet received										
SW064	06/27/89	17 ± 7	7	17 ± 3	4	0.1 ± 0.4	0.	0.00 ± 0.01	0.	0.00 ± 0.01	0.	60 ± 230	31
SW064	07/19/89		DRY										
SW064	08/11/89		DRY										
SW064	09/20/89		DRY										
SW064	10/04/89		DRY										
SW064	11/09/89		DRY										
SW064	12/01/89		DRY										
SW064	01/05/90		DRY										
SW064	02/02/90		DRY										

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Radiochemistry Sampling Results

STATION 64

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW064	07/22/87	11.200	
SW064	07/07/88	23.590	
SW064	03/30/89		DRY
SW064	05/22/89		Data not yet received
SW064	06/27/89	3.600	
SW064	07/19/89		DRY
SW064	08/11/89		DRY
SW064	09/20/89		DRY
SW064	10/04/89		DRY
SW064	11/09/89		DRY
SW064	12/01/89		DRY
SW064	01/05/90		DRY
SW064	02/02/90		DRY

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.
DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Radiochemistry Sampling Results

STATION 103

Station Number	Date Sampled	Gross Alpha pCi/l	mda	Gross Beta pCi/l	mda	Strontium 89,90 pCi/l	mda	Plutonium 239 pCi/l	mda	Americium 241 pCi/l	mda	Tritium pCi/l	mda
SW103	07/11/88	NR		NR		NR		0.0928 ± 0.0920	0.1	NR		458 ± 290	500
SW103	03/23/89	53 ± 39		55 ± 18		-0.5 ± 0.6		0.74 ± 0.05		0.10 ± 0.04		160 ± 160	
SW103	05/25/89	36 ± 18		38 ± 10		-0.1 ± 0.4		1.4 ± 0.1		0.12 ± 0.02		200 ± 210	
SW103	06/15/89	0 ± 1		1 ± 2		-0.1 ± 0.5		0.01 ± 0.01		0.00 ± 0.02		100 ± 230	
SW103	07/13/89		Data not yet received										
SW103	08/02/89		Data not yet received										
SW103	09/07/89	14.0 ± 3.3	2.9	18.8 ± 3.0	3.4	.37 ± .38	.60	.152 ± .035	0	.330 ± .090	0	240 ± 390	390
SW103	10/03/89		Data not yet received										
SW103	11/03/89		Data not yet received										
SW103	12/06/89		Data not yet received										
SW103	01/18/90		Data not yet received										
SW103	02/12/90		Data not yet received										
SW103	03/22/90		Data not yet received										

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

Surface Water

Total Radiochemistry Sampling Results

STATION 103

Station Number	Date Sampled	Total Uranium pCi/l	mda
SW103	07/11/88	7.330	
SW103	03/23/89	7.000	
SW103	05/25/89	2.400	
SW103	06/15/89	0.100	
SW103	07/13/89		Data not yet received
SW103	08/02/89		Data not yet received
SW103	09/07/89	2.690	
SW103	10/03/89		Data not yet received
SW103	11/03/89		Data not yet received
SW103	12/06/89		Data not yet received
SW103	01/18/90		Data not yet received
SW103	02/12/90		Data not yet received
SW103	03/22/90		Data not yet received

VALUE QUALIFIERS: NR = Analyte not requested or analyte data not yet received
*** = Insufficient Sample or Radiochemistry Analyses not requested.

DATA VALIDATION QUALFIERS: (No validation qualifier indicates data has not been validated.) R = Rejected; A = Acceptable with qualifications; V = Valid

APPENDIX C

SURFACE WATER SAMPLING RESULTS

SUMMARY TABLES

OPERABLE UNIT NO. 2

903-PAD AND LIP SITE
VOLATILE ORGANIC COMPOUND CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN ug/l

Analyte	Background Value***		ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value		Minimum Value		Average of All Values**
Chloromethane	10	U		18	0	10.000	U	10	U	5
Bromomethane	10	U		18	0	10.000	U	10	U	5
Vinyl Chloride	10	U	2	18	0	2	J	2	J	5 +
Chloroethane	10	U		18	0	10.000	U	10	U	5
Methylene Chloride	5	U	5U#	18	3	6	B +	1	JB	4
Acetone	10	U	10U#	18	2	12 +		1	JB	6
Carbon Disulfide	5	U	5U#	18	0	3	J	2	J	2
1,1-Dichloroethene	5	U	7	24	5	140 +		5	U	27 +
1,1-Dichloroethene	5	U	5U#	18	0	1	J	1	J	2
1,2-Dichloroethene (total)	5	U	5U#	19	2	11 +		5	U	3
Chloroform	5	U	1U	24	10	84 +		2	J +	9 +
1,2-Dichloroethane	5	U	5	24	0	5.0000	U	5	U	3
2-Butanone	10	U		18	0	10.000	U	10	U	5
1,1,1-Trichloroethane	5	U	200	24	0	9		1	J	3
Carbon Tetrachloride	5	U	5	24	6	1005 +		1	J	62 +
Vinyl Acetate	10	U		18	0	10.000	U	10	U	5
Bromodichloromethane	5	U		18	0	5.0000	U	5	U	3
1,2-Dichloropropane	5	U		18	0	5.0000	U	5	U	3
cis-1,3-Dichloropropene	5	U		18	0	5.0000	U	5	U	3
Trichloroethene	5	U	5	24	16	2500 +		5		132 +
Dibromochloromethane	5	U		18	0	5.0000	U	5	U	3
1,1,2-Trichloroethane	5	U	5U	24	0	5.0000	U	5	U	3
Benzene	5	U	5U	18	0	5.0000	U	5	U	3
Trans-1,3-Dichloropropene	5	U		18	0	5.0000	U	5	U	3
Bromoform	5	U		18	0	5.0000	U	5	U	3
4-Methyl-2-pentanone	10	U		18	0	10.000	U	10	U	5
2-Hexanone	10	U		18	0	10.000	U	10	U	5
Tetrachloroethene	5	U	1U	24	10	65 +		2	J +	15 +
1,1,2,2-Tetrachloroethane	5	U	1U	18	0	5.0000	U	5	U +	3 +
Toluene	5	U	2000	18	0	1	J	1	J	2
Chlorobenzene	5	U		18	0	5.0000	U	5	U	3
Ethylbenzene	5	U		18	0	5.0000	U	5	U	3
Styrene	5	U		18	0	5.0000	U	5	U	3
Total Xylenes	5	U		18	0	5.0000	U	5	U	3

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW050, SW051, SW052, SW055, SW057, SW058, SW077

STATION 53
VOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN ug/l

Analyte	Background Value***	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of All Values**
Chloromethane	10 U		7	0	10.000 U	10 U	5
Bromomethane	10 U		7	0	10.000 U	10 U	5
Vinyl Chloride	10 U	2	7	0	10.000 U	10 U +	5 +
Chloroethane	10 U		7	0	10.000 U	10 U	5
Methylene Chloride	5 U	5U#	7	2	9 B +	5 B	4
Acetone	10 U	10U#	7	1	11 +	3 J	6
Carbon Disulfide	5 U	5U#	7	0	2 J	2 J	2
1,1-Dichloroethene	5 U	7	8	0	5.0000 U	5 U	3
1,1-Dichloroethane	5 U	5U#	7	0	5.0000 U	5 U	3
1,2-Dichloroethene (total)	5 U	5U#	7	3	42 +	5 U	15 +
Chloroform	5 U	1U	8	0	5.0000 U	5 U +	3 +
1,2-Dichloroethane	5 U	5	8	0	5.0000 U	5 U	3
2-Butanone	10 U		7	0	10.000 U	10 U	5
1,1,1-Trichloroethane	5 U	200	8	0	5.0000 U	5 U	3
Carbon Tetrachloride	5 U	5	8	0	5.0000 U	5 U	3
Vinyl Acetate	10 U		7	0	10.000 U	10 U	5
Bromodichloromethane	5 U		7	0	5.0000 U	5 U	3
1,2-Dichloropropane	5 U		7	0	5.0000 U	5 U	3
cis-1,3-Dichloropropene	5 U		7	0	5.0000 U	5 U	3
Trichloroethene	5 U	5	8	1	13 +	1 J	4
Dibromochloromethane	5 U		7	0	5.0000 U	5 U	3
1,1,2-Trichloroethane	5 U	5U	8	0	5.0000 U	5 U	3
Benzene	5 U	5U	7	0	5.0000 U	5 U	3
Trans-1,3-Dichloropropene	5 U		7	0	5.0000 U	5 U	3
Bromoform	5 U		7	0	5.0000 U	5 U	3
4-Methyl-2-pentanone	10 U		7	0	10.000 U	10 U	5
2-Hexanone	10 U		7	0	10.000 U	10 U	5
Tetrachloroethene	5 U	1U	8	0	5.0000 U	5 U +	3 +
1,1,2,2-Tetrachloroethane	5 U	1U	7	0	5.0000 U	5 U +	3 +
Toluene	5 U	2000	7	0	2 J	2 J	2
Chlorobenzene	5 U		7	0	5.0000 U	5 U	3
Ethylbenzene	5 U		7	0	5.0000 U	5 U	3
Styrene	5 U		7	0	5.0000 U	5 U	3
Total Xylenes	5 U		7	0	5.0000 U	5 U	3

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW053

SOUTH WALNUT CREEK
VOLATILE ORGANIC COMPOUND CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN ug/l

Analyte	Background Value***	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of All Values**
Chloromethane	10 U		25	0	10.000 U	10 U	5
Bromomethane	10 U		25	0	10.000 U	10 U	5
Vinyl Chloride	10 U	2	25	5	15 +	2 J	6 +
Chloroethane	10 U		25	0	10.000 U	10 U	5
Methylene Chloride	5 U	5U#	25	6	44 +	1 J	8 +
Acetone	10 U	10U#	25	2	130 +	3 J	13 +
Carbon Disulfide	5 U	5U#	25	0	5.0000 U	5.0 U	3
1,1-Dichloroethene	5 U	7	28	1	143 +	1 J	7 +
1,1-Dichloroethane	5 U	5U#	25	1	6 J +	1 J	3
1,2-Dichloroethene (total)	5 U	5U#	24	0	5.0000 U	5 U	3
Chloroform	5 U	1U	28	15	79 +	1 J	18 +
1,2-Dichloroethane	5 U	5	28	0	5.0000 U	5 U	3
2-Butanone	10 U		25	0	10.000 U	10 U	5
1,1,1-Trichloroethane	5 U	200	28	0	33	5 U	5
Carbon Tetrachloride	5 U	5	28	14	173 +	3 J	24 +
Vinyl Acetate	10 U		25	0	10.000 U	10 U	5
Bromodichloromethane	5 U		25	5	2 J	2 J	2
1,2-Dichloropropane	5 U		25	0	5.0000 U	5.0 U	3
cis-1,3-Dichloropropene	5 U		25	0	5.0000 U	5.0 U	3
Trichloroethene	5 U	5	28	14	140 +	3 J	29 +
Dibromochloromethane	5 U		25	0	5.0000 U	5.0 U	3
1,1,2-Trichloroethane	5 U	5U	28	0	5.0000 U	5 U	3
Benzene	5 U	5U	25	0	5.0000 U	5.0 U	3
Trans-1,3-Dichloropropene	5 U		25	0	5.0000 U	5.0 U	3
Bromoform	5 U		25	0	5.0000 U	5.0 U	3
4-Methyl-2-pentanone	10 U		25	0	10.000 U	10 U	5
2-Hexanone	10 U		25	0	10.000 U	10 U	5
Tetrachloroethene	5 U	1U	28	15	280 +	1 J	39 +
1,1,2,2-Tetrachloroethane	5 U	1U	25	0	5.0000 U	5.0 U +	3 +
Toluene	5 U	2000	25	0	12	1 J	3
Chlorobenzene	5 U		25	0	5.0000 U	5.0 U	3
Ethylbenzene	5 U		25	0	5.0000 U	5.0 U	3
Styrene	5 U		25	0	5.0000 U	5.0 U	3
Total Xylenes	5 U		25	0	5.0000 U	5.0 U	3

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW056, SW060, SW061, SW101

STATION 59
VOLATILE ORGANIC COMPOUND CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN ug/l

Analyte	Background Value***	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of All Values**
Chloromethane	10 U		7	0	10.000 U	10 U	5
Bromomethane	10 U		7	0	10.000 U	10 U	5
Vinyl Chloride	10 U	2	7	0	10.000 U	10 U +	5 +
Chloroethane	10 U		7	0	10.000 U	10 U	5
Methylene Chloride	5 U	5U#	7	2	20 JB +	2 JB	6 +
Acetone	10 U	10U#	7	1	13 B +	3 J	6
Carbon Disulfide	5 U	5U#	7	0	5.0000 U	5.0 U	3
1,1-Dichloroethene	5 U	7	8	2	133 +	3 J	21 +
1,1-Dichloroethane	5 U	5U#	7	1	6 J +	2 J	3
1,2-Dichloroethene (total)	5 U	5U#	7	1	56 +	5 U	10 +
Chloroform	5 U	1U	8	8	82 +	18.7 +	38 +
1,2-Dichloroethane	5 U	5	8	0	5.0000 U	5 U	3
2-Butanone	10 U		7	0	10.000 U	10 U	5
1,1,1-Trichloroethane	5 U	200	8	0	42	5 U	16
Carbon Tetrachloride	5 U	5	8	8	605 +	160 +	284 +
Vinyl Acetate	10 U		7	0	10.000 U	10 U	5
Bromodichloromethane	5 U		7	0	5.0000 U	5.0 U	3
1,2-Dichloropropane	5 U		7	0	5.0000 U	5.0 U	3
cis-1,3-Dichloropropene	5 U		7	0	5.0000 U	5.0 U	3
Trichloroethene	5 U	5	8	8	260 +	49 +	98 +
Dibromochloromethane	5 U		7	0	5.0000 U	5.0 U	3
1,1,2-Trichloroethene	5 U	5U	8	0	5.0000 U	5 U	3
Benzene	5 U	5U	7	0	5.0000 U	5.0 U	3
Trans-1,3-Dichloropropene	5 U		7	0	5.0000 U	5.0 U	3
Bromoform	5 U		7	0	5.0000 U	5.0 U	3
4-Methyl-2-pentanone	10 U		7	0	10.000 U	10 U	5
2-Hexanone	10 U		7	0	10.000 U	10 U	5
Tetrachloroethene	5 U	1U	8	8	270 +	43 +	94 +
1,1,2,2-Tetrachloroethane	5 U	1U	7	0	5.0000 U	5.0 U +	3 +
Toluene	5 U	2000	7	0	5.0000 U	5.0 U	3
Chlorobenzene	5 U		7	0	5.0000 U	5.0 U	3
Ethylbenzene	5 U		7	0	5.0000 U	5.0 U	3
Styrene	5 U		7	0	5.0000 U	5.0 U	3
Total Xylenes	5 U		7	0	5.0000 U	5.0 U	3

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW059

STATION 63
VOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN ug/l

Analyte	Background Value***	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of All Values**
Chloromethane	10 U		1	0	10.000 U	10 U	5
Bromomethane	10 U		1	0	10.000 U	10 U	5
Vinyl Chloride	10 U	2	1	0	10.000 U	10 U +	5 +
Chloroethane	10 U		1	0	10.000 U	10 U	5
Methylene Chloride	5 U	5U#	1	0	5.0000 U	5.0 U	3
Acetone	10 U	10U#	1	0	10.000 U	10 U	5
Carbon Disulfide	5 U	5U#	1	0	5.0000 U	5.0 U	3
1,1-Dichloroethene	5 U	7	2	0	5.0000 U	5 U	3
1,1-Dichloroethane	5 U	5U#	1	0	5.0000 U	5.0 U	3
1,2-Dichloroethene (total)	5 U	5U#	1	0	5.0000 U	5 U	3
Chloroform	5 U	1U	2	1	13 +	5 U +	8 +
1,2-Dichloroethane	5 U	5	2	0	5.0000 U	5 U	3
2-Butanone	10 U		1	0	10.000 U	10 U	5
1,1,1-Trichloroethane	5 U	200	2	0	5.0000 U	5 U	3
Carbon Tetrachloride	5 U	5	2	1	17 +	5 U	10 +
Vinyl Acetate	10 U		1	0	10.000 U	10 U	5
Bromodichloromethane	5 U		1	0	5.0000 U	5.0 U	3
1,2-Dichloropropane	5 U		1	0	5.0000 U	5.0 U	3
cis-1,3-Dichloropropene	5 U		1	0	5.0000 U	5.0 U	3
Trichloroethene	5 U	5	2	1	14 +	5 U	8 +
Dibromochloromethane	5 U		1	0	5.0000 U	5.0 U	3
1,1,2-Trichloroethane	5 U	5U	2	0	5.0000 U	5 U	3
Benzene	5 U	5U	1	0	5.0000 U	5.0 U	3
Trans-1,3-Dichloropropene	5 U		1	0	5.0000 U	5.0 U	3
Bromoform	5 U		1	0	5.0000 U	5.0 U	3
4-Methyl-2-pentanone	10 U		1	0	10.000 U	10 U	5
2-Hexanone	10 U		1	0	10.000 U	10 U	5
Tetrachloroethene	5 U	1U	2	0	1.0 J	1.0 J	2 +
1,1,2,2-Tetrachloroethane	5 U	1U	1	0	5.0000 U	5.0 U +	3 +
Toluene	5 U	2000	1	0	5.0000 U	5.0 U	3
Chlorobenzene	5 U		1	0	5.0000 U	5.0 U	3
Ethylbenzene	5 U		1	0	5.0000 U	5.0 U	3
Styrene	5 U		1	0	5.0000 U	5.0 U	3
Total Xylenes	5 U		1	0	5.0000 U	5.0 U	3

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW063

STATION 64
VOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN ug/l

Analyte	Background Value***	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of All Values**
Chloromethane	10 U		3	0	10.000 U	10 U	5
Bromomethane	10 U		3	0	10.000 U	10 U	5
Vinyl Chloride	10 U	2	3	0	10.000 U	10 U +	5 +
Chloroethane	10 U		3	0	10.000 U	10 U	5
Methylene Chloride	5 U	5U#	3	1	9 B +	5 U	5
Acetone	10 U	10U#	3	0	5 J	2 J	4
Carbon Disulfide	5 U	5U#	3	1	6 +	5 U	4
1,1-Dichloroethene	5 U	7	4	0	5.0000 U	5 U	3
1,1-Dichloroethane	5 U	5U#	3	0	5.0000 U	5 U	3
1,2-Dichloroethene (total)	5 U	5U#	3	0	5.0000 U	5 U	3
Chloroform	5 U	1U	4	1	27 +	1 J	8 +
1,2-Dichloroethane	5 U	5	4	0	5.0000 U	5 U	3
2-Butanone	10 U		3	0	10.000 U	10 U	5
1,1,1-Trichloroethane	5 U	200	4	0	5.0000 U	5 U	3
Carbon Tetrachloride	5 U	5	4	0	3 J	3 J	3
Vinyl Acetate	10 U		3	0	10.000 U	10 U	5
Bromodichloromethane	5 U		3	0	5.0000 U	5 U	3
1,2-Dichloropropane	5 U		3	0	5.0000 U	5 U	3
cis-1,3-Dichloropropene	5 U		3	0	5.0000 U	5 U	3
Trichloroethene	5 U	5	4	3	20 +	5 U	13 +
Dibromochloromethane	5 U		3	0	5.0000 U	5 U	3
1,1,2-Trichloroethane	5 U	5U	4	0	5.0000 U	5 U	3
Benzene	5 U	5U	3	0	5.0000 U	5 U	3
Trans-1,3-Dichloropropene	5 U		3	0	5.0000 U	5 U	3
Bromoform	5 U		3	0	5.0000 U	5 U	3
4-Methyl-2-pentanone	10 U		3	0	10.000 U	10 U	5
2-Hexanone	10 U		3	0	10.000 U	10 U	5
Tetrachloroethene	5 U	1U	4	0	5.0000 U	5 U +	3 +
1,1,2,2-Tetrachloroethane	5 U	1U	3	0	5.0000 U	5 U +	3 +
Toluene	5 U	2000	3	0	5.0000 U	5 U	3
Chlorobenzene	5 U		3	0	5.0000 U	5 U	3
Ethylbenzene	5 U		3	0	5.0000 U	5 U	3
Styrene	5 U		3	0	5.0000 U	5 U	3
Total Xylenes	5 U		3	0	5.0000 U	5 U	3

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW064

STATION 103
VOLATILE ORGANIC COMPOUND CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN ug/l

Analyte	Background Value***		ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value		Minimum Value		Average of All Values**
Chloromethane	10	U		6	0	10.000	U	10	U	5
Bromomethane	10	U		6	0	10.000	U	10	U	5
Vinyl Chloride	10	U	2	6	0	10.000	U	10	U +	5 +
Chloroethane	10	U		6	0	10.000	U	10	U	5
Methylene Chloride	5	U	5U#	6	2	9	B +	5	U	5 +
Acetone	10	U	10U#	6	0	2	JB	2	JB	5
Carbon Disulfide	5	U	5U#	6	0	5.0000	U	5	U	3
1,1-Dichloroethene	5	U	7	6	0	5.0000	U	5	U	3
1,1-Dichloroethane	5	U	5U#	6	0	5.0000	U	5	U	3
1,2-Dichloroethene (total)	5	U	5U#	5	0	5.0000	U	5	U	3
Chloroform	5	U	1U	6	0	5.0000	U	5	U +	3 +
1,2-Dichloroethane	5	U	5	6	0	5.0000	U	5	U	3
2-Butanone	10	U		6	0	10.000	U	10	U	5
1,1,1-Trichloroethane	5	U	200	6	0	5.0000	U	5	U	3
Carbon Tetrachloride	5	U	5	6	5	10 +		5	U	7 +
Vinyl Acetate	10	U		6	0	10.000	U	10	U	5
Bromodichloromethane	5	U		6	0	5.0000	U	5	U	3
1,2-Dichloropropane	5	U		6	0	5.0000	U	5	U	3
cis-1,3-Dichloropropene	5	U		6	0	5.0000	U	5	U	3
Trichloroethene	5	U	5	6	0	2	J	1	J	2
Dibromochloromethane	5	U		6	0	5.0000	U	5	U	3
1,1,2-Trichloroethane	5	U	5U	6	0	5.0000	U	5	U	3
Benzene	5	U	5U	6	0	5.0000	U	5	U	3
Trans-1,3-Dichloropropene	5	U		6	0	5.0000	U	5	U	3
Bromoform	5	U		6	0	5.0000	U	5	U	3
4-Methyl-2-pentanone	10	U		6	0	10.000	U	10	U	5
2-Hexanone	10	U		6	0	10.000	U	10	U	5
Tetrachloroethene	5	U	1U	6	4	3	J +	1	J	2 +
1,1,2,2-Tetrachloroethane	5	U	1U	6	0	5.0000	U	5	U +	3 +
Toluene	5	U	2000	6	0	5.0000	U	5	U	3
Chlorobenzene	5	U		6	0	5.0000	U	5	U	3
Ethylbenzene	5	U		6	0	5.0000	U	5	U	3
Styrene	5	U		6	0	5.0000	U	5	U	3
Total Xylenes	5	U		6	0	5.0000	U	5	U	3

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW103

903-PAD AND LIP SITE
DISSOLVED METAL CONSTITUENT CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte		Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum	(Al)	0.0290	0.4850 *	5.0	24	0	.899	.0300 U	0.1417
Antimony	(Sb)	0.0600	0.0600 U	0.06U	18	0	0.0600 U	.040 U	0.0300
Arsenic	(As)	0.0100	0.0100 U	0.25U	18	0	0.0100 U	.0020 U	0.0050
Barium	(Ba)	0.0100	0.2000 U	1.0	24	0	0.6	.200 U	0.2035
Beryllium	(Be)	0.0050	0.0050 U	0.005	18	0	0.0050 U	.0020 U	0.0025
Cadmium	(Cd)	0.0050	0.0050 U	0.01	18	0	0.0050 U	.0040 U	0.0025
Calcium	(Ca)	0.7500	85.9230	NS	24	0	156	72.30	116
Cesium	(Cs)	0.0200	1.0000 U	1.0	13	0	0.0200 U	.0010 U	0.0100
Chromium	(Cr)	0.0100	0.0100 U	0.05	24	0	0.0100 U	0.01 U	0.0050
Cobalt	(Co)	0.0220	0.0500 U	0.05	24	0	0.0220 U	.0200 U	0.0110
Copper	(Cu)	0.0063	0.0250 U	0.2	24	0	.0279	.0200 U	0.0057
Iron	(Fe)	0.0069	1.7800 *	0.3	24	4	1.48 +	.0554	0.1581
Lead	(Pb)	0.0050	0.0055 *	0.05	18	0	.0126	.0020 U	0.0031
Lithium	(Li)	0.1000	0.1000 U	2.5	13	0	.179	.0795	0.0662
Magnesium	(Mg)	0.0500	12.8150	NS	24	0	28.30	7.54	16
Manganese	(Mn)	0.0051	0.3680 *	0.05	24	17	1.64 +	0.015 U	0.2427 +
Mercury	(Hg)	0.0002	0.0003 *	0.002	18	0	.0003	.0002 U	0.0001
Molybdenum	(Mo)	0.0220	0.1000 U	0.1	19	0	.0201	.0201	0.0112
Nickel	(Ni)	0.0370	0.0400 U	0.20	24	0	0.0370 U	.0200 U	0.0185
Potassium	(K)	0.5000	5.0000 U	NS	18	0	9.04	2.42	1.0591
Selenium	(Se)	0.0050	0.0050 U	0.01	18	1	.0134 +	.0020 U	0.0031
Silver	(Ag)	0.0076	0.0100 U	0.05	24	0	0.0076 U	0.01 U	0.0038
Sodium	(Na)	2.1000	46.2450	NS	24	0	88.50	7.04	28
Strontium	(Sr)	0.0200	0.3960	NS	24	0	.918	.389	0.4180
Thallium	(Tl)	0.0100	0.0100 U	0.01U	18	0	0.0100 U	.0030 U	0.0050
Tin	(Sn)	0.1000	0.1000 U	0.1	13	0	0.1000 U	.100 U	0.0500
Vanadium	(V)	0.0240	0.0500 U	0.1	24	0	0.0240 U	.0100 U	0.0120
Zinc	(Zn)	0.0200	0.0320 *	2.0	24	0	1.26	0.02 U	0.1229

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW050, SW051, SW052, SW055, SW057, SW058, SW077

