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STATEMENT OF WORK

SOIL VAPOR SURVEY

OU-2 SUBSURFACE INTERIM REMEDIAL ACTION

ROCKY FLATS PLANT

Prepared by:

Environmental Science and Engineering

EG&G Rocky Flats, Inc.

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STATEMENT OF WORK
FOR
OU 2 SUBSURFACE INTERIM REMEDIAL ACTION
SOIL VAPOR SURVEY
AT
ROCKY FLATS PLANT

1.0 PURPOSE AND OBJECTIVES

1.1 Purpose - The purpose of this task is to establish the location of three Soil Vapor Extraction (SVE) test sites within Operable Unit No. 2 (OU 2). The primary Individual Hazardous Substance Sites (IHSSs) selected for this Soil Vapor Survey (SVS) are:

- East Trenches Area - IHSS 110
- 903 Pad Area - IHSS 112
- Mound Area -Trench T-1- IHSS 113

The alternate SVE sites selected for this Soil Vapor Survey (SVS) include the 903 Pad Area - IHSS 109 and the East Trenches Area - IHSS 111.1.

1.2 Objectives - The objectives of this Soil Vapor Survey (SVS) shall be to map the concentration/distribution (isopleths) of the volatile organic carbon (VOC) source areas in vicinity of three proposed SVE test sites and two alternative test sites and to aid in locating the proposed SVE pilot plant. This work is the first phase of the Operable Unit No. 2 (OU 2) Subsurface Interim Remedial Action Soil Vapor Extraction Test.

1.3 OU 2 IRA Program - The OU 2 Subsurface Interim Remedial Action Soil Vapor Survey is part of a comprehensive, phased program of site characterization, remedial investigations, feasibility studies, and remedial/corrective actions implemented by EG&G Rocky Flats Environmental Restoration in progress to address contamination associated with the Rocky Flats Plant. These activities are pursuant to the Rocky Flats Interagency Agreement (IAG) developed between the Department of Energy (DOE), Environmental Protection Agency (EPA), and the Colorado Department of Health (CDH).

1.4 EG&G Contacts/Responsibilities - EG&G Procurement Subcontractor Administrator (SA) and the EG&G Environmental Restoration (ER) Contract Technical Representative (CTR) shall be the primary points of contact for the subcontract bidders prior to award and after award. Copies of all project correspondence (administrative and technical) shall be forwarded to both EG&G contacts. The SA shall authorize project award and funding. The Contract Technical Representative (CTR) shall manage the project by implementing the EG&G approved statement of work and controlling all project work and activities.

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2.0 SCOPE

The OU 2 Subsurface Interim Remedial Action Soil Vapor Survey (hereafter referred to as the Soil Vapor Survey) shall provide screening information on the occurrence of subsurface soil VOCs in vicinity of OU 2 IHSSs. This information will be used to establish the location of the SVE test site. The IHSSs selected for this SVS are 110 (East Trenches), 112 (903 Pad), and 113, (Mound). Alternate SVE test sites include IHSSs 109 (903 Pad Area) and 111.1 (East Trenches Area).

Findings from all field testing program shall be included in the Final SVS Summary Report. Significant related findings from other programs in progress at Rocky Flats shall also be incorporated at the direction of the Contract Technical Representative (CTR). These programs include, but are not limited to ongoing OU 2 specific studies.

The SVS scope of work includes the following activities:

- Mobilization
- Soil Vapor Survey
- Summary Report

2.1 Mobilization - The following is included as mobilization:

- Preparation of Implementation Plan
- Review of applicable EG&G documents (Health and Safety Plan(H&SP)), Standard Operating Procedures (SOP's)
- Prepare Activity Summary Forms
- Move-in equipment, conduct training
- Demobilize

2.2 Soil Vapor Survey - The Soil Vapor Survey shall be used to map the concentration distribution of the VOC source areas in vicinity of the three proposed SVE test sites per the SVS Work Plan (EG&G, October 1982).

The Soil Vapor Survey shall include the following activities:

- Implement documentation to support field effort
- Identify field sampling locations on a sampling grid layout
- Perform Soil vapor sampling and analysis and develop characterization data for each of three primary and two alternate test sites
- Evaluate analytical results
- Provide interim brief field reports on VOC plumes including findings, results, summaries of discussions and preliminarily recommended SVE sites.

The Soil Vapor Survey is to be conducted in two parts; a baseline SVS and detailed SVS. The baseline SVS addresses the characterization of only the three primary SVE sites as described in the SVS Workplan (EG&G, 1992 Appendix A). The Detailed SVS addresses the two alternate SVE sites, additional soil survey sampling required at the three primary SVE sites, and additional sampling and testing as

required and approved in writing by the EG&G SA and CTR.

2.3 Report-Prepare draft and final reports of findings, results, discussion and recommended SVE sites.In the final SVS report, placement of the SVE pilot test site shall include isopleths (in color) of the three VOC contaminants TCE,PCE, and CCL4 as determined by the SV surveys. A separate summary report(appendix) shall also be prepared, consisting of EG&G and DOE comments on the SVS Report and the DOE and EG&G responses to these comments.

2.4 Change Requests to Scope - Written change requests prepared by the subcontractor with supporting documentation shall be initially brought to the attention of the CTR to determine if the change request fulfills project needs. The EG&G SA shall review and approve in writing these change requests prior to accomplishing any additional work by the subcontractor (see changes clause).

3.0 BACKGROUND AND APPLICABLE DOCUMENTS

3.1 Background - The OU 2 Subsurface Interim Measures/Interim Remedial Action (IM/IRA) Plan/Environmental Assessment (EG&G, 1992) addresses removal of residual free-phase volatile organic compound (VOC) contamination suspected in the unsaturated subsurface at OU 2. The proposed demonstration of VOC removal actions involve pilot testing SVE technology at three different hydrogeologic settings within OU 2.

3.2 Applicable Documents - The following items as applicable to this project will be furnished by EG&G RFP upon the subcontractor's request after initial review of the data needs, and as required in preparation of this document:

EG&G, 1992	Pilot Test Plan Soil Vapor Extraction Technology, Subsurface Interim Measures/Interim Remedial Action, Operable Unit 2, DRAFT, 29 October 1992.
EG&G, 1992	Soil Vapor Survey Workplan, Subsurface Interim Measures/Interim Remedial Action, Operable Unit No. 2 , DRAFT, 29 October 1992.
EG&G, 1992	Standard Operating Procedures, 5-21000 OPS-FO, OPS-GW, and OPS-GT
EG&G, 1992	Health and Safety Plan, Subsurface Interim Measures/Interim Remedial Action Operable Unit No. 2 , DRAFT, 29 October 1992.
EG&G, 1992	Environmental Management Radiological Guidelines Manual(EMRG), 3-21000 OPS-EMRG Other applicable RFP, local, state and Federal documents and guidance.

4.0 TECHNICAL REQUIREMENTS/TASKS

4.1 General - The soil gas samples shall be analyzed by an on-site mobile laboratory to provide qualitative data on VOCs in the unsaturated zone. VOCs shall be analyzed utilizing gas chromatography/mass spectrometer (GC/MS) methods. The required VOC detection limit and Quality Assurance/Quality Control (QA/QC) requirements shall be maintained as specified in the SVS Workplan (EG&G, 1992) attached as Appendix A.

The concentrations of the primary analytes of concern, trichloroethylene (TCE), carbon tetrachloride, and tetrachloroethylene (PCE) shall be surveyed, reported and discussed. The vapor concentration and depth of each of these VOCs shall be mapped for each site survey within OU 2. A soil vapor VOC isopleth contour map of the 903 Pad , Mound, and East Trenches area shall be generated. Recommendations for placement of the SVE pilot plot for removal of the primary analytes for the 903 Pad, Mound, and East Trenches area shall also be made.

The SVS sample sites shall include boring to shallow depths as specified workplan (generally 2 to 5 ft occasionally deep boreholes shall extend to 10 ft depths.)

4.2 Activities - The following subtasks and activities shall form the subcontractor's work package:

- Mobilization
  - Prepare Implementation Plan.
    Review EG&G documents(H&SP, SOPs)
    Prepare Activity Summary Forms
  - Move in SVS Equipment and Materials.
    Perform Training and establish EG&G EOM Site Interfaces.

- Conduct Soil Vapor Survey
  - Conduct Location Survey for SVS sample sites within five proposed SVS test sites
  - Perform Baseline SVS at each of five proposed test sites
  - Perform Detailed SVS at additional selected SVS sample sites

- Prepare Reports
  - Analyze Data and Prepare SVS characterization.
  - Prepare Draft SVS Report
  - Submit Draft SVS Report
  - Prepare Final SVS Report
  - Submit Final SVS Report

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4.3 Mobilization - The following tasks shall be performed in support of the SVS mobilization effort:

- Prepare Implementation Plan
  - Project Management Plan
  - Field Management Plan
  - Review Health and Safety Plan
  - Review Standard Operating Procedures
  - Prepare Field Activity Summary Forms
  - Move in SVS Equipment and Materials

4.3.1 Prepare Implementation Plan - The Soil Vapor Survey Work Plan includes a scope of work and technical requirements that the subcontractor must fulfill. The subcontractor shall prepare a brief Implementation Plan to demonstrate how he intends to manage, execute and coordinate the work at Rocky Flats. This Implementation Plan shall outline project management issues that include tasks, activities, schedules and milestones agreed upon the CTR, as well as a field activities management section on how to execute the field work. This includes compliance with the Quality Assurance (Attachment 1) and Data Quality Objectives and the EG&G Health and Safety Plan (Appendix B). The project management section shall be used by the subcontractor as a basis for determining earned value measurement criteria for the monthly Budget Status Reports. This plan shall be based on the subcontractor planned resource loading, costs, and durations for each task described herein and as approved by the CTR.

4.3.1.1 Project Management - The Implementation Plan shall be prepared by the subcontractor utilizing project management computer software agreed upon by the CTR. The Implementation Plan shall be approved by the CTR and approved copies submitted to the CTR in both hard copy and computer disk format.

4.3.1.2 Field Management - The field activities management section of the Implementation Plan shall include a brief description of the required major field activities; a Field Activity Summary Form for each major activity (a check off list sample is in Appendix C); a review of and brief discussion on how to implement the EG&G furnished Health and Safety Plan, and a review and discussion on how to implement the Soil Vapor Surveys; a complete list of equipment and materials with quantities and identification numbers if available. Numerical identification is not required for office supplies and other similar consumables.

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4.3.2 Health and Safety Plan - The EG&G OU-2 Subsurface IRA Health and Safety Plan shall be reviewed for safety related issues(see Appendix B). This review shall be performed in the context of the required SVS field activities and field operations. Several of these activities are listed below under the Field Activities Summary Forms section. The SVS field management plan portion includes field operations and sampling activities that shall include health and safety and radiological hold points. This tabulation establishes a brief summary of all that is needed to perform work at Rocky Flats Plant for this project. This also provides an logical interface between the Subcontractor and EG&G for an EG&G Health and Safety assessments, audit and inspection interface with the subcontractor field crews without interruption to work flow. The Health and Safety Plan is a draft version that is being reviewed by EG&G. The final version shall be furnished to the subcontractor when available.

4.3.3 Field Activity Summary Forms - Field Activity Summary Forms (Appendix C) shall be prepared for the field activities listed below. The field operations and sampling activities shall include Environmental Operations management (EOM), Health and Safety and radiological hold points. For each field operation and sampling activity a logical step by step process can be established in tabular format. These steps can then be correlated with hold points that logically occur as begin or as completion points for each work task or sub-activity. Each hold point and step may then be correlated with a standard operating procedure (SOP), a Health and Safety Plan (H&SP) section reference, and a radiological guideline reference. This tabulation establishes a brief summary of all that is needed to perform work at Rocky Flats Plant for this project. This also provides an logical interface between the Subcontractor and EG&G for an EG&G Q/A assessments, audit and inspection interface with the subcontractor field crews without interruption to work flow. A draft sample of this Field Activity Summary Form is in Appendix C.

Field Operations and Activities

- Location Surveys
- Soil Vapor Equipment Calibration
- Soil Vapor Sample Equipment Installation
- Soil Vapor Sampling Procedure
- Soil Vapor Sample Screening
- SVS Equipment Decontamination
- Secondary Generated Waste Handling Procedure

Additional field activities shall be summarized as required using this format.

4.3.4 Review Standard Operating Procedures -The subcontractor shall review applicable EG&G Environmental Restoration Department standard operating procedures for the following areas:

- Field Operations
- Geotechnical
- Groundwater
- Analytical Services

These SOPs describe the steps and data necessary to conduct, perform, and evaluate and initiate the proposed SVS work. These SOPs shall be cross-referenced to the Field Activity Summary Forms.

In addition, the subcontractor shall review the existing EG&G Soil Vapor Survey SOP for the preparation of the steps and data necessary to conduct, perform, and evaluate and initiate the proposed SVS work described herein. This review shall result in a recommended modifications(s). If the recommended modifications are substantial e.g. require revision to the entire SOP (in excess of one day effort), then the subcontractor shall provide a cost estimate based on preparation of draft final versions of these procedures for the selected SVS technology. Minor field modifications (e.g. less than 1 hr effort per field modification) to these SOPs shall be included in the cost estimates for performing field activities described above in Health and Safety Plan.

4.3.5 Move in SVS Equipment and Materials - The subcontractor shall move equipment, materials, and vehicles onto Rocky Flats Plant site in coordination with EG&G Environmental Operations Management staff. Inspections and materials must be conducted on all subcontractor furnished materials and supplies. These items shall be furnished in accordance with EG&G procurement requirements. Trailers used in support of the field operations shall be considered temporary. These items shall be located at sites approved and coordinated by EG&G EOM staff.

All subcontractor supplies, equipment and materials shall be identified and tabulated for EG&G review and inspection. Identification numbering system shall be implemented for all subcontractor supplies, equipment and materials. A complete and accurate record of these items shall be furnished to the EG&G CTR upon completion of the mobilization effort and prior to beginning field work.

4.3.6 Demobilization-Demobilization of subcontractor furnished equipment and labor forces shall be part of this activity. Purchased software, computer hardware, field testing and measurement devices and excess supplies and equipment shall be transferred to EG&G. Arrangements shall be made with EG&G CTR and Environmental Operations staff.

4.4 Conduct Soil Vapor Survey

- Conduct Location Survey for SVS sample sites within five proposed SVS test sites.
- Perform Baseline SVS at each of three proposed test sites.
- Perform Detailed SVS at selected sample sites (additional work to this SOW).

4.4.1 Location Survey - Initial SVS sites shall be field located at approximate points with respect to the existing fences, power lines and terrain features . The IHSSs and final SVS locations shall be determined by the SVS subcontractor using Rocky Flats horizontal and vertical survey datums. The procedures and RFP survey reference benchmarks shall be made available to the SVS subcontractor by EG&G.

Access and site preparation to each SVS sample site is part of this activity. The 903 Pad is covered with an asphalt membrane cap to protect the low level radiological soils beneath the cap from wind erosion. This area will require coordination with EG&G Radiological Engineering and Health and Safety Departments prior to the start of field activities. All Individual Hazardous Substance Sites (IHSSs) are fenced and posted as Radiological Controlled Areas (RCAs). Much of the SVS work shall be adjacent, but outside of these areas.

4.4.2 Baseline SVS - The first of two types of sample site surveys for the SVS are indicated in the attached SVS workplan; a baseline SVS and a detailed SVS. The baseline SVS shall be a reconnaissance level characterization of all three primary SVE test sites; and this effort will characterize the potential presence of VOC plumes and the potential presence of dense non-aqueous phase liquid (DNAPL) at the test sites. Approximately 119 SVS total sample sites shall be installed as part of this activity. This includes surveying both sides of the trenches. An estimated additional 10 SVS sample sites may be required due to various field constraints.

Several soil gas samples shall be obtained for analytically testing, quality control and quality assurance from each SVS site. These soil gas samples shall be analytically tested by GC/MS using EPA Methods (refer to the EG&G QAPjP, GRAASP and ER SOPs for OU 2).

A brief written field report shall be prepared at the completion of each SVS test site . This field report shall tabulate preliminary data, results and SVE site recommendations. Preliminary graphics that display the VOC concentration isopleths for each of three VOC contaminants (TCE, PCE, CCL4) shall also be included.

4.4.3 Detailed SVS -The second SVS indicated in the attached SVS workplan is a detailed SVS. The following circumstances shall define the need for a detailed Soil vapor survey. The Detailed SV Survey shall address characterizing the two alternate SVE sites, providing additional soil survey sampling required at the three primary SVE sites, and providing additional sampling and testing as required and approved in writing by the EG&G SA and CTR. This is an additional activity that is to be bid as a separate item.

The subcontractor shall base the Soil Vapor Survey on the findings from a review of existing and additional OU 2 site characterization data currently being developed as part of OU 2 Phase II Alluvial and Bedrock Remedial Investigations.

A brief written field report shall be prepared upon the completion of each detailed SVS. This field report shall report and tabulate the preliminary data, and preliminary graphics that display the VOC concentration isopleths for each of three VOC contaminants (TCE, PCE, CCL4).

The detailed SVS effort shall be bid specifically to this SOW as an additional item or addendum to this contract. This addendum portion of this subcontract shall be furnished upon written request by EG&G.

4.4.4 Quality Assurance Requirements - The subcontractor shall meet quality assurance requirements described in Attachment No. 1.

4.4.5 Data Quality Objectives - The subcontractor shall fulfill the data quality objectives by performing a soil vapor survey in accordance with EG&G Soil Vapor Survey Work Plan.

4.5 Prepare Reports

- Analyze Data and Prepare SVS characterization results
- Prepare Draft SVS Report
- Submit Draft SVS Report
- Prepare Final SVS Report
- Submit Final SVS Report

4.5.1 Analyze Data and Prepare SVS Characterization - The field and mobile laboratory analytical data shall be collated, prepared, reviewed and evaluated for the characterization of and mapping of potential VOC plumes in the unsaturated zone to fulfill the objective of this task; locating the SVE Pilot plant.

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4.5.2 Prepare Draft SVS Report - The subcontractor shall produce an Project Report which shall include but not be limited to, coverage of the topics listed in this section of the Statement of Work and shall comply with the guidelines provided in the OU 2 Subsurface IRA EG&G, 1992., Soil Vapor Survey Workplan. The subcontractor shall prepare a preliminary outline (see Attachment 2) of the SVS report showing chapter headings, section headings, and a short description of the intended content of each section. This outline shall provide the basis for the structure of the report. It is anticipated that the outline will not exceed five pages in length. The outline shall be approved by the CTR prior to proceeding with the preparation of the Soil Vapor Survey.

4.5.3 Prepare Final SVS Report -The subcontractor shall incorporate all review comments which will be generated by EG&G RFP and DOE-RFO issuing a modified Draft. The subcontractor shall provide a final Draft for DOE/EG&G review; this version shall incorporate formal review comments from EG&G and DOE/RFO. The subcontractor shall address and incorporate into the Soil Vapor Survey all the comments received from the EG&G RFP, and DOE/RFO, as directed by EG&G. This final version shall include color graphics.

4.6 Project Meetings -A minimum of three project meetings shall be conducted as part of this project: kickoff meeting, completion of field work meeting, and draft report review meeting.

4.7 Project Schedules-The project schedule and logic diagram is included in Attachment 4. The schedule has Milestones that coincide with tasks and deliverables described below.

5.0 DELIVERABLES

5.1 General - Deliverables provided by the subcontractor shall include Final Report Outline, weekly field reports, draft, draft final and final versions of SVS summary report in hard copy and electronic format. Additionally, all field notes, field screening analytical test results and bench sheets shall be provided. Field data shall be analyzed using software as approved by EG&G.

5.2 Implementation Plan - The subcontractor shall deliver a completed review of the Draft Implementation Plan including new data and new requirements for EG&G RFP review two weeks from award of the subcontract. The subcontractor shall deliver each section of the report (chapters, appendices and attachments) as it is completed to the EG&G CTR for review.
The subcontractor shall prepare a performance measurement curve based on subcontractor resource loading and project management of the tasks and activities described in this statement of work. This curve shall represent the budgeted cost of work scheduled(BCWS) for the project. This BCWS for the project shall be supported with BCWS for each task. The budget at completion (BAC) shall be determined as part of the calculation for the BCWS performance curve.
The completed final Implementation Plan shall be delivered to the EG&G Procurement Subcontractor Administrator and the EG&G ER CTR three weeks after the award of the subcontract.

5.3 Draft and Final SVS Report Outline - The subcontractor shall review and prepare the Soil Vapor Survey Report Outline for review and EG&G approval within eight (8) weeks from the award of this subcontract. An example outline of the SVS Summary report is in Attachment 2 of this SOW.

5.4 Field Reports -The subcontractor shall review and prepare a brief written field report shall be prepared prior to completion of the SVS baseline and detailed parts of the project. This field report shall tabulate preliminary data, results and locations of the SVE test site. Preliminary graphics that display the VOC concentration isopleths for each of three VOC contaminants (TCE, PCE, CCL4) shall also be included.

5.5 Draft and Final SVS Report - The subcontractor shall furnish 10 copies of the first and second drafts of the Soil Vapor Survey to the EG&G Procurement Subcontractor Administrator and the EG&G ER CTR. These drafts of the Soil Vapor Survey will be reviewed by EG&G RFP and DOE/RFO. After incorporation of EG&G RFP and DOE/RFO comments, the subcontractor shall submit 40 copies of the Draft Final Soil Vapor Survey for transmittal to DOE RFO, EPA and CDH. The completed final draft shall be delivered to the EG&G-CTR 24 weeks after the award of the contract. Comments on each completed section of the Soil Vapor Survey will be formally documented and submitted to the subcontractor for incorporation into the Final Draft Soil Vapor Survey. The Final Draft of the Soil Vapor Survey shall be submitted to EG&G Procurement Subcontractor Administrator and the EG&G ER CTR

for delivery to the DOE RFO 30 weeks from the award of the contract. Color graphics shall be included as part of the final version.

5.6 Project Records - The subcontractor shall be available to participate in all the meetings during the comment resolution period. Additional review meetings may be required. All meetings shall be pre-approved by the EG&G CTR. Transmittal of all documents to the EG&G Procurement Subcontractor Administrator and the EG&G ER CTR shall be recorded in memos, meeting minutes, or transmittal letters by the subcontractor. These documents shall be submitted for EG&G review and approval within 1 week after each meeting.

5.7 Field Records - The subcontractor shall prepare, as a separate volume, a summary of fieldwork that will include formal responses to each EG&G/DOE comment. The Final Soil Vapor Survey Summary report shall reflect all comments and required changes shall be submitted to the EG&G-CTR within three weeks from the time comments are received from DOE-RFO and EG&G and be delivered to the EG&G Procurement Subcontractor Administrator and the EG&G ERM CTR.

5.8 Subcontractor Monthly Reports on Budget Status and Invoiced Data - The subcontractor shall provide Monthly Task Order Status Reports as outlined in the Attachment 3 of this SOW, to the ER and Resource Information Management Division of Environmental Management by the 20th of each month during the subcontract period. The subcontractor shall provide detailed progress report for the current reporting period as well as identify work to be performed over the period. Problems/issues that have arisen or are anticipated to arise should be detailed in these reports. However, should a problem arise, the subcontractor shall contact the EG&G-CTR project manager immediately and follow-up with a written note or letter report on the problem with recommended courses of corrective action.

The above deadlines are subject to any changes if such occurs on the IAG schedule. In this case EG&G RFP will notify the Subcontractor and submit the amended scope of work to justify this change in scope.

5.8.1 Budget Status Reports - The Budget Status Reports shall be completed monthly the by subcontractor and submitted to the SA/CTR by the 20th of each month with the Monthly Task Order Status Reports for current month activity. The report will be based on a current monthly accruals consisting of a combination of actual costs incurred plus the costs anticipated through the end of each current month. These calculations are based on performance by task and summarized by project for month and for the project to date.

This report shall include statements that will detail the following:

- Budgeted Cost of Work Scheduled (BCWS) for the period.
- Budgeted Cost of Work Performed (BCWP) for the period.
- Actual Cost of Work Performed (ACWP) for the period.
- Cumulative costs to date for each of the above items.
- Earned value (EV) = BCWP for the project to date.
- Schedule Conversion

Variance values shall be calculated using the above values to compare the following:

- Cost Variance amount(CV)
- Schedule Variance amount (SV)
- Cost Variance Percent(CV%)
- Schedule Variance percent (SV%)
- Estimated At Completion (EAC)for cost variances only

Cost variance percent values are calculated as:

- CV%=((BCWP-ACWP)/(BCWP))x100

Schedule variance percent values are calculated as:

- SV%=((BCWP-BCWS)/(BCWS))x100.

Performance Indices shall be calculated as:

- Cost performance index (CPI)=(BCWP)/(ACWP)
- Schedule performance index (SPI)=(BCWP)/(BCWS)

Estimate at completion (EAC) for cost variances only shall be calculated as:

- EAC=(BAC)/(CPI)

Schedule Conversion shall be calculated as:

- Months ahead or behind=SV/Average monthly(BCWS*)

  Note *Average monthly BCWS shall be based on total project months to date.

If the schedule and/or cost variances exceed +/- 5% for the project to date value or +/- 10% for a monthly value, the budget status report shall detail the reasons for the variance and the corrective action to be implemented. The monthly variance reports shall include the current monthly variance values as well as a cumulative variance values for the project to date. All calculations shall be completed and reported for the current month and for the project to date. Budgeted costs for work scheduled(BCWS) shall be based upon the Work Plan Implementation Plan Milestone and activity schedule.

5.8.2 Invoices - Monthly invoices shall be complete and accurate. This invoice shall include summaries of all expenditures by tasks as described in this SOW. These include expended labor by name and by labor classification, indirect expenditures, and subcontractor expenditures. Supporting data submitted with the monthly invoice shall include copies of timesheets for all project participants including lower tier subcontractors. invoices shall be submitted with the monthly reports. Monthly summaries of man-hours and expenditures shall be identified by task for each new month and by task for project to date.

6.0 SECURITY REQUIREMENTS

None are required

ATTACHMENT #1

QUALITY ASSURANCE REQUIREMENTS

The Soil Vapor Survey shall be prepared in accordance with the Environmental Management Document Preparation Guidance, 21000-GD.02, RO.

Work performed under this SOW is governed by the EG&G Environmental Restoration (ER) Quality Assurance Project Plan (QAPjP). The ER QAPjP complies with the requirements of EPA QAMS-005/80 and DOE Order 5700.6B which addresses ASME NQA-1. The subcontractor shall comply with the following specific Quality Assurance (QA) requirements prior to the initiation of work, as appropriate:

Organization - The authority and responsibilities of persons or organizations performing work under this statement of work shall be established, documented and submitted to EG&G ER. An organization chart identifying specific individuals by name, supported by itemized authorities and responsibilities is a suitable means of documentation.

Personnel Qualification - Personnel performing technical work shall receive training and indoctrination in accordance with 3-21000-ADM-2.02 to applicable procedures to assure proper understanding of the QA and technical requirements of this SOW before beginning work. In addition, written personnel qualification requirements shall be established for all positions performing technical work. Documented evidence of personnel training, training material content, personnel qualification requirements, and the qualification of personnel who meet the personnel qualification requirements shall be maintained and made available to EG&G for review upon request. EG&G will provide training for Quality Assurance and technical procedures furnished by EG&G.

Design - Activities involving the performance of technical design related activities, specifically, but not limited to, calculations used in developing data and calculations incorporated into reports, shall be reviewed, verified and documented. Calculations shall be performed in accordance with EG&G procedure number 3-21000-ADM-03.07

Instructions, Procedures and Drawings - All work shall be performed to EG&G ER approved and controlled procedures in accordance with EG&G procedure number 3-21000-ADM-06.01.

Document Control - The subcontractor shall acknowledge receipt and manage EG&G plans and procedures that ensure that only correct and accepted items are used or installed and that they are traceable through unique identifiers. The procedures shall be submitted to EG&G for approval.

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ATTACHMENT #1 cont'd

Inspection - Quality affecting activities are subject to inspection by EG&G. These inspections will be performed in accordance with EG&G procedure number 3-21000-ADM-10.02.

Control of Measuring and Test Equipment - Activities in which personnel use measuring and test equipment shall be controlled in accordance with EG&G procedure number 3-21000-ADM-12.01. Such devices shall be controlled, calibrated, and adjusted at predetermined intervals (established by the subcontractor and approved by EG&G) to maintain accuracy.

Handling, Storage and Shipping - Activities in which personnel handle, store, package, ship, or receive items which if damaged, lost or deteriorated would be detrimental to the work performed by the subcontractor or those activities in which personnel handle, store, package, or ship hazardous material shall be controlled by written procedures. The procedures shall be submitted to EG&G for approval.

Control of Nonconforming Items - Activities regarding the identification and disposition of nonconforming items shall be performed in accordance with EG&G procedure number 3-21000-ADM-15.01. The control of nonconforming items shall apply to all activities that involve the handling of all items, including samples, data, raw materials, hardware, and software.

Software Quality Assurance - The development and use of both administrative and scientific computer software which have a potential to affect quality shall be performed in accordance with written procedures prepared by the subcontractor and approved by EG&G.

Accessibility - The subcontractor's work place and working records shall be accessible during normal working hours for verification or audit by EG&G or their representatives, during the performance of this contract. All completed records shall become the property of EG&G and shall be turned over to EG&G no later than sixty (60) days following the completion of the technical work.

Miscellaneous:

> The supplier shall perform all work in accordance with EG&G Quality Assurance program requirements. All work shall be performed under the cognizance of the responsible EG&G organization and in accordance with approved EG&G implementing procedures, or supplier procedures which have been approved by the responsible EG&G organization prior to the start of any work. The responsible EG&G organization shall review and approve all work in accordance with applicable implementing procedures.

ATTACHMENT #1 cont'd

The supplier shall not be permitted to:

1) Provide any safety-related items without prior inspection and acceptance by EG&G Quality Assurance.

2) Perform any special processes such as welding, NDE, heat treatment, plating, etc., for which acceptance is based on supplier-furnished personnel qualifications or other quality assurance criteria.

3) Perform inspections or tests of equipment or components for the purpose of determining final acceptance by EG&G, except for those inspections and tests conducted in accordance with approved EG&G implementing procedures or supplier procedures which have been approved by EG&G. All such inspections and tests shall be performed using measuring and test equipment verified and authorized by the Rocky Flats Meteorology Lab. All work shall be performed under the direct supervision of EG&G, and witnessed by qualified EG&G personnel.

ATTACHMENT #2

TITLE PAGE AND

REPORT FORMAT

SOIL VAPOR SURVEY

FOR

OU-2 Subsurface Interim Remedial Action

AT

ROCKY FLATS PLANT

Prepared by:

Environmental Science and Engineering

EG&G Rocky Flats Plant

1993

ATTACHMENT #2 cont'd

RECOMMENDED OUTLINE FOR THE
SOIL VAPOR SURVEY SUMMARY REPORT, OPERABLE UNIT NO. 2

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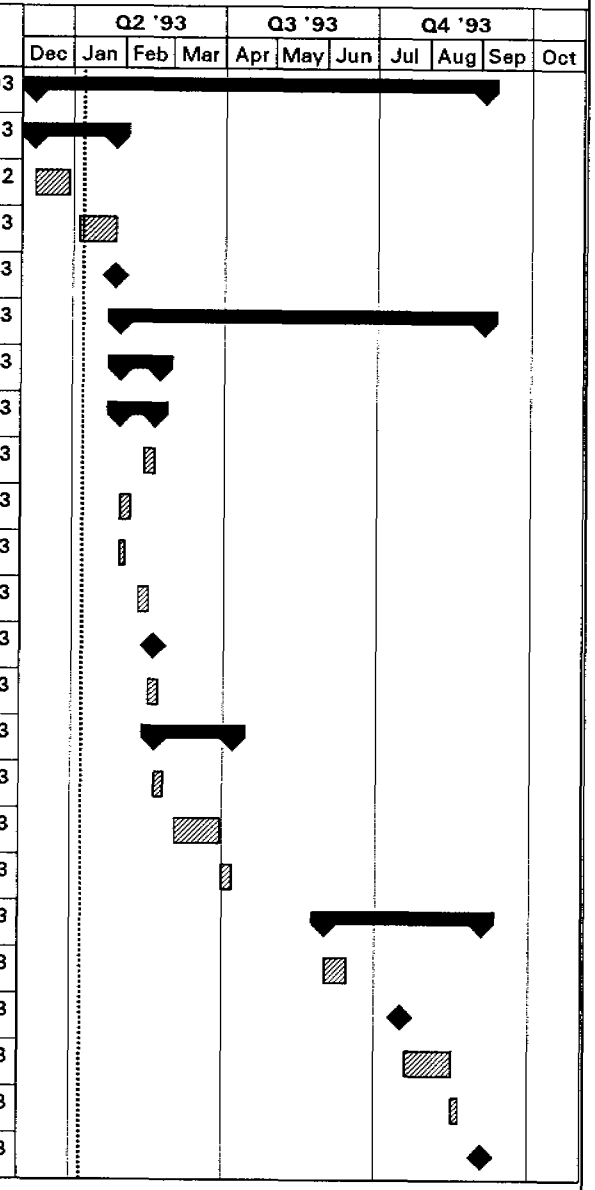
PROJECT GANTT SCHEDULE

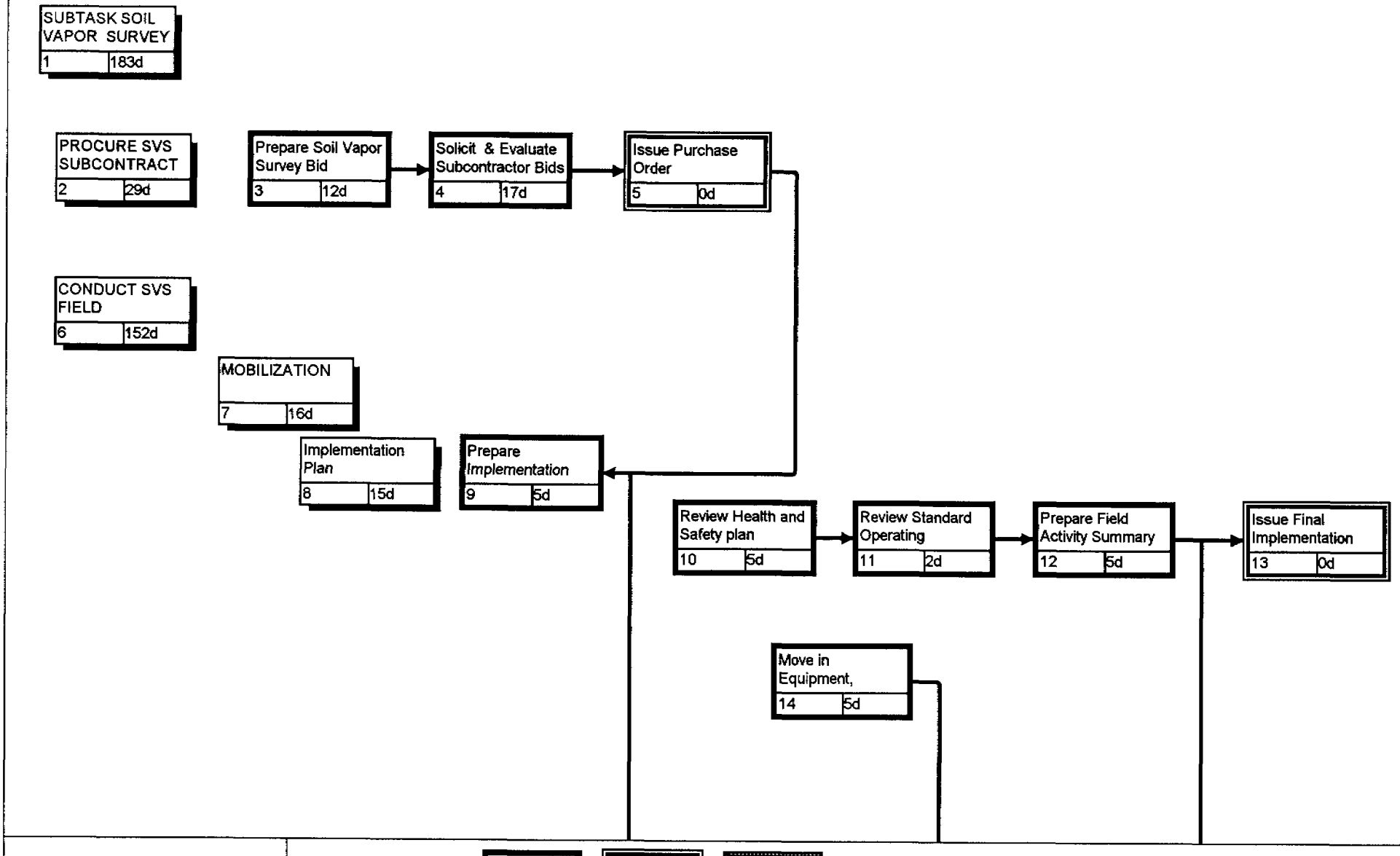
ID	WBS Activit	Name	Sched. Start	Sched. Finish
1		SUBTASK SOIL VAPOR SURVEY	12/9/92	9/3/93
2		PROCURE SVS SUBCONTRACTOR	12/9/92	1/26/93
3	12024445	Prepare Soil Vapor Survey Bid Package	12/9/92	12/29/92
4	12024450	Solicit & Evaluate Subcontractor Bids	1/4/93	1/26/93
5	12024455	Issue Purchase Order	1/26/93	1/26/93
6		CONDUCT SVS FIELD WORK/REPORT	1/29/93	9/3/93
7		MOBILIZATION	1/29/93	2/21/93
8		Implementation Plan	1/29/93	2/18/93
9		Prepare Implementation Plan	2/12/93	2/18/93
10		Review Health and Safety plan	1/29/93	2/4/93
11		Review Standard Operating Procedures	1/29/93	2/1/93
12		Prepare Field Activity Summary Forms	2/9/93	2/15/93
13		Issue Final Implementation Plan	2/18/93	2/18/93
14		Move in Equipment, Trailers,Training,Demob	2/15/93	2/21/93
15	12024460	CONDUCT SOIL VAPOR SURVEYS	2/19/93	4/6/93
16		Locate Sampling Sites	2/19/93	2/24/93
17		Perform Baseline Soil Vapor Survey and Field Lab Screening	3/3/93	3/30/93
18		Perform Detailed SVS and Field Screening	3/31/93	4/6/93
19		PREPARE REPORTS	6/1/93	9/3/93
20	12024470	Prepare Draft SVS Report	6/1/93	6/14/93
21	12024475	Submit Draft SVS Report	7/16/93	7/16/93
22	12024480	EG&G/DOE Review of Draft SVS Report	7/19/93	8/16/93
23	12024485	Final SVS Report	8/16/93	8/20/93
24	12024490	Submit Final SVS Report	9/3/93	9/3/93