STATION 53
DISSOLVED METAL CONSTITUENT CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.0290	0.4850 *	5.0	8	0	.245	0.2 U	0.0433
Antimony (Sb)	0.0600	0.0600 U	0.06U	7	1	.133 +	.040 U	0.0447
Arsenic (As)	0.0100	0.0100 U	0.25U	7	0	0.0100 U	.010 U	0.0050
Barium (Ba)	0.0100	0.2000 U	1.0	8	0	.325	0.2 U	0.0981
Beryllium (Be)	0.0050	0.0050 U	0.005	7	0	0.0050 U	.005 U	0.0025
Cadmium (Cd)	0.0050	0.0050 U	0.01	7	0	0.0050 U	.005 U	0.0025
Calcium (Ca)	0.7500	85.9230	NS	8	0	140	80.0	114
Cesium (Cs)	0.0200	1.0000 U	1.0	6	0	0.0200 U	.100 U	0.0100
Chromium (Cr)	0.0100	0.0100 U	0.05	8	0	0.0100 U	0.01 U	0.0050
Cobalt (Co)	0.0220	0.0500 U	0.05	8	0	0.0220 U	0.05 U	0.0110
Copper (Cu)	0.0063	0.0250 U	0.2	8	0	.0274	0.025 U	0.0062
Iron (Fe)	0.0069	1.7800 *	0.3	8	6	8.54 +	0.1 U	2.4196 +
Lead (Pb)	0.0050	0.0055 *	0.05	7	0	0.0050 U	.0030 U	0.0025
Lithium (Li)	0.1000	0.1000 U	2.5	5	0	.0232	.0232	0.0446
Magnesium (Mg)	0.0500	12.8150	NS	8	0	32.2	21.50	27
Manganese (Mn)	0.0051	0.3680 *	0.05	8	8	.706 +	0.087 +	0.4495 +
Mercury (Hg)	0.0002	0.0003 *	0.002	7	0	0.0002 U	.0002 U	0.0001
Molybdenum(Mo)	0.0220	0.1000 U	0.1	6	0	0.0220 U	.0100 U	0.0110
Nickel (Ni)	0.0370	0.0400 U	0.20	8	0	0.0370 U	0.04 U	0.0185
Potassium (K)	0.5000	5.0000 U	NS	7	0	6.36	5 U	1.1229
Selenium (Se)	0.0050	0.0050 U	0.01	7	0	0.0050 U	.005 U	0.0025
Silver (Ag)	0.0076	0.0100 U	0.05	8	0	0.0076 U	0.01 U	0.0038
Sodium (Na)	2.1000	46.2450	NS	8	0	113	14.30	30
Strontium (Sr)	0.0200	0.3960	NS	7	0	.817	0.69	0.4389
Thallium (Tl)	0.0100	0.0100 U	0.01U	7	0	0.0100 U	.0100 U	0.0050
Tin (Sn)	0.1000	0.1000 U	0.1	5	0	0.1000 U	.100 U	0.0500
Vanadium (V)	0.0240	0.0500 U	0.1	8	0	0.0240 U	0.05 U	0.0120
Zinc (Zn)	0.0200	0.0320 *	2.0	8	0	.0371	0.02 U	0.0180

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW053

SOUTH WALNUT CREEK
DISSOLVED METAL CONSTITUENT CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.0290	0.4850 *	5.0	27	0	0.0290 U	.0300 U	0.0145
Antimony (Sb)	0.0600	0.0600 U	0.06U	24	0	0.0600 U	0.060 U	0.0300
Arsenic (As)	0.0100	0.0100 U	0.25U	24	0	0.0100 U	.0020 U	0.0050
Barium (Ba)	0.0100	0.2000 U	1.0	27	0	.235	.163	0.0580
Beryllium (Be)	0.0050	0.0050 U	0.005	24	1	.0053 +	.0020 U	0.0026
Cadmium (Cd)	0.0050	0.0050 U	0.01	24	0	0.0050 U	.0040 U	0.0025
Calcium (Ca)	0.7500	85.9230	NS	27	0	137	7.72	74
Cesium (Cs)	0.0200	1.0000 U	1.0	20	0	0.0200 U	.0010 U	0.0100
Chromium (Cr)	0.0100	0.0100 U	0.05	27	0	0.0100 U	0.01 U	0.0050
Cobalt (Co)	0.0220	0.0500 U	0.05	27	0	0.0220 U	.0200 U	0.0110
Copper (Cu)	0.0063	0.0250 U	0.2	27	0	0.0063 U	.0200 U	0.0032
Iron (Fe)	0.0069	1.7800 *	0.3	27	0	0.2	.0302	0.0374
Lead (Pb)	0.0050	0.0055 *	0.05	24	0	.0054	.0020 U	0.0026
Lithium (Li)	0.1000	0.1000 U	2.5	20	0	.0200	.0100 U	0.0462
Magnesium (Mg)	0.0500	12.8150	NS	27	0	23	5.0 U	12
Manganese (Mn)	0.0051	0.3680 *	0.05	27	8	.643 +	.0100 U	0.1014 +
Mercury (Hg)	0.0002	0.0003 *	0.002	24	0	0.0007	.0002 U	0.0002
Molybdenum(Mo)	0.0220	0.1000 U	0.1	23	0	.0245	.0100 U	0.0116
Nickel (Ni)	0.0370	0.0400 U	0.20	27	0	0.0370 U	.0200 U	0.0185
Potassium (K)	0.5000	5.0000 U	NS	24	0	1.12	.589	0.2905
Selenium (Se)	0.0050	0.0050 U	0.01	24	0	.0050	.0020 U	0.0026
Silver (Ag)	0.0076	0.0100 U	0.05	27	0	0.0076 U	0.01 U	0.0038
Sodium (Na)	2.1000	46.2450	NS	27	0	60.5	5 U	30
Strontium (Sr)	0.0200	0.3960	NS	27	0	0.8	0.02 U	0.1936
Thallium (Tl)	0.0100	0.0100 U	0.01U	24	0	0.0100 U	.0030 U	0.0050
Tin (Sn)	0.1000	0.1000 U	0.1	20	1	1 +	.100 U	0.0797
Vanadium (V)	0.0240	0.0500 U	0.1	27	0	0.0240 U	.0100 U	0.0120
Zinc (Zn)	0.0200	0.0320 *	2.0	27	0	0.59	0.010	0.1168

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW056, SW060, SW061, SW101

STATION 59
DISSOLVED METAL CONSTITUENT CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.0290	0.4850 *	5.0	8	0	0.0290 U	.0300 U	0.0145
Antimony (Sb)	0.0600	0.0600 U	0.06U	7	0	0.0600 U	0.060 U	0.0300
Arsenic (As)	0.0100	0.0100 U	0.25U	7	0	0.0100 U	.0020 U	0.0050
Barium (Ba)	0.0100	0.2000 U	1.0	8	0	.200	.162	0.0490
Beryllium (Be)	0.0050	0.0050 U	0.005	7	0	0.0050 U	.0020 U	0.0025
Cadmium (Cd)	0.0050	0.0050 U	0.01	7	0	0.0050 U	.0040 U	0.0025
Calcium (Ca)	0.7500	85.9230	NS	8	0	122	88.30	109
Cesium (Cs)	0.0200	1.0000 U	1.0	6	0	0.0200 U	.0010 U	0.0100
Chromium (Cr)	0.0100	0.0100 U	0.05	8	0	0.0100 U	0.01 U	0.0050
Cobalt (Co)	0.0220	0.0500 U	0.05	8	0	0.0220 U	.0200 U	0.0110
Copper (Cu)	0.0063	0.0250 U	0.2	8	0	.0288	.0200 U	0.0064
Iron (Fe)	0.0069	1.7800 *	0.3	8	0	.123	.0361	0.0225
Lead (Pb)	0.0050	0.0055 *	0.05	7	0	0.0050 U	.0020 U	0.0025
Lithium (Li)	0.1000	0.1000 U	2.5	6	0	.0250	.0142	0.0399
Magnesium (Mg)	0.0500	12.8150	NS	8	0	29.10	20	23
Manganese (Mn)	0.0051	0.3680 *	0.05	8	0	.0461	.0100 U	0.0144
Mercury (Hg)	0.0002	0.0003 *	0.002	7	0	.0007	0.0002 U	0.0002
Molybdenum (Mo)	0.0220	0.1000 U	0.1	7	0	0.0220 U	.0100 U	0.0110
Nickel (Ni)	0.0370	0.0400 U	0.20	8	0	0.0370 U	.0200 U	0.0185
Potassium (K)	0.5000	5.0000 U	NS	7	0	.750	.750	0.3214
Selenium (Se)	0.0050	0.0050 U	0.01	7	0	0.0050 U	.0020 U	0.0025
Silver (Ag)	0.0076	0.0100 U	0.05	8	0	0.0076 U	0.01 U	0.0038
Sodium (Na)	2.1000	46.2450	NS	8	0	38.30	28	34
Strontium (Sr)	0.0200	0.3960	NS	8	0	1.17	.614	0.5650
Thallium (Tl)	0.0100	0.0100 U	0.01U	7	0	0.0100 U	.0030 U	0.0050
Tin (Sn)	0.1000	0.1000 U	0.1	6	0	0.1000 U	.100 U	0.0500
Vanadium (V)	0.0240	0.0500 U	0.1	8	0	0.0240 U	.0100 U	0.0120
Zinc (Zn)	0.0200	0.0320 *	2.0	8	0	.626	.0200	0.2212

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW059

STATION 63
DISSOLVED METAL CONSTITUENT CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.0290	0.4850 *	5.0	2	0	0.033	0.033	0.0238
Antimony (Sb)	0.0600	0.0600 U	0.06U	1	0	0.0600 U	0.500 U +	0.0300
Arsenic (As)	0.0100	0.0100 U	0.25U	1	0	0.003	0.003	0.0030
Barium (Ba)	0.0100	0.2000 U	1.0	2	0	0.104	0.104	0.0545
Beryllium (Be)	0.0050	0.0050 U	0.005	1	0	0.0050 U	0.002 U	0.0025
Cadmium (Cd)	0.0050	0.0050 U	0.01	1	0	0.0050 U	0.004 U	0.0025
Calcium (Ca)	0.7500	85.9230	NS	2	0	112	93.0	103
Cesium (Cs)	0.0200	1.0000 U	1.0	0	0			*******
Chromium (Cr)	0.0100	0.0100 U	0.05	2	0	0.0100 U	0.01 U	0.0050
Cobalt (Co)	0.0220	0.0500 U	0.05	2	0	0.0220 U	0.020 U	0.0110
Copper (Cu)	0.0063	0.0250 U	0.2	2	0	0.0063 U	0.020 U	0.0032
Iron (Fe)	0.0069	1.7800 *	0.3	2	0	0.062	0.062	0.0327
Lead (Pb)	0.0050	0.0055 *	0.05	1	0	0.005	0.005	0.0050
Lithium (Li)	0.1000	0.1000 U	2.5	0	0			*******
Magnesium (Mg)	0.0500	12.8150	NS	2	0	34.0	32.2	33
Manganese (Mn)	0.0051	0.3680 *	0.05	2	2	0.412 +	0.393 +	0.4025 +
Mercury (Hg)	0.0002	0.0003 *	0.002	1	0	0.0002 U	0.0002 U	0.0001
Molybdenum(Mo)	0.0220	0.1000 U	0.1	1	0	0.0220 U	0.04 U	0.0110
Nickel (Ni)	0.0370	0.0400 U	0.20	2	0	0.0370 U	0.020 U	0.0185
Potassium (K)	0.5000	5.0000 U	NS	1	0	1.54	1.54	1.5400
Selenium (Se)	0.0050	0.0050 U	0.01	1	0	0.0050 U	0.005 U	0.0025
Silver (Ag)	0.0076	0.0100 U	0.05	2	0	0.0076 U	0.01 U	0.0038
Sodium (Na)	2.1000	46.2450	NS	2	0	110	102	106
Strontium (Sr)	0.0200	0.3960	NS	2	0	1.25	1.07	1.1600
Thallium (Tl)	0.0100	0.0100 U	0.01U	1	0	0.0100 U	0.300 U +	0.0050
Tin (Sn)	0.1000	0.1000 U	0.1	0	0			*******
Vanadium (V)	0.0240	0.0500 U	0.1	2	0	0.0240 U	0.010 U	0.0120
Zinc (Zn)	0.0200	0.0320 *	2.0	2	0	0.03	0.028	0.0290

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW063

STATION 64
DISSOLVED METAL CONSTITUENT CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.0290	0.4850 *	5.0	4	0	0.049	0.049	0.0231
Antimony (Sb)	0.0600	0.0600 U	0.06U	3	0	0.0600 U	.0600 U	0.0300
Arsenic (As)	0.0100	0.0100 U	0.25U	3	0	0.0100 U	0.002 U	0.0050
Barium (Ba)	0.0100	0.2000 U	1.0	4	0	0.105	0.105	0.0300
Beryllium (Be)	0.0050	0.0050 U	0.005	3	0	0.0050 U	0.002 U	0.0025
Cadmium (Cd)	0.0050	0.0050 U	0.01	3	0	0.0050 U	0.004 U	0.0025
Calcium (Ca)	0.7500	85.9230	NS	4	0	71.60	45.8	60
Cesium (Cs)	0.0200	1.0000 U	1.0	2	0	0.0200 U	.100 U	0.0100
Chromium (Cr)	0.0100	0.0100 U	0.05	4	0	0.0100 U	0.01 U	0.0050
Cobalt (Co)	0.0220	0.0500 U	0.05	4	0	0.0220 U	0.020 U	0.0110
Copper (Cu)	0.0063	0.0250 U	0.2	4	0	0.0063 U	0.020 U	0.0032
Iron (Fe)	0.0069	1.7800 *	0.3	4	0	0.059	0.059	0.0173
Lead (Pb)	0.0050	0.0055 *	0.05	3	0	0.0050 U	0.004 U	0.0025
Lithium (Li)	0.1000	0.1000 U	2.5	2	0	.0946	.0946	0.0723
Magnesium (Mg)	0.0500	12.8150	NS	4	0	54.2	45.30	50
Manganese (Mn)	0.0051	0.3680 *	0.05	4	1	0.074 +	0.015 U	0.0355
Mercury (Hg)	0.0002	0.0003 *	0.002	3	0	0.0002 U	0.0002 U	0.0001
Molybdenum (Mo)	0.0220	0.1000 U	0.1	3	0	0.0220 U	.0100 U	0.0110
Nickel (Ni)	0.0370	0.0400 U	0.20	4	0	0.0370 U	0.020 U	0.0185
Potassium (K)	0.5000	5.0000 U	NS	3	0	1.38	1.38	0.6267
Selenium (Se)	0.0050	0.0050 U	0.01	3	1	.0130 +	0.005 U	0.0060
Silver (Ag)	0.0076	0.0100 U	0.05	4	0	0.0076 U	0.01 U	0.0038
Sodium (Na)	2.1000	46.2450	NS	4	0	110	103	106
Strontium (Sr)	0.0200	0.3960	NS	4	0	1.17	1.02	1.1075
Thallium (Tl)	0.0100	0.0100 U	0.01U	3	0	0.0100 U	.0100 U	0.0050
Tin (Sn)	0.1000	0.1000 U	0.1	2	0	0.1000 U	.100 U	0.0500
Vanadium (V)	0.0240	0.0500 U	0.1	4	0	0.0240 U	0.010 U	0.0120
Zinc (Zn)	0.0200	0.0320 *	2.0	4	0	.0320	0.02 U	0.0183

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW064

STATION 103
DISSOLVED METAL CONSTITUENT CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.0290	0.4850 *	5.0	6	0	0.035	.0300 U	0.0179
Antimony (Sb)	0.0600	0.0600 U	0.06U	6	0	0.0600 U	.0600 U	0.0300
Arsenic (As)	0.0100	0.0100 U	0.25U	6	0	0.0100 U	0.002 U	0.0050
Barium (Ba)	0.0100	0.2000 U	1.0	6	0	.200	.151	0.0890
Beryllium (Be)	0.0050	0.0050 U	0.005	6	0	0.0050 U	0.002 U	0.0025
Cadmium (Cd)	0.0050	0.0050 U	0.01	6	0	0.0050 U	0.004 U	0.0025
Calcium (Ca)	0.7500	85.9230	NS	6	0	121	99.6	111
Cesium (Cs)	0.0200	1.0000 U	1.0	5	0	0.0200 U	.0010 U	0.0100
Chromium (Cr)	0.0100	0.0100 U	0.05	6	0	0.0100 U	.0100 U	0.0050
Cobalt (Co)	0.0220	0.0500 U	0.05	6	0	0.0220 U	0.020 U	0.0110
Copper (Cu)	0.0063	0.0250 U	0.2	6	0	0.0063 U	0.020 U	0.0032
Iron (Fe)	0.0069	1.7800 *	0.3	6	0	.156	0.061	0.0521
Lead (Pb)	0.0050	0.0055 *	0.05	6	0	0.0050 U	.0020 U	0.0025
Lithium (Li)	0.1000	0.1000 U	2.5	5	0	.0160	.0100 U	0.0432
Magnesium (Mg)	0.0500	12.8150	NS	6	0	12.60	5 U	9.9708
Manganese (Mn)	0.0051	0.3680 *	0.05	6	2	.0730 +	0.010 U	0.0355
Mercury (Hg)	0.0002	0.0003 *	0.002	6	0	.0007	0.0002 U	0.0003
Molybdenum(Mo)	0.0220	0.1000 U	0.1	5	0	0.0220 U	.0100 U	0.0110
Nickel (Ni)	0.0370	0.0400 U	0.20	6	0	0.0370 U	0.020 U	0.0185
Potassium (K)	0.5000	5.0000 U	NS	6	0	0.853	.547	0.4000
Selenium (Se)	0.0050	0.0050 U	0.01	6	0	0.0050 U	.0020 U	0.0025
Silver (Ag)	0.0076	0.0100 U	0.05	6	0	0.0076 U	.0100 U	0.0038
Sodium (Na)	2.1000	46.2450	NS	6	0	14.20	5 U	11
Strontium (Sr)	0.0200	0.3960	NS	6	0	.421	0.395	0.2110
Thallium (Tl)	0.0100	0.0100 U	0.01U	6	0	0.0100 U	.0030 U	0.0050
Tin (Sn)	0.1000	0.1000 U	0.1	5	0	0.1000 U	.100 U	0.0500
Vanadium (V)	0.0240	0.0500 U	0.1	6	0	0.0240 U	0.010 U	0.0120
Zinc (Zn)	0.0200	0.0320 *	2.0	6	0	.0270	.0200 U	0.0152

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW103

903-PAD AND LIP SITE
TOTAL METAL CONSTITUENT CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.2000	0.9160 *	0.2U	18	15	28.30 +	.0002 U	4.3912 +
Antimony (Sb)	0.0600	0.0600 U	0.064U#	18	0	0.0600 U	.00004 U	0.0300
Arsenic (As)	0.0100	0.0100 U	0.05	18	0	.0024	.00001 U	0.0049
Barium (Ba)	0.2000	0.2000 U	1.0	18	0	.573	.0003	0.2274
Beryllium (Be)	0.0050	0.0050 U	0.1	18	0	.0069	.0020 U	0.0026
Cadmium (Cd)	0.0050	0.0050 U	0.01	18	0	0.0050 U	.0040 U	0.0025
Calcium (Ca)	5.0000	85.0080		18	0	156	.109	96
Cesium (Cs)	1.0000	1.0000 U	1.0U#	13	0	1.0000 U	.0010 U	0.5000
Chromium (Cr)	0.0100	0.0100 U	0.05	18	0	.0288	.00001 U	0.0083
Cobalt (Co)	0.0500	0.0500 U	0.05U	18	0	0.0500 U	.00005 U	0.0250
Copper (Cu)	0.0250	0.0250 U	0.2	18	0	.0570	.00003 U	0.0172
Iron (Fe)	0.1000	3.1670	1.0	18	10	26.70 +	.0001 U	5.1458 +
Lead (Pb)	0.0050	0.0050 U	0.05	18	1	.0576 +	.0030 U	0.0147
Lithium (Li)	0.1000	0.1000 U	2.5	13	1	3.20 +	.0831	0.1553
Magnesium (Mg)	5.0000	12.4800		18	0	31.10	.0229	15
Manganese (Mn)	0.0150	0.6360	1.0	18	0	.954	.0016	0.2222
Mercury (Hg)	0.0002	0.0010	0.002	18	0	.0006	.0002 U	0.0001
Molybdenum(Mo)	0.1000	0.1000 U	0.1	13	0	.0275	.0275	0.0494
Nickel (Ni)	0.0400	0.0400 U	0.2	18	0	.0654	.00004 U	0.0225
Potassium (K)	5.0000	5.0000 U		18	0	8.77	.0050 U	3.0231
Selenium (Se)	0.0050	0.0050 U	0.01	18	1	.0126 +	.0020 U	0.0032
Silver (Ag)	0.0100	0.0106 *	0.05	18	0	0.0100 U	.00001 U	0.0050
Sodium (Na)	5.0000	47.3620		18	0	86.90	.0592	26
Strontium (Sr)	0.2000	0.3820	NS	18	0	.879	.0006	0.3138
Thallium (Tl)	0.0100	0.0500 U	0.05U	18	0	0.0100 U	.00001 U	0.0050
Tin (Sn)	0.2000	0.1000 U	0.1U	13	2	.141 +	.100 U	0.1020 +
Vanadium (V)	0.0500	0.0500 U	0.1	18	0	.0852	.00005 U	0.0282
Zinc (Zn)	0.0200	0.0276	2.0	18	2	2.84 +	.00003	0.2829

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW050, SW051, SW052, SW055, SW057, SW058, SW077

STATION 53
TOTAL METAL CONSTITUENT CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.2000	0.9160 *	0.2U	6	4	6.62 +	.200 U	1.7060 +
Antimony (Sb)	0.0600	0.0600 U	0.064U#	6	0	0.0600 U	.040 U	0.0300
Arsenic (As)	0.0100	0.0100 U	0.05	6	0	0.0100 U	.010 U	0.0050
Barium (Ba)	0.2000	0.2000 U	1.0	6	0	.448	.218	0.2727
Beryllium (Be)	0.0050	0.0050 U	0.1	6	0	.0055	.005 U	0.0030
Cadmium (Cd)	0.0050	0.0050 U	0.01	6	0	0.0050 U	.005 U	0.0025
Calcium (Ca)	5.0000	85.0080		6	0	146	116	135
Cesium (Cs)	1.0000	1.0000 U	1.0U#	5	0	1.0000 U	.100 U	0.5000
Chromium (Cr)	0.0100	0.0100 U	0.05	6	0	0.0100 U	.010 U	0.0050
Cobalt (Co)	0.0500	0.0500 U	0.05U	6	0	0.0500 U	.050 U	0.0250
Copper (Cu)	0.0250	0.0250 U	0.2	6	0	.0299	.025 U	0.0154
Iron (Fe)	0.1000	3.1670	1.0	6	6	22.30 +	5.06 +	8.8400 +
Lead (Pb)	0.0050	0.0050 U	0.05	7	1	.0623 +	.0030 U	0.0110
Lithium (Li)	0.1000	0.1000 U	2.5	5	0	.0240	.0240	0.0448
Magnesium (Mg)	5.0000	12.4800		6	0	31.30	24.60	28
Manganese (Mn)	0.0150	0.6360	1.0	6	0	.719	.467	0.5873
Mercury (Hg)	0.0002	0.0010	0.002	6	0	.0007	.0002 U	0.0002
Molybdenum (Mo)	0.1000	0.1000 U	0.1	5	0	0.1000 U	.0100 U	0.0500
Nickel (Ni)	0.0400	0.0400 U	0.2	6	0	0.0400 U	.040 U	0.0200
Potassium (K)	5.0000	5.0000 U		6	0	5.0000 U	5 U	2.5000
Selenium (Se)	0.0050	0.0050 U	0.01	6	0	0.0050 U	.005 U	0.0025
Silver (Ag)	0.0100	0.0106 *	0.05	6	0	0.0100 U	.010 U	0.0050
Sodium (Na)	5.0000	47.3620		6	0	20.90	14.70	18
Strontium (Sr)	0.2000	0.3820	NS	6	0	.847	.796	0.4575
Thallium (Tl)	0.0100	0.0500 U	0.05U	6	0	0.0100 U	.010 U	0.0050
Tin (Sn)	0.2000	0.1000 U	0.1U	5	1	.109 +	.100 U	0.1018 +
Vanadium (V)	0.0500	0.0500 U	0.1	6	0	0.0500 U	.050 U	0.0250
Zinc (Zn)	0.0200	0.0276	2.0	6	0	.121	.0200 U	0.0370

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW053

SOUTH WALNUT CREEK
TOTAL METAL CONSTITUENT CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.2000	0.9160 *	0.2U	27	19	25.40 +	.0300 U	3.9927 +
Antimony (Sb)	0.0600	0.0600 U	0.064U#	27	0	.0611	0.060 U	0.0309
Arsenic (As)	0.0100	0.0100 U	0.05	27	0	0.0100 U	.0020 U	0.0050
Barium (Ba)	0.2000	0.2000 U	1.0	27	1	2.02 +	.170	0.2330
Beryllium (Be)	0.0050	0.0050 U	0.1	27	0	.0572	.0020 U	0.0051
Cadmium (Cd)	0.0050	0.0050 U	0.01	27	1	.0142 +	.0040 U	0.0030
Calcium (Ca)	5.0000	85.0080		27	0	152	7.73	80
Cesium (Cs)	1.0000	1.0000 U	1.0U#	23	0	1.0000 U	.0010 U	0.5000
Chromium (Cr)	0.0100	0.0100 U	0.05	27	1	.212 +	0.010 U	0.0151
Cobalt (Co)	0.0500	0.0500 U	0.05U	27	1	.132 +	.0200 U	0.0295
Copper (Cu)	0.0250	0.0250 U	0.2	27	1	.293 +	.0200 U	0.0271
Iron (Fe)	0.1000	3.1670	1.0	27	12	204 +	.0855	12 +
Lead (Pb)	0.0050	0.0050 U	0.05	27	1	.215 +	.0020 U	0.0140
Lithium (Li)	0.1000	0.1000 U	2.5	23	0	.152	.0100 U	0.0533
Magnesium (Mg)	5.0000	12.4800		27	0	36.70	5.0 U	14
Manganese (Mn)	0.0150	0.6360	1.0	27	1	3.68 +	.0100 U	0.3603
Mercury (Hg)	0.0002	0.0010	0.002	27	1	.0024 +	0.0002 U	0.0002
Molybdenum(Mo)	0.1000	0.1000 U	0.1	23	1	.174 +	.0100 U	0.0561
Nickel (Ni)	0.0400	0.0400 U	0.2	27	1	.246 +	.0200 U	0.0294
Potassium (K)	5.0000	5.0000 U		27	0	21.50	.624	3.3224
Selenium (Se)	0.0050	0.0050 U	0.01	27	0	.0059	.0020 U	0.0026
Silver (Ag)	0.0100	0.0106 *	0.05	27	0	.0117	0.010 U	0.0053
Sodium (Na)	5.0000	47.3620		27	0	58.20	5 U	29
Strontium (Sr)	0.2000	0.3820	NS	27	0	0.8	.100 U	0.2317
Thallium (Tl)	0.0100	0.0500 U	0.05U	27	0	0.0100 U	.0030 U	0.0050
Tin (Sn)	0.2000	0.1000 U	0.1U	23	0	0.2000 U	.100 U	0.1000
Vanadium (V)	0.0500	0.0500 U	0.1	27	1	.555 +	.0100 U	0.0499
Zinc (Zn)	0.0200	0.0276	2.0	27	0	1.19	.0200 U	0.2363