Project: OU 2 Subsurface IRA-SOIL
Company: EG&G Rocky Flats Inc.
Date: 1/6/93

Critical
Noncritical
Progress
Milestone
Summary
Rolled Up

PERT SCHEDULE CHART

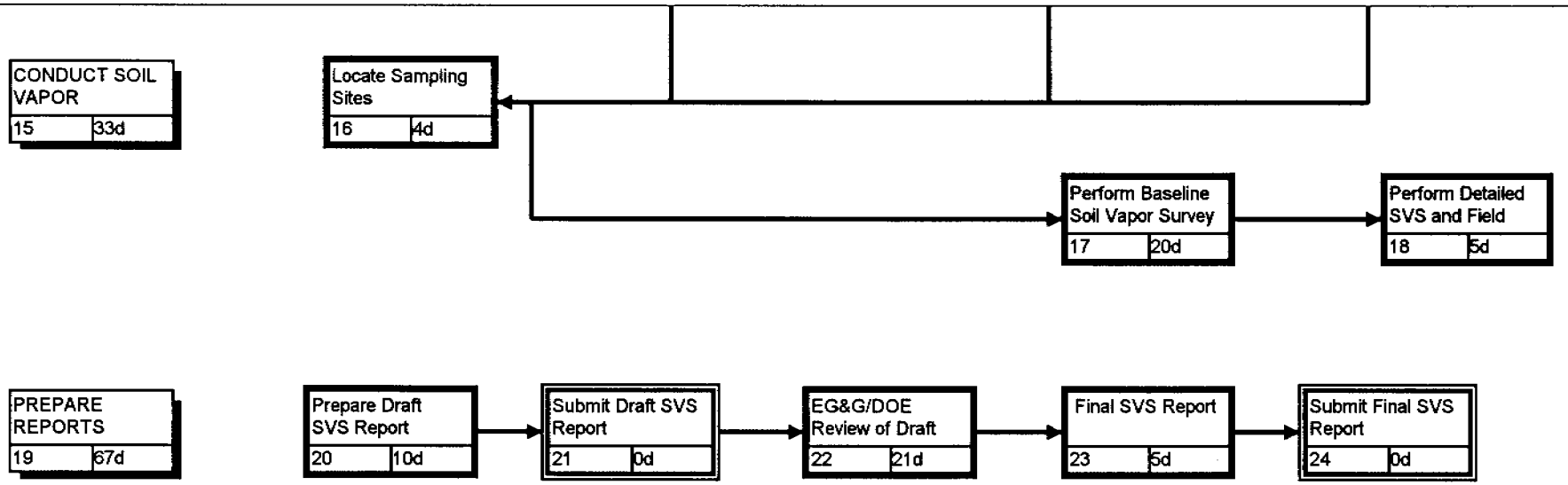


Company EG&G Rocky Flats Inc.
Project: OU 2 Subsurface IRA-SOIL
Date: 1/6/93

Name
ID | Duration

Critical | Milestone | Subproject
Noncritical | Summary | Marked

PERT SCHEDULE CHART



Company EG&G Rocky Flats Inc.
Project: OU 2 Subsurface IRA-SOIL
Date: 1/6/93

Name
ID | Duration

Critical | Milestone | Subproject
Noncritical | Summary | Marked

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APPENDIX A

SOIL VAPOR SURVEY WORKPLAN

SOIL VAPOR SURVEY WORK PLAN

SUBSURFACE INTERIM MEASURES/ INTERIM REMEDIAL ACTION 903 PAD, MOUND, AND EAST TRENCHES AREAS

OPERABLE UNIT NO. 2

U.S. Department of Energy
Rocky Flats Plant
Golden, Colorado

04 January 1993

FINAL

Prepared by:

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

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LIST OF ACRONYMS

C	celsius
CFR	Code of Federal Regulations
DNAPL	dense nonaqueous phase liquid
DQO	data quality objectives
ECD	electron capture detector
EPA	Environmental Protection Agency
FFACO	Federal Facility Agreement and Consent Order
GC/MS	gas chromatograph/mass spectroscope
HASP	health and safety plan
IAG	Inter-Agency Agreement
IHSS	individual hazardous substance sites
IM/IRA	Interim Measures/Interim Remedial Action
mg/ℓ	milligrams per liter
mℓ	milliliter
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OU2	Operable Unit No. 2
PCE	tetrachloroethylene
PID	photoionization detector
QAPP	Quality Assurance Project Plan
QC	quality control
RF	response factor
RFP	Rocky Flats Plant
RI	remedial investigation
RPD	relative percent difference
SOP	standard operating procedures
SVS	soil vapor survey
SVE	soil vapor extraction
TCE	trichloroethylene
VOC	volatile organic compounds

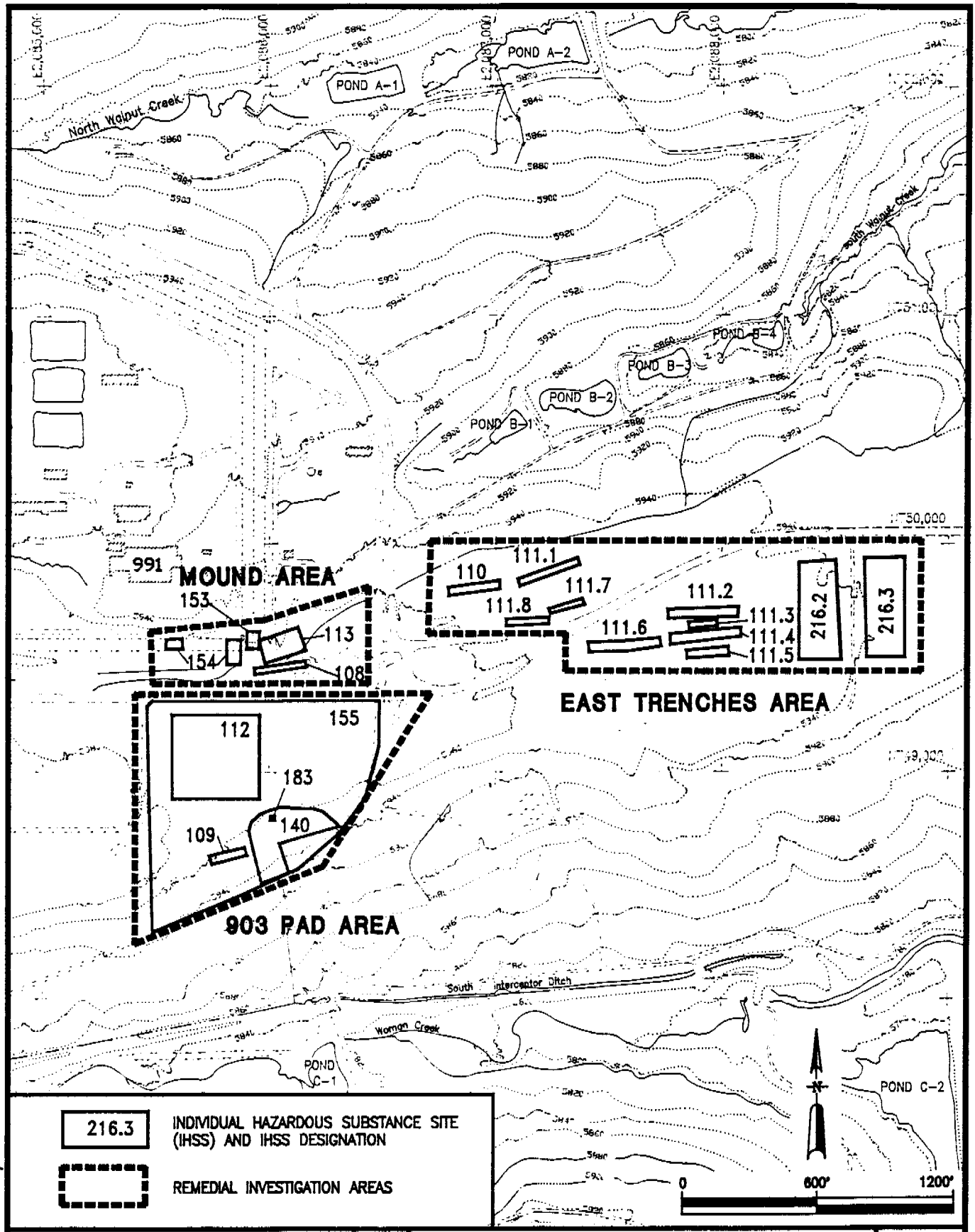
SECTION 1
INTRODUCTION

1.1 BACKGROUND

The final Subsurface Interim Measures/Interim Remedial Action (IM/IRA) Plan/Environmental Assessment (EG&G, 1992b) addresses removal of residual free-phase volatile organic compound (VOC) contamination suspected in the subsurface within an area identified as Operable Unit No. 2 (OU2) (Figure 1-1) of the Rocky Flats Plant (RFP). The term "residual" free-phase refers to the non-aqueous phase contamination remaining in the soil matrix (by capillary force) subsequent to the passage of dense non-aqueous-phase liquid (DNAPL) through the subsurface. The terms "source area" and "source material" are also used to refer to the source for dissolved contaminant ground-water plumes present at OU2. The proposed free-phase VOC-removal actions involve pilot testing soil vapor extraction (SVE) technology at three different hydrogeologic settings at OU2. The three unique hydrogeologic settings selected for pilot testing are located within the 903 Pad, Mound and East Trenches Areas, respectively.

As discussed in the Subsurface IM/IRA Plan, the precise locations for pilot testing the SVE systems will be determined from the Phase II Remedial Investigation (RI) data and results of soil vapor surveys (SVS) to be conducted pursuant to this Work Plan. Based on all OU2 RI data available to date, Individual Hazardous Substance Sites (IHSS) Nos. 110, 112, and 113 (Figure 1-2) are currently being retained as the three primary sites for SVE pilot testing. SVS data will thus be collected at these three primary IHSSs in order to optimize the locations for the vapor extraction wells. Per EPA Observations/Streamlined Approval methodology; however, this Work Plan also describes SVSs that may be performed at two contingency sites at OU2 (IHSSs Nos. 109 and 111.1). The contingency sites are retained in the event that soil gas VOC concentrations at one or more of the primary sites are not sufficiently high enough to indicate the feasibility of SVE pilot testing.

It should be noted that the final Subsurface IM/IRA Plan (EG&G, 1992b) and draft Pilot Test Plan (EG&G, 1992a) indicate that an SVE pilot test will be conducted at IHSS No. 111.1 located within the East Trenches Area. Phase II RI data which became available since the IM/IRA Plan



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U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	SITE MAP OF REMEDIAL INVESTIGATION AREAS AND INDIVIDUAL HAZARDOUS SUBSTANCE SITES OPERABLE UNIT NO. 2	FIGURE 1-1

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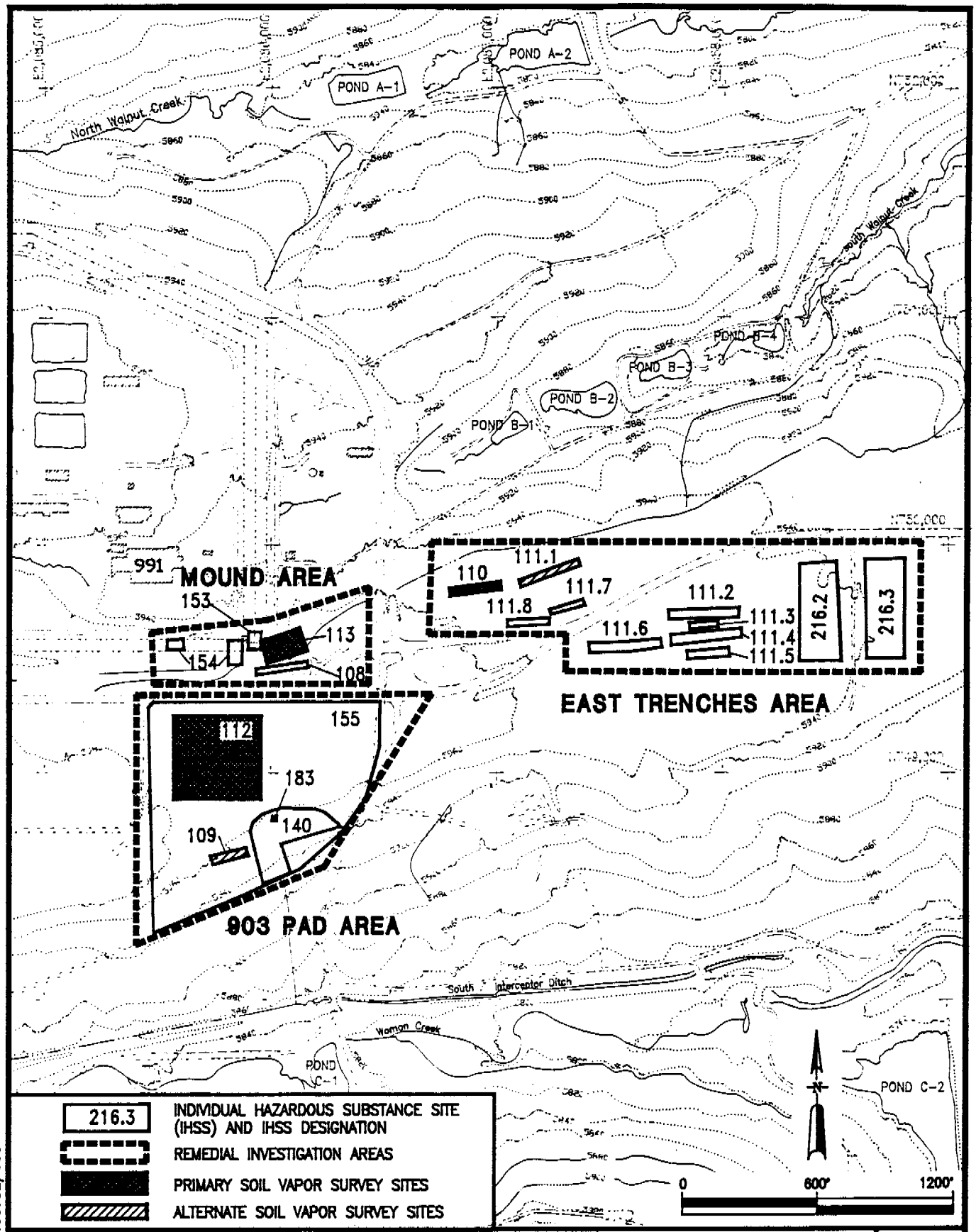

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U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

SOIL VAPOR SURVEY SITES
OPERABLE UNIT NO. 2

FIGURE
1-2

was finalized revealed the presence of over 10,000 mg/kg of perchloroethylene in a soil sample collected 3 feet below IHSS No. 110, located approximately 100 feet to the west of IHSS No. 111.1. This SVS Work Plan therefore proposes to first investigate IHSS No. 110. If the results of the SVS further indicate that IHSS No. 110 will provide an adequate pilot test site, the Pilot Test Plan will be modified to reflect this change.

1.2 PURPOSE

The purpose of the SVS presented in this Work Plan is to provide "screening level" information that may be used to approximate the locations of VOC source areas at each of the three test sites, if present, and to guide the placement of the pilot unit vapor extraction wells. It is important to emphasize that the proposed SVS program is not a site characterization effort that is intended to define the areal and vertical extent of VOCs in the different IHSSs.

The SVS Program described in this Work Plan involves collection and analysis of shallow soil gas from 3 to 5 feet below the ground surface. Sample depth may be limited by the presence of cobbles in the subsurface and cannot be exactly specified at each location. Soil gas samples will be analyzed in a mobile laboratory unit with a gas chromatograph (GC). The analytical results will be used to map the concentration of VOCs in the soil gas, and to assist in the identification of source areas.

The SVS is an effective way to map subsurface VOCs. VOCs that are adsorbed to soils, or are present as residual free-phase, will diffuse into soil gas. VOCs will also partition out of ground water at a rate proportional to their Henry's Law constant. Once in the vapor phase, the VOCs diffuse vertically and horizontally through the soil to the ground surface where they dissipate into the atmosphere. Typically, a concentration gradient develops between the source area and the ground surface. Thus, relatively high soil gas VOC levels at or near the ground surface may be indicative of a local source area.

1.3 SCOPE

The SVS program includes three primary tasks, each of which are described in detail in Sections 3 and 4 of this Work Plan.

- Identification of field sampling locations (i.e., sampling grids).
- Soil vapor sampling and analysis.
- Evaluation of analytical results and reporting.

This work plan describes both essential and non-essential components of an SVS. Work requirements include meeting Data Quality Objectives (DQOs) and are so specified in Section 3 of this work plan. Non-essential components may include equipment type and sample collection procedures. Many different methods and types of equipment are currently employed by SVS subcontractors and may be substituted for those described in the Work Plan so long as they achieve the DQOs. The Work Plan has been prepared in this manner to permit competitive bidding between subcontractors who use different SVS techniques with equivalent performance.

A standard operating procedure will be prepared by EG&G based on actual methodologies proposed by the selected SVS subcontractor.

1.4 PROJECT SCHEDULE

A proposed schedule for the planning and implementation of the SVS at OU2 is presented in Table 1-1. Table 1-1 presents specific completion dates for project activities leading up to the commencement of the SVS at Site 1 (i.e., East Trenches Area). Due to the uncertainty associated with the actual length of time that will be required to complete the SVS, estimated time durations are listed in lieu of specific completion dates for activities conducted subsequent to "Begin Site 1 SVS."

Table 1-1

Proposed Schedule
Soil Vapor Survey
Subsurface IM/IRA
Operable Unit No. 2

Activity	Date
Submit Draft SVS Work Plan to EPA/CDH	29 October 1992
EPA/CDH Comments on Draft SVS Work Plan	26 November 1992
Submit Final SVS Work Plan to EPA/CDH	12 January 1993
Complete SVS Bid Package	01 February 1993
Solicit and Complete Evaluation of Subcontractor Bids/Issue Purchase Order	15 March 1993
Begin Site 1 SVS (East Trenches Area)	15 March 1993
Complete Site 1 SVS	Within 4 weeks after Site 1 SVS begins
Complete Site 2 SVS	Within 4 weeks after Site 1 SVS is completed
Complete Site 3 SVS	Within 4 weeks after Site 2 SVS is completed
Submit Draft SVS Report to EPA/CDH	4 weeks after SVS concludes
EPA/CDH Comments on Draft SVS Report	3 weeks after receipt of Draft SVS Report
Submit Final SVS Report to EPA/CDH	4 weeks after receipt of EPA/CDH comments on Draft SVS Report

1.5 WORK PLAN ORGANIZATION

Section 2 of this Work Plan describes each of the locations to be surveyed and the criteria and rationale for the site sampling grid designs. Section 3 presents the SVS Program approach including DQOs, field sampling procedures, and analytical methods. Section 4 presents the methods to be used to evaluate and report the data collected during implementation of the SVS Program. Appendix A presents the Quality Assurance procedures that will be followed during conduct of the SVS Program.

SECTION 2
SITE DESCRIPTION

OU2 is defined in the Federal Facility Agreement and Consent Order (FFACO), otherwise known as the Inter-Agency Agreement [IAG]) (DOE,1991) as an area comprised of 20 IHSS that are known in aggregate as the 903 Pad, Mound, and East Trenches Areas. These Areas are located east-southeast of the RFP (Figures 1-1 and 1-2), and lie within either the Woman Creek or South Walnut Creek drainage basins.

Selection of the proposed SVS test sites was based on historical waste disposal information and test site conditions extrapolated from quantitative chemical and hydrogeologic data collected near the proposed test sites. These data suggested the presence of source material associated with the dissolved contaminant ground-water plumes.

The primary sites for the SVS Program are: the 903 Pad (IHSS No. 112); Mound Area (IHSS No. 113), and East Trenches Area (IHSS No. 110). If the SVS results at these sites do not meet the selection criteria for vapor extraction pilot test well locations, the alternate site to be investigated are IHSS 109 and IHSS 111.1. The SVSs will be conducted on the three primary sites initially and the results compared with success criteria outlined in Section 3. If one or more of the sites fail to meet the success criteria, the alternate site(s) will be surveyed.

A description of all IHSSs selected for the SVS, including past and present use, hydrogeology, and contaminant type and distribution, is presented in the following sections.

2.1 903 PAD AREA (IHSS No. 112)

IHSS No. 112, the former drum storage area at the 903 Pad, experienced a reported release of approximately 5,000 gallons of fluid including hydrocarbon oils, carbon tetrachloride, hydraulic oils, vacuum pump oils, trichloroethylene (TCE) and tetrachloroethylene (PCE) (Rockwell, 1987). Carbon tetrachloride has been detected in ground water downgradient of the 903 Pad (EG&G, 1992b). The suspected locations of fluids released at the 903 Pad were determined by

review of aerial photographs which reveal former drum storage locations and areas of stained soils.

Section 4.3.1.2 of the Subsurface IM/IRA Plan presents an idealized conceptual hydrogeologic and contaminant distribution model for IHSS No. 112, based on results of Phase I and II RI data. The data indicate that alluvial sand and gravel may extend to approximately 18 feet below ground surface in the vicinity of the 903 Pad Area, and that the alluvium may contain unconfined ground water perched on bedrock with a saturated thickness of approximately 4 feet. This thickness may vary seasonally. The alluvium overlies claystone bedrock that may contain isolated or interconnected fractures (EG&G, 1990).

It is expected that carbon tetrachloride comprises the majority of the released contamination at IHSS No. 112 with lesser amounts of TCE and PCE. The conceptual model indicates that these DNAPLs may have migrated through the vadose zone and the saturated alluvium, coming to rest in structural depressions on the underlying claystone bedrock surface. The DNAPL may have also infiltrated bedrock fractures.