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW056, SW060, SW061, SW101

STATION 59
TOTAL METAL CONSTITUENT CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.2000	0.9160 *	0.2U	7	5	22.80 +	.190	6.6900 +
Antimony (Sb)	0.0600	0.0600 U	0.064U#	7	1	.102 +	0.060 U	0.0403
Arsenic (As)	0.0100	0.0100 U	0.05	7	0	0.0100 U	.0020 U	0.0050
Barium (Ba)	0.2000	0.2000 U	1.0	7	0	.461	.166	0.2094
Beryllium (Be)	0.0050	0.0050 U	0.1	7	0	.0076	.0020 U	0.0037
Cadmium (Cd)	0.0050	0.0050 U	0.01	7	0	0.0050 U	.0040 U	0.0025
Calcium (Ca)	5.0000	85.0080		7	0	466	102	183
Cesium (Cs)	1.0000	1.0000 U	1.0U#	6	0	1.0000 U	.0010 U	0.5000
Chromium (Cr)	0.0100	0.0100 U	0.05	7	0	.0232	0.010 U	0.0090
Cobalt (Co)	0.0500	0.0500 U	0.05U	7	0	0.0500 U	.0200 U	0.0250
Copper (Cu)	0.0250	0.0250 U	0.2	7	0	.0446	.0200 U	0.0215
Iron (Fe)	0.1000	3.1670	1.0	7	4	17 +	.100 U	5.7857 +
Lead (Pb)	0.0050	0.0050 U	0.05	7	0	.0317	.0020 U	0.0124
Lithium (Li)	0.1000	0.1000 U	2.5	6	1	2.56 +	.0250	0.4608
Magnesium (Mg)	5.0000	12.4800		7	0	28.70	20.60	25
Manganese (Mn)	0.0150	0.6360	1.0	7	0	.197	.0100 U	0.0723
Mercury (Hg)	0.0002	0.0010	0.002	7	0	.0006	0.0002 U	0.0002
Molybdenum(Mo)	0.1000	0.1000 U	0.1	6	0	.0191	.0191	0.0449
Nickel (Ni)	0.0400	0.0400 U	0.2	7	0	0.0400 U	.0200 U	0.0200
Potassium (K)	5.0000	5.0000 U		7	0	.819	.819	2.2599
Selenium (Se)	0.0050	0.0050 U	0.01	7	1	.0160 +	.0020 U	0.0044
Silver (Ag)	0.0100	0.0106 *	0.05	7	0	0.0100 U	0.010 U	0.0050
Sodium (Na)	5.0000	47.3620		7	0	37.60	29	33
Strontium (Sr)	0.2000	0.3820	NS	7	0	1.36	.601	0.6096
Thallium (Tl)	0.0100	0.0500 U	0.05U	7	0	0.0100 U	.0030 U	0.0050
Tin (Sn)	0.2000	0.1000 U	0.1U	6	0	0.2000 U	.100 U	0.1000
Vanadium (V)	0.0500	0.0500 U	0.1	7	0	.0595	.0100 U	0.0347
Zinc (Zn)	0.0200	0.0276	2.0	7	1	2.66 +	.209	0.8141

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW059

STATION 63
TOTAL METAL CONSTITUENT CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.2000	0.9160 *	0.2U	1	1	0.750 +	0.750 +	0.7500 +
Antimony (Sb)	0.0600	0.0600 U	0.064U#	1	0	0.0600 U	0.500 U +	0.0300
Arsenic (As)	0.0100	0.0100 U	0.05	1	0	0.003	0.003	0.0030
Barium (Ba)	0.2000	0.2000 U	1.0	1	0	0.107	0.107	0.1070
Beryllium (Be)	0.0050	0.0050 U	0.1	1	0	0.0050 U	0.002 U	0.0025
Cadmium (Cd)	0.0050	0.0050 U	0.01	1	0	0.0050 U	0.004 U	0.0025
Calcium (Ca)	5.0000	85.0080		1	0	94.5	94.5	95
Cesium (Cs)	1.0000	1.0000 U	1.0U#	0	0			*******
Chromium (Cr)	0.0100	0.0100 U	0.05	1	0	0.0100 U	0.020 U	0.0050
Cobalt (Co)	0.0500	0.0500 U	0.05U	1	0	0.0500 U	0.020 U	0.0250
Copper (Cu)	0.0250	0.0250 U	0.2	1	0	0.0250 U	0.020 U	0.0125
Iron (Fe)	0.1000	3.1670	1.0	1	1	1.32 +	1.32 +	1.3200 +
Lead (Pb)	0.0050	0.0050 U	0.05	1	0	0.006	0.006	0.0060
Lithium (Li)	0.1000	0.1000 U	2.5	0	0			*******
Magnesium (Mg)	5.0000	12.4800		1	0	32.0	32.0	32
Manganese (Mn)	0.0150	0.6360	1.0	1	0	0.465	0.465	0.4650
Mercury (Hg)	0.0002	0.0010	0.002	1	0	0.0002 U	0.0002 U	0.0001
Molybdenum (Mo)	0.1000	0.1000 U	0.1	0	0			*******
Nickel (Ni)	0.0400	0.0400 U	0.2	1	0	0.0400 U	0.020 U	0.0200
Potassium (K)	5.0000	5.0000 U		1	0	1.61	1.61	1.6100
Selenium (Se)	0.0050	0.0050 U	0.01	1	1	0.011 +	0.011 +	0.0110 +
Silver (Ag)	0.0100	0.0106 *	0.05	1	0	0.0100 U	0.030 U	0.0050
Sodium (Na)	5.0000	47.3620		1	0	98.4	98.4	98
Strontium (Sr)	0.2000	0.3820	NS	1	0	1.25	1.25	1.2500
Thallium (Tl)	0.0100	0.0500 U	0.05U	1	0	0.0100 U	0.300 U +	0.0050
Tin (Sn)	0.2000	0.1000 U	0.1U	0	0			*******
Vanadium (V)	0.0500	0.0500 U	0.1	1	0	0.0500 U	0.010 U	0.0250
Zinc (Zn)	0.0200	0.0276	2.0	1	0	0.0200 U	0.020 U	0.0100

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW063

STATION 64
TOTAL METAL CONSTITUENT CONCENTRATIONS
IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.2000	0.9160 *	0.2U	3	3	15.4 +	.446 +	5.6147 +
Antimony (Sb)	0.0600	0.0600 U	0.064U#	3	0	0.0600 U	.0600 U	0.0300
Arsenic (As)	0.0100	0.0100 U	0.05	3	0	0.006	0.006	0.0053
Barium (Ba)	0.2000	0.2000 U	1.0	3	0	0.268	.200 U	0.1560
Beryllium (Be)	0.0050	0.0050 U	0.1	3	0	0.0050 U	0.002 U	0.0025
Cadmium (Cd)	0.0050	0.0050 U	0.01	3	0	0.007	.0050 U	0.0040
Calcium (Ca)	5.0000	85.0080		3	0	136	68.50	92
Cesium (Cs)	1.0000	1.0000 U	1.0U#	2	0	1.0000 U	.100 U	0.5000
Chromium (Cr)	0.0100	0.0100 U	0.05	3	0	0.041	.0100 U	0.0170
Cobalt (Co)	0.0500	0.0500 U	0.05U	3	0	0.0500 U	0.020 U	0.0250
Copper (Cu)	0.0250	0.0250 U	0.2	3	0	0.041	.0250 U	0.0220
Iron (Fe)	0.1000	3.1670	1.0	3	2	17.1 +	.920	6.3633 +
Lead (Pb)	0.0050	0.0050 U	0.05	3	0	0.0050 U	0.004 U	0.0025
Lithium (Li)	0.1000	0.1000 U	2.5	2	0	.0925	.0925	0.0713
Magnesium (Mg)	5.0000	12.4800		3	0	56.7	44.80	52
Manganese (Mn)	0.0150	0.6360	1.0	3	0	0.368	.0515	0.1579
Mercury (Hg)	0.0002	0.0010	0.002	3	0	0.0002 U	0.0002 U	0.0001
Molybdenum(Mo)	0.1000	0.1000 U	0.1	2	0	0.1000 U	.0100 U	0.0500
Nickel (Ni)	0.0400	0.0400 U	0.2	3	0	0.023	0.023	0.0210
Potassium (K)	5.0000	5.0000 U		3	0	3.42	3.42	2.8067
Selenium (Se)	0.0050	0.0050 U	0.01	3	1	.0115 +	.0050 U	0.0055
Silver (Ag)	0.0100	0.0106 *	0.05	3	0	0.0100 U	.0100 U	0.0050
Sodium (Na)	5.0000	47.3620		3	0	110	99.30	105
Strontium (Sr)	0.2000	0.3820	NS	3	0	1.36	1.14	1.2333
Thallium (Tl)	0.0100	0.0500 U	0.05U	3	0	0.0100 U	.0100 U	0.0050
Tin (Sn)	0.2000	0.1000 U	0.1U	2	0	0.2000 U	.100 U	0.1000
Vanadium (V)	0.0500	0.0500 U	0.1	3	0	0.033	0.033	0.0277
Zinc (Zn)	0.0200	0.0276	2.0	3	0	0.126	.0200 U	0.0713

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW064

STATION 103
TOTAL METAL CONSTITUENT CONCENTRATIONS IN SURFACE WATER
ALL CONCENTRATIONS IN mg/l

Analyte	Detection Limit***	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	Average of** All Values
Aluminum (Al)	0.2000	0.9160 *	0.2U	6	6	169 +	0.766 +	36 +
Antimony (Sb)	0.0600	0.0600 U	0.064U#	6	0	0.0600 U	.0600 U	0.0300
Arsenic (As)	0.0100	0.0100 U	0.05	6	0	.0448	0.002 U	0.0185
Barium (Ba)	0.2000	0.2000 U	1.0	6	1	4.23 +	0.174	1.1015 +
Beryllium (Be)	0.0050	0.0050 U	0.1	6	0	.0214	0.002 U	0.0056
Cadmium (Cd)	0.0050	0.0050 U	0.01	6	1	.0241 +	0.004 U	0.0061
Calcium (Ca)	5.0000	85.0080		6	0	903	99.0	309
Cesium (Cs)	1.0000	1.0000 U	1.0U#	5	1	1.11 +	.0010 U	0.6220
Chromium (Cr)	0.0100	0.0100 U	0.05	6	1	.172 +	.0100 U	0.0410
Cobalt (Co)	0.0500	0.0500 U	0.05U	6	1	.224 +	0.020 U	0.0582 +
Copper (Cu)	0.0250	0.0250 U	0.2	6	1	.213 +	0.020 U	0.0650
Iron (Fe)	0.1000	3.1670	1.0	6	5	142 +	0.691	40 +
Lead (Pb)	0.0050	0.0050 U	0.05	6	3	.656 +	0.005	0.1528 +
Lithium (Li)	0.1000	0.1000 U	2.5	5	0	.116	.0180	0.0568
Magnesium (Mg)	5.0000	12.4800		6	0	56.80	5 U	19
Manganese (Mn)	0.0150	0.6360	1.0	6	3	10.70 +	0.019	2.7192 +
Mercury (Hg)	0.0002	0.0010	0.002	5	0	.0009	0.0002 U	0.0003
Molybdenum (Mo)	0.1000	0.1000 U	0.1	5	1	.114 +	.100 U	0.0628
Nickel (Ni)	0.0400	0.0400 U	0.2	6	1	.273 +	0.020 U	0.0622
Potassium (K)	5.0000	5.0000 U		6	0	32.70	0.928	7.5297
Selenium (Se)	0.0050	0.0050 U	0.01	6	0	0.0050 U	.0020 U	0.0025
Silver (Ag)	0.0100	0.0106 *	0.05	6	0	0.0100 U	.0100 U	0.0050
Sodium (Na)	5.0000	47.3620		6	0	20.60	5 U	13
Strontium (Sr)	0.2000	0.3820	NS	6	0	2.27	0.389	0.5650
Thallium (Tl)	0.0100	0.0500 U	0.05U	6	0	0.0100 U	.0030 U	0.0050
Tin (Sn)	0.2000	0.1000 U	0.1U	5	0	0.2000 U	.100 U	0.1000
Vanadium (V)	0.0500	0.0500 U	0.1	6	2	.445 +	0.010 U	0.1248 +
Zinc (Zn)	0.0200	0.0276	2.0	6	0	.772	0.020 U	0.2563

(+) Value exceeds ARAR; (____) Value exceeds background; # - Value shown is TBC; *Where no Tolerance Interval, highest background value.
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW103

903-PAD AND LIP SITE
INORGANIC CONSTITUENT CONCENTRATIONS
ALL CONCENTRATIONS IN MG/L

Analyte	***CRDL	Background Value*	ARAR/TBC Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Nitrate-Nitrite as N	5.0000	2.69	10	27	1	24 +	0.06	2.900
Chloride	5.0000	106.94	250	27	0	120	16.9	35
Sulfate	5.0000	48.81	250	27	0	120	1.0 U	47
Total Dissolved Solids	5.0000	271.15	400	27	22	790 +	332	479 +
HCO3-	10.0000	296.97	NS	27	0	600	220	357

(+) Value exceeds ARAR; (____) Value exceeds background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW050, SW051, SW052, SW055, SW057, SW058, SW077

STATION 53
INORGANIC CONSTITUENT CONCENTRATIONS
ALL CONCENTRATIONS IN MG/L

Analyte	***CRDL	Background Value*	ARAR/TBC Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Nitrate-Nitrite as N	5.0000	2.69	10	10	0	0.17	0.05 U	2.024
Chloride	5.0000	106.94	250	10	0	170	30.6	68
Sulfate	5.0000	48.81	250	10	0	49	5 U	27
Total Dissolved Solids	5.0000	271.15	400	10	10	666 +	460 +	534 +
HCO3-	10.0000	296.97	NS	10	0	710	370	473

(+) Value exceeds ARAR; (____) Value exceeds background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW053

SOUTH WALNUT CREEK
INORGANIC CONSTITUENT CONCENTRATIONS
ALL CONCENTRATIONS IN MG/L

Analyte	***CRDL	Background Value*	ARAR/TBC Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Nitrate-Nitrite as N	5.0000	2.69	10	43	0	5.6	0.05 U	3.246
Chloride	5.0000	106.94	250	43	0	81	3 U	35
Sulfate	5.0000	48.81	250	43	0	74	16	43
Total Dissolved Solids	5.0000	271.15	400	43	22	3300 +	26	411 +
HCO3-	10.0000	296.97	NS	43	0	540	6	260

(+) Value exceeds ARAR; (____) Value exceeds background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW056, SW060, SW061, SW101

STATION 59
INORGANIC CONSTITUENT CONCENTRATIONS
ALL CONCENTRATIONS IN MG/L

Analyte	***CRDL	Background Value*	ARAR/TBC Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Nitrate-Nitrite as N	5.0000	2.69	10	11	0	5	2.7	4.009
Chloride	5.0000	106.94	250	11	0	53	27	45
Sulfate	5.0000	48.81	250	11	0	60	24.5	49
Total Dissolved Solids	5.0000	271.15	400	11	10	580 +	210	477 +
HCO3-	10.0000	296.97	NS	11	0	500	324	400

(+) Value exceeds ARAR; (____) Value exceeds background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW059

STATION 63
INORGANIC CONSTITUENT CONCENTRATIONS
ALL CONCENTRATIONS IN MG/L

Analyte	***CRDL	Background Value*	ARAR/TBC Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Nitrate-Nitrite as N	5.0000	2.69	10	2	0	5.0000 U	0.1 U	2.500
Chloride	5.0000	106.94	250	2	0	51	50.5	51
Sulfate	5.0000	48.81	250	2	0	228	197	213
Total Dissolved Solids	5.0000	271.15	400	2	2	675 +	651 +	663 +
HCO3-	10.0000	296.97	NS	2	0	384	361	373

(+) Value exceeds ARAR; (____) Value exceeds background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW063

STATION 64
INORGANIC CONSTITUENT CONCENTRATIONS
ALL CONCENTRATIONS IN MG/L

Analyte	***CRDL	Background Value*	ARAR/TBC Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Nitrate-Nitrite as N	5.0000	2.69	10	4	0	0.2	0.05 U	1.343
Chloride	5.0000	106.94	250	4	0	64	0.5 U	42
Sulfate	5.0000	48.81	250	4	0	130	4.0 U	82
Total Dissolved Solids	5.0000	271.15	400	4	4	720 +	660 +	694 +
HCO3-	10.0000	296.97	NS	4	0	580	404	484

(+) Value exceeds ARAR; (____) Value exceeds background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW064

STATION 103
INORGANIC CONSTITUENT CONCENTRATIONS
ALL CONCENTRATIONS IN MG/L

Analyte	***CRDL	Background Value*	ARAR/TBC Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Nitrate-Nitrite as N	5.0000	2.69	10	10	0	7.3	3.9	5.450
Chloride	5.0000	106.94	250	10	0	48	31	40
Sulfate	5.0000	48.81	250	10	0	68	51	58
Total Dissolved Solids	5.0000	271.15	400	10	8	490 +	210	406 +
HCO3-	10.0000	296.97	NS	10	0	710	251	361

(+) Value exceeds ARAR; (____) Value exceeds background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates non-detected, the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL)*.
NS-No Standard. U-Detection Limit. J-Present below Detection Limit. B-Present in Blank.
Minimum, Maximum, and Average based on all available data.
Wells/Stations in this group: SW103

903-PAD AND LIP SITE
DISSOLVED RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	4.3760	7.0	5	0	5.67	< 2.00	2.8
Gross Beta	8.7980	5.0	5	0	.28	< 4.00	2.0
Strontium 89, 90	1.3980	8.0	0	0		< 1.00	*******
Plutonium 239, 240	0.0000	.05	5	3	1.06 +	< 0.01	0.40 +
Americium 241	0.0130	.05	0	0		< 0.01	*******
Tritium	0.0000	500	0	0			*******
Total Uranium	1.8000*	5.0	5	1	5.020 +	2.860	4.0

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW050, SW051, SW052, SW055, SW057, SW058, SW077

STATION 53
DISSOLVED RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	4.3760	7.0	2	1	8.48 +	< 2.00	4.7
Gross Beta	8.7980	5.0	2	1	7 +	< 4.00	4.5
Strontium 89, 90	1.3980	8.0	1	0	.0	< 1.00	0.50
Plutonium 239, 240	0.0000	.05	2	2	1.89 +	0.20 +	1.0 +
Americium 241	0.0130	.05	1	0	0.03	0.03	0.030
Tritium	0.0000	500	0	0			*******
Total Uranium	1.8000*	5.0	2	1	7.260 +	2.000	4.6

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW053

SOUTH WALNUT CREEK
DISSOLVED RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	4.3760	7.0	8	1	20.6 +	< 2.00	3.8
Gross Beta	8.7980	5.0	8	5	43.7 +	< 4.00	10.0 +
Strontium 89, 90	1.3980	8.0	4	0	.3	< 1.00	0.50
Plutonium 239, 240	0.0000	.05	8	0	.108 +	< 0.01	0.0081
Americium 241	0.0130	.05	4	0	0.02	< 0.01	0.0050
Tritium	0.0000	500	0	0			*******
Total Uranium	1.8000*	5.0	8	5	10.260 +	< 1.80	4.9

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW056, SW060, SW061, SW101

STATION 59
DISSOLVED RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	4.3760	7.0	2	1	16 +	5.03	11 +
Gross Beta	8.7980	5.0	2	1	8.24 +	< 4.00	5.1 +
Strontium 89, 90	1.3980	8.0	1	0	0.2	< 1.00	0.50
Plutonium 239, 240	0.0000	.05	2	0	.0117	< 0.01	0.0075
Americium 241	0.0130	.05	1	0	0.01	< 0.01	0.0050
Tritium	0.0000	500	0	0			*******
Total Uranium	1.8000*	5.0	2	2	7.500 +	5.660 +	6.6 +

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW059

STATION 63
DISSOLVED RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	4.3760	7.0	1	1	8.25 +	8.25 +	8.3 +
Gross Beta	8.7980	5.0	1	1	18.9 +	18.9 +	19 +
Strontium 89, 90	1.3980	8.0	0	0		< 1.00	*******
Plutonium 239, 240	0.0000	.05	1	0	.0750 +	< 0.01	0.0050
Americium 241	0.0130	.05	0	0		< 0.01	*******
Tritium	0.0000	500	0	0			*******
Total Uranium	1.8000*	5.0	1	1	17.790 +	17.790 +	18 +

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW063

STATION 64
DISSOLVED RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	4.3760	7.0	1	0	6.34	6.34	6.3
Gross Beta	8.7980	5.0	1	1	7.20 +	7.20 +	7.2 +
Strontium 89, 90	1.3980	8.0	0	0		< 1.00	*******
Plutonium 239, 240	0.0000	.05	1	0	.00	< 0.01	0.0050
Americium 241	0.0130	.05	0	0		< 0.01	*******
Tritium	0.0000	500	0	0			*******
Total Uranium	1.8000*	5.0	1	1	15.530 +	15.530 +	16 +

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW064

STATION 103
DISSOLVED RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	4.3760	7.0	2	0	.03	< 2.00	1.0
Gross Beta	8.7980	5.0	2	1	21.7 +	< 4.00	12 +
Strontium 89, 90	1.3980	8.0	1	0	0.2	< 1.00	0.50
Plutonium 239, 240	0.0000	.05	2	0	.01	< 0.01	0.0050
Americium 241	0.0130	.05	1	0	.00	< 0.01	0.0050
Tritium	0.0000	500	0	0			*******
Total Uranium	1.8000*	5.0	2	0	4.440	3.300	3.9

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW103

903-PAD AND LIP SITE
TOTAL RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	7.7450	7.0	13	11	350 +	< 2.00	85 +
Gross Beta	9.8880	5.0	13	11	65 +	< 4.00	29 +
Strontium 89, 90	2.0400	8.0	13	0	2.5	< 1.00	0.69
Plutonium 239, 240	0.0180	.05	18	17	60 +	< 0.01	15 +
Americium 241	0.0420	.05	13	7	33 +	< 0.01	2.0 +
Tritium	257.18	500	18	1	829 +	<400.00	230
Total Uranium	1.8000*	5.0	18	4	18,100 +	1.770	4.5

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW050, SW051, SW052, SW055, SW057, SW058, SW077

STATION 53
TOTAL RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	7.7450	7.0	4	3	230 +	3.2	125 +
Gross Beta	9.8880	5.0	4	3	14 +	< 4.00	7.8 +
Strontium 89, 90	2.0400	8.0	4	0	29 +	< 1.00	1.3
Plutonium 239, 240	0.0180	.05	5	5	56 +	1.101 +	20 +
Americium 241	0.0420	.05	4	3	28 +	< 0.01	9.5 +
Tritium	257.18	500	5	0	310	<400.00	222
Total Uranium	1.8000*	5.0	5	2	8.470 +	1.500	5.2 +

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW053

SOUTH WALNUT CREEK
TOTAL RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	7.7450	7.0	23	12	780 +	< 2.00	73 +
Gross Beta	9.8880	5.0	23	22	570 +	< 4.00	56 +
Strontium 89, 90	2.0400	8.0	23	0	24 +	< 1.00	0.72
Plutonium 239, 240	0.0180	.05	27	8	3.3 +	< 0.01	0.32 +
Americium 241	0.0420	.05	21	6	0.44 +	< 0.01	0.083 +
Tritium	257.18	500	27	0	500	<400.00	225
Total Uranium	1.8000*	5.0	27	14	11,100 +	1.990	5.5 +

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW056, SW060, SW061, SW101

STATION 59
TOTAL RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	7.7450	7.0	5	3	310 +	< 2.00	96 +
Gross Beta	9.8880	5.0	5	4	340 +	4	96 +
Strontium 89, 90	2.0400	8.0	5	0	1.0	< 1.00	0.60
Plutonium 239, 240	0.0180	.05	6	3	3.1 +	< 0.01	0.75 +
Americium 241	0.0420	.05	5	2	1.3 +	< 0.01	0.30 +
Tritium	257.18	500	6	0	200	<400.00	200
Total Uranium	1.8000*	5.0	6	5	16.600 +	0.200	7.9 +

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW059

STATION 63
TOTAL RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	7.7450	7.0	0	0			*******
Gross Beta	9.8880	5.0	0	0			*******
Strontium 89, 90	2.0400	8.0	0	0			*******
Plutonium 239, 240	0.0180	.05	1	1	0.242 +	0.242 +	0.24 •
Americium 241	0.0420	.05	0	0			*******
Tritium	257.18	500	1	1	1100 +	1100 +	1100 +
Total Uranium	1.8000*	5.0	1	1	20.500 +	20.500 +	21 +

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW063

STATION 64
TOTAL RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	7.7450	7.0	2	2	34 +	17 +	26 +
Gross Beta	9.8880	5.0	2	2	93 +	17 +	55 +
Strontium 89, 90	2.0400	8.0	2	0	1.5	< 1.00	1.0
Plutonium 239, 240	0.0180	.05	3	0	.123 +	< 0.01	0.0050
Americium 241	0.0420	.05	2	0	.01	< 0.01	0.0050
Tritium	257.18	500	3	0	110	<400.00	200
Total Uranium	1.8000*	5.0	3	2	23.590 +	3.600	13 +

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW064

STATION 103
TOTAL RADIOCHEMISTRY CONCENTRATIONS
FOR SURFACE WATER
ALL CONCENTRATIONS IN pCi/l

Analyte	Background Value*	ARAR Value	Number of Results	Number of Results Above ARAR	Maximum Value	Minimum Value	**Average of All Values
Gross Alpha	7.7450	7.0	4	3	53 +	< 2.00	26 +
Gross Beta	9.8880	5.0	4	3	55 +	< 4.00	28 +
Strontium 89, 90	2.0400	8.0	4	0	37 +	< 1.00	0.50
Plutonium 239, 240	0.0180	.05	5	4	1.4 +	0.01	0.48 +
Americium 241	0.0420	.05	4	3	.330 +	< 0.01	0.14 +
Tritium	257.18	500	5	0	458	<400.00	244
Total Uranium	1.8000*	5.0	5	2	7.330 +	0.100	3.9

(+) Value exceeds ARAR; (_____) Value exceeds Background
The average is computed by first determining the arithmetic mean concentration at individual wells/stations and then using this data to compute the arithmetic mean for the wells/stations in this group. If a datum indicates a less than (<) value, or the counting error for a datum is greater than the datum, the value used in the computation is one half the Minimum Detectable Activity (MDA).
NS-No Standard *When no Background Tolerance Interval value used is the Minimum Detectable Activity (MDA)
Minimum, Maximum, and Average based on all availabe data.
Wells/Stations in this group: SW103

APPENDIX D

MILESTONE SCHEDULE

SURFACE WATER IM/IRAP/EA

SOUTH WALNUT CREEK BASIN

OPERABLE UNIT NO. 2

TABLE D-1

MILESTONE SCHEDULE

SURFACE WATER IM/IRAP/EA
SOUTH WALNUT CREEK BASIN
OPERABLE UNIT NO. 2

SOUTH WALNUT CREEK BASIN INTERIM MEASURE/INTERIM REMEDIAL ACTION PLAN/ ENVIRONMENTAL ASSESSMENT (IM/IRAP/EA) AND DECISION DOCUMENT

Submit Draft Proposed IM/IRA Decision Document	June 19, 1990
Submit Proposed IM/IRA Decision Document to EPA/CDH	September 18, 1990
Public Review of Proposed IM/IRA Decision Document	September 26, 1990
Submit Draft Responsiveness Summary and Final IM/IRA Decision Document	January 11, 1991
Field Treatability Test System Installation Complete	April 12, 1991
Begin Field Treatability Testing	April 15, 1991
Complete IM/IRA Construction	September 30, 1991
Begin Field Treatability Testing (Entire System)	October 30, 1991
Submit Draft Treatability Test Report	April 1, 1992
Submit Final Treatability Test Program Report	June 2, 1992

APPENDIX E

ARAR TABLES FOR

SURFACE WATER CONTAMINANTS

TABLE E-1.1
CHEMICAL SPECIFIC ARARs
FOR VOLATILE ORGANIC COMPOUNDS
IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	Maximum Concentration in Surface Water* (ug/l)	ARAR (ug/l)	TBC (ug/l)	ARAR Reference	Comment	Hazard Quotient/ Cancer Risk*
Organic Compounds						
Vinyl Chloride	15	2		WQCC Surface Water; Drinking Water Standard		No oral RfD/ 1.3E-04
Methylene Chloride	44		5U	No Standard	RCRA Subpart F background is TBC	2.4E-03/1.1E-06
Acetone	130		10U	No Standard	Acetone is RCRA (40 CFR Part 264, Subpart F) Appendix IX constituent. Background is TBC.	2.8E-03/not considered an oral carcinogen.
Carbon Tetrachloride	605	5		WQCC Surface Water; Drinking Water Standard		2.0E-01/1.9E-05
1,1 Dichloroethane	6		5U	No Standard	RCRA Subpart F background is TBC	1.4E-03/1.3E-05
1,2 Dichloroethene	56		5U	No Standard	RCRA Subpart F background is TBC	7.1E-03 (based on transisomer)/ not considered an oral carcinogen
1,1 Dichloroethene	143	7		WQCC Surface Water; Drinking Water Standard		2.24E-02/1.2E-04
Tetrachloroethene	280	1.0U		WQCC Surface Water; Fish and Water Ingestion Standard	Standard (0.8) is below detection limit, therefore, detection limit is ARAR.	2.8E-03/1.5E-06
Trichloroethene	260	5		WQCC Surface Water; Drinking Water Standard		No oral RfD/ 1.6E-06
Chloroform	82	1U		WQCC Surface Water; Fish and Water Ingestion Standard	Standard is below detection limit, therefore, detection limit is ARAR	2.9E-3/1.7E-7

TABLE E-1.2
CHEMICAL SPECIFIC ARARs
FOR METALS DETECTED ABOVE BACKGROUND
IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	Maximum Concentration in Surface Water* (mg/l)	ARAR (mg/l)	TBC (mg/l)	ARAR Reference	Comment	Hazard Quotient/ Cancer Risk*
Metals						
Aluminum	25.4	0.2U		WQCC Surface Water Aquatic Life Standard; Default to detection limit.	Standard (0.150)is below detection limit, therefore, detection limit is ARAR.	No oral RfD/not considered an oral carcinogen
Antimony	0.102		0.064	No Standard	RCRA Subpart F background is TBC.	1.71E-03/not considered an oral carcinogen
Arsenic	0.01U	0.05(0.025U)		WQCC Surface Water; Drinking Water Standard.	The detection limit is selected as a remediation goal because of the relative high hazard quotient and cancer risk associated with the standard (0.05).	0.7/1.25E-03
Barium	2.02	1.0		WQCC Surface Water; Drinking Water Standard.	5.7E-01/not considered an oral carcinogen	
Beryllium	0.0572	0.1		WQCC Surface Water; Agricultural Standard.	0.56/1.2E-02	
Cadmium	0.0142	<0.005		WQCC Surface Water Aquatic Life Standard.	Standard (<0.005) is detection limit, therefore, detection limit is ARAR.	2.8E-01/not considered an oral carcinogen
Calcium	152			No Standard		No oral RfD/not considered an oral carcinogen
Chromium III	0.212	0.01		WQCC Surface Water; Aquatic Life Standard.	Analytical result is total chromium.	2.8E-04/not considered an oral carcinogen
Chromium V	0.212	0.01		WQCC Surface Water; Aquatic Life Standard.	Analytical result is total chromium.	5.8E-02/not considered an oral carcinogen.

TABLE E-1.2 (cont.)
CHEMICAL SPECIFIC ARARs
FOR METALS DETECTED ABOVE BACKGROUND
IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	Maximum Concentration in Surface Water* (mg/l)	ARAR (mg/l)	TBC (mg/l)	ARAR Reference	Comment	Hazard Quotient/ Cancer Risk*
Metals (cont.)						
Cobalt	0.132		0.05	WQCC Ground Water Agricultural Standard is TBC.		No oral Rfd/not considered an oral carcinogen
Copper	0.293	0.025U		WQCC Surface Water; Aquatic Life Standard. therefore, detection limit is ARAR	Standard (<0.025) is less than detection limit is ARAR	1.9E-02/not considered an oral carcinogen
Iron	204 (3.69)	1.0 (0.3)		WQCC Surface Water Standard	Analytical results are total iron; dissolved iron in parentheses	No oral RfD/not considered an oral carcinogen
Lead	0.215	0.005U		WQCC Surface Water; Aquatic Life Standard	Standard (<0.005) is less than detection limit, therefore, detection limit is ARAR	No oral RfD/not considered an oral carcinogen
Lithium	2.56		2.5	WQCC Ground Water Agricultural Standard is TBC.		No oral RfD/not considered an oral carcinogen
Magnesium	36.70			No Standard		No oral RfD/not considered an oral carcinogen
Manganese	3.68 (0.643)	1.0 (0.05)		WQCC Surface Water Standard	Analytical results are total manganese; dissolved manganese in parentheses	1.4E-01 (7.1E-03)/not considered an oral carcinogen
Mercury	0.0024	0.0002U		WQCC Surface Water; Aquatic Life Standard. therefore, detection limit is ARAR	Standard (0.00001)is less than detection limit is ARAR	1.9E-02/not considered an oral carcinogen

TABLE E-1.2 (cont.)
CHEMICAL SPECIFIC ARARs
FOR METALS DETECTED ABOVE BACKGROUND
IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	Maximum Concentration in Surface Water[b] (mg/l)	ARAR (mg/l)	TBC (mg/l)	ARAR Reference	Comment	Hazard Quotient/ Cancer Risk*
Metals (cont.)						
Molybdenum	0.174			No Standard		No oral RfD/not considered an oral carcinogen
Nickel	0.246	0.04U		WQCC Surface Water; Aquatic Life Standard	Standard (<0.04) is below detection limit, therefore, detection limit is ARAR	5.8E-02/not considered an oral carcinogen
Potassium	21.5			No Standard		No oral RfD/not considered an oral carcinogen
Selenium	0.016	0.01		WQCC Surface Water; Drinking Water Standard.		9.5E-02/not considered an oral carcinogen
Sodium	58.20			No Standard		No oral RfD/not considered an oral carcinogen
Strontium	1.36			No Standard		No oral RfD/not considered an oral carcinogen
Vanadium	0.555		0.1	WQCC Groundwater; Agriculture Standard is TBC.		4.08E-01/not considered an oral carcinogen
Zinc	2.66	0.05		WQCC Surface Water; Aquatic Life Standard		7.0E-03/not considered an oral carcinogen

TABLE E-1.3
CHEMICAL SPECIFIC ARARs
FOR OTHER INORGANIC CONSTITUENTS DETECTED ABOVE BACKGROUND
IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	Maximum Concentration in Surface Water[a] (mg/l)	ARAR (mg/l)	TBC (mg/l)	ARAR Reference	Comment	Hazard Quotient/ Cancer Risk*
Conventional Pollutants						
Nitrite	5.6	1.0		WQCC Surface Water Standard	Analytical results are total nitrate plus nitrate nitrogen. Reanalysis required to determine if nitrite ARAR is exceeded.	2.9E-01/not considered an oral carcinogen
Nitrate	5.6	10.0		WQCC Surface Water Standard	Analytical results are total nitrate plus nitrite nitrogen.	No oral RfD/not considered an oral carcinogen
Chloride	170	250		WQCC Surface Water Standard		No oral RfD/not considered an oral carcinogen
Sulfate	74	250		WQCC Surface Water Standard		No oral RfD/not considered an oral carcinogen
Bicarbonate as $CaCO_3$	540			No Standard		No oral RfD/not considered an oral carcinogen
T.D.S.	3300	400		WQCC Ground Water Standard is TBC		No oral RfD/not considered an oral carcinogen

TABLE E-1.4
CHEMICAL SPECIFIC ARARs
FOR RADIONUCLIDES DETECTED ABOVE BACKGROUND
IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	Maximum Concentration in Surface Water* (pCi/l)	ARAR (pCi/l)	TBC (pCi/l)	ARAR Reference	Comment	Hazard Quotient/ Cancer Risk**
Radionuclides						
Gross Alpha	780	11		WQCC Surface Water Standard		No oral RfD/NA
Gross Beta	570	19		WQCC Surface Water Standard		No oral RfD/NA
$Pu^{238,239,240}$	3.3	0.05		WQCC Surface Water Standard		No oral RfD/7.0×10^{-7}, 8.0×10^{-8}, 8.0×10^{-8}
Am^{241}	1.3	0.05		WQCC Surface Water Standard		No oral RfD/8.0×10^{-7}
H^{3}	0.00	500		WQCC Surface Water Standard		No oral RfD/1.4×10^{-8}
$Sr^{89,90}$	0.3	8		WQCC Surface Water Standard		No oral RfD/1.2×10^{-6}, 1.4×10^{-5}
$Uranium^{total}$	16.6	10		WQCC Surface Water Standard		No oral RfD/3.3×10^{-5}

(a) - Maximum compound concentrations determined from all available data (see Appendix B).
(b) - Total concentration unless specified.
U - Detection limit
J - Estimated below detection limit
B - Compound also present in blank
ARAR - Applicable or Relevant and Appropriate Requirement
TBC - To Be Considered
(c) - Below minimum detectable activity (MDA)
* - Hazard quotient is ratio of daily intake at level of ARAR based on the consumption of 2 liters/day and a body weight of 70 kg to the chronic oral RfD (EPA, 1990b - Health Effects Assessment Summary Tables, Fourth Quarter, FY 1990). RfD = Agency-wide reference dose, developed by an inter-office work group chaired by the Office of Research and Development, U.S. EPA, Washington, D.C. Cancer Risk = ARAR (ug/l) x Carcinogenic Slope Factor $(ug/l)^{-1}$
** - For radionuclides cancer risk = ARAR (pCi/l) x Pathway-specific unit risk $(pCi/l)^{-1}$. The cancer risk is not applicable to gross alpha and beta. Cancer risk depends not only on the form of radiation, but also on the radionuclide emitting the radiation because radionuclides selectively affect various organs.

TABLE E-2.1
ANALYSIS OF CHEMICAL SPECIFIC ARARs FOR VOLATILE
ORGANIC COMPOUNDS IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	RCRA Subpart F Concentration Limit[a] (ug/ℓ)	WQCC Ground Water Quality Standards[b] (ug/ℓ)	SDWA Maximum Contaminant Level (MCL)[c] (ug/ℓ)	For Use In Special Circumstances SDWA/MCLG[d] (ug/ℓ)	CWA Ambient Water Quality Criteria for Protection of Aquatic Life[k] Freshwater Acute/Chronic (ug/ℓ)	WQCC Surface Water Quality Standards[e] (ug/ℓ)	ARAR (ug/ℓ)	Comment
Organic Compounds								
Carbon Tetrachloride	5U	5	5	0	35,000/	5	5	WQCC Surface Wate Quality Standard i applicable. RCR Subpart F is TBC.
1,2 Dichloroethene	5U	-	-	-	11,000[f]/	-		No Standard. RCR Subpart F is TBC.
1,1 Dichloroethane	5U	-	-	-	-	-		No Standard. RCR Subpart F is TBC.
1,1 Dichloroethene	5U	7	7	7	11,000[f]/	7	7	WQCC Surface Wate Quality Standard i applicable. RCR Subpart F is TBC.
Tetrachloroethene	5U	-	-	0	5,200/840[f]	0.8	1.0U	WQCC Surface Water Fish and Wate Ingestion Standar (0.8 ug/ℓ) is BDL so detection limi is applicable
Acetone	10U[h]	-	-	-	-	-		No Standard. RCR Subpart F is TBC.
Methylene Chloride	5U	-	-	-	-	-		No Standard. RCR Subpart F is TBC.

TABLE E-2.1 (cont.)
ANALYSIS OF CHEMICAL SPECIFIC ARARs FOR VOLATILE
ORGANIC COMPOUNDS IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	RCRA Subpart F Concentration Limit[a] (ug/ℓ)	WQCC Ground Water Quality Standards[b] (ug/ℓ)	SDWA Maximum Contaminant Level (MCL)[c] (ug/ℓ)	For Use In Special Circumstances SDWA/MCLG[d] (ug/ℓ)	CWA Ambient Water Quality Criteria for Protection of Aquatic Life[k] Freshwater Acute/Chronic (ug/ℓ)	WQCC Surface Water Quality Standards[e] (ug/ℓ)	ARAR (ug/ℓ)	Comment
Organic Compounds (cont.)								
Trichloroethene	5U	5	5	0	45,000/21,000[f]	5	5	WQCC Surface Water Quality Standard is applicable
Vinyl Chloride	1U	2	2	0	-	2	2	WQCC Surface Water Quality Standard is applicable.

(a) - 40 CFR Part 264.92 Subpart F releases from individual hazardous substance sites. (40 CFR 261, Appendix VIII, List of Hazardous Constituents)
(b) - 5 CCR 1002-8, Section 3.11.5, Basic Standards for Ground Water September 20, 1990.
(c) - 40 CFR Part 141.61 National Primary Drinking Water Standards.
(d) - 40 CFR Part 141.50 National Primary Drinking Water Standards.
(e) - 5 CCR 1002-8, Section 3.8.29, Final Rule Effective March 30, 1990.
(f) - Lowest observed effect level.
(g) - 40 CFR Part 268.41 Subpart D - Treatment Standards.
(h) - RCRA 40 CFR 264, Appendix IX Ground Water Monitoring List Substance Not Included in 40 CFR 261, Appendix VIII, List of Hazardous Constituents
(k) - Clean Water Act, Section 304

ARAR - Applicable or relevant and appropriate requirements
BDL - Below detection limits
LDR - Land disposal restrictions
MCL - Maximum contaminant level
MCLG - Maximum contaminant level goal
RCRA - Resource Conservation and Recovery Act
SDWA - Safe Drinking Water Act
TBC - To be considered
U - Detection Limit
WQCC - Colorado Water Quality Control Commission

TABLE E-2.2
ANALYSIS OF CHEMICAL SPECIFIC ARARs FOR METALS
DETECTED ABOVE BACKGROUND IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	RCRA Subpart F Concentration Limit[a] (mg/l)	WQCC Ground Water Standard Human Health/ Agriculture[b] (mg/l)	SDWA Maximum Contaminant Level (MCL)[c] (mg/l)	For Use In Special Circumstances SDWA/MCLG (mg/l)	CWA Ambient Water Quality Criteria for Protection of Aquatic Life[k] Freshwater Acute/Chronic (mg/l)	WQCC Surface Water Quality Standard[d] Drinking Water/ Agriculture (mg/l)	ARAR (mg/l)	Comment
Metals								
Aluminum	-	/5.0	-	-	-	0.150	0.2U	WQCC Surface Water Aquatic Life Standard i applicable. Default to detection limit.
Antimony	0.06U	-	-	-	-	-		No Standard. RCRA Subpart F background (0.064) is TBC.
Arsenic	0.05	0.05/0.1	0.05	-	0.8[e]/0.048[g]	0.05	0.05	WQCC Surface Water Drinking Water Standard is applicable.
Barium	1.0	1.0/	1.0	1.5[f]	-	-	1.0	WQCC Surface Water Drinking Water Standard is applicable.
Beryllium	0.005U	/0.1	-	-	0.1[g]/.0053[g]	0.1	0.1	WQCC Surface Water Agricultural Standard i applicable.
Cadmium	0.01	0.01/0.01	0.01	0.005	0.0039[h]/0.0011[h]	<0.005	0.005U	WQCC Surface Water Aquatic Life Standard i applicable. Default to detection limit.
Calcium	-	-	-	-	-	-		No Standard
Chromium III	0.05 (tot)	0.05/0.1	-	-	1.7[h]/0.2[h]	0.01	0.01	WQCC Surface Water Aquatic Life Standard i applicable.

TABLE E-2.2 (cont.)
ANALYSIS OF CHEMICAL SPECIFIC ARARs FOR METALS
DETECTED ABOVE BACKGROUND IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	RCRA Subpart F Concentration Limit[a] (mg/l)	WQCC Ground Water Standard Human Health/ Agriculture[b] (mg/l)	SDWA Maximum Contaminant Level (MCL)[c] (mg/l)	For Use In Special Circumstances SDWA/MCLG (mg/l)	CWA Ambient Water Quality Criteria for Protection of Aquatic Life[k] Freshwater Acute/Chronic (mg/l)	WQCC Surface Water Quality Standard[d] Drinking Water/ Agriculture (mg/l)	ARAR (mg/l)	Comment
Metals (cont.)								
Chromium VI	0.05 (tot)	0.05/0.1	0.05	0.0012	0.016/.011	0.01	0.01	WQCC Surface Water Aquatic Life Standard is applicable.
Cobalt	-	0.05	-	-	-	0.05		WQCC Groundwater Standard is TBC.
Copper	0.046	1.0/0.2	1.0	1.3[f]	0.018[h]/0.012[h]	0.025	0.025U	WQCC Surface Water Aquatic Life Standard is applicable. Default to detection limit.
Iron	-	0.3/5.0	0.3	-	-	1.0 (0.3)	1.0 (0.3)	WQCC Surface Water Drinking Water Standard is applicable.
Lead	0.05	0.05/0.1	0.05	0.002[f]	0.0082[h]/.0032	<0.005	0.005U	WQCC Surface Water Aquatic Life Standard is applicable. Default to detection limit.
Lithium	-	/2.5	-	-	-	-		WQCC Ground Water Agricultural Standard is TBC.
Magnesium	-	-	-	-	-	-		No Standard
Manganese	-	0.05/0.2	0.05	-	-	1.0(0.05)	1.0 (0.05)	WQCC Surface Water Drinking Water Standard is applicable.

TABLE E-2.2 (cont.)
ANALYSIS OF CHEMICAL SPECIFIC ARARs FOR METALS
DETECTED ABOVE BACKGROUND IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	RCRA Subpart F Concentration Limit[a] (mg/l)	WQCC Ground Water Standard Human Health/ Agriculture[b] (mg/l)	SDWA Maximum Contaminant Level (MCL)[c] (mg/l)	For Use In Special Circumstances SDWA/MCLG (mg/l)	CWA Ambient Water Quality Criteria for Protection of Aquatic Life[k] Freshwater Acute/Chronic (mg/l)	WQCC Surface Water Quality Standard[d] Drinking Water/ Agriculture (mg/l)	ARAR (mg/l)	Comment
Metals (cont.)								
Mercury	0.002	0.002/0.01	0.002	0.003	0.0024/0.000012	0.0001	0.0002U	WQCC Surface Water .1Aquatic Life Standard is applicable. Default to detection limit.
Molybdenum	-	/0.1	-	-	-	-		WQCC Ground-water Agriculture Standard is TBS.
Nickel	0.0185	/0.20	-	-	1.8[h]/.096[h]	<0.04	0.04U	WQCC Surface Water Aquatic Life Standard is applicable. Default to detection limit.
Potassium	-	-	-	-	-	-		No Standard
Selenium	0.01	0.01/0.02	0.01	0.045[f]	0.26/0.35	0.01	0.01	WQCC Surface Water Drinking Water Standard is applicable.
Sodium	-	-	-	-	-			No Standard
Strontium	-	-	-	-	-	-		
Vanadium	1.65	/0.1	-	-	-	-		WQCC Ground-water Agricultural Standard is TBC.
Zinc	0.0517[j]	5.0/2.0	5.0	-	0.32[h]/0.047[h]	0.05	0.05	WQCC Surface Water Aquatic Life Standard is applicable.

*Notes on the next page.

(a) - 40 CFR Part 264.92 Subpart F
(b) - 5 CCR 1002-8, Section 3.11.5, Ground Water Quality Standards
(c) - 40 CFR Part 141.11 National Primary Drinking Water Standards
(d) - 5 CCR 1002-8, Section 3.8.29, Final Rule Effective March 30, 1990 (Total Recoverable Concentrations). Most stringent standard from aquatic life, agricultural, or drinking water is shown.
(f) - Proposed value as of October 1986
(g) - Lowest Observed Effect Level
(h) - Hardness dependent criteria (100 mg/l)
(K) - Clean Water Act, Section 304
(J) - RCRA 40 CFR 264, Appendix IX, Ground Water Monitoring List Substance not Included in 40 CFR 261, Appendix VIII, List of Hazardous Constituents
ARAR - Applicable or relevant and appropriate
CWA - Clean Water Act
MCL - Maximum Contaminant Level
MCLG - Maximum Contaminant Level Goal
NS - No standard
R&A - Relevant and Appropriate
RCRA - Resource Conservation and Recovery Act
SDWA - Safe Drinking Water Act
WQCC - Colorado Water Quality Control Commission

TABLE E-2.3
ANALYSIS OF CHEMICAL SPECIFIC ARARs FOR OTHER INORGANIC
CONSTITUENTS DETECTED ABOVE BACKGROUND IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	RCRA Subpart F Concentration Limit[a] (mg/l)	WQCC Ground Water Standard Human Health/ Agriculture[b] (mg/l)	SDWA Maximum Contaminant Level (MCL)[c] (mg/l)	For Use In Special Circumstances SDWA/MCLG (mg/l)	CWA Ambient Water Quality Criteria for Protection of Aquatic Life[k] Freshwater Acute/Chronic (mg/l)	WQCC Surface Water Quality Limited Standard[d] Drinking Water/ Agriculture (mg/l)	ARAR (unless otherwise noted)	Comment
Conventional Pollutants								
Nitrite	-	1.0 as N/ 10.0 as N	-	-	-	1[e]/10[h]	1.0	WQCC Surface Water Standard is applicable
Nitrate	-	10.0 as N/ 100 as NO_2+NO_3-N	10	-	-	10[i]/100[h]	10.0	WQCC Surface Water Standard i applicable
Chloride	-	250/	250	-	-	250/	250	WQCC Surface Water Standard is applicable
Sulfate	-	250/	250[f]	-	-	250/	250	WQCC Surface Water Standard is applicable
Bicarbonate as $CaCO_3$	-	-	-	-	-	-		No Standard

eg&g\sw kap\walnut\tb-e2-3.

TABLE E-2.3 (cont.)
ANALYSIS OF CHEMICAL SPECIFIC ARARs FOR OTHER INORGANIC
CONSTITUENTS DETECTED ABOVE BACKGROUND IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	RCRA Subpart F Concentration Limit[a] (mg/l)	WQCC Ground Water Standard Human Health/ Agriculture[b] (mg/l)	SDWA Maximum Contaminant Level (MCL)[c] (mg/l)	For Use In Special Circumstances SDWA/MCLG (mg/l)	CWA Ambient Water Quality Criteria for Protection of Aquatic Life[k] Freshwater Acute/Chronic (mg/l)	WQCC Surface Water Quality Limited Standard[d] Drinking Water/ Agriculture (mg/l)	ARAR (unless otherwise noted)	Comment
Conventional Pollutants (cont.)								
T.D.S.	-	400 mg/l or 1.25 times background, whichever is least restrictive	500[f]	-	-	-		WQCC Ground Water Standard is TBC.

(a) - 40 CFR Part 264.92 Subpart F releases from individual hazardous substance sites
(b) - 5 CCR 1002-8, Section 3.11.5, Groundwater Quality Standards
(c) - 40 CFR Part 141.11(b,c) National Primary Drinking Water Standards
(d) - 5 CCR 1002-8, Section 3.8.29, Final Rule Effective March 30, 1990.
(f) - 40 CFR Part 143.3 National Secondary Drinking Water Standards
(g) - To be applied at the point of water supply intake
(h) - In order to provide such a reasonable margin of safety to allow for unusual situations such as extremely high water ingestion or nitrite formation in slurries, the NO_3-N plus NO_2-N content in drinking waters for livestock and poultry should be limited to 100 ppm or less, and the NO_2-N content alone be limited to 10 ppm or less.
(i) - A combined total of Nitrite and Nitrate at the point of intake to the domestic water supply shall not exceed 10 mg/l.
(k) - Clean Water Act, Section 304

ARAR - Applicable or relevant and appropriate requirements
CWA - Clean Water Act
MCLG - Maximum contaminant level goal
NS - No standard
RCRA - Resource Conservation and Recovery Act
SDWA - Safe Drinking Water Act
WQCC - Water Quality Control Commission

TABLE E-2.4
ANALYSIS OF CHEMICAL SPECIFIC ARARs FOR RADIONUCLIDES
DETECTED ABOVE BACKGROUND IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	RCRA Subpart F Concentration Limit[a] (pCi/l)	WQCC Ground Water Quality Standards[b] (pCi/l)	SDWA Maximum Contaminant Level (MCL)[c] (pCi/l)	For Use In Special Circumstances SDWA/MCLG (pCi/l)	CWA Ambient Water Quality Criteria for Protection of Aquatic Life[k] Freshwater Acute/Chronic (pCi/l)	WQCC Surface Water Quality Standards[d] (pCi/l)	ARAR (pCi/l)	Comment
Radionuclides								
Gross Alpha	-	15	15	-	-	11	11	WQCC Surface Water Standard for Walnut Creek is applicable
Gross Beta	-	4 mrem/yr[e]	50	-	-	19	19	WQCC Surface Water Standard for Walnut Creek is applicable
$Pu^{238,239,240}$	-	15	40[f]	-	-	0.05	0.05	WQCC Surface Water Standard is applicable
Am^{241}	-	-	4[f]	-	-	0.05	0.05	WQCC Surface Water Standard is applicable
H^{3}	-	20,000	20,000	-	-	500	500	WQCC Surface Water Standard is applicable
$Sr^{89,90}$	-	8	8	-	-	8	8	WQCC Surface Water Standard is applicable

TABLE E-2.4 (cont.)
ANALYSIS OF CHEMICAL SPECIFIC ARARs FOR RADIONUCLIDES
DETECTED ABOVE BACKGROUND IN SURFACE WATER AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

Chemical	RCRA Subpart F Concentration Limit[a] (pCi/l)	WQCC Ground Water Quality Standards[b] (pCi/l)	SDWA Maximum Contaminant Level (MCL)[c] (pCi/l)	For Use In Special Circumstances SDWA/MCLG[d] (pCi/l)	CWA Ambient Water Quality Criteria for Protection of Aquatic Life[k] Freshwater Acute/Chronic (pCi/l)	WQCC Surface Water Quality Standards[e] (pCi/l)	ARAR (pCi/l)	Comment
Radionuclides (cont.)								
Uranium[total]	-	-	-	-	-	10	10	WQCC Surface Water Standard for Walnut Creek is applicable

(a) - 40 CFR Part 264.92 Subpart F releases from individual hazardous substance sites
(b) - 5 CCR 1002-8, Section 3.11.5(B), Basic Standards Applicable to Ground Waters of the State
(c) - 40 CFR Parts 141.15, 16, National Primary Drinking Water Standards
(d) - 5 CCR 1002-8, Section 3.8.29, Final Rule Effective March 30, 1990.
(e) - For beta and photon emitters, if two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem per year. Except for Tritium and Strontium 90 the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168-hour data listed in "Maximum Permissible Body Burden and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure," NBS Handbook 69, as amended, August 1963, US Department of Commerce.
(f) - Proposed value in drinking water yielding a risk equal to that from a dose rate of 4 mrem/year, September 30, 1986 (51 FR 34859).
(k) - Clean Water Act, Section 304.