2.2 ALTERNATE 903 PAD AREA SITE (IHSS No. 109)

The alternate SVS site for the 903 Pad Area is IHSS No. 109, a burial trench located approximately 300 feet south of the 903 Pad. It is believed that IHSS No. 109 (Trench T-2) was used from approximately 1969 to 1971 for the disposal of nonradioactive liquid wastes. After radiation screening, solvents which were found to be nonradioactive were disposed in the trench. The solvents were disposed in small quantities and may have included PCE, TCE, carbon tetrachloride, paint thinner and small quantities of construction related chemicals.

The log of a boring (No. 7391) advanced as part of the Phase II RI 60 feet south of Trench T-2 was examined. The geology consists of unsaturated, clayey and sandy gravel over claystone bedrock which was encountered at 8.1 feet below ground surface (bgs). Phase II RI analytical data are currently not available, however, a review of soil chemistry data presented in the Phase I RI (Rockwell, 1987) revealed the presence of 16 mg/kg of TCE in soils directly adjacent to Trench T-2. In addition, a TCE isoconcentration contour map presented in the Subsurface

IM/IRA Plan (EG&G, 1992b) shows a dissolved TCE ground-water plume apparently originating in the area around this trench. The presence of soil and ground-water contamination in this area coupled with a history of solvent disposal suggests Trench T-2 as a source area for TCE contamination in this section of the 903 Pad Area.

2.3 MOUND AREA (IHSS No. 113)

IHSS No. 113 was used to store an estimated 1,405 drums containing primarily depleted uranium- and beryllium-contaminated lathe coolant (a mixture of hydraulic oil and carbon tetrachloride). Some drums were reported to contain PCE. Ground-water samples collected downgradient of the Mound Area contained PCE, suggesting that leakage from these drums may have occurred. Soil contamination at the Mound Area (IHSS No. 113) is expected to be limited to PCE and carbon tetrachloride.

Results from drilling of exploratory boreholes and ground-water monitoring near the test site were used to construct a conceptual model of the site hydrogeology and contaminant type and distribution. This model is presented in Section 4.4.1.2 of the Subsurface IM/IRA Plan (EG&G, 1992b). This model indicates that sand and gravel alluvium extends to approximately 10 feet below ground surface and overlies claystone bedrock that may contain isolated or interconnected fractures. The alluvium is expected to be dry but may contain a small amount of seasonal ground water perched on the underlying claystone bedrock. Results of ground-water quality analyses of wells adjacent to IHSS No. 113 indicate that PCE comprises the majority of the VOC contamination in this area with lesser amounts of carbon tetrachloride present. The conceptual model assumes that free-phase PCE released at IHSS No. 113 infiltrated the alluvium and may have formed pools on the claystone bedrock. The alluvium may also contain residual DNAPL.

An alternate SVS site within the Mound Area has not been identified for inclusion in this Work Plan.

2.4 EAST TRENCHES AREA (IHSS No. 110)

The East Trenches Area consists of nine burial trenches and two spray irrigation areas. 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 No. 110 (Trench T-3) was used primarily for the disposal of sanitary wastewater treatment plant sludge. The sludge disposed in the trench consisted of concentrated organic matter typically found in sanitary wastewater treatment plant sludge. Uranium contamination may also be present as a result of contaminated, flattened drums that may have been disposed in the trench. Disposal operations at Trench T-3 were conducted during the period of July 2, 1955 through August 14, 1968.

The log of a shallow borehole No. 2791 advanced as part of the Phase II RI and located 50 feet north of the east end of the trench, was examined. The geology consists of 12.9 feet of unsaturated, sandy gravel alluvium over a sandy/clayey siltstone bedrock. The log of bedrock well No. 12191 located 15 feet south of the east side of the trench indicates 15 feet of unsaturated, sandy gravel alluvium over silty sandstone to 27.5 feet bgs where ground water is first encountered. A layer of sandstone is encountered between 27.5 feet and 35 feet underlain by clayey sandstone. The total depth of the well is 37 feet.

Preliminary chemical data on soil samples collected as part of the Phase II RI reveal the presence of several chlorinated solvents. A soil sample collected at 3 feet below ground surface during the advancement of a boring (No. 10191) through the west end of Trench T-3, contained PCE at 1,300 mg/kg and lesser amounts of TCE, carbon tetrachloride and chloroform. Contaminant concentrations were found to decrease with depth in this boring. The high concentration of PCE in the soil suggests the presence of DNAPL.

2.5 ALTERNATE EAST TRENCHES AREA SITE (IHSS No. 111.1)

The alternate SVS site for the East Trenches Area is IHSS No. 111.1, a burial trench located approximately 100 feet east of IHSS No. 110. IHSS No. 111.1 is also known as Trench T-4.

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One exploratory boring (boring 10291) was advanced through T-4 as part of the Phase II RI approximately 25 feet east of the western end of the trench. The geologic log of this boring describes sandy gravel alluvium to a depth of 18 feet. The alluvium is underlain by silty sandstone to a depth of 34 feet which is underlain by interbedded sandstone, silty sandstone, sandy siltstone and an occasional layer of claystone (interbeds are on the order of 5 feet in thickness). This interbedded interval is primarily sandstone and extends from 34 feet to at least 60 feet, which is the total depth of borehole 10291. Lithologies beyond the total depth of borehole 10291 were extrapolated from a deeper boring (No. B217589) drilled in 1989 approximately 50 feet southeast of borehole 10291. The log of this boring describes the interval between 60 and 160 feet as primarily claystone. Based on the log of boring 10291 and historical ground-water level data from monitoring well 3687 (located just north of T-4), unconfined ground water is expected to be encountered at approximately 35 feet below ground surface in the sandstone. An idealized conceptual geologic model based on the logs of borings 10291, B217589, and others is presented in Section 4.5.1.2 of the subsurface IM/IRA/EA (EG&G, 1992a).

TCE is expected to be the primary contaminant at this site. Although soil samples collected during the advancent of boring 10291 contained relatively low concentrations of TCE, higher levels of contamination may be present in other portions of the trench. A sample of water collected in May 1988 from monitoring well 3687 located approximately 40 feet north of the trench contained 221.8 milligrams per liter (mg/l), which represents approximately 20 percent of the TCE solubility limit. This well is screened in the sandstone bedrock. The high concentration of TCE within 40 feet of IHSS No. 111.1 suggests the presence of residual, free-phase TCE in geologic materials underlying this burial trench. The conceptual model indicates that DNAPL may have migrated downward through the unsaturated alluvium and sandstone leaving a zone of residual, free-phase solvent. The solvent may have also migrated downward through the saturated zone and pooled in structural depressions on the underlying claystone, and may have migrated short distances in the claystone through the fractures.

SECTION 3
SOIL VAPOR SURVEY PROGRAM

This section presents the technical elements of the SVS Program. These elements include Data Quality Objectives (DQOs), development of sampling locations for the three primary and two alternate SVS sites. Field sampling procedures, on-site laboratory analysis, and a list of suggested and required equipment are presented, as well as decontamination procedures and requirements for management of investigation derived wastes.

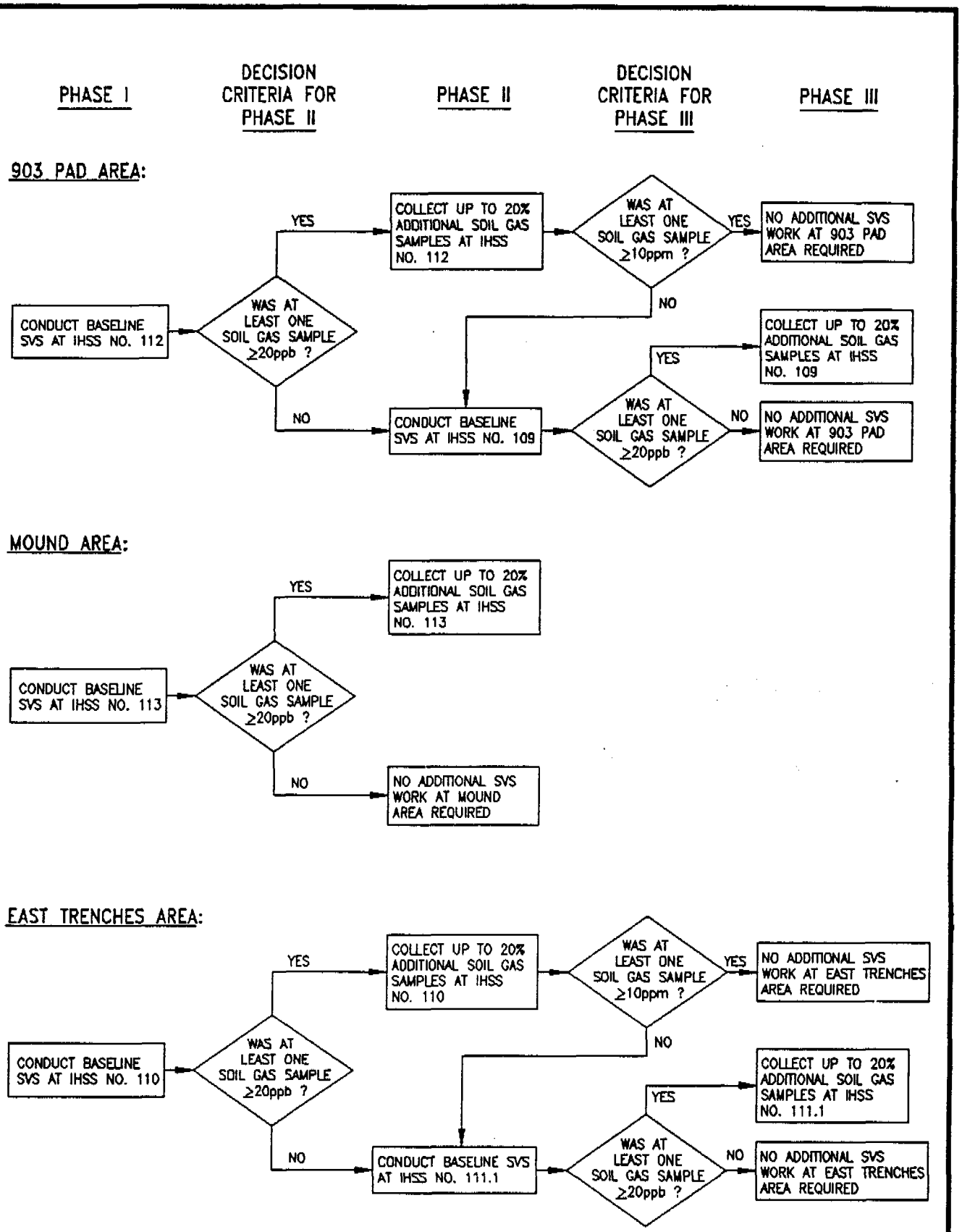
3.1 APPROACH

The SVS will be implemented using a phased approach that is graphically illustrated on Figure 3-1. A baseline survey will be conducted at the three primary sites. If contaminants are detected ($\geq$ 20 ppbv) in any samples, additional samples will be taken around that sampling point(s) to better pinpoint the source of the contamination. If no contaminants are detected, the site will be abandoned and a baseline survey conducted at the alternate site. If at any location, the cumulative concentration of all analytes equals or exceeds 10 ppmv, the site will be considered adequate for the vapor extraction pilot test. If this occurs at the primary site, the corresponding alternate site will not be surveyed.

The criteria for determining whether a site is adequate for executing a vapor extraction pilot test essentially reduces to one issue; whether the SVS results suggest high enough contaminant concentrations in the subsurface to justify the pilot test effort. This is a somewhat subjective determination, and the final decision will be made by the EG&G Project Manager. The selection of 10 ppmv as a tentative threshold criteria for success is loosely based on the success criteria (1 pound of total chlorinated hydrocarbons per day, EG&G 1992a) for the SVE pilot tests.

3.2 DATA QUALITY OBJECTIVES

The project DQOs have been developed per EPA guidance, and include the following six data quality elements:



U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	OBSERVATIONAL STREAMLINED APPROACH GUIDANCE FOR SVS PROGRAM OPERABLE UNIT NO. 2	FIGURE 3-1

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- Data uses/users.
- Data types.
- Data quality.
- Data quantity.
- Sampling and analysis approach.
- PARCC parameters (precision, accuracy, representativeness, completeness, and comparability).

The project-specific requirements for each of the data quality elements listed above are presented in Table 3-1.

3.3 SAMPLING GRIDS

The first phase of the SVS Program involves locating soil vapor sampling points at the primary test sites (IHSS Nos. 112, 113, and 110) as specified by the baseline sampling grids. The baseline sampling grids include 30 foot sampling intervals and are illustrated in Figures 3-2 through 3-6. A typical SVS sampling grid interval is 25 to 50 feet depending upon site geology (Devitt et al., 1987; Chambers and Hennier, 1991; Joyner and Thomsen, 1991; Nielsen, 1991). The grid points are placed in staggered rows to provide a triangular grid pattern, which results in uniform coverage of the target area with equally spaced samples.

In the second phase of the SVS program, sampling grid intervals will be reduced to no tighter than 5 feet at the zone(s) displaying the highest concentrations by the use of additional sampling

Table 3-1

Soil Vapor Survey Program
Data Quality Objectives

1. DATA USES/USERS:

Soil gas samples will be analyzed in an on-site mobile laboratory to provide qualitative data on VOCs in the unsaturated zone at each of five locations within OU2. Data will be used by the EG&G Project Manager to locate historical contaminant release points. These data will be used to locate the pilot unit vapor extraction wells.

2. DATA TYPES

- Systematic grab samples of soil gas along an established grid.

3. DATA QUALITY

a) Prioritized data uses:
- Location of contaminant release points
- Location of pilot unit vapor extraction wells

b) Appropriate analytical level
- Level II - mobile laboratory GC – this level of quality is required because this is a screening effort. Level II is characterized by the use of portable analytical instruments or immobile laboratories stationed near a site.

c) Analytes
- Carbon tetrachloride, TCE, and PCE – others contaminants may be present; however, it is not necessary to quantify them for this effort.

d) Required detection limit
- 20 ppbV per analyte

4. DATA QUANTITY

- Baseline sampling grid for primary sites (119 soil gas samples):
  - IHSS No. 112 - 64 samples
  - IHSS No. 113 - 33 samples
  - IHSS No. 110 - 22 samples

- Baseline sampling grid for alternate sites (36 soil gas samples);
  IHSS No. 109 - 14 samples
  IHSS No. 111.1 - 22 samples

- Thirty-one (20%) additional shallow samples at each of the primary and alternate SVS sites to expand grid or increase grid density on-site, depending on results from initial samples.

- Up to 10 deeper samples at the Mound Area.

5. SAMPLING AND ANALYSIS APPROACH

Shallow soil gas samples will be collected by inserting soil probes to a depth of 3 to 5 feet. Each sample will be collected and analyzed for carbon tetrachloride, PCE and TCE within 2 hours. (A Soil Gas Sampling SOP is provided in Appendix A for additional guidance.)

6. PARCC PARAMETERS

a) Precision
   - Field duplicate ± 20% RPD*
   - Replicate analysis ± 10% RPD

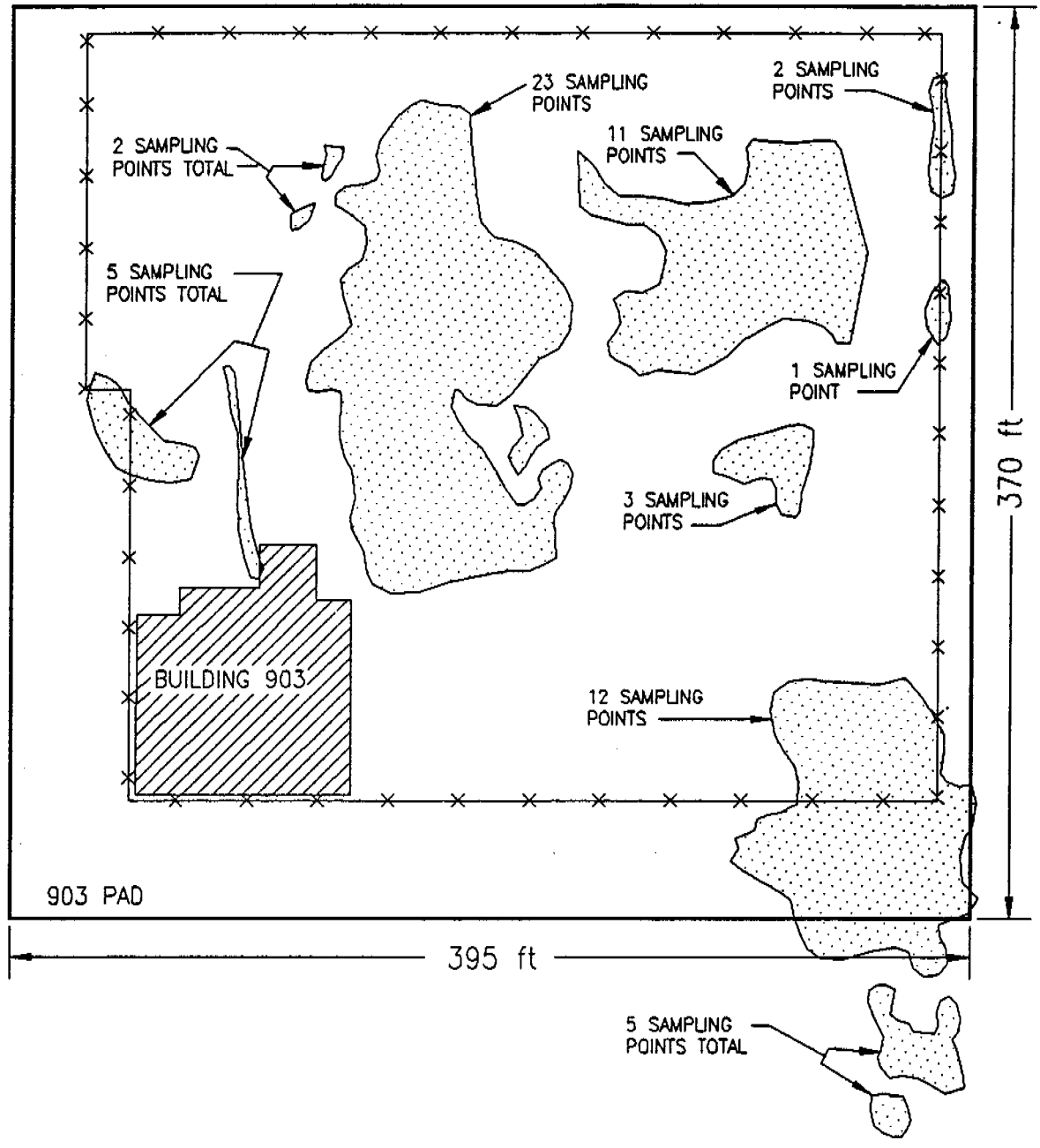
b) Accuracy
   - Use of calibration standards in laboratory provides accuracy ± 20% RPD.
   - Analysis once per day of an independently prepared gas standard ± 30% RPD.

c) Representativeness
   - Adherence to sampling procedures specified in this Plan.

d) Completeness
   - Laboratory completeness 95%
   - Field completeness 90%

e) Comparability
   - Adherence to analysis procedures specified in this Plan. Analysis techniques will not change throughout the course of the program.

* RPD - relative percent deviation



AREAS OF PROPOSED SOIL VAPOR SAMPLING POINT* – 30 FT SPACING. STAGGERED

IHSS – INDIVIDUAL HAZARDOUS SUBSTANCE SITE

* PROPOSED SAMPLING LOCATIONS BASED ON AREAS OF SOIL STAINING APPARENT IN AERIAL PHOTOGRAPH.

SCALE: 1 INCH = 69 FEET

U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	SOIL VAPOR SURVEY SAMPLING LOCATIONS 903 PAD IHSS No. 112	FIGURE 3-2

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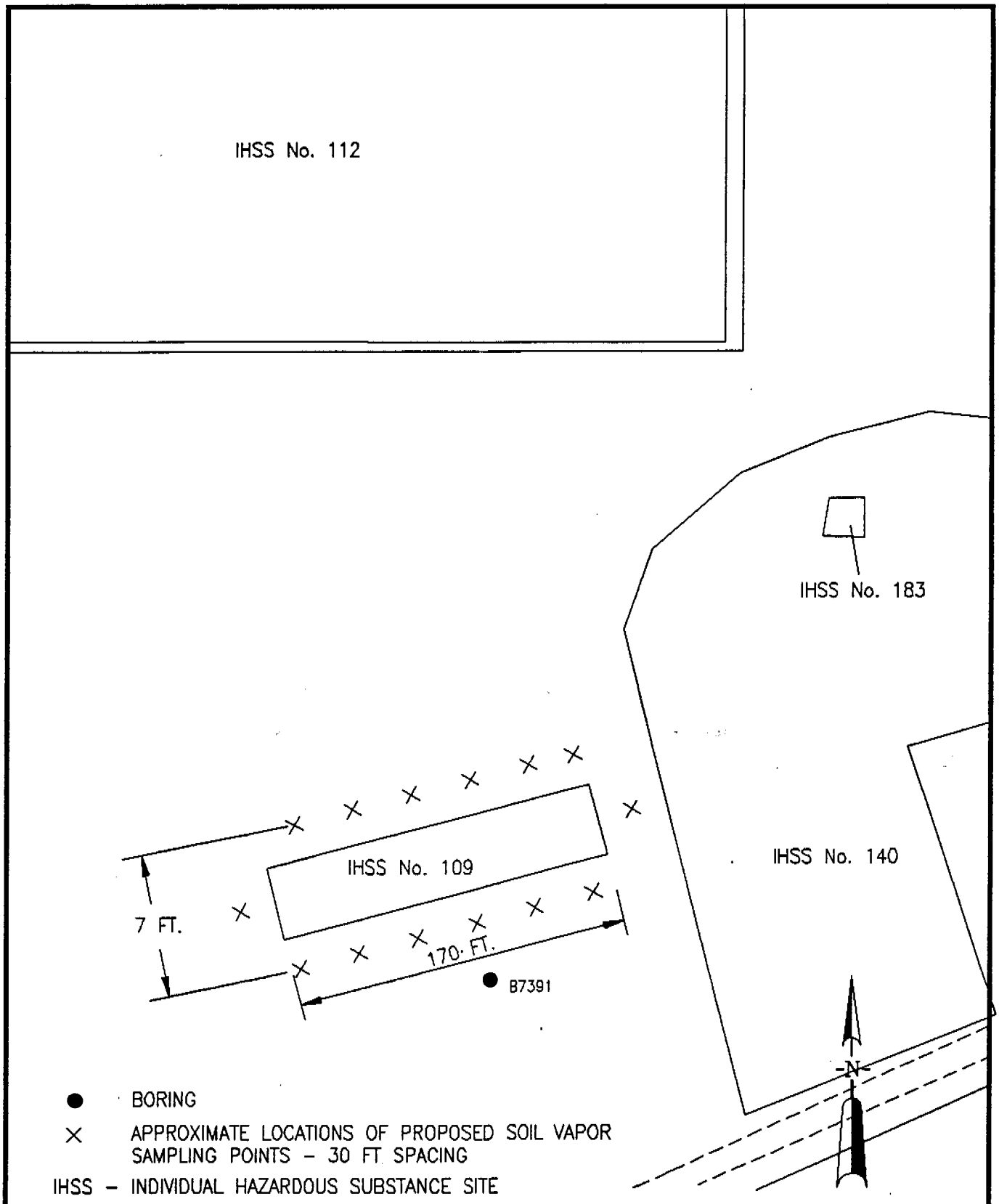

U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	SOIL VAPOR SURVEY SAMPLING LOCATIONS 903 PAD AREA IHSS No. 109	FIGURE 3-3

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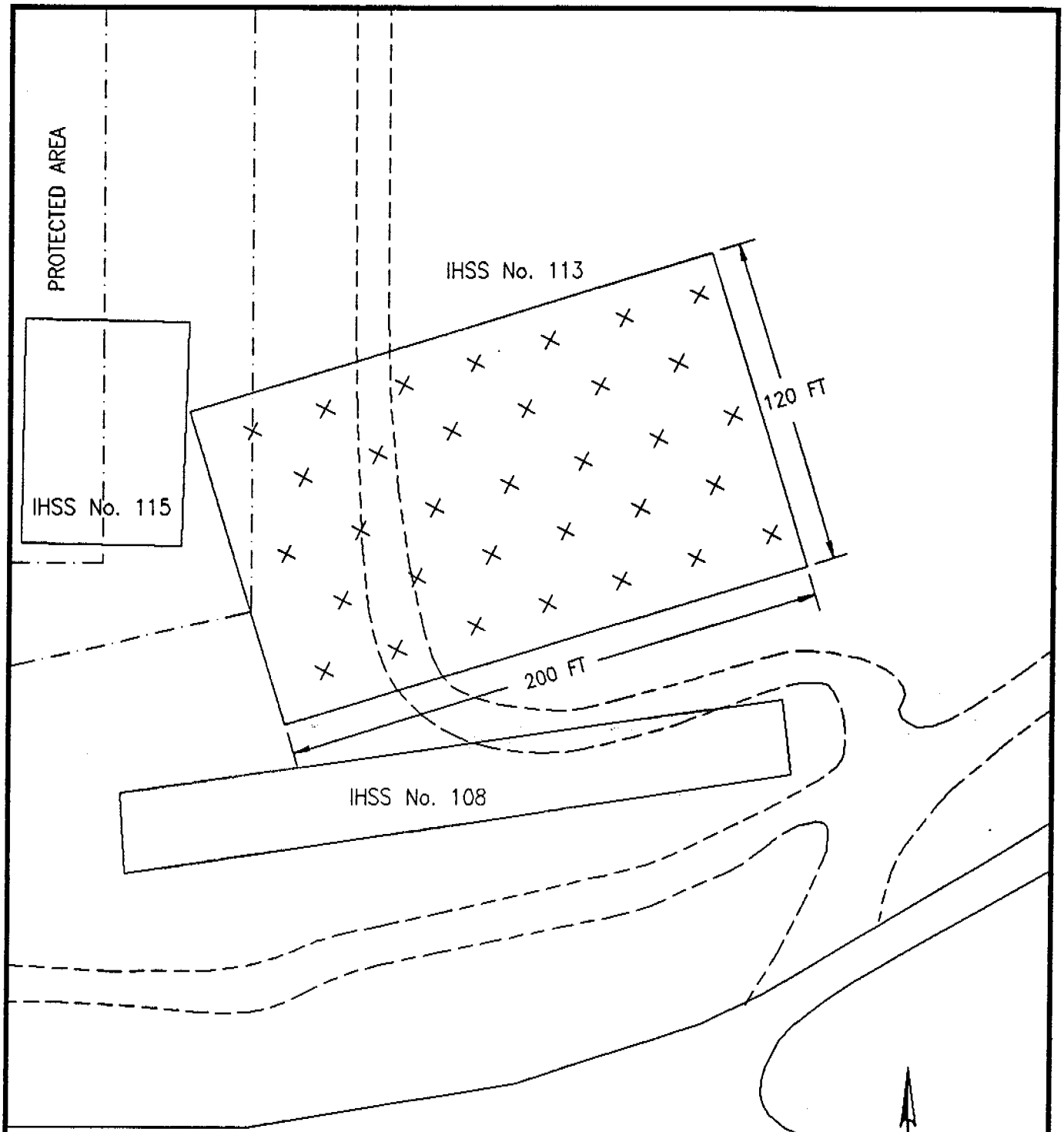

U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	SOIL VAPOR SURVEY SAMPLING LOCATIONS MOUND AREA IHSS No. 113	FIGURE 3-4

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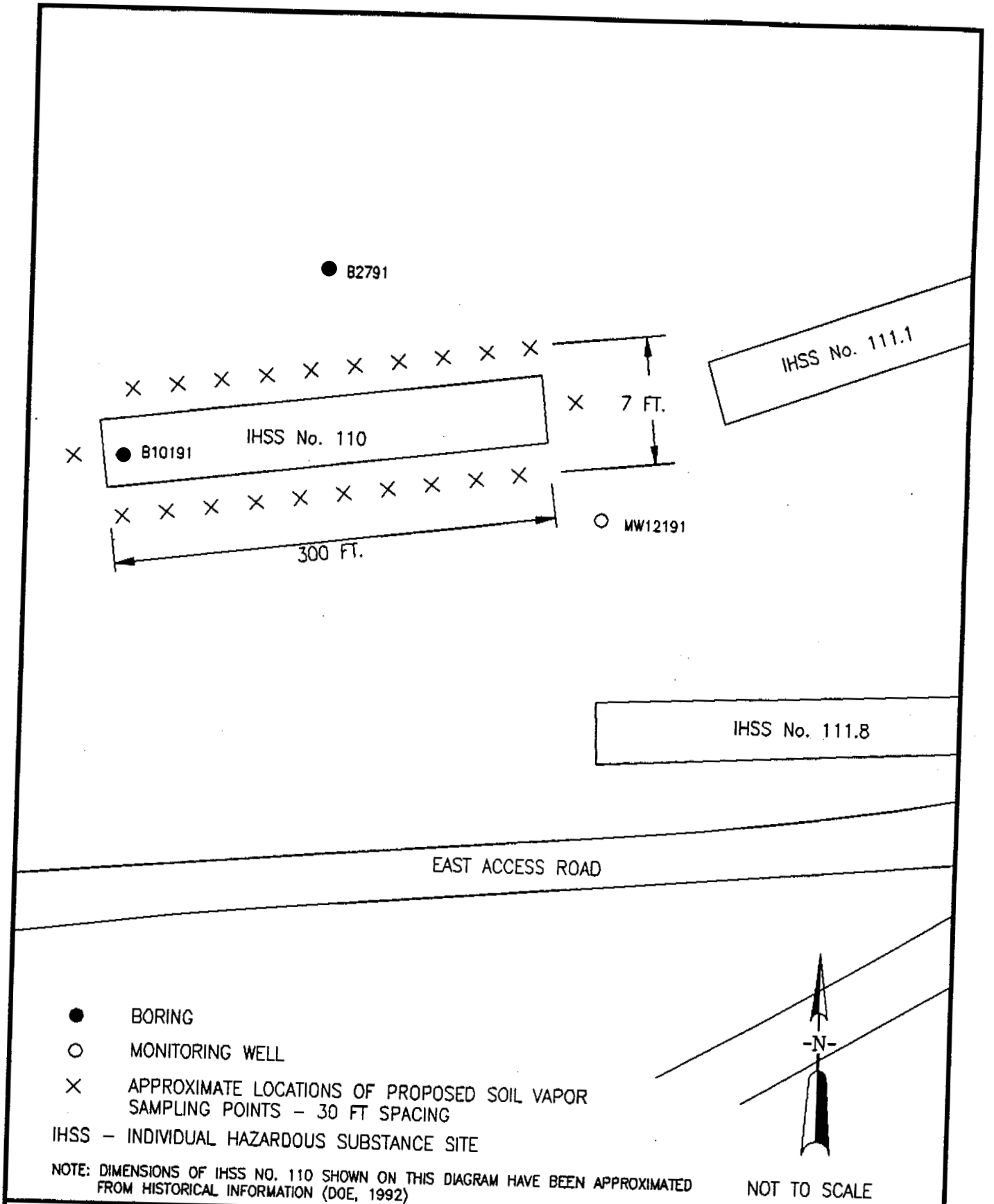
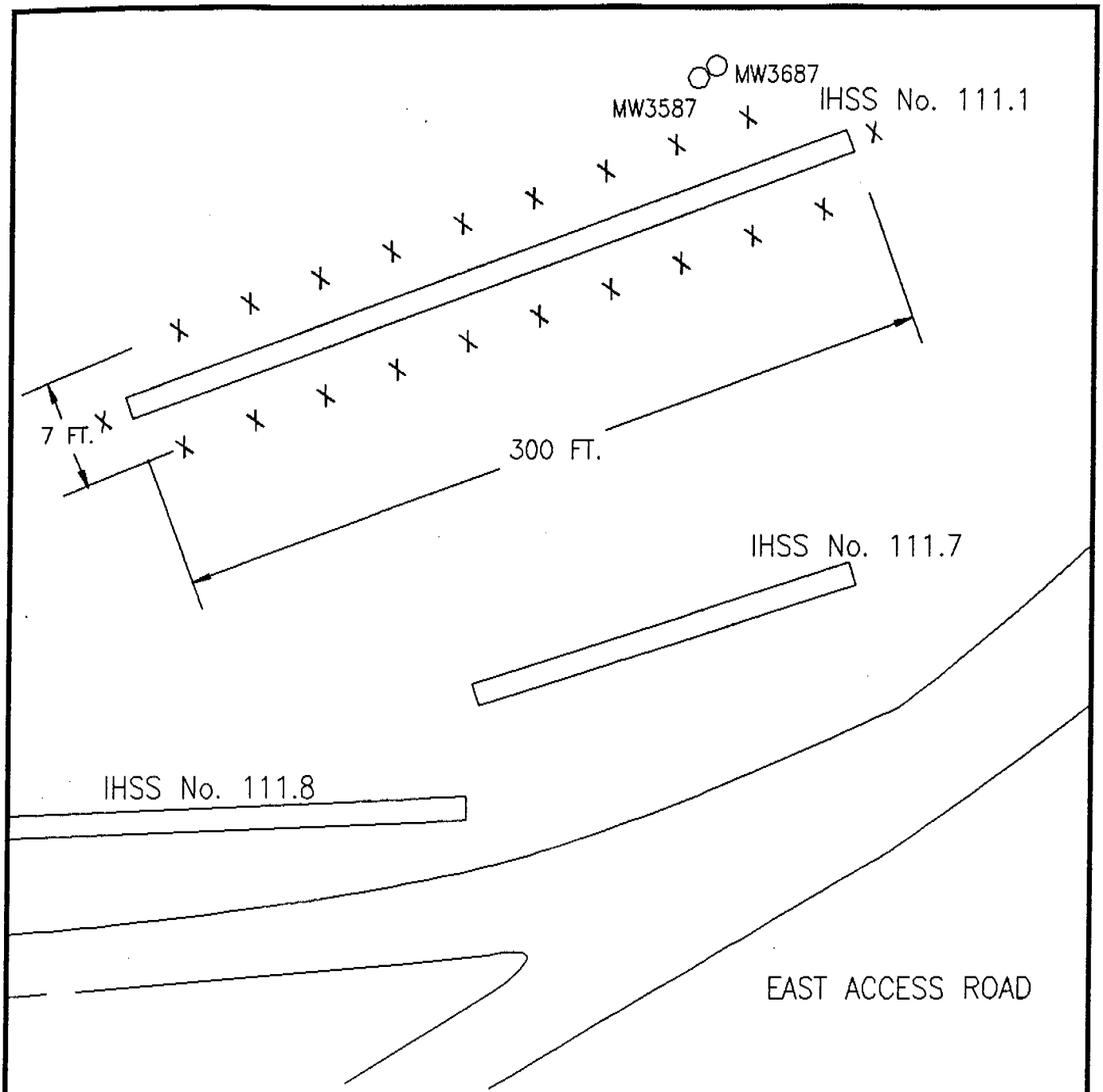


U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	SOIL VAPOR SURVEY SAMPLING LOCATIONS EAST TRENCHES AREA IHSS No. 110	FIGURE 3-5

R37080.CWpj–122992



○ MONITORING WELL

X APPROXIMATE LOCATIONS OF PROPOSED SOIL VAPOR SAMPLING POINTS – 30 FT. SPACING

IHSS – INDIVIDUAL HAZARDOUS SUBSTANCE SITE

NOTE: DIMENSIONS OF IHSS NO. 111.1 SHOWN ON THIS DIAGRAM HAVE BEEN APPROXIMATED FROM HISTORICAL INFORMATION (DOE, 1992)

-N-

NOT TO SCALE

U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	SOIL VAPOR SURVEY SAMPLING LOCATIONS EAST TRENCHES AREA IHSS No. 111.1	FIGURE 3-6

R37073.PJ-122892

54

points to further define potential contaminant source areas. The use and placement of additional sample points will be determined by the EG&G Project Manager using Phase I results. Depending upon the source configuration, deeper samples may be required (at the direction of the EG&G Project Manager) at the Mound Area. This contingency was developed because surface soil at the Mound Area IHSS No. 113 has been disturbed and/or removed; however, there is evidence of a release due to high concentrations of dissolved contaminants found in a nearby well (No. 0174) (EG&G, 1992b). A deeper soil gas sample taken near the bedrock surface, at the same elevation as the screened interval (10 feet below ground) might detect contaminants not present in the surface soils.

A total of 155 sampling points will be required to obtain a 30 foot grid spacing for baseline sampling at the five sites. Of these sampling points, 64 points will be required at IHSS No. 112, 33 points at IHSS No. 113, 22 points at IHSS No. 110, and 14 points at IHSS No. 109. Additional sampling points (up to 20% of the Phase I sampling points) will be used to better characterize potential contaminant source areas, as necessary. Up to 10 additional deep sampling points (approximately 10 feet in depth) at the Mound Area will be used if shallow samples contain no contaminants.

3.3.1 903 Pad Area (IHSS No. 112)

The 903 Pad covers an area of approximately 395 feet by 370 feet (Figure 3-2). Aerial photographs of the 903 Pad taken on 29 April 1967, 10 April 1968, and 24 May 1969 (DOE, 1992) indicate areas of soil staining. The SVS will concentrate on these stained areas (Figure 3-2) because they are suspected to represent contaminant release points. A grid consisting of 64 sample points has been designed to cover these stained areas. The largest stained area in the center of the site will be covered by 23 sample grid points. The small stained areas to the west may be covered by 7 points. The large stained area to the east will require 11 points with surrounding smaller areas requiring an additional 3 points. The remaining 20 points will be used to address the southern area. A grid spacing of 30 feet will be utilized initially and may be augmented, at the direction of the EG&G Project Manager, with up to 12 additional sampling points based on the soil gas analytical results from the Phase I survey.

3.3.2 903 Pad Area (IHSS No. 109)

IHSS No. 109 is approximately 70 feet long and 3 feet wide (Figure 3-3). Soil vapor sample points will be placed directly on either side of the trench. A total of 14 points will be used with a spacing of 30 feet. This grid may be augmented, at the direction of the EG&G Project Manager, with up to 3 additional sampling points to further define contaminated areas.

3.3.3 Mound Area (IHSS No. 113)

The Mound Site (IHSS No. 113) covers an area approximately 200 by 120 feet (Figure 3-4). A total of 33 sample points will cover the entire area of IHSS No. 113 at 30 foot spacing. The grid spacing may be augmented, at the direction of the EG&G Project Manager, with up to 7 shallow sampling points based upon Phase I SVS analytical results. In addition, up to 10 deeper (10 foot depth) sampling points may be used to identify contamination at the bedrock/alluvial contact at the discretion of the EG&G Project Manager.

3.3.4 East Trenches Area (IHSS No. 110)

IHSS No. 110 is approximately 300 feet long and 3 feet wide (Figure 3-5). Soil vapor sample points will be placed directly on either side of the trench with a spacing of 30 feet. A total of 22 points will be used with a spacing of 30 feet. This grid may be augmented, at the direction of the EG&G Project Manager, with up to 5 additional sampling points to further define contaminated areas.

3.3.5 East Trenches Area (IHSS No. 111.1)

IHSS No. 111.1 is approximately 300 feet long and 3 feet wide (Figure 3-6). Soil vapor sample points will be placed directly on either side of the trench. A total of 22 sample points will be used to surround the perimeter of the trench; therefore, 10 sample points will be placed down each side of the trench and 1 sample point will be placed at each end. The grid spacing may be augmented, at the direction of the EG&G Project Manager, with up to 5 additional sampling points based upon Phase I SVS results.

3.4 EQUIPMENT

This subsection provides a list of the basic field and analytical equipment used to conduct the SVS. This list is intended to provide examples of the types of equipment that may be required and, as such, may not be a comprehensive equipment list There are a number of SVS sampling techniques and equipment that have been developed in recent years that will provide equivalent results. The actual equipment used will depend on the SVS methods employed. It is required, however, that the SVS methods and equipment used will meet the SVS Program DQOs set forth in Section 3.1.

3.4.1 Sampling Equipment

- Portable or truck-mounted driver for soil probes.
- Slam bar to prime hole (if soil probe refusal is met).
- Soil probe.
- Drive tips.
- Teflon tubing.
- Assembly to connect Teflon tubing to soil probe.
- Teflon septa.
- Vapor sampling pump.
- Vacuum gauge sized for pump operating range.
- Flow meter
- Gas-tight glass sampling syringes.