Am - Americium
ARAR - Applicable or relevant and appropriate requirements
CWA - Clean Water Act
H^3 - Tritium
MCL - Maximum contaminant level
MCLG - Maximum contaminant level goal
Pu - Plutonium
RCRA - Resource Conservation and Recovery Act
SDWA - Safe Drinking Water Act
Sr - Strontium
WQCC - Water Quality Control Commission

TABLE E-3.1
ANALYSIS OF ACTION SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT 2, SOUTH WALNUT CREEK

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Treatment	BDAT standards for spent solvent wastes and dioxin-containing wastes are based on one of four technologies or combinations; for waste waters, (1) steam stripping, (2) biological treatment, or (3) carbon absorption [alone or in combination with (1) or (2)]; and for all other wastes, incineration. Any technology may be used, however, if it will achieve the concentration levels specified.	Effective November 8, 1988, disposal of contaminated soil or debris resulting from CERCLA response actions or RCRA corrective actions is subject to land disposal prohibitions and/or treatment standards established for spent solvent wastes, dioxin-containing wastes, and "California List" wastes.	RCRA Sections 3004(d)(3), (e)(3) 42 U.S.C. 6924(d)(3), (e)(3)	Applicable	Movement of excavated soil on-site or transportation of soil off-site for disposal must be treated to attain levels achievable by best demonstrated available treatment technologies before being land-disposed.
Hazardous Waste Generation	Standards applicable to generators including waste accumulation, recordkeeping, container labelling, manifesting, etc.	Waste must be identifiable as hazardous per 40 CFR Part 261	40 CFR Part 262	Applicable	Wastes generated in proposed action may be identifiable as hazardous wastes. Examples may include treatment sludge, excavated soils, used treatment materials. R&A if wastes are not hazardous.
Hazardous Waste Transportation	Hazardous waste shipment off-site is subject to DOT regulations, manifesting, recordkeeping, and discharge cleanup, etc.	Wastes must be identifiable as hazardous per 40 CFR Part 261.	40 CFR Part 263	Applicable	Wastes identifiable as hazardous must comply with applicable hazardous waste requirements for off-site shipment. R&A if not hazardous.
Excavation/ Consolidation	Consolidation in storage piles/storage tanks will trigger storage requirements.	Movement of hazardous waste (listed or characteristic) from one unit or area of contamination into another. Consolidation within a unit or area of contamination does not trigger applicability.	40 CFR Part 264 Subpart L/ 40 CFR Part 264 Subpart J	Applicable	RCRA requirements for storage in waste piles or tanks are applicable to interim storage of excavated soil destined for consolidation or off-site disposal.
	Placement on or in land outside unit boundary or area of contamination will trigger land disposal requirements and restrictions. (See Table E-3.2 for allowable constituent concentrations.)		40 CFR 268 (Subpart D)	R&A	Soil excavated during installation is subject to land disposal restrictions for wastes if placement occurs outside the area of contamination. Requirements are applicable for RCRA hazardous waste; R&A if not RCRA hazardous waste.
Ground-Water Diversion	Excavation of soil for construction of slurry wall may trigger cleanup or land disposal restrictions.	RCRA hazardous waste placed at site after November 19, 1980, or movement hazardous waste from one unit, area of contamination, or location into another unit or area of contamination.	See Excavation/ Consolidation	R&A	See Excavation/Consolidation

TABLE E-3.1 (continued)
ANALYSIS OF ACTION SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT 2, SOUTH WALNUT CREEK

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Treatment or Storage in Tanks	Tanks must have sufficient shell strength (thickness), and, for closed tanks, pressure controls, to assure that they do not collapse or rupture.	RCRA hazardous waste (listed or characteristic), held for temporary period before treatment, disposal, or storage elsewhere, (40 CFR 264.10) in a tank.	40 CFR 264.190	R&A	Applicable to treatment and storage tanks used in treating or containing water contaminated with hazardous waste. R&A if units would be excluded under RCRA, such as wastewater treatment units or if wastes are not RCRA hazardous waste.
	Waste must not be incompatible with the tank material unless the tank is protected by a liner or by other means.		40 CFR 264.191	R&A	
	New tanks or components must be provided with secondary containment.		40 CFR 264.193	R&A	
	Tanks must be provided with controls to prevent overfilling, and sufficient freeboard maintained in open tanks to prevent overtopping by wave action or precipitation.		40 CFR 264.194	R&A	
	Inspect the following: overfilling control, control equipment, monitoring data, waste level (for uncovered tanks), tank condition, above-ground portions of tanks, (to assess their structural integrity) and the area surrounding the tank (to identify signs of leakage).		40 CFR 264.195	R&A	
	Repair any corrosion, crack, or leak.		40 CFR 264.196	R&A	
	At closure, remove all hazardous waste and hazardous waste residues from tanks, discharge control equipment and discharge confinement structures.		40 CFR 264.197	R&A	

TABLE E-3.1 (continued)
ANALYSIS OF ACTION SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT 2, SOUTH WALNUT CREEK

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Treatment or Storage in Tanks (cont.)	Store ignitable and reactive waste so as to prevent the waste from igniting or reacting. Ignitable or reactive wastes in covered tanks must comply with buffer zone requirements in "Flammable and Combustible Liquids Code," Tables 2-1 through 2-6 (National Fire Protection Association, 1976 or 1981).		40 CFR 264.198	R&A	
Container Storage (On-Site)	Containers of hazardous waste must be: · Maintained in good condition;	RCRA hazardous waste (listed or characteristic) held for a temporary period before treatment, disposal, or storage elsewhere, in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled) (40 CFR 264.10).	40 CFR 264.171	Applicable	RCRA container storage requirements are applicable if hazardous wastes are stored, R&A if stored wastes are not RCRA hazardous wastes.
	· Compatible with hazardous waste to be stored; and		40 CFR 264.172		
	· Closed during storage (except to add or remove waste).		40 CFR 264.173		
	Inspect container storage areas weekly for deterioration.		40 CFR 264.174		
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10% of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.		40 CFR 264.175		
	Keep containers of ignitable or reactive waste at least 50 feet from the facility's property line.		40 CFR 264.176		

TABLE 3-3.1 (continued)
ANALYSIS OF ACTION SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT 2, SOUTH WALNUT CREEK

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Container Storage (On-Site) (cont)	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		40 CFR 264.177		
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers, liners.		40 CFR 264.178		
Off-Site Treatment Storage or Disposal	In the case of any removal or remedial action involving the transfer of any hazardous substance or pollutant or contaminant off-site, such hazardous substance or pollutant or contaminant shall only be transferred to a facility which is operating in compliance with section 3004 and 3005 of the Solid Waste Disposal Act (or where applicable, in compliance with the Toxic Substances Control Act or other applicable Federal law) and all applicable State requirements. Such substance or pollutant or contaminant may be transferred to a land disposal facility only if the President determines that both of the following requirements are met: · The unit to which the hazardous substance or pollutant or contaminant is transferred is not releasing any hazardous waste, or constituent thereof, into the ground water or surface water or soil.		SARA section 121(d)(2)(C)	Applicable	Applicable to the off-site treatment, storage, or disposal of wastes generated during on-site remedial actions.

TABLE E-3.1 (continued)
ANALYSIS OF ACTION SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT 2, SOUTH WALNUT CREEK

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Off-Site Treatment Storage or Disposal (cont)	· All such releases from other units at the facility are being controlled by a corrective action program approved by the Administrator under subtitle C of the Solid Waste Disposal Act.				
	Wastes must be treated using technology or to concentra- level by best demonstrated available technology (BDAT) for each hazardous constituent in the waste, prior to land disposal. (See Table E-3.2)	Wastes must be identifiable as hazardous per 40 CFR Part 261	40 CFR Part 268	Applicable	Applicable to wastes, other than treated effluent, such as treatment sludge, excavated soils, used treatment materials. Also applicable to on-site land disposal or "placement" outside the area of contamination. R&A if not RCRA hazardous waste.
Discharge of Storm Waters	Requires storm water discharges to be permitted under the Federal (or state) National Pollution Discharge Elimination Systems (NPDES) program. Different requirements are applicable for different classes and types of discharges.		40 CFR 122.21(g) 40 CFR 122.26, and 40 CFR 122.28	R&A	Treated effluent will be collected and treated in Pond B-5, which is subject to NPDES permit, prior to discharge off-site.
Discharge of Water into Surface Water Bodies	An NPDES permit is required for discharging water into surface water bodies.		40 CFR 122 and 40 CFR 125	R&A	Treated effluent will be collected and treated in Pond B-5, which is subject to NPDES permit, prior to discharge off-site.
	All surface water discharges must be in compliance with recently promulgated Colorado Stream Discharge Standards		5 CCR 1002-8	R&A	Treated effluent will be collected and treated in Pond B-5, which is subject to NPDES permit, prior to discharge off-site.

TABLE E-3.1 (continued)
ANALYSIS OF ACTION SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT 2, SOUTH WALNUT CREEK

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Effluent Guidelines and Standards: Pre-Treatment Standards	This section establishes pre-treatment standards (both general and categorical) for the control of pollutant discharges into Public Owned Treatment Works (POTW). Discharge of POTW must not cause pass-through interference, violation of specific prohibitions, or violations of local limitations or ordinances. POTW should either have an EPA-approved pre-treatment program or have sufficient mechanisms to meet the requirements of the national pre-treatment program in accepting CERCLA waste.		40 CFR 403.5	R&A	Treated effluent will be collected and treated in Pond B-5, which is subject to NPDES permit, prior to discharge off-site.
Discharge of Treatment System Effluent	Use of best available technology (BAT) economically achievable is required to control toxic and non-conventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-basedlimitations may be determined on a case-by-case basis.		40 CFR 122.44	R&A	The remedial alternatives at Operable Unit 2 may include the discharge of treatment system effluent.
U.S. EPA Ground-Water Protection Strategy	The strategy includes guidelines on classifying ground water for EPA decisions affecting ground water protection and corrective actions. Criteria include ecological importance, replaceability, and vulnerabilityconsideration.	The protection strategy does not involve applicable ARARs but does contain policy statements to be considered.		TBC	This strategy is to be considered regarding ground water remedial alternatives for Operable Unit 2.
National Ambient Air Quality	National ambient air quality standards have been set to attain and maintain primary and secondary standards to protect public health and the environment. Requirements include a major-source permit, prevention of significant deterioration permit, non-attainable area permit, and visibility permit.		CAA Section 109 and 40 CFR 50	R&A	Remedial actions at Operable Unit 2 that may result in new sources of air emissions include incineration, excavation, and air stripping of contaminated ground water.

TABLE E-3.1 (continued)
ANALYSIS OF ACTION SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT 2, SOUTH WALNUT CREEK

Action	Requirement	Prerequisite	Citation	ARAR	Comments
New Source Performance Standards	Standards for new sources of air emissions. Requirements are source-specific.	Need to determine if these standards apply to potential remedial actions.	CAA Section III	R&A	
Transportation of Hazardous Materials	Specific DOT requirements exist for labeling, packaging, shipping papers/manifesting, and transporting by rail, aircraft, vessel, and highway.		49 CFR 100-199	Applicable	Applicable to wastes or materials shipped off-site.
Environmental Impact of Federal Actions	A statement of environmental impact is required. Establishes provisions applicable to and binding on all federal agencies for implementing the procedural requirements of the National Environmental Policy Act (NEPA). Includes procedures for planning (Part 1501), preparing environmental impact statements (part 1502), decision-making (Part 1505), and compliance (Part 1507).		NEPA Section 102(2)(c) and 40 CFR 1500-1508; DOE 5440.1C	R&A	EPA, CDH, and DOE have reached agreement on the applicability of NEPA to RCRA/CERCLA actions.
Worker Safety	Occupational Safety and Health program for DOE contractor employees at government-owned contractor-operated facilities.		DOE 5483.1A	TBC	
Emergency Planning, Preparedness, and Response for Operations	Provide coordination direction of planning, preparedness, and response to operational emergencies in which there is a potential for personal injury, destruction of property, theft, or release of toxic, radioactive, or other hazardous material which present a potential threat to health, safety, or the environment.		DOE 5500.2	TBC	

TABLE E-3.1 (continued)
ANALYSIS OF ACTION SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT 2, SOUTH WALNUT CREEK

Action	Requirement	Prerequisite	Citation	ARAR	Comments
General Environmental Protection Program	Establishes environmental protection program requirements, authorities, and responsibilities for DOE operations for ensuring compliance with federal and state environment protection laws and regulations, federal executive orders, and internal department policies.		DOE 5400.1	TBC	
Environmental Compliance Issue Coordination	Establishes DOE requirements for coordination of significant environmental compliance issues.		DOE 5400.2A	TBC	
Hazardous and Radioactive Mixed Waste Program	Establishes DOE hazards and radioactive mixed waste policies and requirements and implements RCRA.		DOE 5400.3	TBC	
Radiation Protection	Establishes radiation protection standards and requirements including occupationally related exposure of individuals in controlled areas.		DOE 5480.1	TBC	
Packaging and Transportation of Hazardous Materials, Hazardous Substances, hazardous wastes, and radioactive materials	Establishes requirements for packaging and transportation.		DOE 5480.3	TBC	
Comprehensive Environmental Response, Compensation and Liability Act Program	Establishes basic requirements for implementation of the Superfund at DOE facilities.		DOE 5480.14	TBC	
Environmental Protection Safety, and Health Protection Information Reporting Requirements	Establishes requirements and procedures for reporting information having environmental protection, safety, or health significance for DOE operations.		DOE 5484.1	TBC	

TABLE E-3.1 (continued)
ANALYSIS OF ACTION SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT 2, SOUTH WALNUT CREEK

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Radioactive Waste Management	Establishes policies and guidelines by which DOE manages radioactive waste, waste byproducts, and radioactively contaminated surplus facilities.		DOE 5820.2A	TBC	

TABLE E-3.2

ACTION-SPECIFIC ARARS FOR CONSTITUENTS IN WASTES FOR OFF-SITE DISPOSAL OR ON-SITE PLACEMENT, OPERABLE UNIT NO. 2 SOUTH WALNUT CREEK INTERIM REMEDIAL ACTION*

Constituent	Potential Waste Code	Treatment Standard (mg/ℓ)**	Best Demonstrated Available Technology (BDAT) Basis for Standard
Aluminum	--	--	--
Antimony	--	--	--
Arsenic	D004	5.0 (in extract)	Vitrification
Barium	D005	100	--
Beryllium	P015 (as product dust)	--	Metals Recovery[1]
Cadmium	D006	1.0	Chemical Precipitation
Calcium	--	--	--
Cesium	--	--	--
Chromium (total)	D007	5.0	Reduction and Stabilization
Cobalt	--	--	--
Copper	--	--	--
Iron	--	--	--
Lead	D008	5.0	Stabilization
Lithium	--	--	--
Magnesium	--	--	--
Manganese	--	--	--
Mercury	D009 U151	0.20 0.025	Acid Leaching and Chemical Precipitation
Molybdenum	--	--	--
Nickel	F006-F009 F011-F012	0.32	Chemical Precipitation, Settling, Filtration, and Stabilization
Potassium	--	--	--
Selenium	D010	5.7	Stabilization
Sodium	--	--	--
Strontium	--	--	--
Vanadium	--	--	--
$Pu^{238,239,240}$	--	--	--
Am^{241}	--	--	--
H^3	--	--	--

TABLE E-3.2 (continued)

ACTION-SPECIFIC ARARS FOR CONSTITUENTS
IN WASTES FOR OFF-SITE DISPOSAL OR
ON-SITE PLACEMENT, OPERABLE UNIT NO. 2
SOUTH WALNUT CREEK INTERIM REMEDIAL ACTION*

Constituent	Potential Waste Code	Treatment Standard (mg/ℓ)**	Best Demonstrated Available Technology (BDAT) Basis for Standard
$Sr^{89,90}$	--	--	--
$Uranium^{total}$	--	--	--
Carbon Tetrachloride	U211	5.6	Incineration or Fuel Substitution
	F001	0.96	Incineration
1,2 Dichloroethene	U079	33	Incineration or Fuel Substitution
1,1 Dichloroethane	U076	7.2	Incineration or Fuel Substitution
1,1 Dichloroethene	U078	33	Incineration or Fuel Substitution
Tetrachloroethene	U210	5.6	Incineration or Fuel Substitution
	F001	0.05	Incineration
Acetone	U002	160	Incineration or Fuel Substitution
	F003	0.59	Incineration
Methylene Chloride	U080	33	Incineration or Fuel Substitution
	F001	0.96	Incineration
	F002	0.96	Incineration
Trichloroethene	U228	5.6	Incineration or Fuel Substitution
	F001	0.91	Incineration
	F002	0.91	Incineration
Vinyl Chloride	U043	33	Incineration or Fuel Substitution
Multi-Source Leachate[2]	F039		

* Land Disposal Restrictions at 40 CFR Part 268

** Treatment standards are presented for non-wastewaters

1 Standard is expressed as a specific technology

2 U.S. EPA added listed hazardous waste code F039 to 40 CFR 261.31 June 1, 1990 (55 FR 22520) and defined it as "leachate resulting from the treatment, storage, or disposal of wastes classified by more than one waste code under [40 CFR Part 261] Subpart D, or from a mixture of wastes classified under Subparts C and D of this part." If this waste code is deemed applicable to a waste, the waste must meet the treatment standards (see 40 CFR Part 268 Tables CCW and CCWE) prior to land disposal.

TABLE E-4
ANALYSIS OF LOCATION-SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

LOCATION	CITATION	REQUIREMENT	ARAR TYPE*	COMMENTS
Fault zones	40 CFR 264.18(a)	RCRA regulations specify that hazardous waste treatment, storage, or disposal must not take place within 200 feet of a Holocene fault.	R&A	No faults displaced during Holocene times exist within 200 feet of this site.
Flood plain	40 CFR 264.18(b)	Any RCRA treatment, storage, or disposal facility which lies within a 100-year floodplain must be designed, constructed and operated to avoid washout.	R&A	This site is not located within a 100-year floodplain.
Siting of Hazardous Waste Disposal Sites	Colorado Hazardous Waste Act, Sections 25-15-101, 203, 208, 302	Outlines siting criteria for hazardous waste disposal sites.	R&A	Although the proposed action involves the treatment of water rather than disposal of hazardous wastes, these criteria are considered in the siting of the unit.
Siting of Wastewater Treatment Facilities	Colorado Water Quality Control Act Section 25-8-202 and 25-8-702	CDH Water Quality Control Division must approve locations of wastewater treatment facilities.	R&A	Applicable to domestic wastewater treatment facilities, relevant and appropriate to the proposed action.
Siting within an area where action may cause irreparable harm, loss, or destruction of significant articles.	36 CFR Part 65, National Historic Preservation Act	Planned actions must avoid threatening significant scientific, prehistorical, historical, or archeological data.	Applicable	Proposed activities will not threaten significant scientific, historic, prehistoric, or archeological artifacts.
Siting on or near historic property owned or controlled by Federal agency.	36 CFR Part 800, National Historic Preservation Act	Action to preserve historic properties; planning of action to minimize harm to National Historic Landmarks, included in or eligible for the National Register of Historic Places	Applicable	Proposed activities will not disturb known or suspected historic sites. Refer to Sections 2.2.7 and 7.4

TABLE E-4 (continued)
ANALYSIS OF LOCATION-SPECIFIC ARARs
FOR REMEDIAL ACTIONS AT OPERABLE UNIT NO. 2, SOUTH WALNUT CREEK

LOCATION	CITATION	REQUIREMENT	ARAR TYPE*	COMMENTS
Siting on critical habitat of endangered or threatened species.	50 CFR Parts 200, 402, 33 CFR Parts 320-330	Action to conserve endangered or threatened species.	Applicable	Proposed activities will not adversely affect endangered or threatened species. Refer to Section 2.2.5 and 7.3.
Wetlands	40 CFR Part 6, Appendix A	Actions must minimize the destruction, loss, or degradation of wetlands, as defined by Executive Order 11990, Section 7.	Applicable	Proposed activities will not adversely affect wetlands. Refer to Sections 2.2.6 and 7.3.
	40 CFR Parts 230, 231	Actions must not discharge dredged or fill material into wetlands without permit.	Applicable	Proposed activities will not adversely affect wetlands.
Area affecting stream or river.	40 CFR 6.302	Action must protect fish or wildlife.	Applicable	Proposed action will be protective of potentially affected fish and wildlife resources. Refer to Sections 2.2.3.1 and 7.3.

* The ARAR types designated reflect the application status of each requirement when preparation of this IM/IRA began. In response to these requirements, investigations were performed and the results are indicated in the Comments column which reflect the lack of any location-specific ARAR requirements which would preclude the proposed activity.

APPENDIX F

CALCULATION SPREAD SHEET

TABLE F-1

FLOW WEIGHTED MAXIMUM CONCENTRATIONS

ANALYTE	ARAR	(1) SW-61 (Flow = 37.5 GPM)		SW059 (Flow = 4.5 GPM)		FLOW WEIGHTED AVERAGE CONCENTRATION	FLOW WEIGHTED MAXIMUM CONCENTRATION
VOLATILE ORGANICS		(2)	(3)				
(Concentration Units = ug/l)		C avg	C max	C avg	C max		
Vinyl Chloride	2	6	15	5	10	6	14
Methylene Chloride (4,5)	5 U	7	44	3	5	7	40
Acetone (4,5)	10 U	13	130	6	13	12	117
1,1-Dichloroethene	7	7	143	21	133	9	142
1,1-Dichloroethane (5)	5 U	3	6	3	6	3	6
1,2-Dichloroethene (total)(5)	5 U	3	5	10	56	4	10
Chloroform	1 U	18	79	38	82	20	79
Carbon Tetrachloride	5	24	173	284	605	52	219
Trichloroethene	5	29	140	98	260	36	153
Tetrachloroethene	1 U	39	280	94	270	45	279
DISSOLVED METALS							
(Concentration Units = mg/l)		C avg	C max	C avg	C max		
Beryllium (Be)	0.005 U	0.0026	0.0053	0.0025	0.0050	0.0026	0.0053
Manganese (Mn)	0.050	0.1014	0.6430	0.0144	0.0461	0.0921	0.5790
Strontium (Sr) (6)	0.396	0.1936	0.8000	0.5650	1.1700	0.2334	0.8396
Tin (Sn)	0.100	0.0797	1.0000	0.0500	0.1000	0.0765	0.9036
TOTAL METALS							
(Concentration Units = mg/l)		C avg	C max	C avg	C max		
Aluminum (Al)	2.000 U	3.9927	25.4000	6.6900	22.8000	4.2817	25.1214
Antimony (Sb) (5)	0.064 U	0.0309	0.0611	0.0403	0.1020	0.0319	0.0655
Barium (Ba)	1.000	0.2283	2.0200	0.2094	0.4610	0.2263	1.8530
Beryllium (Be)	0.100 U	0.0051	0.0572	0.0037	0.0076	0.0050	0.0519
Cadmium (Cd)	0.010	0.0030	0.0142	0.0025	0.0050	0.0029	0.0132
Chromium (Cr)	0.050	0.0151	0.2120	0.0090	0.0232	0.0144	0.1918
Cobalt (Co)	0.050 U	0.0295	0.1320	0.0250	0.0500	0.0290	0.1232
Copper (Cu)	0.200	0.0271	0.2930	0.0215	0.0446	0.0265	0.2664
Iron (Fe)	1.000	12.0000	204.0000	5.7857	17.0000	11.3342	183.9643
Lead (Pb)	0.050	0.0140	0.2150	0.0124	0.0317	0.0138	0.1954
Lithium (Li)	2.500	0.0533	0.1520	0.4608	2.5600	0.0970	0.4100
Manganese (Mn)	1.000	0.3603	3.6800	0.0723	0.1970	0.3294	3.3068
Mercury (Hg)	0.002	0.0002	0.0024	0.0002	0.0006	0.0002	0.0022
Molybdenum (Mo)	0.100	0.0561	0.1740	0.0449	0.0191	0.0549	0.1574
Nickel (Ni)	0.200	0.0294	0.2460	0.0200	0.0400	0.0284	0.2239
Selenium (Se)	0.010	0.0026	0.0059	0.0044	0.0160	0.0028	0.0070
Strontium (Sr) (6)	0.382	0.2317	0.8000	0.6096	1.3600	0.2722	0.8600
Vanadium (V)	0.100	0.0499	0.5550	0.0347	0.0595	0.0483	0.5019
Zinc (Zn)	2.000	0.2363	1.1900	0.8141	2.6600	0.2982	1.3475

TABLE F-1 (Cont)

FLOW WEIGHTED MAXIMUM CONCENTRATIONS

ANALYTE	ARAR	SW-61 (Flow = 37.5 GPM)		SW059 (Flow = 4.5 GPM) (1)		FLOW WEIGHTED AVERAGE CONCENTRATION	FLOW WEIGHTED MAXIMUM CONCENTRATION
DISSOLVED RADIONUCLIDES (Concentration Units = pCi/l)		C avg	C max	C avg	C max		
Gross Alpha	11.00	3.800	20.600	11.000	16.000	4.571	20.107
Gross Beta	19.00	10.000	43.700	5.100	8.240	9.475	39.901
Total Uranium	10.00	4.900	10.260	6.600	7.500	5.082	9.964
TOTAL RADIONUCLIDES (Concentration Units = pCi/l)		C avg	C max	C avg	C max		
Gross Alpha	11.00	73.000	780.000	96.000	310.000	75.464	729.643
Gross Beta	19.00	56.000	570.000	96.000	340.000	60.286	545.357
Plutonium 239, 240	0.05	0.320	3.300	0.750	3.100	0.366	3.279
Americium 241	0.05	0.083	0.440	0.300	1.300	0.106	0.532
Total Uranium	10.00	5.500	11.100	7.900	16.600	5.757	11.689
TOTAL INORGANICS (Concentration Units = mg/l)		C avg	C max	C avg	C max		
Total Dissolved Solids	400	411.0	3300.0	477.0	580.0	418.1	3008.6

(1) Collection at SW-61 includes flows from surface water stations SW056, SW060, SW061 and SW101.

(2) C avg = Average Analyte Concentration. For a group of stations (e.g. South Walnut Creek) C avg is computed by first determining the arithmetic mean concentration at individual stations and then using this data to compute the arithmetic mean for the stations in the group. If a datum indicates non-detected (i.e. 'U' designation), the value used in computation of the arithmetic mean is one-half the Contract Required Detection Limit (CRDL). In cases where a station or group of stations has many non-detect results in addition to one or more results below the detection limit for a containment, the calculated C avg may be greater than C max.

(3) C max = Maximum Analyte Concentration. C max is the maximum detected concentration in the entire data set for the station or group of stations. If the analyte is not detected (i.e. 'U' designation) in any of the station samples, C max is set equal to the CRDL.

(4) Methylene chloride and acetone were detected in several laboratory blanks. Surface water data in which these common laboratory contaminants wree detected in blanks are evaluated for computation of C avg and C max as follows: If the datum is less than 10 times the concentration found in the corresponding blanks, the datum is evaluated as a non-detect, 5U and 10U for methylene chloride and acetone, respectively. If the datum is greater than 10 times the concentration found in the corresponding blanks, the datum is evaluated at the concentration reported by the sample analysis.

(5) ARAR value for this constituent is TBC.

(6) No ARAR or TBC value exists for this constituent. The value listed as ARAR for this constituent is background concentration which is considererd as an IM/IRA treatment goal.

APPENDIX G

RISK ASSESSMENT CALCULATIONS

Risk Calculation Worksheet

South Walnut Creek Basin
Surface Water Treatment
Fugative Dust during construction
Exposure of the Public

Written: 09-Jan-91
Author: DCPalmer/KKerrigan
Printed: 09-Jan-91

Constants:

kg/mg	1.00E-06
gm/kg	1.00E+03
gm/mg	1.00E-03
m3/ml	1.00E-06
Sec Per Min	60

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hour
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	8	Hours/day
Exposure Frequency	EF	60	Days/year
Adult Exposure Duration	EDa	1	Years
Youth Exposure Duration	EDy	0	Years
Child Exposure Duration	EDc	1	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	365	Days
Child Avg Time (non-carc.)	ATnc	365	Days

Public Dispersion Factor	Chi over Q	1.40E-06	sec/cubic meter
	Airborn Dust	NA	mg/cubic meter
	Constr. Area	1.0	acres
	Dust Source	4.20E-04	kg/sec
	Job Duration	1.00	Years

Carcinogenic:(g)	Soil Conc (mg/kg)	Slope Factor SF	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg-day)	Adult Risk	Child Lifetime Risk
Arsenic	2.64E+03	5.00E+01 (b)	1.11E+00	1.55E-06	3.47E-10	1.74E-08	6.08E-08
Beryllium	1.00E+00	8.40E+00 (b)	4.20E-04	5.88E-10	1.32E-13	1.10E-12	3.87E-12
Bis-(2-ethylhexyl)phthalate	1.95E+00	1.40E-02 (d)	8.19E-04	1.15E-09	2.56E-13	3.59E-15	1.26E-14
Cadmium	3.00E+00	6.10E+00 (b)	1.26E-03	1.76E-09	3.95E-13	2.41E-12	8.42E-12
Chromium	5.33E+00	4.10E+01 (b)	2.24E-03	3.13E-09	7.01E-13	2.87E-11	1.01E-10
Nickel	4.70E+03	8.40E-01 (b)	1.97E+00	2.76E-06	6.18E-10	5.19E-10	1.82E-09
Total						1.79E-08	6.27E-08

Non-carcinogenic:(g)	Soil Conc (mg/kg)	RfC/RfD	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Intake (mg/kg/day)	Child Risk
Bis-(2-ethylhexyl)phthalate	1.95E+00	2.00E-02 (e)	8.19E-04	1.15E-09	1.80E-11	8.98E-10	6.28E-11	3.14E-09
Barium	4.70E+01	1.00E-03 (a,b)	1.98E-02	2.77E-08	4.33E-10	4.33E-07	1.52E-09	1.52E-06
Chromium	5.33E+00	4.00E-06 (a,c)	2.24E-03	3.13E-09	4.91E-11	1.23E-05	1.72E-10	4.29E-05
Mercury	1.00E-01	8.40E-05 (a,c)	4.20E-05	5.88E-11	9.21E-13	1.10E-08	3.22E-12	3.84E-08
Manganese	1.30E+02	1.14E-04 (a,b)	5.44E-02	7.62E-08	1.19E-09	1.05E-05	4.18E-09	3.66E-05
Total						2.32E-05		8.11E-05

Radionuclides:	Soil Conc (uCi/gm)	DCF(f) (mrem/uCi)	Source (uCi/sec)	Air Conc (uCi/m3)	Adult Intake (uCi)	Adult Dose (mrem)
Uranium	2.20E-05	1.30E+05	9.24E-06	1.29E-11	5.17E-09	6.73E-04
Americium	3.00E-06	5.20E+05	1.26E-06	1.76E-12	7.06E-10	3.67E-04
Plutonium	1.80E-05	3.30E+05	7.56E-06	1.06E-11	4.23E-09	1.40E-03
Total	4.30E-05					2.44E-03

(a)Subchronic Inhalation RfC values utilized.
(b)Inhalation value from IRIS.
(c)Inhalation value from HEAST, 4th Quarter, FY 1990.
(d)Oral value from IRIS.
(e)Subchronic RfD value from HEAST, 4th Quarter, FY 1990. RfC not available.
(f)Internal Dose Conversion Factors from DOE/EH-0071.
(g)Metals included in risk analysis include only those which have Slope Factors or RfCs available.

Dust Source = (1.2 tons/acre-month * Construction Area / (30 * 24 * 3600)) * 2000 lb\ton * .4536 kg/lb
Source = Dust source * Soil Concentration
Air concentration = source * (X/Q)
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfC or RfD
Intake (radionuclides) = air concentration * IR * ET * EF * job duration
Dose (radionuclides) = Intake * Dose Conversion Factor (DCF)

Risk Calculation Worksheet

South Walnut Creek Basin
Surface Water Treatment
Fugative Dust during construction
Exposure of Construction Workers

Written: 09-Jan-91
Author: DCPalmer/KK
Printed: 09-Jan-91

Constants:

kg/mg	1.00E-06
gm/kg	1.00E+03
gm/mg	1.00E-03
m3/ml	1.00E-06
Sec Per Min	60

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hour
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	8	Hours/day
Exposure Frequency	EF	60	Days/year
Adult Exposure Duration	EDa	1	Years
Youth Exposure Duration	EDy	NA	Years
Child Exposure Duration	EDc	NA	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	365	Days
Child Avg Time (non-carc.)	ATnc	NA	Days
Worker Dispersion Factor	Chi over Q	NA	sec/cubic meter
	Airborn Dust	5	mg/cubic meter
	Constr. Area	NA	acres
	Dust Source	NA	kg/sec
	Job Duration	1.00	Years

Carcinogenic:(g)

	Soil Conc (mg/kg)	Slope Factor SF	Source (mg/sec)	Air Conc (mg/m3)	------Adult------- Intake (mg/kg-day)	Risk
Arsenic	2.64E+03	5.00E+01 (b)	NA	1.32E-02	2.95E-06	1.47E-04
Beryllium	1.00E+00	8.40E+00 (b)	NA	5.00E-06	1.12E-09	9.39E-09
Bis-(2-ethylhexyl)phthalate	1.95E+00	1.40E-02 (d)	NA	9.75E-06	2.18E-09	3.05E-11
Cadmium	3.00E+00	6.10E+00 (b)	NA	1.50E-05	3.35E-09	2.05E-08
Chromium	5.33E+00	4.10E+01 (b)	NA	2.67E-05	5.96E-09	2.44E-07
Nickel	4.70E+03	8.40E-01 (b)	NA	2.35E-02	5.26E-06	4.41E-06
Total						1.52E-04

Non-carcinogenic:(g)

	Soil Conc (mg/kg)	RfC/RfD(a)	Source (mg/sec)	Air Conc (mg/m3)	------Adult------- Intake (mg/kg/day)	Risk
Bis-(2-ethylhexyl)phthalate	1.95E+00	2.00E-02 (e)	NA	9.75E-06	1.53E-07	7.63E-06
Barium	4.70E+01	1.00E-03 (a,b)	NA	2.35E-04	3.68E-06	3.68E-03
Chromium	5.33E+00	4.00E-06 (a,c)	NA	2.67E-05	4.17E-07	1.04E-01
Mercury	1.00E-01	8.40E-05 (a,c)	NA	5.00E-07	7.83E-09	9.32E-05
Manganese	1.30E+02	1.14E-04 (a,b)				1.08E-01
Total						

Radionuclides:

	Soil Conc (uCi/gm)	DCF(f) (mrem/uCi)	Source (uCi/sec)	Air Conc (uCi/m3)	------Adult------- Intake (uCi)	Dose (mrem)
Uranium	2.20E-05	1.30E+05	NA	1.10E-07	4.40E-05	5.72E+00
Americium	3.00E-06	5.20E+05	NA	1.50E-08	6.00E-06	3.12E+00
Plutonium	1.80E-05	3.30E+05	NA	9.00E-08	3.60E-05	1.19E+01
Total	4.30E-05					2.07E+01

(a)Subchronic Inhalation RfC values utilized.
(b)Inhalation value from IRIS.
(c)Inhalation value from HEAST, 4th Quarter, FY 1990.
(d)Oral value from IRIS.
(e)Subchronic RfD value from HEAST, 4th Quarter, FY 1990. RfC not available.
(f)Internal Dose Conversion Factors from DOE/EH-0071.
(g)Metals included in risk analysis include only those which have Slope Factors or RfCs available.

Air concentration = Soil concentration * airborn dust * kg/mg
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfC or RfD
Intake (radionuclides) = air concentration * IR * ET * EF * job duration
Dose (radionuclides) = Intake * Dose Conversion Factor (DCF)

Risk Calculation Worksheet

South Walnut Creek Basin
Surface Water Treatment
Fugative Dust during construction
Exposure of Other Site Workers

Written: 09-Jan-91
Author: DCPalmer/KKerrigan
Printed: 09-Jan-91

Constants:

kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	
Sec Per Min	60	

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hour
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	8	Hours/day
Exposure Frequency	EF	60	Days/year
Adult Exposure Duration	EDa	1	Years
Youth Exposure Duration	EDy	0	Years
Child Exposure Duration	EDc	1	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	365	Days
Child Avg Time (non-carc.)	ATnc	365	Days

Worker Dispersion Factor	Chi over Q	2.43E-04	sec/cubic meter
	Airborn Dust	NA	mg/cubic meter
	Constr. Area	1.0	acres
	Dust Source	4.20E-04	kg/sec
	Job Duration	1.00	Years

Carcinogenic:(g)	Soil Conc (mg/kg)	Slope Factor SF	Source (mg/sec)	Air Conc (mg/m3)	------Adult------- Intake (mg/kg-day)	Risk
Arsenic	2.64E+03	5.00E+01 (b)	1.11E+00	2.69E-04	6.03E-08	3.01E-06
Beryllium	1.00E+00	8.40E+00 (b)	4.20E-04	1.02E-07	2.28E-11	1.92E-10
Bis-(2-ethylhexyl)phthalate	1.95E+00	1.40E-02 (d)	8.19E-04	1.99E-07	4.45E-11	6.23E-13
Cadmium	3.00E+00	6.10E+00 (b)	1.26E-03	3.06E-07	6.85E-11	4.18E-10
Chromium	5.33E+00	4.10E+01 (b)	2.24E-03	5.44E-07	1.22E-10	4.99E-09
Nickel	4.70E+03	8.40E-01 (b)	1.97E+00	4.80E-04	1.07E-07	9.01E-08
Total						3.11E-06

Non-carcinogenic:(g)	Soil Conc (mg/kg)	RfC/RfD(a)	Source (mg/sec)	Air Conc (mg/m3)	------Adult------- Intake (mg/kg/day)	Risk
Bis-(2-ethylhexyl)phthalate	1.95E+00	2.00E-02 (e)	8.19E-04	1.99E-07	3.12E-09	1.56E-07
Barium	4.70E+01	1.00E-03 (a,b)	1.98E-02	4.80E-06	7.52E-08	7.52E-05
Chromium	5.33E+00	4.00E-06 (a,c)	2.24E-03	5.44E-07	8.52E-09	2.13E-03
Mercury	1.00E-01	8.40E-05 (a,c)	4.20E-05	1.02E-08	1.60E-10	1.90E-06
Manganese	1.30E+02	1.14E-04 (a,b)	5.44E-02	1.32E-05	2.07E-07	1.82E-03
Total						4.02E-03

Radionuclides:	Soil Conc (uCi/gm)	DCF(f) (mrem/uCi)	Source (uCi/sec)	Air Conc (uCi/m3)	------Adult------- Intake (uCi)	Dose (mrem)
Uranium	2.20E-05	1.30E+05	9.24E-06	2.25E-09	8.98E-07	1.17E-01
Americium	3.00E-06	5.20E+05	1.26E-06	3.06E-10	1.22E-07	6.37E-02
Plutonium	1.80E-05	3.30E+05	7.56E-06	1.84E-09	7.35E-07	2.42E-01
Total	4.30E-05					4.23E-01

(a)Subchronic Inhalation RfC values utilized.
(b)Inhalation value from IRIS.
(c)Inhalation value from HEAST, 4th Quarter, FY 1990.
(d)Oral value from IRIS.
(e)Subchronic RfD value from HEAST, 4th Quarter, FY 1990. RfC not available.
(f)Dose Conversion Factors from DOE/EH-0071.
(g)Metals included in risk analysis include only those with Slope Factors or RfCs available.

Dust Source = (1.2 tons/acre-month * Construction Area / (30 * 24 * 3600)) * 2000 lb\ton * .4536 kg/lb
Source = Dust source * Soil Concentration
Air concentration = source * (X/Q)
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfC or RfD
Intake (radionuclides) = air concentration * IR * ET * EF * job duration
Dose (radionuclides) = Intake * Dose Conversion Factor (DCF)

Risk Calculation Worksheet

South Walnut Creek Basin
Surface Water Treatment
Collection Tank Venting
Exposure of the Public

Written: 07-Jan-91
Author: DCPalmer/KKerrigan
Printed: 08-Jan-91

Constants:

Liter Per Gal	3.7853	
Sec Per Min	60	
R	62.37	mmHg l/gmole K
N/V	3.28E+01	
kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hour
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	265	Days/year
Adult Exposure Duration	EDa	30	Years
Youth Exposure Duration	EDy	25	Years
Child Exposure Duration	EDc	5	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	10950	Days
Child Avg Time (non-carc.)	ATnc	1825	Days

Public Dispersion Factor	Chi over Q	1.40E-06	sec/cubic meter
	Job Duration	NA	Years
	Flow Rate	60	gpm

Carcinogenic:

	Vapor Conc (mg/l)	Slope Factor SF	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Lifetime Risk
Carbon Tetrachloride	1.97E-05	1.30E-01 (b)	7.46E-05	1.04E-10	9.29E-12	1.21E-12	2.39E-12
Acetone	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichlorethene	7.16E-05	1.20E+00 (b)	2.71E-04	3.79E-10	3.37E-11	5.66E-11	8.03E-11
1,2-Dichloroethene	1.69E-06	NA	6.42E-06	8.98E-12	7.99E-13	0.00E+00	0.00E+00
Tetrachloroethene	4.13E-06	1.80E-03 (c,f)	1.56E-05	2.19E-11	1.94E-12	4.90E-15	6.94E-15
Trichloroethene	9.41E-06	1.70E-02 (c,f)	3.56E-05	4.99E-11	4.43E-12	1.05E-13	1.49E-13
Methylene Chloride	0.00E+00	1.40E-02 (b)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	1.90E+00 (e,f)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethane	3.02E-06	NA	1.14E-05	1.60E-11	1.42E-12	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals	1.10E-04					5.80E-11	8.28E-11

Non-carcinogenic:

	Vapor Conc (mg/l)	RfC/RfD(a)	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Intake (mg/kg/day)	Child Risk
Carbon Tetrachloride	1.97E-05	7.00E-04 (a,d)	7.46E-05	1.04E-10	2.17E-11	3.10E-08	7.58E-11	1.08E-07
Acetone	0.00E+00	1.00E-01 (a,d)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichlorethene	7.16E-05	9.00E-03 (a,d)	2.71E-04	3.79E-10	7.87E-11	8.74E-09	2.75E-10	3.06E-08
1,2-Dichloroethene	1.69E-06	2.00E-02 (a,d)	6.42E-06	8.98E-12	1.86E-12	9.32E-11	6.52E-12	3.26E-10
Tetrachloroethene	4.13E-06	1.00E-02 (a,d)	1.56E-05	2.19E-11	4.54E-12	4.54E-10	1.59E-11	1.59E-09
Trichloroethene	9.41E-06	NA	3.56E-05	4.99E-11	1.03E-11	NA	3.62E-11	NA
Methylene Chloride	0.00E+00	9.00E-01 (c,f)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA
1,1 Dichloroethane	3.02E-06	1.00E-01 (c,f)	1.14E-05	1.60E-11	3.32E-12	3.32E-11	1.16E-11	1.16E-10
Carbon Disulfide	0.00E+00	3.00E-03 (c,f)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals	1.10E-04					4.03E-08		1.41E-07

(a)Chronic Oral RfD utilized where Chronic Inhalation RfC not available.
(b)Inhalation value from IRIS.
(c)Inhalation value from HEAST, 4th Quarter, FY 1990.
(d)Oral value from IRIS.
(e)Oral value from HEAST, 4th Quarter, FY 1990.
(f)Value not available on IRIS.

Source = Vapor concentration * flow rate * liters per gallon/seconds per minute
Air concentration = source * (X/Q)
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfC or RfD

Risk Calculation Worksheet

South Walnut Creek Basin
Surface Water Treatment
Collection Tank Venting
Exposure of RFP Workers

Written: 07-Jan-91
Author: DCPalmer/KK
Printed: 08-Jan-91

Constants:

Liter Per Gal	3.7853	
Sec Per Min	60	
R	62.37	mmHg l/gmole K
N/V	3.28E+01	
kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hr
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	265	Days/year
Adult Exposure Duration	EDa	30	Years
Youth Exposure Duration	EDy	25	Years
Child Exposure Duration	EDc	5	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	10950	Days
Child Avg Time (non-carc.)	ATnc	1825	Days

Worker Dispersion Factor	Chi over Q	2.69E-05	sec/cubic meter
	Job Duration	NA	Years
	Flow Rate	60	gpm

Carcinogenic:

	Conc (mg/l)	Slope Factor SF	Source (mg/sec)	Air Conc (mg/m3)	Intake (mg/kg/day)	Risk
Carbon Tetrachloride	1.97E-05	1.30E-01 (b)	7.46E-05	2.01E-09	1.78E-10	2.32E-11
Acetone	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichlorethene	7.16E-05	1.20E+00 (b)	2.71E-04	7.29E-09	6.48E-10	7.77E-10
1,2-Dichloroethene	1.69E-06	NA	6.42E-06	1.73E-10	1.53E-11	0.00E+00
Tetrachloroethene	4.13E-06	1.80E-03 (c,f)	1.56E-05	4.20E-10	3.74E-11	6.72E-14
Trichloroethene	9.41E-06	1.70E-02 (c,f)	3.56E-05	9.58E-10	8.52E-11	1.45E-12
Methylene Chloride	0.00E+00	1.40E-02 (b)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	1.90E+00 (e,f)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethane	3.02E-06	NA	1.14E-05	3.08E-10	2.74E-11	0.00E+00
Carbon Disulfide	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals	1.10E-04					8.02E-10

Non-carcinogenic:

	Conc (mg/l)	RfC/RfD(a)	Source (mg/sec)	Air Conc (mg/m3)	Intake (mg/kg/day)	Risk
Carbon Tetrachloride	1.97E-05	7.00E-04 (a,d)	7.46E-05	2.01E-09	4.16E-10	5.95E-07
Acetone	0.00E+00	1.00E-01 (a,d)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichlorethene	7.16E-05	9.00E-03 (a,d)	2.71E-04	7.29E-09	1.51E-09	1.68E-07
1,2-Dichloroethene	1.69E-06	2.00E-02 (a,d)	6.42E-06	1.73E-10	3.58E-11	1.79E-09
Tetrachloroethene	4.13E-06	1.00E-02 (a,d)	1.56E-05	4.20E-10	8.72E-11	8.72E-09
Trichloroethene	9.41E-06	NA	3.56E-05	9.58E-10	1.99E-10	NA
Methylene Chloride	0.00E+00	9.00E-01 (c,f)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	NA
1,1 Dichloroethane	3.02E-06	1.00E-01 (c,f)	1.14E-05	3.08E-10	6.39E-11	6.39E-10
Carbon Disulfide	0.00E+00	3.00E-03 (c,f)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals	1.10E-04					7.74E-07

(a)Chronic Oral RfD utilized where Chronic Inhalation RfC not available.
(b)Inhalation value from IRIS.
(c)Inhalation value from HEAST, 4th Quarter, FY 1990.
(d)Oral value from IRIS.
(e)Oral value from HEAST, 4th Quarter, FY 1990.
(f)Value not available on IRIS.

Source = Vapor concentration * flow rate * liters per gallon/seconds per minute
Air concentration = source * (X/Q)
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfC or RfD

Vapor concentration calculation

South Walnut Creek Basin Surface Water Treatment
Collection Tank Venting

Printed: 08-Jan-91
Written: 08-Jan-91
Author: DCPalmer

	Liq Conc (mg/l)	Molecular Weight	g_moles/l	Liq mole Fraction	Vap Press (mm Hg)	Partial Prs (mm Hg)	PP Fract	Vap Conc
Carbon Tetrachloride	2.19E-01	153.84	1.42E-06	2.57E-08	91.17	2.34E-06	3.90E-09	1.97E-05
Acetone	0.00E+00	58.08	0.00E+00	0.00E+00	185.20	0.00E+00	0.00E+00	0.00E+00
1,1-Dichlorethene	1.42E-01	96.95	1.46E-06	2.64E-08	510.56	1.35E-05	2.25E-08	7.16E-05
1,2-Dichloroethene	1.00E-02	96.95	1.03E-07	1.86E-09	171.69	3.20E-07	5.33E-10	1.69E-06
Tetrachloroethene	2.79E-01	165.85	1.68E-06	3.04E-08	14.98	4.55E-07	7.58E-10	4.13E-06
Trichloroethene	1.53E-01	131.4	1.16E-06	2.10E-08	62.28	1.31E-06	2.18E-09	9.41E-06
Methylene Chloride	0.00E+00	84.93	0.00E+00	0.00E+00	351.86	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	133.41	0.00E+00	0.00E+00	2819.28	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethane	6.00E-03	98.96	6.06E-08	1.09E-09	510.56	5.59E-07	9.31E-10	3.02E-06
Carbon Disulfide	0.00E+00	76.14	0.00E+00	0.00E+00	306.22	0.00E+00	0.00E+00	0.00E+00
Water	0	18.02	5.54E+01	1.000E+00	18.69	1.87E+01	3.12E-02	1.84E+01
Totals	0.00E+00		5.54E+01			6.00E+02		

Gram-moles per liter = (liquid concentration / 1000) / molecular weight
Liquid mole fraction = gram-moles per liter / total gram-moles
Partial pressure = vapor pressure * liquid mole fraction
Partial pressure fraction = partial pressure / atmospheric pressure
Vapor concentration = partial pressure fraction * (N/V) * molecular weight

Vapor Pressure Calculation

Printed: 08-Jan-91
Written: 08-Jan-91
Author: DCPalmer

	T1	P1	T2	P2	T1(K)	T2(K)	(20-T1)/(T2-T1)	Log P	P
Carbon Tetrachloride	4.3	40	23	100	277.4	296.1	8.93E-01	1.96	91.17
Acetone	7.7	100	39.5	400	280.8	312.6	4.18E-01	2.27	185.20
1,1-Dichlorethene	14.8	400	31.7	760	287.9	304.8	3.67E-01	2.71	510.56
1,2-Dichloroethene	9.5	100	41	400	282.6	314.1	3.65E-01	2.23	171.69
Tetrachloroethene	-13.8	10	40.1	40	286.9	313.2	2.74E-01	1.18	14.98
Trichloroethene	11.9	40	31.4	100	285	304.5	4.67E-01	1.79	62.28
Methylene Chloride	-6.3	100	24.1	400	266.8	297.2	8.98E-01	2.55	351.86
Vinyl Chloride	-28	400	-13.8	760	245.1	259.3	3.45E+00	3.45	2819.28
1,1 Dichloroethane	14.8	400	31.7	760	287.9	304.8	3.67E-01	2.71	510.56
Carbon Disulfide	-5.1	100	28	400	268	301.1	7.89E-01	2.49	306.22
Water	11.2	10	22.1	20	284.3	295.2	8.99E-01	1.27	18.69

Log P = [log(P2/P1] * (T2/294.1) * [(20-T1)/(T2-T1)]+log P1
Vapor pressure (P) = 10^(log P)
P1 is the vapor pressure at temperature T1, etc.

Risk Calculation Worksheet

South Walnut Creek Basin
Surface Water Treatment
Influent Tank Rupture (10,000 gal)
Exposure of the Public

Written: 08-Jan-91
Author: DCPalmer/KKerrigan
Printed: 08-Jan-91

Constants:

Liter Per Gal	3.7853	
Sec Per Min	60	
R	62.37	mmHg l/gmole K
M/V	3.28E+01	
kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hour
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	1	Days/year
Adult Exposure Duration	EDa	1	Years
Youth Exposure Duration	EDy	0	Years
Child Exposure Duration	EDc	1	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	365	Days
Child Avg Time (non-carc.)	ATnc	365	Days

Public Dispersion Factor	Chi over Q	1.27E-03	sec/cubic meter
	Job Duration	NA	Years
	Flow Rate	6.9	gpm

Carcinogenic:

	Liquid Conc (mg/l)	Slope Factor SF	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Lifetime Risk
Carbon Tetrachloride	2.19E-01	1.30E-01 (b)	9.59E-02	1.22E-04	1.36E-09	1.77E-10	6.20E-10
Acetone	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichlorethene	1.42E-01	1.20E+00 (b)	6.22E-02	7.90E-05	8.84E-10	1.06E-09	3.71E-09
1,2-Dichloroethene	1.00E-02	NA	4.38E-03	5.56E-06	6.22E-11	0.00E+00	0.00E+00
Tetrachloroethene	2.79E-01	1.80E-03 (c,g)	1.22E-01	1.55E-04	1.74E-09	3.12E-12	1.09E-11
Trichloroethene	1.53E-01	1.70E-02 (c,g)	6.70E-02	8.51E-05	9.52E-10	1.62E-11	5.66E-11
Methylene Chloride	0.00E+00	1.40E-02 (b)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	1.90E+00 (e,g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethane	6.00E-03	NA	2.63E-03	3.34E-06	3.73E-11	0.00E+00	0.00E+00
Carbon Disulfide	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals	8.09E-01					1.26E-09	4.40E-09

Non-carcinogenic:

	Liquid Conc (mg/l)	RfC/RfD(a)	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Intake (mg/kg/day)	Child Risk
Carbon Tetrachloride	2.19E-01	7.00E-03 (a,e)	9.59E-02	1.22E-04	9.54E-08	1.36E-05	3.34E-07	4.77E-05
Acetone	0.00E+00	1.00E+00 (a,e)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichlorethene	1.42E-01	9.00E-03 (a,e)	6.22E-02	7.90E-05	6.18E-08	6.87E-06	2.16E-07	2.41E-05
1,2-Dichloroethene	1.00E-02	2.00E-01 (a,e)	4.38E-03	5.56E-06	4.36E-09	2.18E-08	1.52E-08	7.62E-08
Tetrachloroethene	2.79E-01	1.00E-01 (a,e)	1.22E-01	1.55E-04	1.22E-07	1.22E-06	4.25E-07	4.25E-06
Trichloroethene	1.53E-01	NA	6.70E-02	8.51E-05	6.66E-08	ERR	2.33E-07	ERR
Methylene Chloride	0.00E+00	9.00E-01 (c,g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	ERR	0.00E+00	ERR
1,1 Dichloroethane	6.00E-03	1.00E+00 (c,g)	2.63E-03	3.34E-06	2.61E-09	2.61E-09	9.15E-09	9.15E-09
Carbon Disulfide	0.00E+00	3.00E-03 (c,f,g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals	8.09E-01					2.17E-05		7.61E-05

(a)Subchronic Oral RfD utilized where Subchronic Inhalation RfC not available. Subchronic values not available on IRIS.
(b)Inhalation value from IRIS.
(c)Inhalation value from HEAST, 4th Quarter, FY 1990.
(d)Oral value from IRIS.
(e)Oral value from HEAST, 4th Quarter, FY 1990.
(f)Subchronic value not available; chronic value utilized.
(g)Value not available on IRIS.