Sampling equipment will be made of materials such as Teflon, which will not compromise sample quality.

3.4.2 Mobile Laboratory Equipment

The mobile laboratory equipment specified is only an example of the kind of equipment needed to meet the DQOs. Other equipment may be substituted if it can meet the DQOs.

- Mobile laboratory van.
- Programmable gas chromatograph (GC), with photoionization detectors (PID), electron capture detector (ECD), or other detector with comparable performance.

- GC carrier gases.
- Laboratory oven, as necessary.
- Generator with an exhaust tube to prevent exhaust gases from entering the mobile lab.
- Analytical standards.

Mobile laboratory equipment should be capable of attaining Level II analytical data quality. Pumps, tubing, and purge gases should be sufficiently inert to meet SVS program DQOs.

3.5 PROCEDURES

The following procedures are an example of those often used to conduct SVS programs. This discussion covers both field sampling procedures and analytical procedures. There are a number of soil gas sampling techniques and equipment that have been developed in recent years that will provide equivalent results. Procedures that will provide equivalent results may be substituted as long as the DQOs of the SVS are met (see Section 3.1). Several procedures or methods described in the following sections are considered essential elements of the SVS program and are so noted.

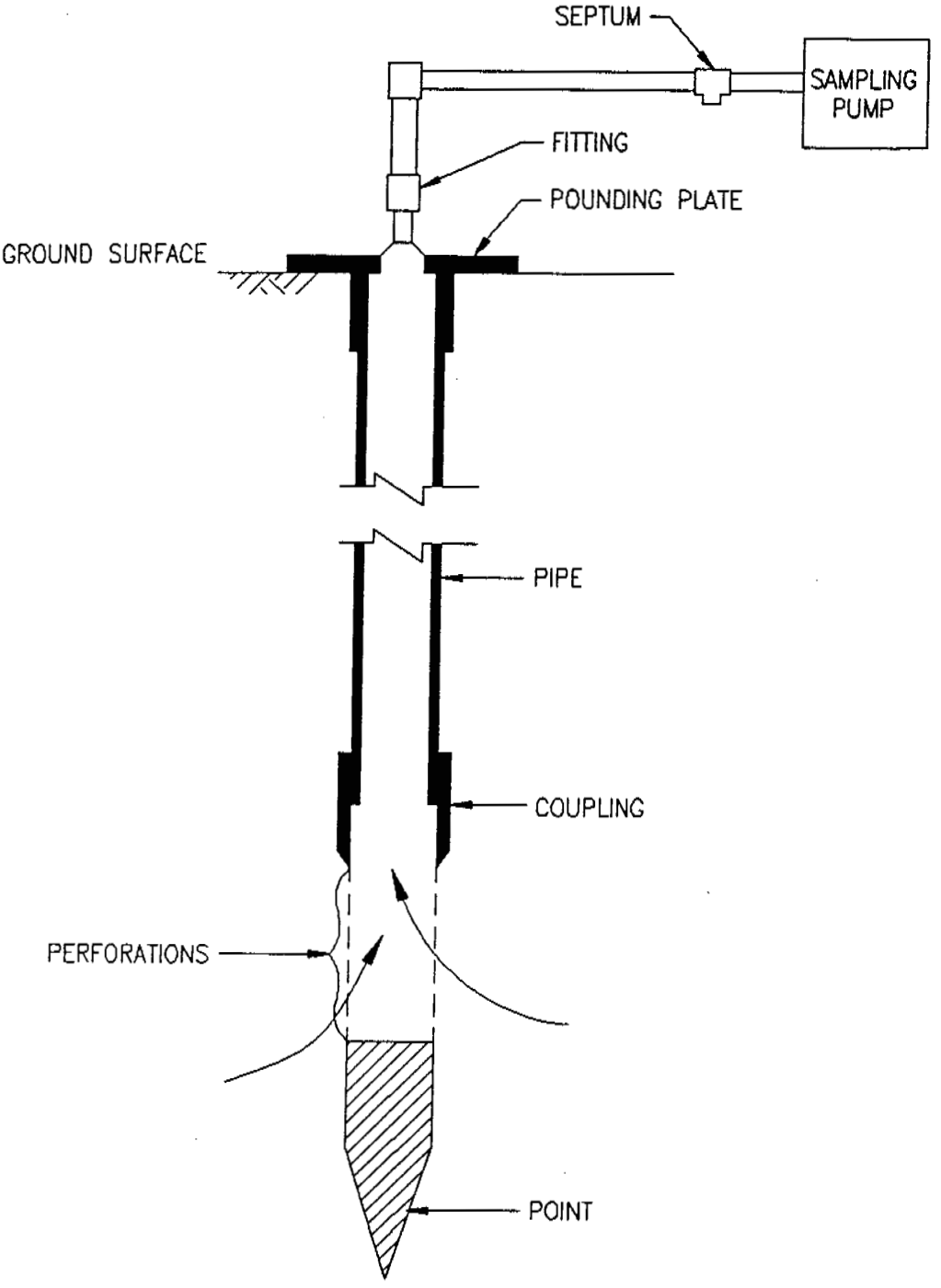
3.5.1 Pre-Field Sampling Tasks

The portable laboratory will be mobilized to the site with all necessary equipment, instrumentation, and manpower approximately 48 hours prior to the beginning of the sampling program. The laboratory will be set up, and the instrumentation powered up, allowed to stabilize, and then calibrated prior to soil gas sampling and analyses. During this period, the planned grid locations for Phase I soil gas collection points will be flagged. Each location will be given a unique sample identification number, described in the logbook and mapped on the site map. The EG&G project manager will inspect and approve the marked sample locations before any soil gas samples are collected.

3.5.2 Field Sampling Procedures

Shallow sampling to depths of 3 to 5 feet will be accomplished by driving a soil probe into the ground using a truck-mounted or portable driver or equivalent. In order to penetrate asphalt (present at IHSS No. 112) it may be necessary to first drill a hole before driving the probe. Sample depth may be limited by the presence of cobbles in the subsurface. If hole refusal is encountered, it may be necessary to drive a preliminary hole into the soil with a "slam bar", and then insert a soil probe into the hole. The diameter of the slam bar should be less than the soil probe to ensure a tight seal. If refusal is met using the "slam bar", a second and third attempt will be made within 3 feet of the original location before moving to the next pre-designated sampling location. After the soil probe has been driven, the probe will be lifted a few inches allowing the drive tip to drop, and gas to enter the probe. Teflon tubing will be attached to the top of the soil probe. A Teflon septum (or a gas sampling bulb, depending on the sampling method used) will be attached to the Teflon tubing and a vacuum gauge, flow meter, and flow control valve will be installed downstream of the septum. The vacuum pump will be turned on and used to evacuate at least 3 probe volumes of air using the measured flow rate to calculate the required evacuation time. With the vacuum pump running, a gas tight syringe is inserted through the septum (Figure 3-7). The syringe will be purged several times with soil gas after which a soil gas sample will be collected. The syringe will then be removed from the septum, the end of the needle plugged, and the sample delivered to the mobile laboratory for analysis. Sample preservation/shipment and chain of custody forms will not be required, since the analysis will be done onsite with a mobile laboratory.

The vacuum pump will then be turned off and the probe removed from the ground using a hydraulic puller mechanism on the probe driver. The used probe will be stored separately from the clean probes, for later decontamination. The probe holes will be backfilled with a thin bentonite slurry to the extent practical. A requirement for work conducted at IHSS No. 112 (903 Pad) includes installing a surface seal compatible with and equal in thickness to the existing asphalt cap.



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U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	SOIL VAPOR SAMPLING PROBE DESIGN	FIGURE 3-7

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3.5.3 Documentation

A laboratory log notebook and a field log notebook will be maintained during the time that sampling and analyses are conducted. A copy of the log notebooks will be provided to EG&G after the completion of the project.

3.5.3.1 Contents of Field Log Notebook

The field log notebook will include, but not be limited to, the following information:

- Time (military notation).
- Sample number.
- Location (approximated description).
- Sampling depth.
- Volume purged from sample probe.
- Inches of mercury on vacuum pump gauge.
- Probe and adaptor identification numbers.
- Observations (i.e., ground conditions, paving type, soil appearance, surface water, odors, vegetation, etc.)
- Back-fill procedure and materials.
- Sample location marked on site map.

3.5.3.2 Contents of Laboratory Log Notebook

The laboratory log notebooks will include, but not be limited to, the following information:

- Time (military notation).
- Sample number.
- Location (approximated description).

- Sampling depth.
- Type of sample (blank, duplicate, etc.).
- Observations (instrument performance, procedures to meet calibration range, etc.).

3.5.4 Project QC Procedures

The following requirements are necessary to comply with the stated project DQOs.

QC Requirements

- A GC or gas chromatograph/mass spectrometer (GC/MS) for analysis of samples. A PID, and ECD, (or detector with comparable performance) will be required for each GC.

- A sufficient number (minimum of 20) of glass syringes or other suitable sampling containers for the purpose of soil gas sampling and injection of sample into an analytical instrument. Stainless-steel hypodermic syringe needles equipped with a shut-off valve (for sample isolation) shall be required if glass syringes are utilized for sampling and injection purposes.

- A log of each sampling point will be kept and shall contain, at a minimum, the following: time and date (military notation); sample location; sample number; sampling depth; purge time before sampling; inches of mercury on vacuum pump during purge; surface conditions during sampling (surface covering, standing water, etc.,); backfill procedure and materials.

- The first sample to be analyzed each day will be a field blank: the field blank will be obtained by collecting a sample of ultra high purity (UHP) air through each sampling system. The field blank analysis must show a level less than one-half of the nominal detection limit for each halogenated species before sampling can begin. If these levels cannot be achieved, all sampling syringes will be blank checked before use.

- At 10 percent of the soil gas sampling locations, a replicate field sample will be collected and analyzed. The replicate will be taken at the same location as the original sample (i.e., from the same probe).

- An EG&G representative will have access to the on-site sampling and analysis vehicle to observe analytical methods and procedures.

- A four-point calibration will be performed on each GC at the start of each week using standards containing the following compounds: carbon tetrachloride, TCE and PCE. A response factor (R.F.) will then be determined for each of compounds using a linear regression. The correlation coefficient for each of the compounds must be >0.99 or the calibration must be repeated.

- An analytical blank will be analyzed following the daily calibration by injection of UHP nitrogen in to the instrument. This blank must show levels equal to or less than the criteria for a field blank. If necessary, the analytical blank is repeated until this level is achieved.

- Ten percent of the soil gas samples shall be analyzed by replicate injection. The relative percent difference (RPD) for all detected analytes is calculated and documented. The RPD of the two most concentrated species for duplicate injections must be less than 20 percent or a third injection is required. Soil gas samples which require dilution may require a fourth run to check reproducibility. The results from the third injection (or fourth in the case of a diluted sample) determine subsequent action as follows. If the data from the final injection results in RPDs of less than 50 percent (for the two most concentrated species), sample analysis may continue. However, it is imperative that associated data points from all samples analyzed since the last replicate (or daily QC check if this is the first replicate of the day) are flagged to note this excessive variability. If the RPDs using the third injection are greater than 50 percent for either of the two most concentrated species, immediate corrective action is required (i.e., stop sample analysis, locate source of problem, conduct system maintenance as needed). A mid-level gas standard must then be analyzed as described below under "QC check sample."

- Five percent of the field locations will take a field duplicate sample within 2 feet of the original sample location.

- A GC system blank of UHP air shall be injected following samples which have levels above the calibrated range. The system blank shall be repeated until levels fall below 10 ppbv.

- A soil gas sample which contains a calibrated compound at a concentration above the calibrated range shall be diluted and rerun to bring it within the calibrated range.

- A QC check sample which shall be a standard in the middle of the calibrated range will be the last run of the day to determine drift on the instrument. Recoveries will be calculated for each compound and recorded on the daily report sheet. If recoveries are not within 70 to 130 percent of the true value for a compound, then the data will be flagged for that compound.

- On days that a multipoint calibration is not performed, a QC check sample shall be done as the first run of the day. Recoveries will be calculated and recorded as described above. If recoveries are not within 70 to 130 percent of the true value for all but one calibrated compound, the multipoint calibration is repeated.

- An analysis report sheet will be prepared to report the following data at the end of each work day:

  - Daily R.F. for each calibrated compound
  - Correlation coefficient for each compound
  - System blank levels in ppbv
  - Ambient blank levels, when required.
  - Field blank levels in ppbv
  - Field I.D. and concentration in ppbv of calibrated compounds for each soil gas sample run that day.
  - Volume injected for each sample, if syringe injection is used, and time of analysis.
  - Percent recovery for each compound in the QC check sample.
  - RPDs for duplicate analyses.

- Unidentified peaks reported with nearest calibrated compound.

- Analyses shall be performed for the following compounds:

  carbon tetrachloride
  TCE
  PCE

- Subcontractor shall submit written results for each days analyses by 10 a.m. on the following working day.

- Detection limits for on-site GC are required as follows:

COMPOUND	METHOD DETECTION LIMIT
carbon tetrachloride	20 ppbv
TCE	20 ppbv
PCE	20 ppbv

- The QA/QC requirements are written based on syringe sampling and on-site GC analysis with PID and ECD detectors. Alternative methods of sampling and analysis that are equivalent to the above described methods may be submitted for consideration.

3.6 DECONTAMINATION

Equipment decontamination will be conducted in accordance with Rocky Flats Plant SOP FO.03, General Equipment Decontamination and FO.04, Heavy Equipment Decontamination. These procedures should be considered minimum requirements as sampling equipment will be decontaminated to the extent necessary to conform to the quality control objectives.

3.7 MANAGEMENT OF INVESTIGATION-DERIVED WASTES

Investigation-derived wastes will consist of decontamination wastes from cleaning sampling materials, personal protective equipment, and disposable sampling equipment. It is important

that different types of investigation-derived wastes are kept separate. Personal protective equipment will be handled separately under SOP FO.06, Handling of Personal Protective Equipment. Decontamination water and wash water should be containerized according to SOP FO.07, Handling of Decontamination Water and Wash Water. If cuttings are generated during the SVS (this is not expected), they should be containerized and handled according to SOP FO.08, Handling of Drilling Fluids and Cuttings. The procedures to be followed for containerizing liquid and solid wastes are specified in SOP FO.10, Receiving, Labeling, and Handling of Environmental Material Containers. If residual samples are generated (this is not expected), they should be handled according to SOP FO.09, Handling of Residual Samples.

In addition, many of the procedures specified in the previously mention SOPs require the use of the RFP Main Decontamination Facility for the screening, and disposal of different types of wastes. There are special procedures to be followed in using this facility which are described in SOP FO.12, Decontamination Facility Operations. Any situations which may arise which are not covered by the previously mentioned SOPs should be immediately brought to the attention of the EG&G Project Manager for further guidance.

SECTION 4

DATA REPORTING AND ANALYSIS

4.1 DATA EVALUATION IN THE FIELD

The use of the mobile laboratory will allow collection of real-time analytical results (i.e., within 2 hours after the sample is taken). The Phase I grid sampling locations are based upon 30-foot intervals. If the analytical data generated during the Phase I SVS indicate the presence of high levels of VOCs in certain locations, this information will be used to locate additional Phase II soil gas sampling points in coordination with the EG&G Project Manager at up to three distinct locations displaying the highest concentrations within a given IHSS. During Phase II sample spacing may be reduced to but no less than 5 feet to better define the configurations of the contaminant source areas. At IHSS No. 113, deeper samples may be taken, if the analytical data indicates that no concentrations of VOCs are present in shallow soil gas. Deep samples will be used to confirm the presence or absence of residual DNAPLs at the bedrock contact.

4.2 DATA REPORTING REQUIREMENTS

The final project report will include each of the following elements for the SVS conducted at each site:

- Procedures used.
- Maps of surveyed sample locations including location of sample refusals. Horizontal control will be established on sample location to 1.0 foot.
- Soil vapor VOC concentration and depth data.
- Quality Control results with a narrative summary of compliance with QC procedures.
- VOC isoconcentration contour maps.

SECTION 5

REFERENCES

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APPENDIX A

QUALITY ASSURANCE ADDENDUM

Approved by:

_____	___/___/___	_____	___/___/___
Director, Environmental Science & Engineering		Project Manager	

QUALITY ASSURANCE ADDENDUM

This Appendix consists of the Quality Assurance Addendum (QAA) for the Soil Vapor Survey Work Plan for the 903 Pad, Mound, and East Trenches Area (Operable Unit No. 2 [OU2]). This QAA supplements the "Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigation/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities" (QAPjP). The QAA establishes the site-specific Quality Assurance (QA) controls applicable to the investigation activities described in the Soil Vapor Survey Work Plan (SVS WP).

Five Individual Hazardous Substance Sites (IHSSs) within the OU2 boundary have been targeted for testing a vapor extraction system (VES), which is designed to remove free-phase volatile organic compounds (VOCs) in situ. The soil vapor survey described in the SVS WP will provide information on the location of residual free-phase VOCs in the subsurface beneath the IHSSs, which will assist in determining the locations for installation of the VES. The SVS WP describes the IHSS locations to be surveyed, the criteria and rationale for the site sampling grid designs, sampling procedures and analytical methods, and the methods to evaluate and report data collected.

A.1 ORGANIZATION AND RESPONSIBILITIES

The overall organization of EG&G Rocky Flats and the Environmental Restoration (ER) Management Organization responsible for implementing the ER Program activities at the DOE

Rocky Flats Plant (RFP) is presented in Section 1.0 of the QAPjP. Functional responsibilities are also described in Section 1.0 of the (QAPjP).

A.2 QUALITY ASSURANCE PROGRAM

The QAPjP was written to address QA controls and requirements for implementing ER Program activities, as required by the RFP Interagency Agreement (IAG). The content of the QAPjP was driven by Department of Energy (DOE) Order 5400.1, the RFP QA Manual (RF QAM), and the IAG. DOE 5400.1 and the RFQAM both require a QA program to be implemented based on American Society of Mechanical Engineers (ASME) NQA-1, "Quality Assurance Requirements for Nuclear Facilities." The IAG specifies development of a QAPjP in accordance with the Environmental Protection Agency (EPA) QAMS-005/80, "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans." The 18-element format of NQA-1 was selected as the basis for both the QAPjP and subsequent QAAs with the applicable elements of QAMS-005/80 incorporated where appropriate. Figure 2-1 of Section 2.0 of the QAPjP illustrates where the 16 QA elements of QAMS-005/80 are integrated into the QAPjP and also into this QAA. Section 2.0 of the QAPjP also identifies other DOE Orders and QA requirements documents to which the QAPjP and this QAA are responsive.

The controls and requirements addressed in the QAPjP are applicable to SVS WP activities, unless specified otherwise in this QAA. Where site-wide actions are applicable to SVS activities, the applicable section of the QAPjP is referenced in this QAA. This QAA addresses additional and site-specific QA controls and requirements that are applicable to SVS activities that may not have been addressed on a site-wide basis in the QAPjP. Many of the QA requirements specific to the SVS are addressed in the SVS WP and are referenced in this QAA.

OU2 IHSSs of interest. The work plan identifies the objectives of the investigations; specifies the sampling, analysis, and data generation requirements; identifies applicable operating procedures that will provide controls for the investigations, and presents the methods to be used to evaluate and report data collected during the implementation of the SVS program. As such, the SVS WP is considered the environmental investigation control plan for the SVS program.

A.3.2 Data Quality Objectives

The development of Data Quality Objectives (DQOs) for the OU2 SVS program was presented in Section 3.1 of the WP. The DQOs were established in general accordance with the 3-stage process described in EPA/540/G-87/003 (OSWER Directive 9335.0-7B), Data Quality Objectives for Remedial Response Activities, and Appendix A of the QAPjP. Table 3-1 identifies the data uses, data types, data needs, appropriate analytical levels, contaminants of concern, required detection limits, data quantity needs, and the sampling and analysis approach for the OU2 SVS program.

Data quality is typically measured in terms of precision, accuracy, representativeness, comparability, and completeness (also referred to as PARCC parameters). Precision, accuracy, and completeness are quantitative measures of data quality, while representativeness and comparability are qualitative statements that express the degree to which sample data represent actual conditions and describe the confidence of one data set to another. These parameters are defined in Appendix A of the QAPjP. PARCC parameter objectives are established in Table 3-1.

A.3.3 Sampling Locations and Sampling Procedures

The soil vapor sampling plan is described in Section 3.2 of the SVS WP. Soil vapor sampling points are based on a 15-foot grid covering the IHSSs to be sampled. Sampling intervals may be reduced around points with the highest concentrations to further define potential contaminant source areas. The sampling equipment to be used to collect the soil vapor samples is identified in Section 3.3. Soil vapor samples will be collected at 3 to 5 foot depths following EM Operating Procedure 5-21000-OPS-GT.9, Soil Gas Survey. A general description of the soil vapor sampling procedure is presented in Section 3.4.2 of the SVS WP.

Soil vapor samples shall be collected in glass syringes. Stainless-steel hypodermic needles equipped with a shut-off valve shall be utilized for injection purposes. Sampling syringes and stainless-steel needles shall be sterilized (i.e., decontaminated) between samples by baking them in a forced air oven at 150°C overnight.

A.3.4 Analytical Procedures

Soil vapor samples will be analyzed on site using a portable gas chromatograph/mass spectrometer (GC/MS). The contaminants of concern and the method detection limits are identified in Section 3.4.4 of the SVS WP.

A.3.5 Equipment Decontamination

Sampling equipment that is used at more than one location shall be decontaminated between sampling locations in accordance with OPS-FO.03, General Equipment Decontamination. Other equipment (e.g., portable or truck mounted driver) potentially contaminated during sampling shall be decontaminated as specified in OPS-FO.04, Heavy Equipment Decontamination.

A.3.6 Quality Control

Field sampling and analytical quality control (QC) requirements are described in Section 3.4.4 of the SVS WP.

A.3.7 Quality Assurance Monitoring

To assure the overall quality of the SVS sampling and analysis activities field oversight inspections will be conducted during the conduct of sampling and analysis.

A.3.8 Data Reduction, Validation, and Reporting

Data management and reporting requirements for field and laboratory data are discussed in Sections 3.4.3.1 and 3.4.4, respectively.

A.4 PROCUREMENT DOCUMENT CONTROL

Procurement documents for items and services, including services for conducting field sampling and analysis, shall be prepared, handled, and controlled in accordance with the requirements and methods specified in Section 4.0 of the QAPjP.

A.5 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

The SVS WP describes the field sampling and analysis activities to be performed. The SVS WP will be reviewed and approved in accordance with the requirements for instructions, procedures, and drawings outlined in Section 5.0 of the QAPjP.

EM OPS approved for use and their applicability are identified in Table A.1. Any additional quality-affecting procedures proposed for use but not identified in Table A.1 will also be developed and approved as required by Section 5.0 of the QAPjP prior to performing the affected activity.

Changes and variances to approved operating procedures and the SVS WP shall be documented through preparation of Document Change Notices (DCNs), which will be prepared, reviewed, and approved in accordance with requirements specified in Section 5.0 of the QAPjP.

A.6 DOCUMENT CONTROL

The following documents will be controlled in accordance with Section 6.0 of the QAPjP:

- Soil Vapor Survey Work Plan for 903 Pad, Mound, and East Trenches Area (Operable Unit 2), including appendices.
- "Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigation/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities" (QAPjP)
- EM Operating Procedures (all operating procedures specified in the SVS WP).

A.7 CONTROL OF PURCHASED ITEMS AND SERVICES

Subcontractors that provide services to support the SVS program activities will be selected and evaluated as outlined in Section 7.0 of the QAPjP. This includes preaward evaluation/audit of proposed subcontractors as well as periodic assessment of the acceptability of contractor performance during the program. Any items or materials that are purchased for use during the SVS sampling and analysis that have the ability to affect the quality of the data should be inspected upon receipt.

A.8 IDENTIFICATION AND CONTROL OF ITEMS, SAMPLES, AND DATA

Soil gas samples shall be identified and handling, containerizing, shipping, and storage controlled in accordance with EM operating procedure 5-21000-OPS-FO.13, Containerizing, Preserving, Handling, and Shipping of Samples, and Section 3 of the SVS work plan.

Sample chain-of-custody will be maintained through the application of OPS-FO.13 and Section 8.0 of the QAPjP.

A.9 CONTROL OF PROCESSES

The overall processes of collecting and analyzing samples require control. The processes are controlled by adhering to the SVS WP and the sampling and analytical procedures.

A.10 INSPECTION

Inspection of SVS activities shall be conducted in accordance with Section 10.0 of the QAPjP.

A.11 TEST CONTROL

Test control requirements specified in Section 11.0 of the QAPjP are not applicable to any of the SVS program.

A.12 CONTROL OF MEASURING AND TEST EQUIPMENT (M&TE)

The GC/MS used to analyze soil gas samples should have a file that contains:

- Specific model and instrument serial number

- Operating instructions
- Routine preventative maintenance procedures, including a list of critical spare parts to be provided or available in the field
- Calibration methods, frequency, and description of the calibration solutions
- Standardization procedures (traceability to nationally recognized standards)

A.13 HANDLING, STORAGE, AND SHIPPING

Samples shall be packaged, transported, and stored in accordance with Section 3 of the SVS WP and 5-21000-OPS-FO.13.

A.14 STATUS OF INSPECTION, TEST, AND OPERATIONS

The requirements for the identification of inspection, test, and operating status specified in Section 14.0 of the QAPjP do not apply to the SVS program.

A.15 CONTROL OF NONCONFORMANCES

The requirements for the identification, control, evaluation, and disposition of nonconforming items, samples, and data will be implemented as specified in Section 15.0 of the QAPjP. Nonconformances identified by the implementing contractor shall be submitted to EG&G for processing as outlined in the QAPjP.

A.16 CORRECTIVE ACTION

The requirements for the identification, documentation, and verification of corrective actions for conditions adverse to quality will be implemented as outlined in Section 16.0 of the QAPjP. Conditions adverse to quality identified by the implementing contractor shall be documented and submitted to EG&G for processing as outlined in the QAPjP.

A.17 QUALITY ASSURANCE RECORDS

Field QA records will be controlled in accordance with OPS-FO.02, Field Document Control. QA records to be generated during the SVS program are identified in Sections 3.4.3.1 and 3.4.4 of the SVS WP.

A.18 QUALITY VERIFICATION

The requirements for the verification of quality shall be implemented as specified previously in Section A.3.7 of this Appendix.

A Readiness Review shall be conducted by the QAPM prior to the implementation of the SVS program. The readiness review will determine if all activity prerequisites have been met that are required to begin work. The applicable requirements of the QAPjP, the SVS WP, and this QAA will be addressed.

A.19 SOFTWARE CONTROL

The requirements for the control of software is not applicable to the SVS program.

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APPENDIX B

HEALTH AND SAFETY PLAN (DRAFT)

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APPENDIX B

PROJECT-SPECIFIC HEALTH AND SAFETY PLAN
FOR
SOIL VAPOR SURVEY WORK PLAN
SUBSURFACE INTERIM
MEASURES/INTERIM
REMEDIAL ACTION
903 PAD, MOUND, AND
EAST TRENCHES AREAS

OPERABLE UNIT NO. 2

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant
Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM

14 October 1992

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HEALTH AND SAFETY PLAN

Review and Approval Signatures:

ER Health and Safety Officer	Date
ER Program Manager	Date
Director - Environmental Restoration	Date
Health and Safety Liaison Officer	Date
Occupational Safety Manager	Date
Director - Health and Safety	Date
EG&G Project Manager	Date
Contractor Project Manager	Date

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LIST OF ACRONYMS

ALARA	as low as reasonably achievable
CFR	Code of Federal Regulations
CRZ	contamination reduction zone
dBA	decibels on the "A" weighted scale
DOT	Department of Transportation
ER	Environmental Restoration
EZ	exclusion zone
HSL	health and safety liaison
IHSS	individual hazardous substance sites
OU2	Operable Unit No. 2
OSHA	Occupational Safety and Health Administration or Act
PCE	tetrachloroethylene (perchloroethylene)
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
PSHSP	project-specific health and safety plan
RFP	Rocky Flats Plant
RPT	radiation protection technician
SHSC	site health and safety coordinator
SVS	soil vapor survey
SZ	support zone
TBD	to be determined
TCE	trichloroethylene
TSP	total suspended particulate matter

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SECTION B 1
INTRODUCTION

This Project-Specific Health and Safety Plan (PSHSP) provides detailed health and safety guidance for a project planned to investigate the presence of volatile organic compounds (VOC) soil gas at the 903 Pad, Mound, and East Trenches Areas at the Rocky Flats Plant (RFP).

It is written as an addendum to the previously approved health and safety plan issued by EG&G Rocky Flats, Inc. (EG&G) for environmental work at Operable Unit No. 2 (OU2) entitled "Health and Safety Plan for Phase II RCRA Facility Investigation/ Remedial Investigation at the 903 Pad, Mound, and East Trenches Areas."

This PSHSP will become final when it is completed and/or modified by the contractor hired to conduct the work, and subsequently approved by EG&G. Items necessary to complete this PSHSP include:

- A specific listing of the contractor's project manager and site health and safety coordinator (SHSC) including their relevant credentials.
- Clarification and approval of the contractor's emergency response and medical surveillance programs including identification of emergency hospital services.
- A specific listing of all personnel to be used on the project by the contractor including verification by EG&G of all required training.
- Clarification of the contractor's air monitoring responsibilities.
- Verification and approval of the contractor's PPE program.

The EG&G-approved health and safety plan for OU2 must be reviewed by all site personnel in conjunction with this PSHSP. It includes sections on:

- EG&G Policy for environmental restoration work conducted at OU2.

- Description of specific locations within OU2.
- Assignment of EG&G health and safety personnel and responsibilities.
- Hazard assessment of OU2 locations including chemical,radiological, physical, and mechanical hazards.
- The EG&G hazard communications program.
- Site control requirements.
- Personal protective equipment (PPE) requirements.
- Decontamination procedures.
- Medical Surveillance.
- Air monitoring, training, and emergency response requirements.
- Material handling.

Details of the work to be conducted are described in the "Soil Vapor Survey Work Plan - 903 Pad, Mound, and East Trenches Area" (EG&G, October 1992). A summary of the areas in which the soil vapor survey will be conducted is included in Section B 3 of this PSHSP. Section B 4 summarizes the soil vapor survey methods used and the potential hazards present. Additional sections of this PSHSP describe the contractor's health and safety action plan including the elements of site control, PPE, decontamination, medical surveillance, air monitoring, training, and emergency response.

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SECTION B 2

SOIL VAPOR SURVEY PERSONNEL

The following personnel have been assigned to this project. Descriptions of the responsibilities of these positions are included in the approved Health and Safety Plan for OU2 (EG&G, 1991).

EG&G Project Manager
Craig Cowdery
(303) 273-6030

EG&G Health and Safety Liaison
Jeff Van Meighem
(303) 966-5810/Pager (303) 966-4000, # 3055

EG&G Health and Safety Coordinator
Lisa A. LeLievri
(303) 966-7691/Pager (303) 966-4000, # 5390

EG&G ER Health and Safety Officer
Dennis Smith
(303) 966-8636/Pager (303) 966-4000, # 3836

EG&G Radiological Operations Foreman
Dennis K. Schrock
(303) 966-2513/Pager (303) 966-4000, # 5510

EG&G Occupational Health Director
F.J. Furman
(303) 966-2895/Pager (303) 966-4000, # 2356

Contractor Project Manager
To be determined

Contractor Site Health and Safety Coordinator
To be determined

Contractor Mobile Laboratory Operator
To be determined

Contractor Field Equipment Operators
To be determined

Contractor Soil Vapor Samplers
To be determined

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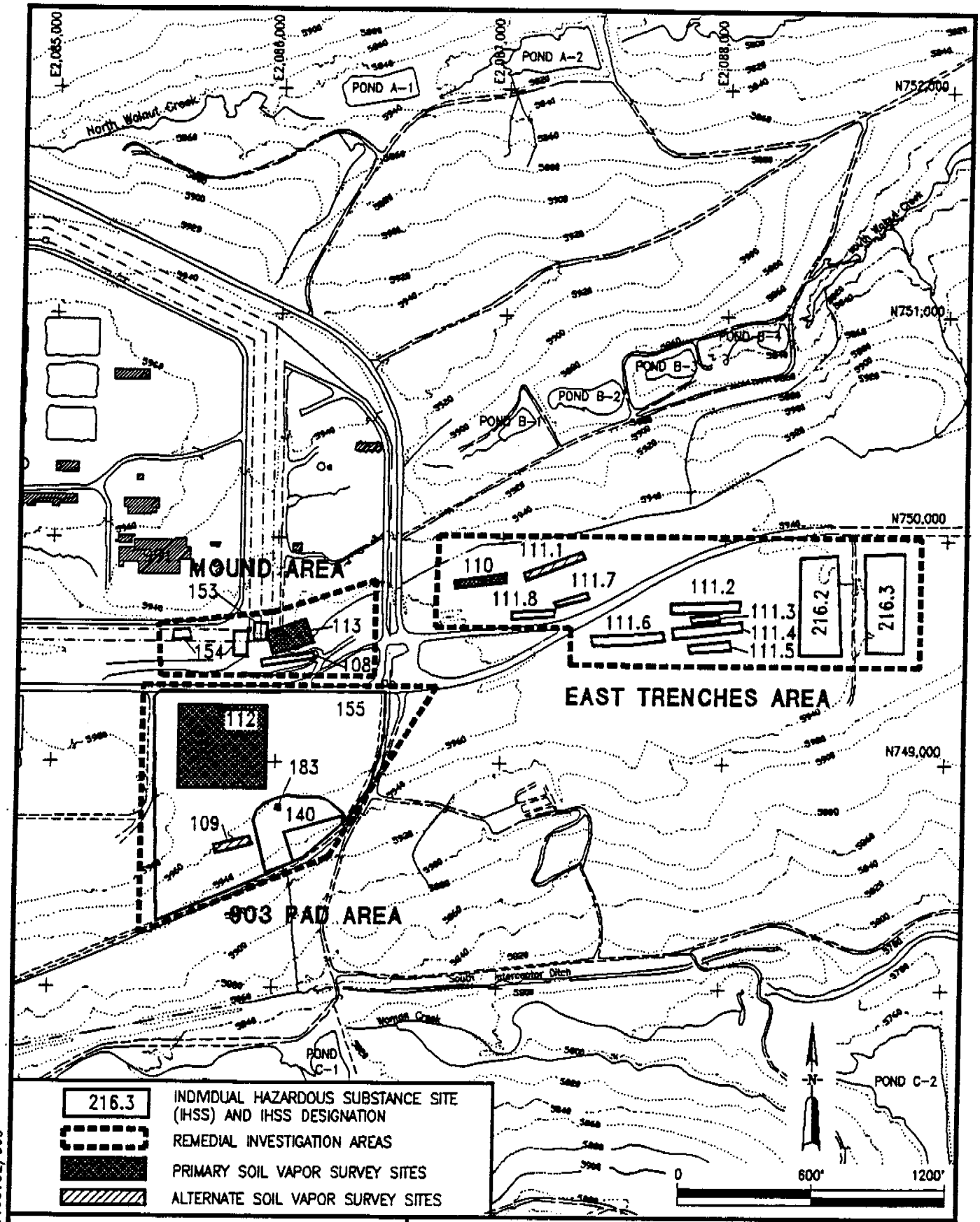
SECTION B 3
SITE DESCRIPTION

The soil vapor survey (SVS) will be conducted at 3 Individual Hazardous Substance Sites (IHSS) within OU2: IHSS Nos. 112, 113, and 110; and may be conducted at two alternate sites: IHSS Nos. 109 and 111.1 (Figure B 3-1). These sites are described in detail in Sections 2 and 3 of the "Soil Vapor Survey Work Plan " preceding this PSHSP.

In brief, it is expected that carbon tetrachloride, chloroform, tetrachloroethylene (PCE), and trichloroethylene (TCE) comprise the majority of released VOC contaminants at the SVS sites. Inorganic contaminants may include uranium, plutonium, beryllium, and Americium.



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U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	SOIL VAPOR SURVEY SITES OPERABLE UNIT NO. 2	FIGURE B3-1

SECTION B 4
SOIL VAPOR SURVEY METHODS

SVS methods are described in detail in Section B 3 of the Soil Vapor Survey Work Plan preceding this PSHSP. The initial task will involve mobilization and set up of a portable laboratory. Shallow sampling to depths of 3 to 5 feet will be accomplished by driving a soil probe into the ground using a truck-mounted or portable driver. In order to penetrate asphalt (present at IHSS No. 112) it may be necessary to first punch a hole with a hydraulic hammer before driving the probe. If hole refusal is encountered, it may be necessary to drive a preliminary hole into the soil with a "slam bar", and then insert a probe into the hole. A vacuum pump will then be attached to the soil probe to pull gas to a gas sampling bulb. Samples will be collected from the gas sampling bulb with a gas tight syringe. Samples will be delivered to the mobile laboratory for analysis. It is anticipated that approximately 155 sampling points will be required to complete Phase I sampling. Phase II sampling may be done at an additional 30 points to better characterize potential contaminant source areas. It is estimated that 10 deep sampling points (up to 10 feet in depth) may be required if shallow samples contain no contaminants.

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SECTION B 5

HAZARD ASSESSMENT

Potential physical, chemical, and radiological hazards that may be encountered during work within OU2 are described in detail in the EG&G HASP (EG&G, 1991). This section will summarize the specific hazards expected to be encountered during the Soil Vapor Survey.

5.1 PHYSICAL HAZARDS

TASK	HAZARD	MEASURES OR CONTROLS TO REDUCE HAZARD
Soil Vapor Sampling	Noise	Noise exposure may occur when driving the soil probe into the ground or when operating the slam bar. Noise monitoring will be conducted during the initial sampling. If noise exposures exceed 85dBA, hearing protection will be required.
	Pinch Points	The SHSC will identify sampling related pinch points, including the injection hazard from gas-tight syringes, and will train sampling personnel in safe work practices.
	Material Handling	The SHSC will identify items such as soil probes and slam bars which may present lifting/material handling stress and will train samplers in proper techniques. Samplers will wear safety shoes to protect their feet.
	Trip/Fall	Pre-designated routes will be established to prevent trips and falls. Safe housekeeping and material handling techniques will be stressed. Tripping hazards presented by the terrain will be identified and communicated to samplers.
	Electrical	Samplers will be trained in electrical safety. Ground fault interrupters will be used with all electrical generators.

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TASK	HAZARD	MEASURES OR CONTROLS TO REDUCE HAZARD
Soil Vapor Sampling	Cold Stress	Samplers will be trained in the symptoms of cold stress. Warm PPE will be worn if temperatures drop below 55 degrees F and PPE will be changed if it gets wet. Direct contact with cold surfaces and air will be avoided. Extra breaks to warm areas may be needed on days below 40 degrees F.
	Heat Stress	If outside temperatures exceed 70 degrees F, samplers will have radial pulse monitored for 30 seconds as early as possible in the resting period. If the heart rate exceeds 110 beats per minute, the next work period will be shortened by 33%. If the heart rate exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle will be further reduced by 33%. Plenty of cool water or other non-caffeinated drinks shall be available. The SHSC shall observe field personnel for symptoms of heat stress.
	Buried Drums	Screening with a magnetometer or equivalent shall be done to identify the presence of buried drums. Sampling shall not be attempted above such areas. Sampling shall proceed with caution and will be aborted in locations where buried drums are encountered.
Laboratory Analysis	Pinch Points	Shall be controlled as discussed above.
	Material Handling	Shall be controlled as discussed above.
	Trip/Fall	Shall be controlled as discussed above.
	Electrical	Shall be controlled as discussed above.
	Cold Stress	Shall be controlled as discussed above.
	Heat Stress	Shall be controlled as discussed above.
	Compressed/ Flammable Gases	The handling, storage, and use shall be per OSHA and DOT standards. Cylinders shall be secured and non-sparking tools will be used.

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5.2 CHEMICAL HAZARDS

The following table summaries the major chemical contaminants present in the soil at OU2, the safe exposure limits (PEL), the most important exposure routes, and the major symptoms of exposure.