Source = Liquid Concentration * Flow Rate * Liters per gallon / seconds per minute
Air concentration = source * (X/Q)
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfC or RfD

Risk Calculation Worksheet

South Walnut Creek Basin
Surface Water Treatment
Influent Tank Rupture (10,000 gal)
Exposure of RFP Workers

Written: 08-Jan-91
Author: DCPalmer/KKerrigan
Printed: 08-Jan-91

Constants:

	Liter Per Gal	3.7853	
	Sec Per Min	60	
	R	62.37	mmHg l/gmole K
	N/V	3.28E+01	
	kg/mg	1.00E-06	
	gm/kg	1.00E+03	
	gm/mg	1.00E-03	
	m3/ml	1.00E-06	
Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hr
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	1	Days/year
Adult Exposure Duration	EDa	1	Years
Youth Exposure Duration	EDy	0	Years
Child Exposure Duration	EDc	1	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	365	Days
Child Avg Time (non-carc.)	ATnc	365	Days
Worker Dispersion Factor	Chi over Q	2.83E-02	sec/cubic meter
	Job Duration	NA	Years
	Flow Rate	6.9	gpm

Carcinogenic:

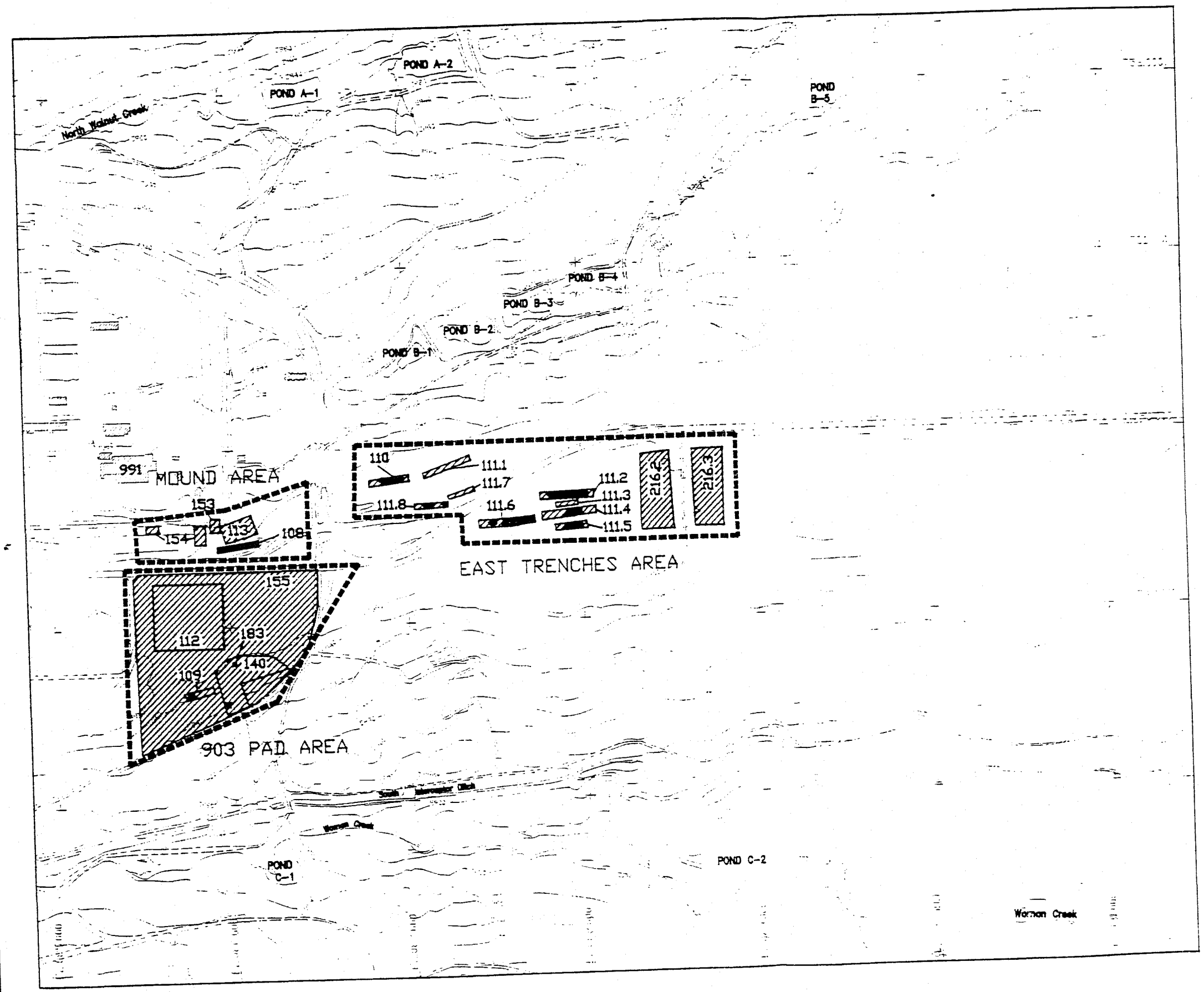
	Liquid Conc (mg/l)	Slope Factor SF	Source (mg/sec)	Air Conc (mg/m3)	Intake (mg/kg/day)	Risk
Carbon Tetrachloride	2.19E-01	1.30E-01 (b)	9.59E-02	2.72E-03	3.04E-08	3.95E-09
Acetone	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichlorethene	1.42E-01	1.20E+00 (b)	6.22E-02	1.76E-03	1.97E-08	2.36E-08
1,2-Dichloroethene	1.00E-02	NA	4.38E-03	1.24E-04	1.39E-09	0.00E+00
Tetrachloroethene	2.79E-01	1.80E-03 (c,g)	1.22E-01	3.46E-03	3.87E-08	6.96E-11
Trichloroethene	1.53E-01	1.70E-02 (c,g)	6.70E-02	1.90E-03	2.12E-08	3.61E-10
Methylene Chloride	0.00E+00	1.40E-02 (b)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	1.90E+00 (e,g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1 Dichloroethane	6.00E-03	NA	2.63E-03	7.44E-05	8.32E-10	0.00E+00
Carbon Disulfide	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals	8.09E-01					2.80E-08

Non-carcinogenic:

	Liquid Conc (mg/l)	RfC/RfD(a)	Source (mg/sec)	Air Conc (mg/m3)	Intake (mg/kg/day)	Risk
Carbon Tetrachloride	2.19E-01	7.00E-03 (a,e)	9.59E-02	2.72E-03	2.13E-06	3.04E-04
Acetone	0.00E+00	1.00E+00 (a,e)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichlorethene	1.42E-01	9.00E-03 (a,e)	6.22E-02	1.76E-03	1.38E-06	1.53E-04
1,2-Dichloroethene	1.00E-02	2.00E-01 (a,e)	4.38E-03	1.24E-04	9.71E-08	4.85E-07
Tetrachloroethene	2.79E-01	1.00E-01 (a,e)	1.22E-01	3.46E-03	2.71E-06	2.71E-05
Trichloroethene	1.53E-01	NA	6.70E-02	1.90E-03	1.48E-06	ERR
Methylene Chloride	0.00E+00	9.00E-01 (c,g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	ERR
1,1 Dichloroethane	6.00E-03	1.00E+00 (c,g)	2.63E-03	7.44E-05	5.82E-08	5.82E-08
Carbon Disulfide	0.00E+00	3.00E-03 (c,f,g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals	8.09E-01					4.84E-04

(a)Subchronic Oral RfD utilized where Subchronic Inhalation RfC not available. Subchronic values not available on IRIS.
(b)Inhalation value from IRIS.
(c)Inhalation value from HEAST, 4th Quarter, FY 1990.
(d)Oral value from IRIS.
(e)Oral value from HEAST, 4th Quarter, FY 1990.
(f)Subchronic value not available; chronic value utilized.
(g)Value not available on IRIS.

Source = Liquid Concentration * Flow Rate * Liters per gallon / seconds per minute
Air concentration = source * (X/Q)
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfC or RfD



EXPLANATION

216.2 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) AND IHSS DESIGNATION

LOCATION OF BARRELS DETERMINED BY VISUAL INSPECTION OR MAGNETOMETER SURVEY

REMEDIAL INVESTIGATION AREAS

N

Scale: 1" = 600'

0' 300' 600'

CONTOUR INTERVAL = 20'

U.S. DEPARTMENT OF ENERGY
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Golden, Colorado

OPERABLE UNIT NO. 2
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASIN

FIGURE 2-2

REMEDIAL INVESTIGATION AREAS AND INDIVIDUAL HAZARDOUS SUBSTANCE SITES

March 1991

MB122690/600

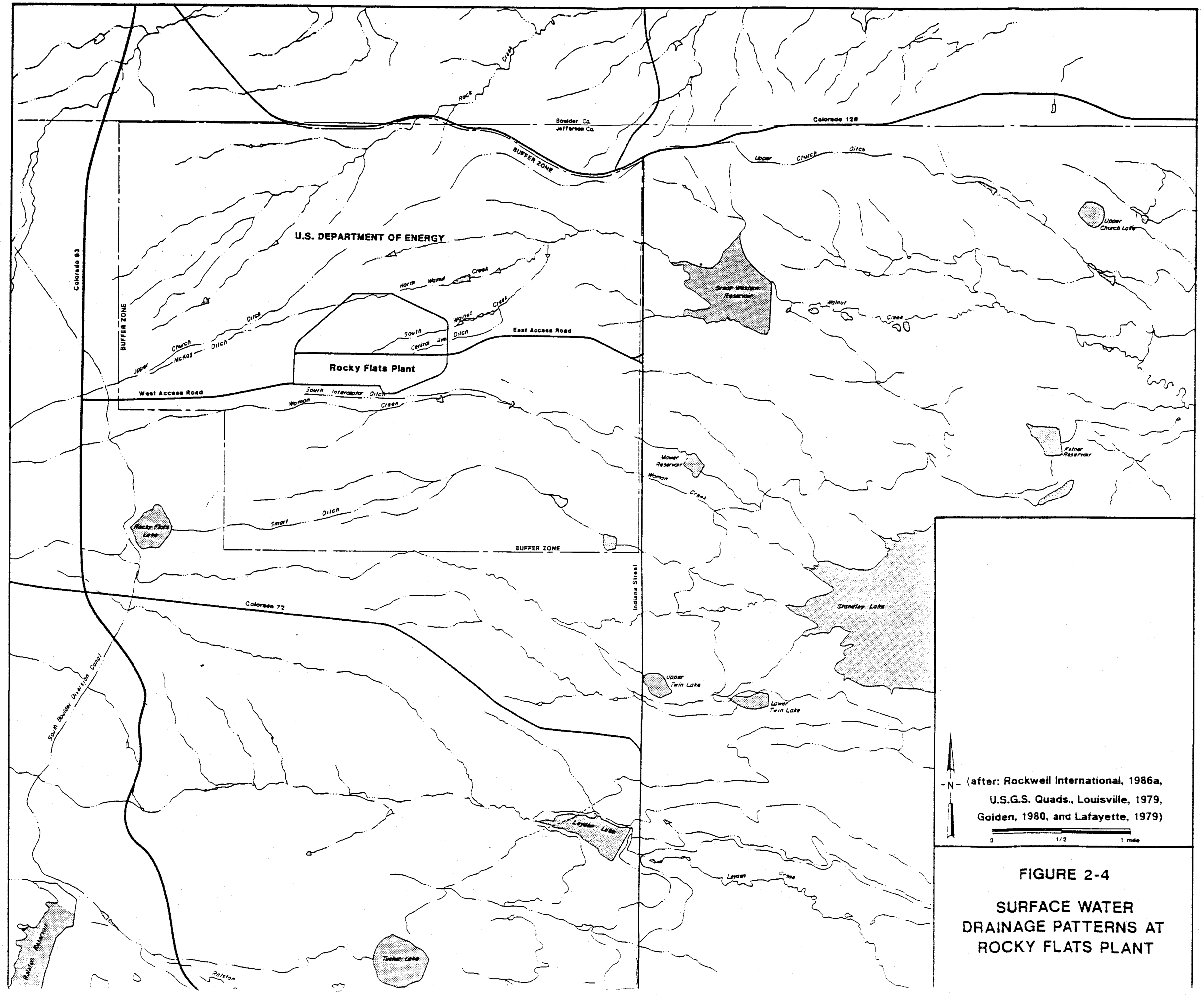
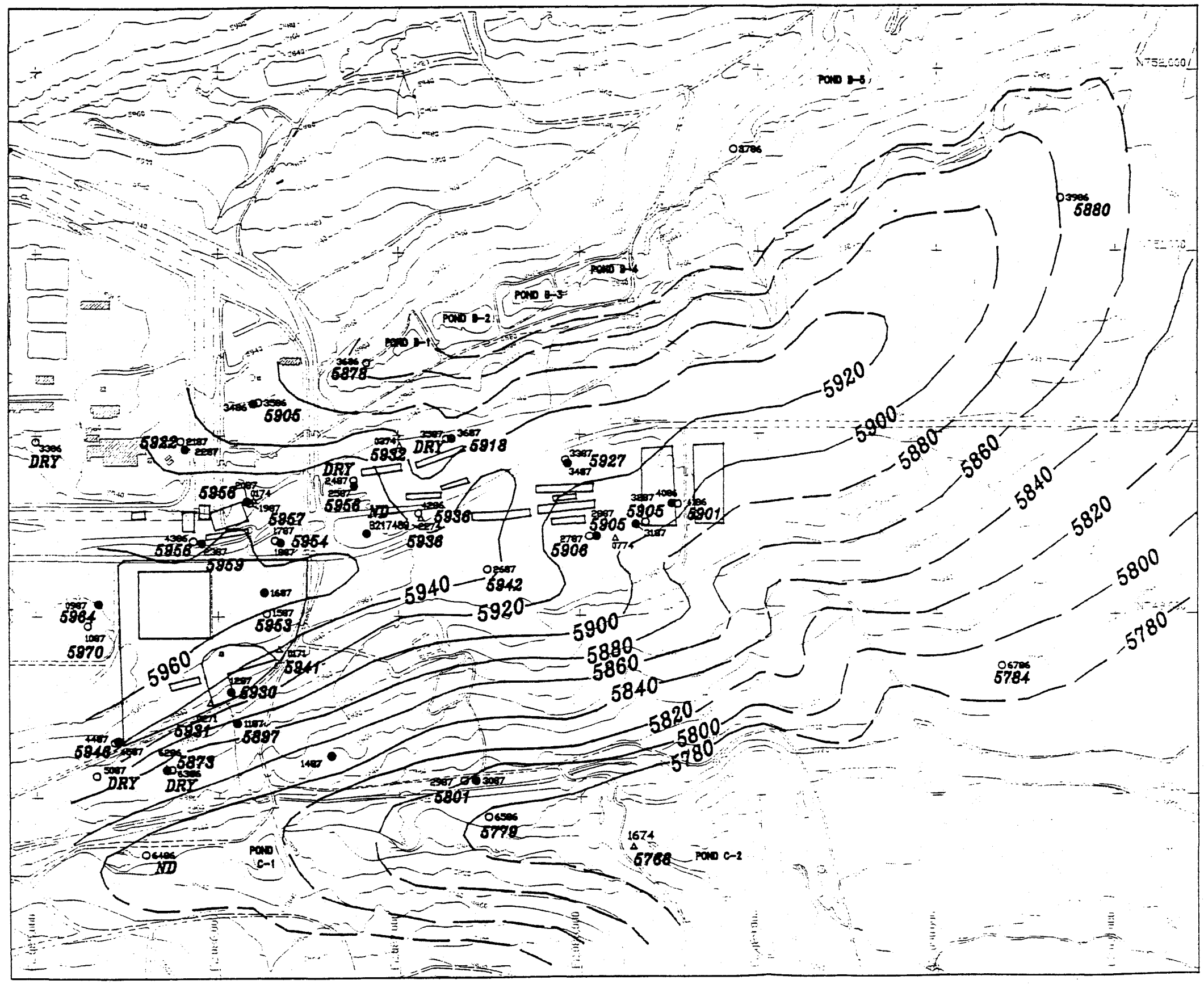


FIGURE 2-4

SURFACE WATER DRAINAGE PATTERNS AT ROCKY FLATS PLANT



EXPLANATION

INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)

5798 — POTENTIOMETRIC SURFACE ELEVATION (feet above mean sea level)

ALL DATA BASED ON MEASUREMENTS MADE APRIL 4–8, 1988 INCLUSIVE

5860 — LINE OF EQUAL POTENTIOMETRIC SURFACE ELEVATION (feet above mean sea level)—DASHED WHERE APPROXIMATELY LOCATED

ND — NO DATA

2587 ● BEDROCK MONITOR WELL

3789 ○ ALLUVIAL MONITOR WELL

0382 △ PRE-1986 MONITOR WELL

Scale: 1" = 600'

0' 300' 600'

CONTOUR INTERVAL = 20'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

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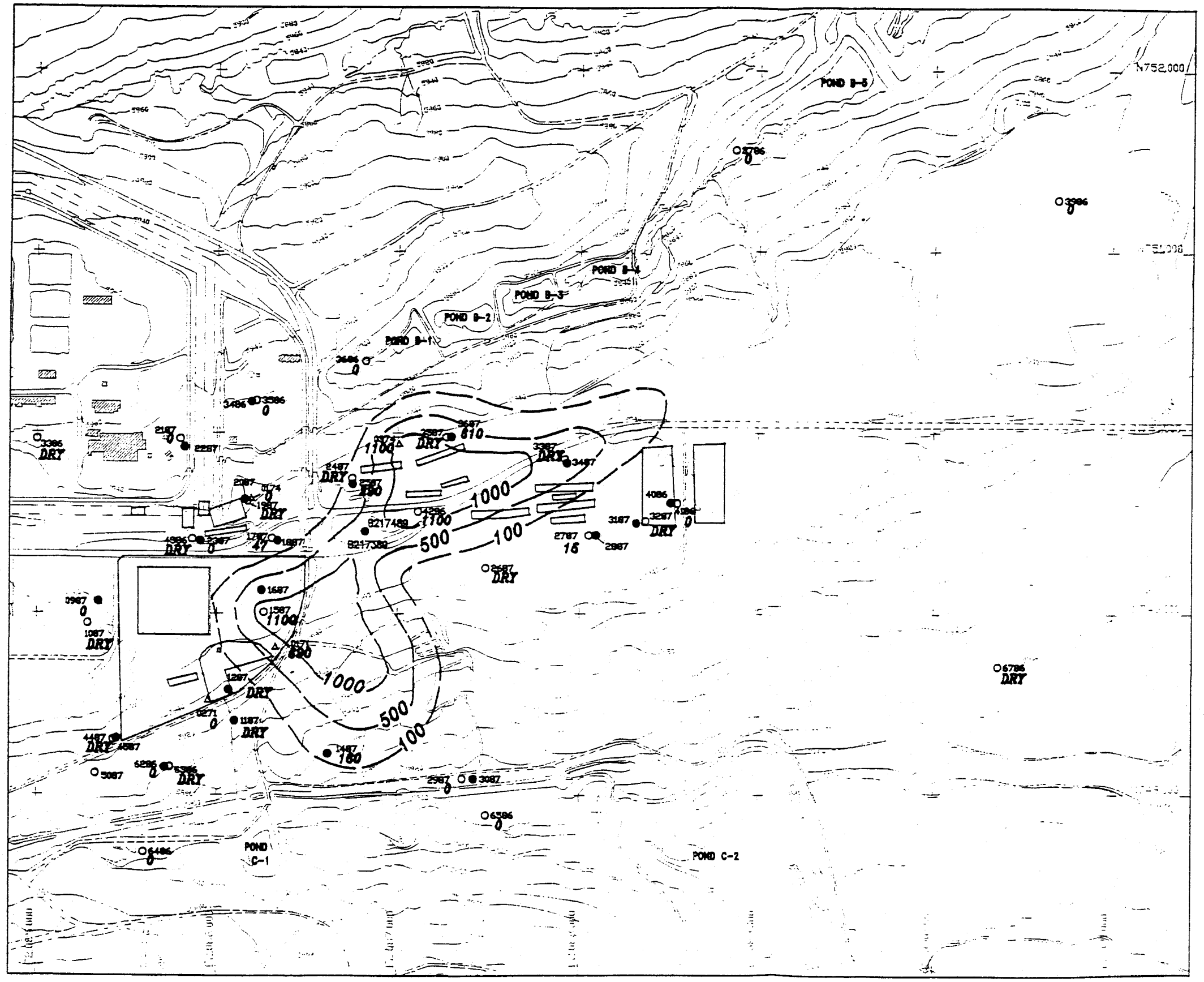
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASIN

FIGURE 2-7

POTENTIOMETRIC SURFACE OF THE UNCONFINED GROUND-WATER FLOW SYSTEM

March 199

903008.MB122790/600



EXPLANATION

INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)

500 — LINE OF EQUAL CCl_4 CONCENTRATION DASHED WHERE APPROXIMATELY LOC

290 — CCl_4 CONCENTRATION ($\mu g/l$)

2587 ● BEDROCK MONITOR WELL

3789 ○ ALLUVIAL MONITOR WELL

0382 △ PRE-1988 MONITOR WELL

N

Scale: 1" = 600'

0' 300' 600'

CONTOUR INTERVAL = 20'

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Golden, Colorado

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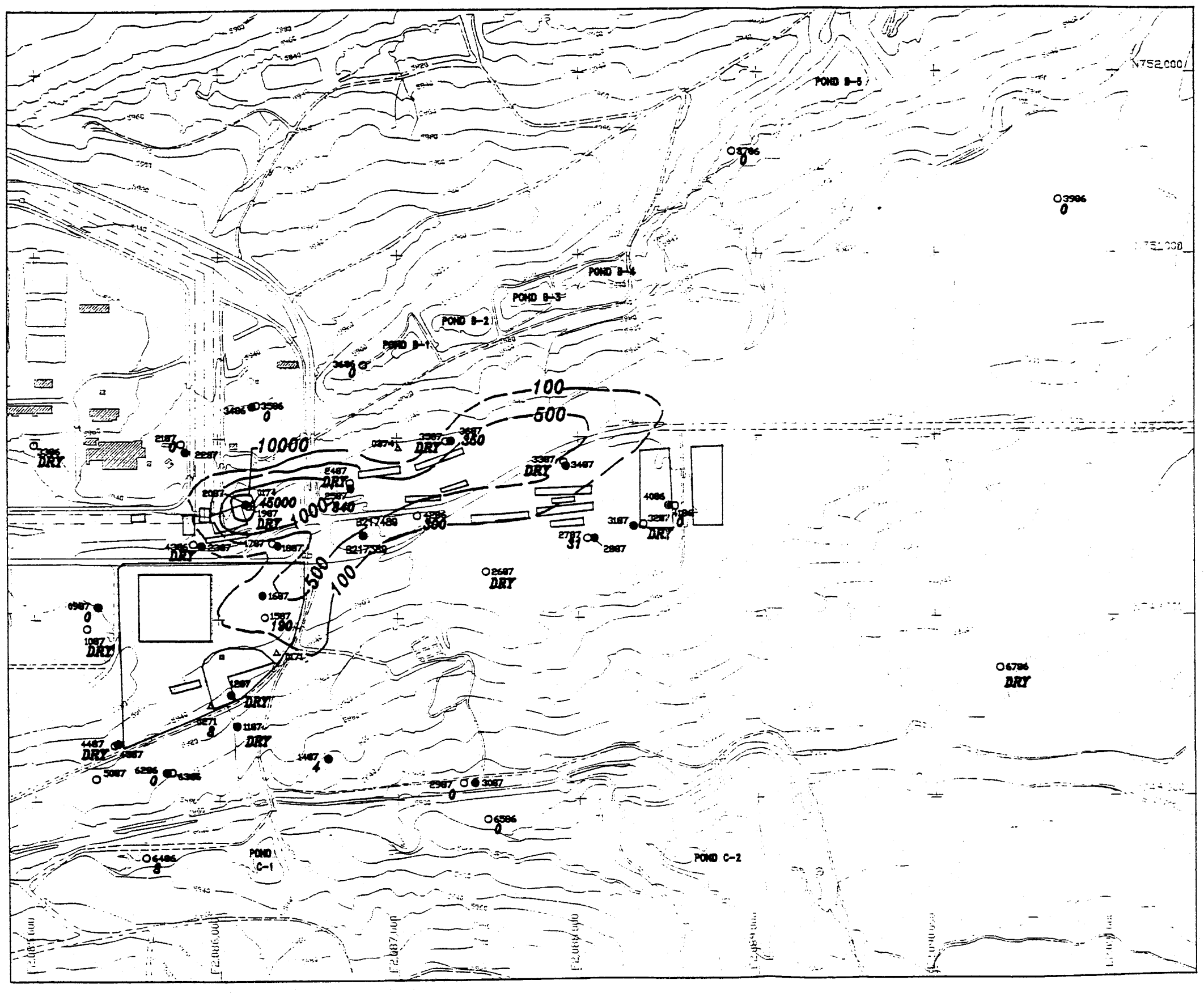
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASIN

FIGURE 2-8

CARBON TETRACHLORIDE ISOPLET
FOR THE UNCONFINED GROUND-W
FLOW SYSTEM
Second Quarter 1989

March

903010.MB010491/800



EXPLANATION

INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)

500 — LINE OF EQUAL PCE CONCENTRATION (µg DASHED WHERE APPROXIMATELY LOCATED

160 — PCE CONCENTRATION (µg/l)

2587 ● BEDROCK MONITOR WELL

3789 ○ ALLUVIAL MONITOR WELL

0382 △ PRE-1986 MONITOR WELL

N

Scale: 1" = 600'

0' 300' 600'

CONTOUR INTERVAL = 20'

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Golden, Colorado

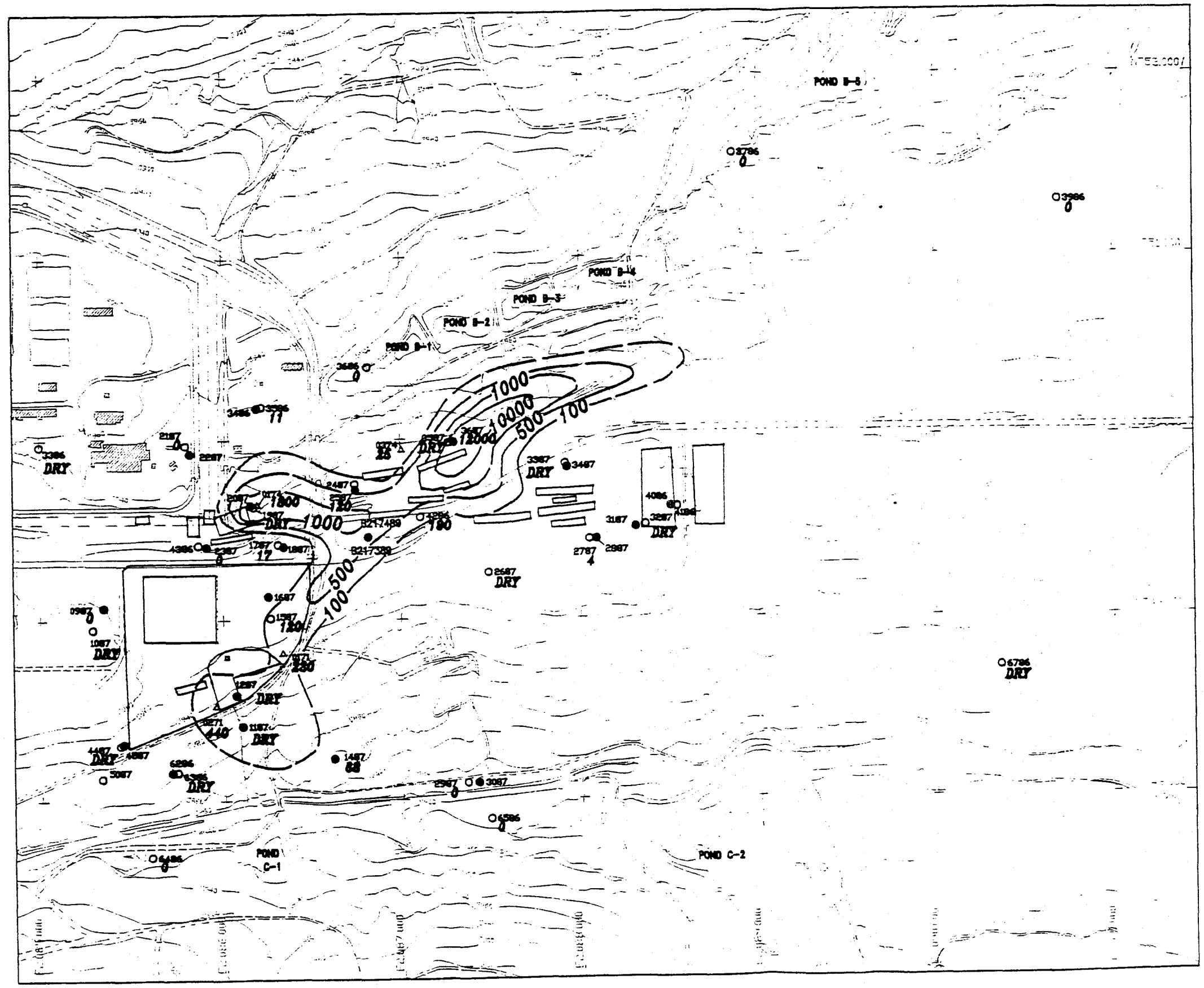
OPERABLE UNIT NO. 2
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASIN

FIGURE 2-9

TETRACHLOROETHENE ISOPLETHS FOR THE UNCONFINED GROUND-WA FLOW SYSTEM
Second Quarter 1989

March

03009.MP010491/600



EXPLANATION

INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)

500 — LINE OF EQUAL TCE CONCENTRATION (µg/l) DASHED WHERE APPROXIMATELY LOCATED

120 — TCE CONCENTRATION (µg/l)

2587 ● BEDROCK MONITOR WELL

3789 ○ ALLUVIAL MONITOR WELL

0382 △ PRE-1986 MONITOR WELL

N

Scale: 1" = 600'

0' 300' 600'

CONTOUR INTERVAL = 20'

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Rocky Flats Plant
Golden, Colorado

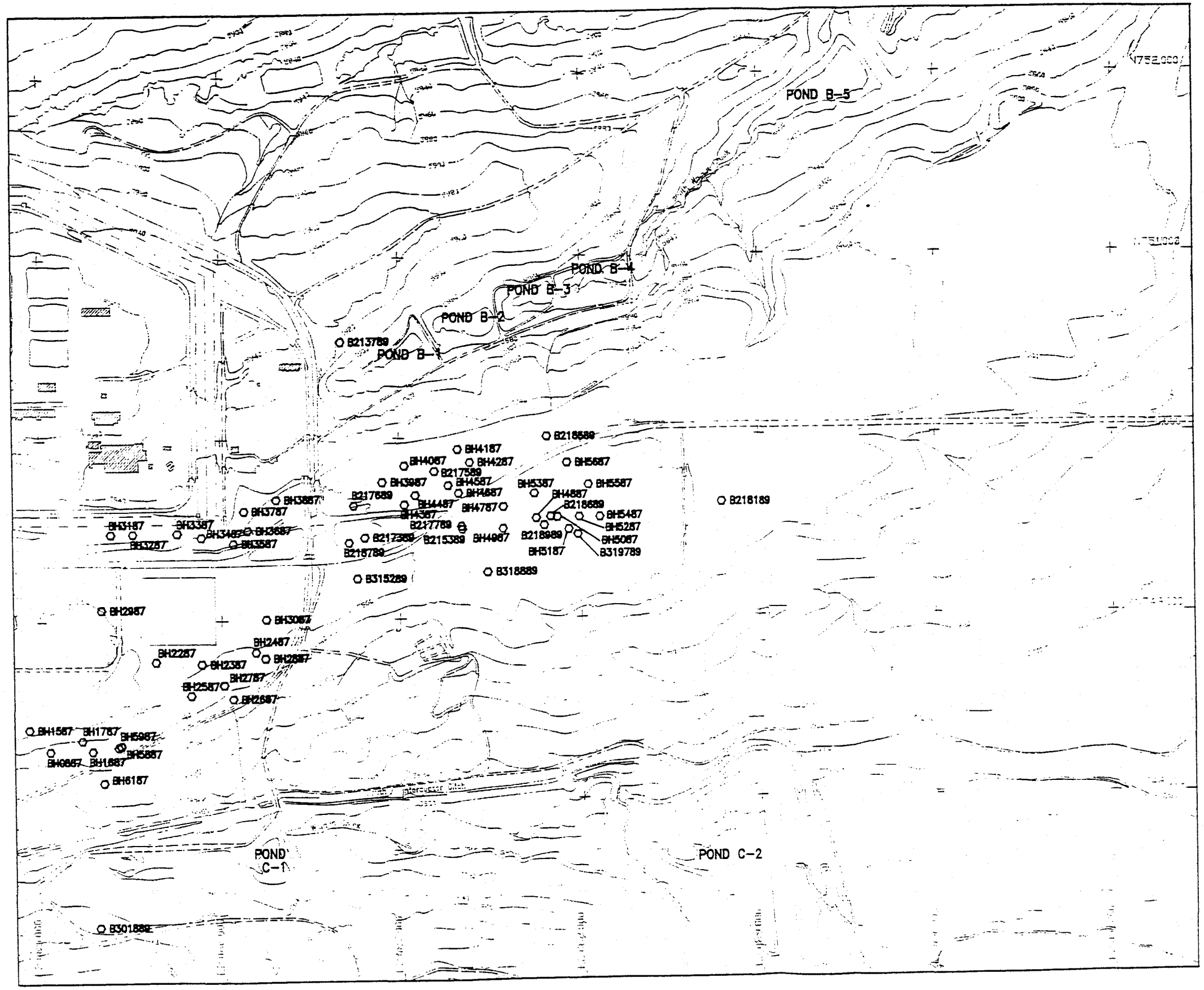
OPERABLE UNIT NO. 2
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASIN

FIGURE 2-10

TRICHLOROETHENE ISOPLETHS
FOR THE UNCONFINED GROUND-WAT
FLOW SYSTEM
Second Quarter 1989

March 1

3007.MB010401/800



EXPLANATION

○ BH3087 BOREHOLE LOCATION AND SOIL SAMPLE SITE (REFER TO TABLES A-10 THROUGH A-13)

N

Scale: 1" = 600'

0' 300' 600'

CONTOUR INTERVAL = 20'

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Golden, Colorado

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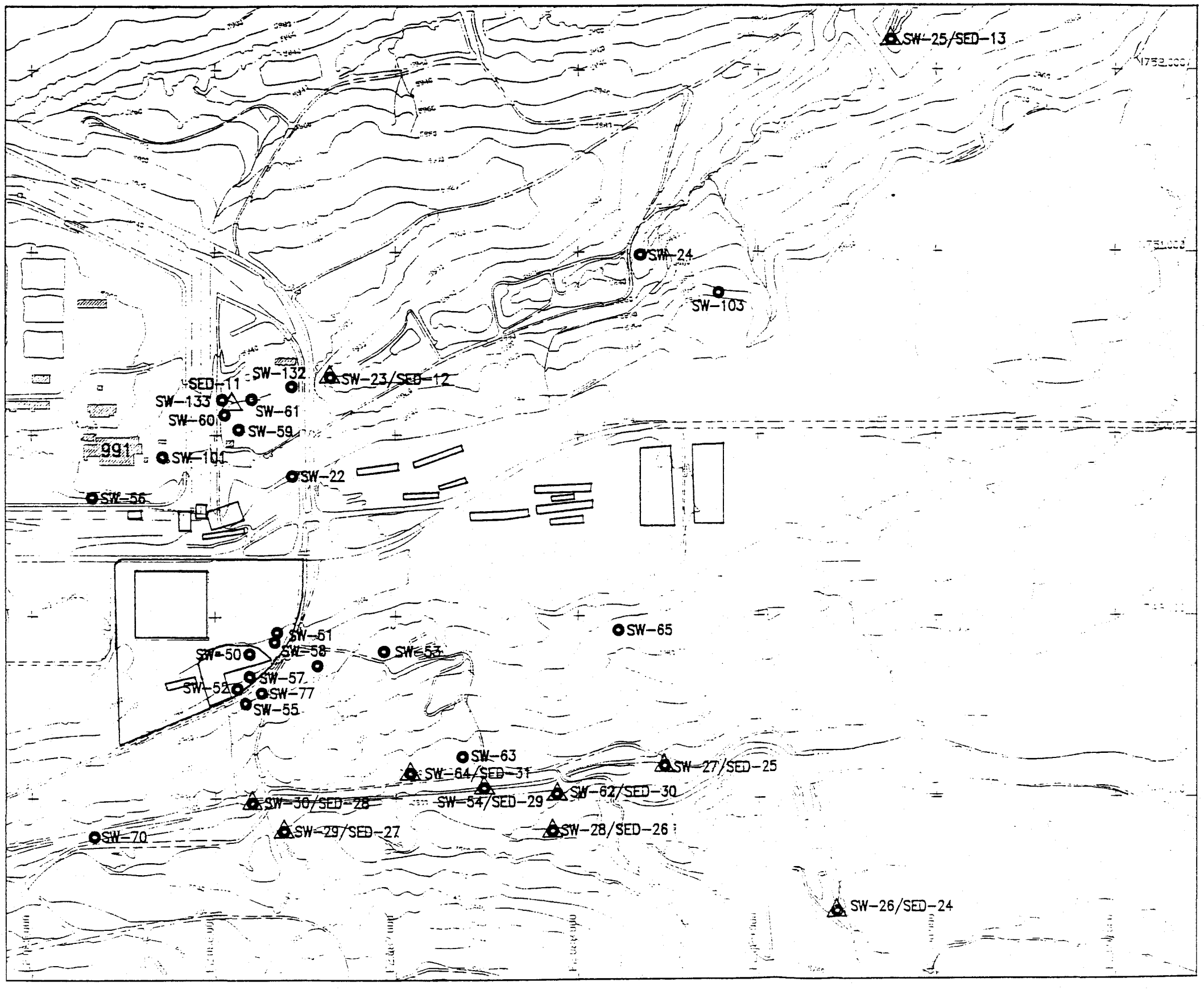
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASIN

FIGURE 2-11

SOIL SAMPLING
LOCATION MAP

Marc

3003.MB122790/800



EXPLANATION

INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)

SW-23 SURFACE WATER MONITORING STATION

SED-13 SEDIMENT MONITORING STATION

N

Scale: 1" = 600'

0' 300' 600'

CONTOUR INTERVAL = 20'

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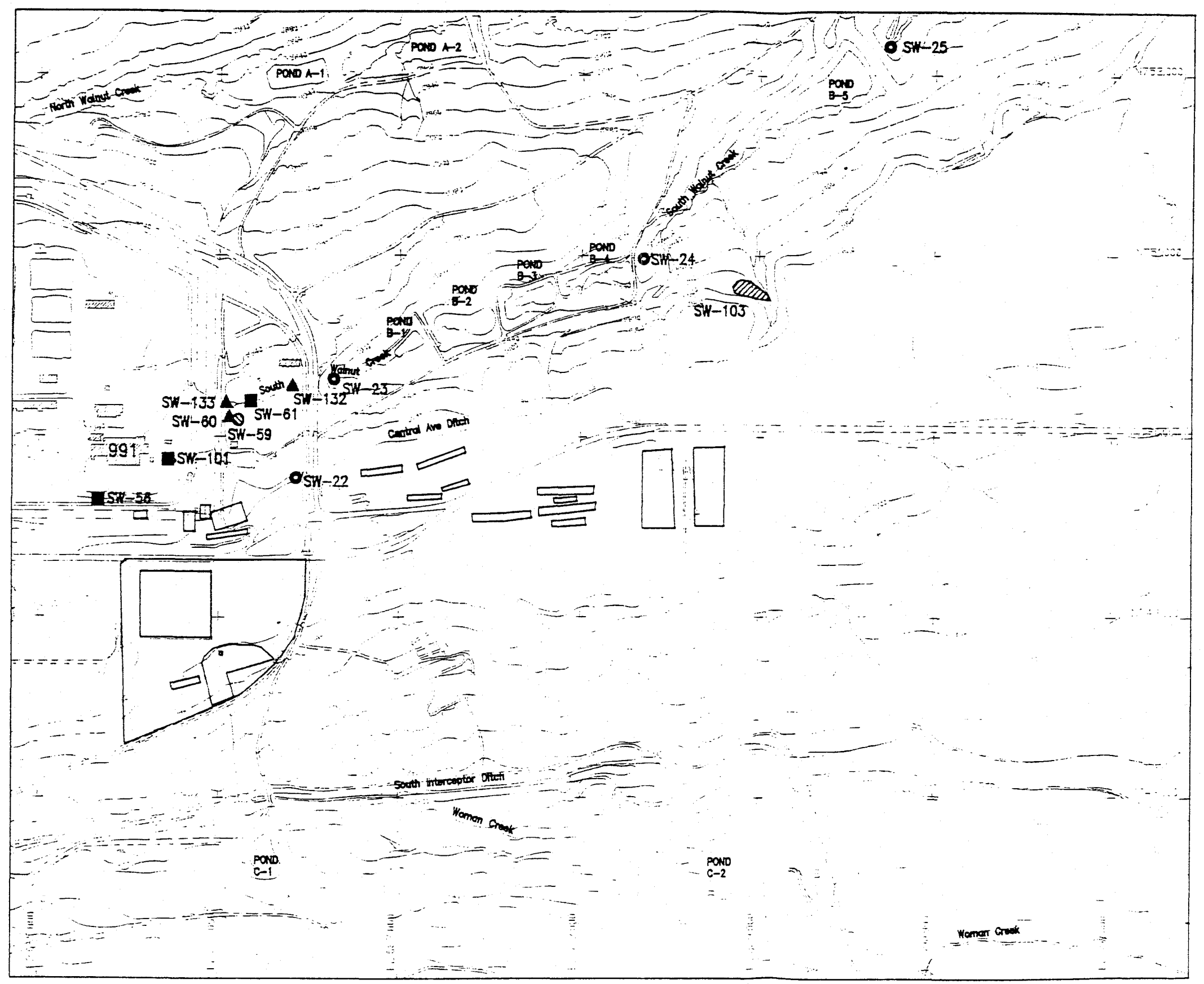
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASIN

FIGURE 2-12

SURFACE WATER AND SEDIMENT MONITORING STATIONS

March 199

3006.MP010391



EXPLANATION

INDIVIDUAL HAZARDOUS SUBSTA SITE (IHSS)

SW-103 SURFACE WATER MONITORING ST AT A SURFACE SEEP

SW-23 SURFACE WATER MONITORING ST IN A SURFACE WATER DRAINAGE

SW-59 IM/IRA SURFACE WATER MONITO STATION AT A SURFACE SEEP

SW-61 IM/IRA SURFACE WATER MONITO STATION IN A SURFACE WATER

SW-60 IM/IRA SURFACE WATER MONITO STATION AT THE EXIT OF A CUL

N

Scale: 1" = 600'

0' 300' 600'

CONTOUR INTERVAL = 20'

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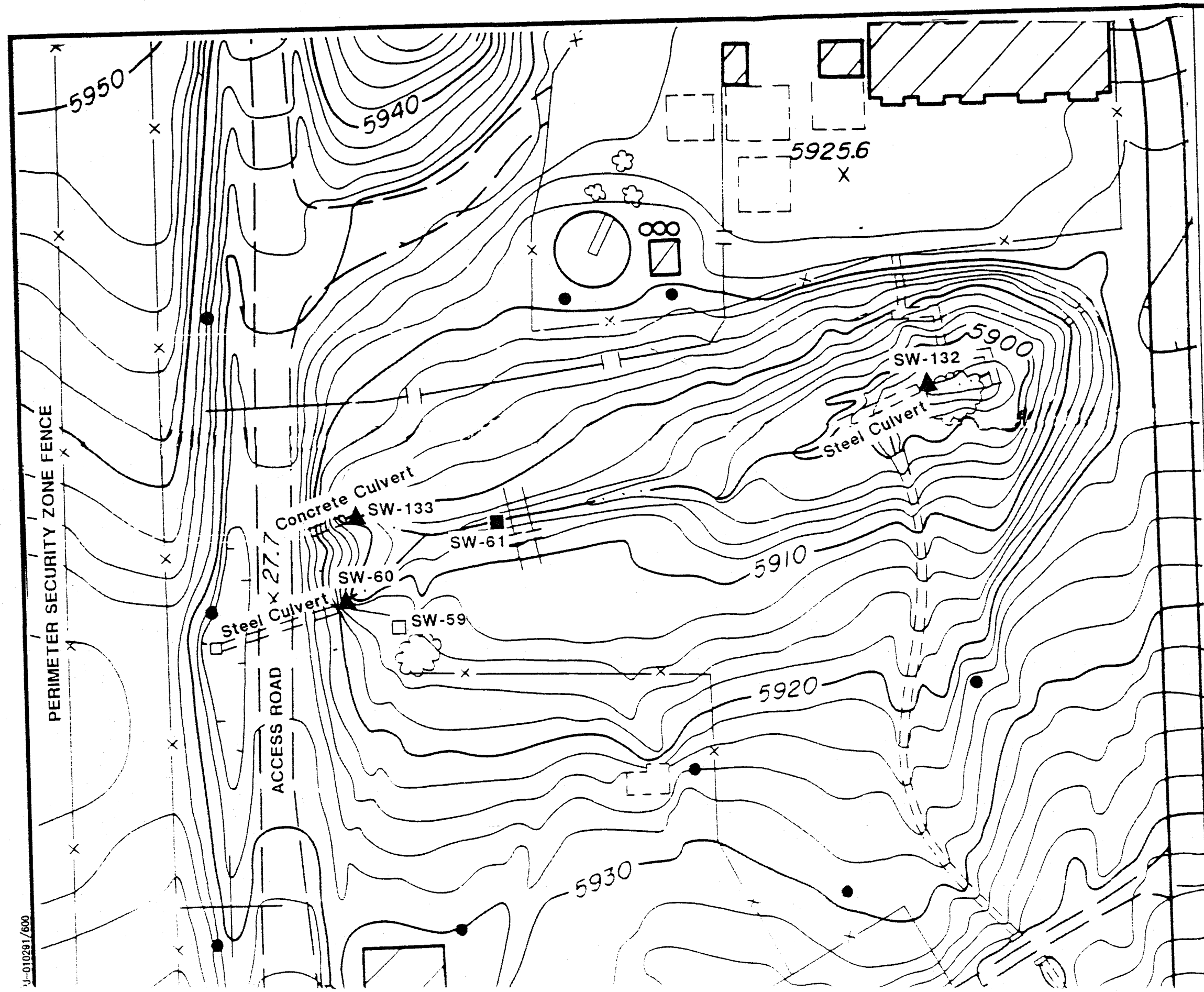
Golden, Colorado

OPERABLE UNIT NO. 2
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASI

FIGURE 4-1

SURFACE WATER
MONITORING STATIONS

MB010391/600



EXPLANATION

SW-59 — IM/IRA SURFACE WATER MONITORING STATION AT A SURFACE SEEP

SW-61 — IM/IRA SURFACE WATER MONITORING STATION IN A SURFACE WATER DRAINAG

SW-60 — IM/IRA SURFACE WATER MONITORING STATION AT OUTFLOW OF A CULVERT

N

Scale: 1" = 50'

0' 25' 50'

Contour Interval = 2'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

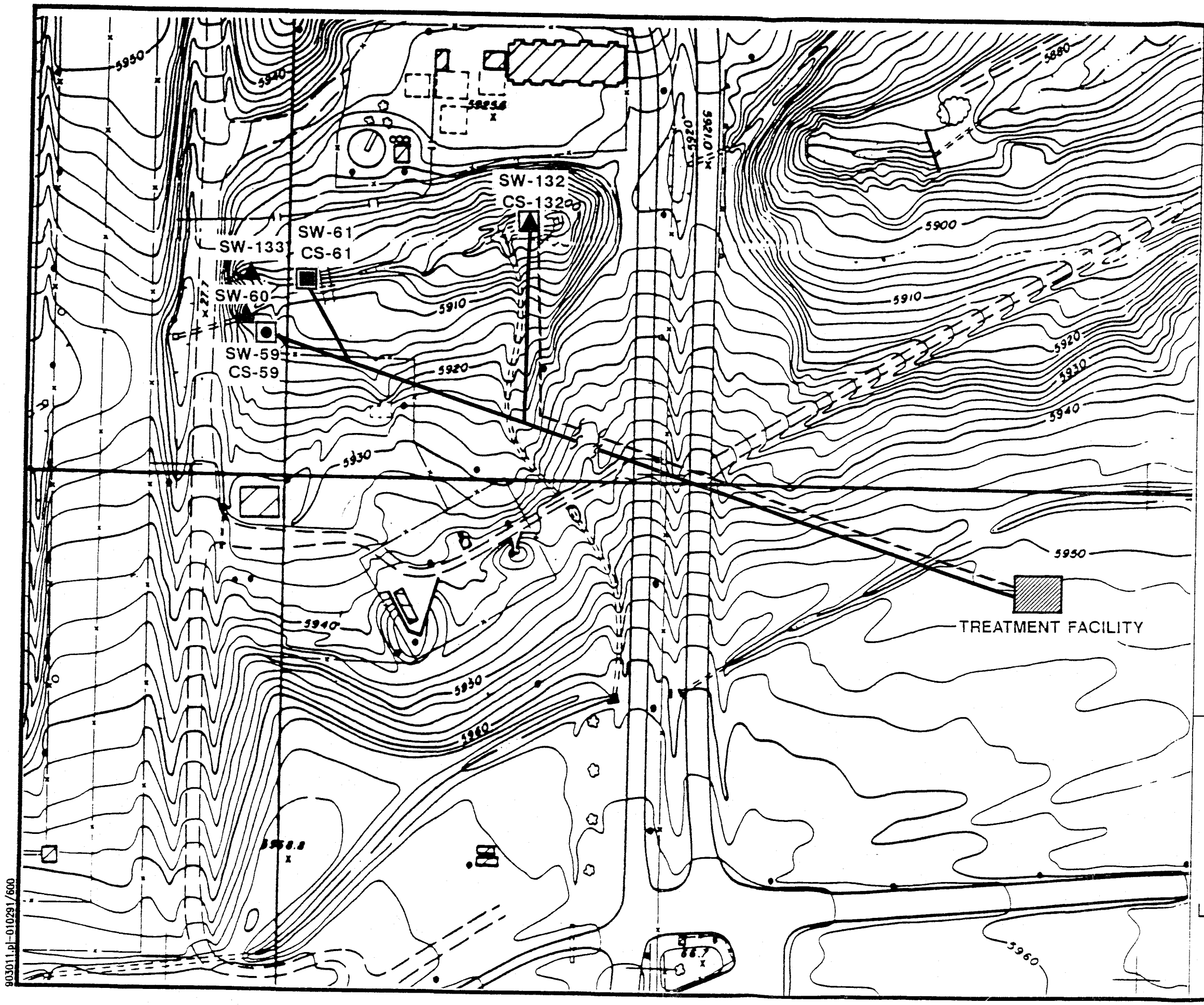
OPERABLE UNIT NO. 2
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASIN

FIGURE 4-2

DETAIL PLAN OF SURFACE WATER ST
SW-59, SW-60, SW-61, SW-
SW-133

Mar

U-010291/600



EXPLANATION

● SW-59	IM/IRA SURFACE WATER MONITORING STATION AT A SURFACE SEEP
■ SW-61	IM/IRA SURFACE WATER MONITORING STATION IN A SURFACE WATER DRAIN
▲ SW-60	IM/IRA SURFACE WATER MONITORING STATION AT OUTFLOW OF A CULVERT
□ CS-61	SURFACE WATER DIVERSION AND COLLECTION SYSTEM
———	SURFACE WATER TRANSFER PIPELINE
— — —	TREATMENT SYSTEM DISCHARGE PIPE

N

Scale: 1" = 100'

0' 50' 100'

Contour Interval = 2'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

OPERABLE UNIT NO. 2
SURFACE WATER IM/IRA
SOUTH WALNUT CREEK BASIN

FIGURE 4-3

LOCATION OF PROPOSED SURFACE WA
COLLECTION AND TREATMENT FACILIT

March, 1

903011.pl-010291/600

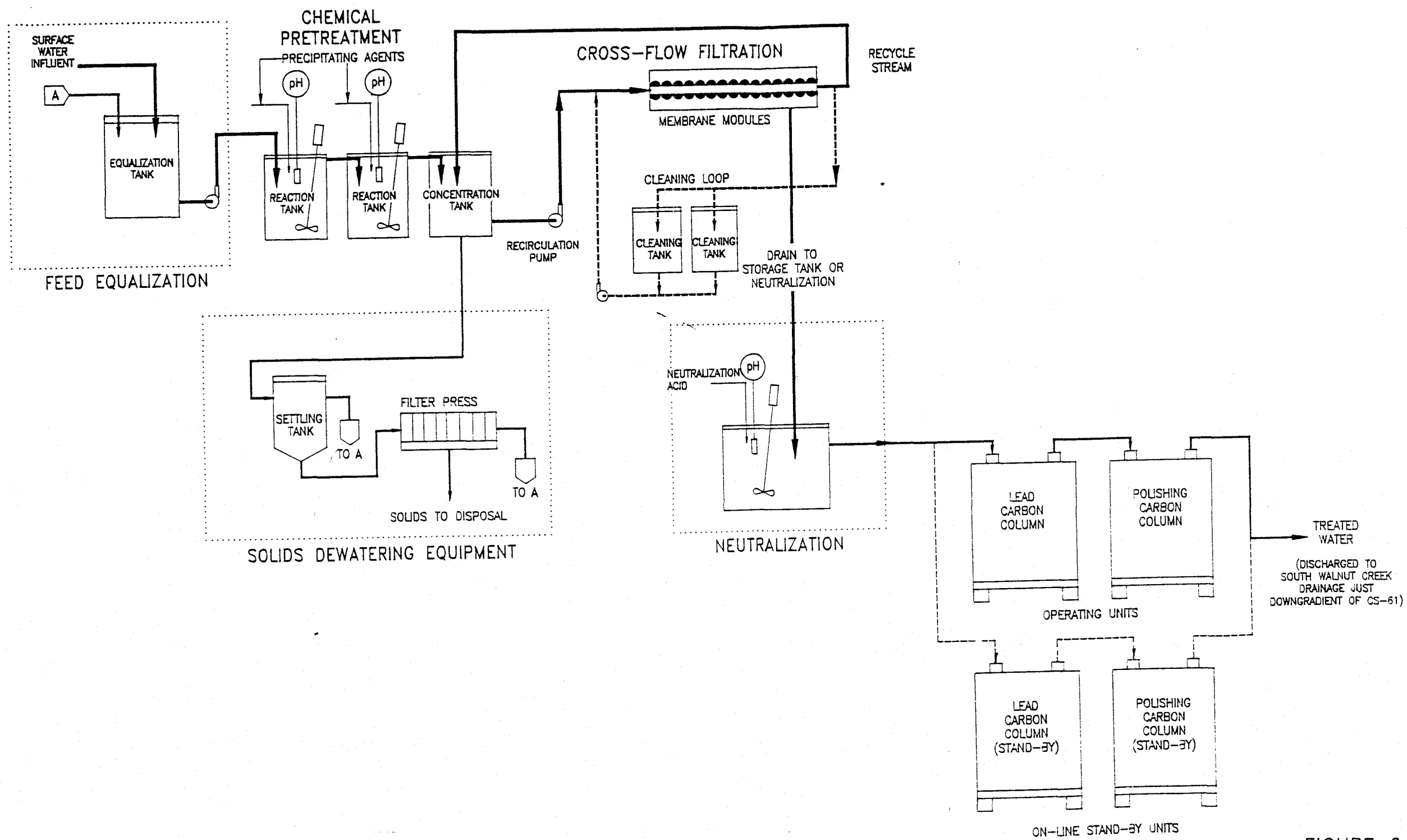


FIGURE 6-1

PROPOSED IM/IRA TREATMENT SYSTEM
PROCESS FLOW DIAGRAM