Table 5-1

Chemical Hazards

Chemical Name	PEL	Route of Entry	Symptoms of Exposure
Carbon tetrachloride	2 ppm	Inh., Abs., Ing., Con.	CNS depression, nausea, liver/kidney damage.
Trichloroethylene	50 ppm	Inh., Ing., Con.	Headache, dizziness, visual disturbance, nausea.
Tetrachloroethylene	25 ppm	Inh., Ing., Con.	Irritate eyes, nose, throat; nausea, CNS depression, decreased alertness, headache, liver damage (cancer).
Beryllium	0.002 mg/m^3	Inh.	Respiratory irritation, weakness, fatigue, weight loss, cancer.

Key:
- Abs - Skin Adsorption
- Inh - Inhalation
- Ing - Ingestion
- Con - Skin and/or eye contact
- CNS - Central Nervous System
- PEL - OSHA permissible exposure level

Air monitoring during soil vapor sampling for volatile organics will be performed by the SHSC with a Photoionization Detector (PID) or a detector tube system. Beryllium is the most toxic metal present within OU2. The highest level of beryllium found within OU2 is 15 $\mu g/kg$ of sediment (EG&G, 1991). Therefore, if all the particulate in the air were from this highest source, there would still need to be 133,000 mg/m^3 of dust in the air to reach the PEL of 0.002 mg/m^3 beryllium. 15 mg/m^3 of particulate is a dense dust cloud. This means that it will be literally impossible for sampling technicians to exceed the risk exposure limits to beryllium. Although overexposure to airborne contamination is unlikely, the sampling technicians shall stay on the upwind site of the soil probe to further reduce exposure potential. To identify the wind direction a wind sock, piece of banner tape or other suitable lightweight material will be placed

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on a pole at a height of approximately 5.5 feet above the ground. The wind direction can then be determined by observing the device.

5.3 RADIOLOGICAL HAZARDS

Five radionuclide contaminants may be present in particulate form during soil vapor sampling. These five are uranium-238, uranium-233, uranium-234, plutonium-239; and americium-241. The primary type of radiation of concern relative to particulate exposure is "alpha" radiation. Alpha radiation presents an internal hazard when radionuclides in particulate form are inhaled or ingested. The relatively large amount of ionization occurring in a small volume from alpha particulates inside the body is typically 20 times more damaging than ionization caused by X-ray or gamma radiation. Radiation exposure is reduced when the concentration of the radionuclides in the soil is low or the potential for the material to become airborne is low (EG&G, 1991).

The risk of radiation uptake from inhalation during conduct of the SVS is expected to be low because it is distributed throughout large volumes of soil (EG&G, 1991). The risk of uptake through ingestion is also low and can be further minimized by following good hygienic practices such as wearing gloves, washing hands after working around contaminated soil, and not smoking, drinking, or eating in or around the contaminated areas. The highest potential for contamination occurs within 1 foot of the contaminated soil.

Since the exposure to radiation can cause serious health effects, it is important to assess the amount of these materials present and the potential for exposure during work operations. Plutonium-239 is the most hazardous radionuclide present in the SVS soils. If adequate protection is taken for plutonium, protection will also be adequate for the another alpha emitting radionuclides (EG&G, 1991).

The derived air concentration (DAC) is the concentration of a single radionuclide in air, which if inhaled over a 1-year period would irradiate a person to the occupational exposure limit of 5 rem per year. In general, 1/10 of the DAC is the action level for upgrade to a full-face respirator.

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Table B 5-1 shows the information that will be used to ensure that airborne concentrations are maintained below the DAC during field operations. This procedure was developed by RFP Environmental Restoration personnel and will be implemented in the areas of suspected contamination of soils (EG&G, 1991).

5.3.1 Radiological Monitoring and Screening

Radiological monitoring and screening will be conducted by the SHSC. Radiation meter deflections above background will be logged/recorded. Sampling technicians will also be "frisked" with the Ludlum 12-1A prior to leaving any area suspected of containing radiological hazards.

A Ludlum Model 12-1A Count Rate Meter or equivalent device will be used at each site of intrusive activity. The Ludlum probe will be placed as close as possible and parallel to the material being monitored. In no case should the probe be held farther than ¼ inch from the surface being measured. When monitoring, do not move the probe faster than 1 inch/second. Furthermore, the probe should not come in contact with the material being monitored. If activity is detected, the probe will be held stationary for a quantitative measurement. Soil cuttings, equipment, and PPE that are dry will be monitored with the Ludlum probe, although any surface that is dry may be monitored.

A SHSC that is familiar with how to operate a Ludlum Model 12-1A will be present at each activity that requires monitoring with a Ludlum Model 12-1A. The SHSCs are considered to be semi-skilled radiation monitors and will conduct day-to-day monitoring activities, immediately implement the action levels in Section B 6 and notify the EG&G Health and Safety Liaison (HSL) of all monitoring results. The HSL will arrange for a Radiation Protection Technician (RPT) to verify SHSCs radiation monitoring results that indicate the presence of greater than 250 counts per minute (cpm). An RPT will have in depth familiarity and experience in radiation monitoring.

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Table B 5-1

Local Air Monitoring Trigger Levels for ^{239} Plutonium in Soils

Soil Activity pCi/gram	1.8 Rem/yr. TSP mg/m^3	DAC/10 TSP mg/m^3
0.001	1,060,500	2,000,000
0.01	106,050	20,000
0.1	10,605	2,000
1	1,061	200
5	212	40
10	106	20
20	53	10
40	27	5
60	18	3
80	13	3
100	11	2
200	5	1
400	3	0.5
600	2	0.3
800	1.3	0.3
100	1.1	0.2
1,500	0.7	0.13
200	0.5	0.10
500	0.2	0.04
10,000	0.1	0.02
20,000	0.05	0.01
50,000	0.02	0.004
80,000	0.013	0.003
100,000	0.011	0.002

Trigger levels are for Total Suspended Particulate matter (TSP) concentrations measured in the breathing zone as 8-hour, time-weighted averages. They are based on (1) the Derived Air Concentration (DAC)/10 which DOE recognizes as the criteria for implementing respiratory protection and (2) the RFP ALARA based recommended annual committed effective dose equivalent of 1.8 Rem/year.

Use of the Table B 5-1

1) Identify the approximate soil activity in the area where intrusive activities are to be conducted.
2) Identify the corresponding DAC/10 and annual committed effective dose equivalent (i.e., 1.8 Rem/yr.) trigger levels. Those values represent total suspended particulate (TSP) concentrations that trigger the following actions:
   A) Donning respiratory protection equipment: DAC/10 threshold.
   B) Stop intrusive actions and reevaluate the activities, conditions, and precautionary requirements: 1.8 rem/yr TSP threshold.
3) Measure TSP breathing zone concentrations during intrusive activities using a Piezometric Balance, Mini-RAM, or comparable real-time instrument.
4) If measured TSP concentrations attain the trigger levels identified above, for a sustained period of time (15-30 minutes), such that the 8-hour time-weighted average could be approached, follow the appropriate requirements identified above (A or B) and notify the SHSC.
5) RFP practice dictates that reasonable measures be taken to keep exposures to radionuclides as low as reasonable achievable (ALARA). Routine dust avoidance procedures such as avoiding the dust plume path should be implemented, to the extent practicable, regardless of the TSP measurements.
6) Environmental concentration measurements and estimates can vary at a given location. Thus, users of this table are encouraged to exercise conservative judgment regarding the selection of trigger levels.

Source: EG&G, Industrial Hygiene.

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SECTION B 6

MONITORING

The following Table B 6-1 indicates the air and personal monitoring instruments, frequency of monitoring, action limits, and action required for all work conducted as a part of the SVS.

Table B 6-1

Instrument	Frequency	Action Limit	Action
Photoionization Detector (PID, HNu 11.7 eV lamp or equivalent) or Detector Tube	(H + D)	0-1 ppm	Level D, no respiratory protection required to be worn.
		1-10 ppm	Level C respiratory protection required. Respirator equipped with combination cartridge approved for organic vapors (OV) and high efficiency particulate from air filter (HEPA).
		>10 ppm	Withdraw from site.
TLD Badge	(C)		Normal TLD badge use.
Ludlum Model 12-1A	(H + D)		If greater than 250 counts per minute, don level C PPE and notify HSL.
Mini-RAM	(H + D)	>2.5 mg/m	Stop work. Call radiation protection technician (RPT). Trigger level based on annual committed effective dose equivalent of 1.8 Rem/yr. assuming worst-case soil level of 500 pCi/g plutonium.
		>0.4 mg/m^3	Level C respiratory protection required.
		<0.4 mg/m^3	Respirators not required.
Pulse Check (heat stress)	(H)	50-110 bpm	Continue work. If approaching 110 bpm, reduce work load to minimize heat stress.
		>110 bpm	No field work permitted. Rest in cool location. Drink cool fluids.

(H + D) is hourly plus more frequent monitoring during activities which disturb the soil.
(C) is continuous monitoring.
(H) is hourly monitoring.

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SECTION B 7

EXPOSURE SYMPTOMS AND ACTION REQUIRED

Specific exposure conditions/agents, warning symptoms, and actions required during this SVS project if warning symptoms are encountered are specified in Table B 7-1. Actions required if radiation or chemical exposures occur are given in Sections B 5 and B 6.

Table B 7-1

Condition/ Agent	Warning Symptoms	Action Required
Pre heat stress	Headache Pulse over 110 bpm	Check pulse. Rest and drink cool fluids until heart rate is below 110. Increase frequency of breaks and increase cool water intake.
Heat cramps	Cramps Exhaustion Dizziness	Move to cool place. Give cool fluids to drink. Massage cramping area. Withdraw from field work for minimum of 1 day.
Heat exhaustion	Rapid breathing Weak pulse Cold, clammy skin Heavy perspiration	Move to cool place. Make patient rest. Remove PPE. Give cool fluids to drink. Withdraw from field work for a minimum of 2 days.
Heat stroke	Pulse over 110 bpm Hot, dry skin Dilated pupils disorientation	Remove PPE. Cool rapidly using cool-**NOT COLD**-water. Treat for shock. **TRANSPORT TO HOSPITAL. LIFE THREATENING:** Doctor must provide written permission for return to work.
Frostbite	Gray, blanched skin Numbness	If medical attention is not available, the affected area should be carefully warmed. If warming is done, it should be done by immersing the affected area in water that is approximately body temp. (100-105°F). Do not allow the affected body parts to touch the sides or bottom of the container (bath tub). Do not place pressure on the affected area. The presence of pain is an indicator of successful rewarming. Wrap rewarmed area in gauze and transport to hospital for treatment.
Hypothermia	Shivering Body temperature below 95.6°F	**SEEK MEDIAL ATTENTION IMMEDIATELY,** if not readily available, remove wet clothing, dry the person, keep victim at rest, slowly warm core without warming legs, give warm (not hot) liquids if person is conscious, transport to hospital as soon as possible.
Radiation	No exposure symptoms expected	Trace quantities of americium, plutonium, tritium, and uranium may be present as soil and groundwater contaminants. Based on maximum soil contaminant concentrations found in nearby areas, resuspended dust is not expected to exceed regulatory limits for airborne radiation. See Sections B 5 and B 6 for action limits
Chemicals	No symptoms expected	Airborne contaminant concentrations are expected to remain well below occupational exposure limits. No exposure symptoms are therefore expected. Exposures above the PEL may produce headache, nausea, dizziness. Irritation of eyes, nose and lungs. See Section B 5 and B 6 if action levels are exceeded.

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SECTION B 8

PERSONAL PROTECTIVE EQUIPMENT

Work on this project will begin in level C protection. Downgrading to level D protection can proceed if action levels identified in Section B 6 are not exceeded. Table B 8.1 specifies PPE required.

Table B 8-1

Item	Comment
Respiratory Protection	Full-face air purifying respirators (manufacturers: MSA or AO) when action levels or conditions dictate the use. Initial sampling will be done using respirators in Level C PPE. PPE can be downgraded to Level D (no respirator) if action levels are not exceeded.
Respirator Cartridges	Use organic vapor and high efficiency particulate filter cartridges (OV/HEPA) when respirator required. Cartridges to use: AO = R53HE and MSA = GMA-H.
Boots, safety (leather) steel toe, steel shank	OSHA requirement
Gloves (leather)	To prevent potential for direct contact with radiological wastes.
Inner gloves (surgical)	To provide added protection.
Coveralls (Saranex or poly-coated Tyvek)	Potential for radiological contact during soil vapor survey is considered to be low. To protect against potential contact, chemical resistant disposable clothing will be worn.
Eye wash	Eye wash solution shall be available at SVS and mobile lab locations to perform initial flushing if necessary. Can transport to RFP medical clinic in immediate vicinity for remainder of 15 minute flushing or further first aid/medical attention if needed.
First Aid Kit	Contains antiseptic spray, sterile eye wash, 1" x 5-yd. roller bandage, 1½" x 2" gauze pads, 1½" x 5-yd. spool of tape, aspirin, clean wipes, ice pack, ammonia inhalants, tweezers kit, triangular bandage, plastic bandage, compress, finger bandages, knuckle bandages, and first-aid book.

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SECTION B 9
WORK ZONES

Each SVS site will be divided into three basic zones: 1) Exclusion Zone, 2) Contamination Reduction Zone, and 3) the Support Zone. The Exclusion Zone (EZ) includes areas of high physical, chemical, or radiological hazards. Only authorized personnel are permitted within the exclusion zone. Examples of exclusion zones are a 4-foot radius around a rotating auger, and areas where respiratory protection is required. The exclusion zone will be clearly marked with traffic cones, survey flags, banner tape, or other high visibility markings.

The Contamination Reduction Zone (CRZ) or decontamination area is the corridor through which all authorized personnel may enter or exit from the exclusion zone. The CRZ contains decontamination equipment and containers for disposable outerwear, etc. The CRZ is located on the upwind side of the EZ. Entrances and exits are clearly marked with high visibility items such as traffic cones.

The Support Zone (SZ) contains personnel who perform support functions for the physical work and a break area. It is upwind of the CRZ. Managers, spare equipment, etc., are generally located in the SZ. All personnel exiting the EZ must be decontaminated prior to entering the SZ. Heat stress monitoring is performed in the SZ.

Contamination prevention techniques will be used wherever feasible. Monitoring equipment will be wrapped in plastic to prevent possible contamination and to minimize decontamination, to the extent possible, without interfering with their function. The plastic will be discarded as contaminated waste after each day's use.

Engineering controls will be used first, wherever feasible, followed by a combination of administrative and personal protective equipment controls. The possibility of significant dust generation during SVS is low.

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Sampling technicians will be wearing full-face respirators at the beginning of work until monitoring confirms that they are no longer needed. PPE will be used when the other controls are not feasible or will not adequately control potential exposures.

All equipment to be used by personnel will be checked to ensure proper function and to make sure that all calibration/safety checks have been performed to manufacturer's specifications prior to use in the field. Testing of the breathing zone atmosphere is required for OSHA documentation. If special hazards are identified, appropriate equipment must be selected to assess the hazard level. The instruments selected must detect all suspected hazards, substances, agents, or materials of concern (radiation, VOCs, and dust/particulate hazards).

Equipment and instrument calibration, safety and function checks, and the daily safety briefings will be documented in the field logbook. Incidents, exposures, accidents, and other health and safety problems or conversations relating to field activities will also be documented.

Only authorized personnel are permitted to enter the EZ. Authorized personnel are those preapproved personnel, named in this PSHSP, who are needed in the EZ to perform essential site functions.

SECTION B 10
DECONTAMINATION

10.1 PERSONNEL

Discard disposable outerwear.[1] Wash exposed skin with soap and water. Rinse with water.

10.2 FIELD MONITORING EQUIPMENT

Remove and dispose of plastic wrapping. All potentially exposed surfaces will be wiped with a cloth dampened with soap and water after each use and housed in a trailer on the RFP site. Effectiveness of decontamination will be checked by frisking or wipe testing each instrument. Contaminated equipment is not permitted to be stored in general use areas or to leave the site. Decontamination wash and rinse water will be disposed of in the client's approved disposal area or as stated in the contract.

10.3 RENTAL EQUIPMENT

Rental equipment will be washed and wipe tested for removable surface contamination. Equipment will not be removed from the site until RFP determines that it is safe for use by the general public (obtain written RFP approval). A copy of the RFP approval will be maintained in the project file.

10.4 VEHICLES

Vehicles used in potentially radioactive areas will be surveyed for radioactive contamination prior to leaving the RFP facility. Vehicles must meet facility decontamination standards before exiting the site (obtain written RFP approval).

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[1]Solid wastes will be placed in a plastic bag, labelled and transferred to RFP for proper disposal. Liquid wastes will be containerized and transferred to RFP for proper disposal.

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SECTION B 11
TRAINING REQUIREMENTS

All field personnel will have completed and be current in the training specified in 20 CFR 1910.120. This training includes, but is not limited to:

40-hour Hazardous Waste Site Worker Training

8-hour annual refresher training

8-hour supervisory training (supervisors)

24-hour on-the-job training

8-hour Remediation Safety for Environmental Restoration

Table B 11-1

Personnel Training

	Medical Clearance	OSHA 40-hour Training	OSHA Supervisory Training	First Aid	CPR
PROJECT MANAGER TBD	X	X	X	X	X
TASK MANAGERS TBD	X	X	X	X	X
FIELD STAFF TBD	X	X	X	X	X
TECHNICIANS TBD	X	X	X	X	X

SECTION B 12
MEDICAL MONITORING REQUIREMENTS

All field personnel are participants in a medical monitoring program which fulfills the requirements of 29 CFR 1910.120. The program includes:

Baseline Medical Examination
Annual Medical Examination
Exit Medical Examination
Incident Specific Examination

A written copy of this PSHSP must be present on site. The contents of this PSHSP must be discussed, and understood by all personnel prior to beginning each day's work (site safety briefing). A final visual and paperwork check of site hazards will be made to ensure that all safety concerns have been addressed.

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SECTION B 13

CONTINGENCY PLANS

The concentrations of chemical and radiological contaminants are suspected to be low. Site emergencies are therefore expected to be limited to the slip, trip, fall, cut, and abrasion variety. The highest potential for injuries is expected to occur during SVS operations (material handling).

If emergencies arise, the injuries will be stabilized using standard first aid practices. All injuries will be documented in the field logbook and reported to the contractors project manager and/or SHSC. Minor injuries and cuts will be treated by the field workers using basic first aid procedures and materials. Additional medical attention will be sought if the worker's injury requires more than basic first aid measures or the condition worsens.

Injuries which require more than simple first aid measures will be treated by medical personnel (at the RFP or through the prearranged medical hospital or clinic as stated below).

- Exposures or suspected exposures to chemical or radiological hazards will be taken seriously. If treatment is required, the individual will be taken to a hospital without delay. Effective diagnosis and treatment sometimes require the individual to be tested within hours of the suspected exposure. After rendering first aid and transport to the medical facility, the exposure will be reported to the contractor's project manager or SHSC as soon as possible.

- If a chemical gets in the eyes, flush eyes with water for 15 minutes. Remember to occasionally lift the upper and lower lids during flushing. Phone emergency response personnel.

- If a chemical gets on the skin, flush the affected skin with water for 10-15 minutes. Phone emergency response personnel.

- If a chemical is ingested, call emergency medical personnel.

- If a chemical is inhaled, move the victim to fresh air at once. Phone emergency response personnel.

Ambulance:	Building 331 - Phone: 2911 RFPFD
Hospital:	Phone: 2911 or Hospital TBD
Police:	Phone: 2911
Fire:	Phone: 2911

EMERGENCY CONTACT PHONE NUMBERS

EG&G Emergency Coordinator TBD	_____	_____
EG&G Project Manager Craig Cowdery	(303) 273-6030	_____
Contractor Project Manager TBD	_____	_____
Contractor Health & Safety	_____	_____
Coordinator (TBD)	_____	_____

SECTION B 14

UNDERSTANDING AND COMPLIANCE STATEMENT

The undersigned persons understand the provisions of this safety plan and agree to abide by its provisions:

Name Lettered	Signature	Date

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SECTION B 15

REFERENCES

EG&G. 1991. Final Health and Safety Plan for Phase II RCRA Facility Investigation/Remedial Investigation at the 903 Pad, Mound, and East Trenches Areas.

APPENDIX B-1

ROUTES TO HOSPITAL

To be determined

APPENDIX C

FIELD ACTIVITY SUMMARY FORM

(SAMPLE)

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Rig Geologist

ACTIVITY SUMMARY

-DRILLING/WELL COMPLETION

BOREHOLE/WELL DESIGNATION: _____ DATE: _____ / _____ (Initiated) (Completed)

APPLICABLE SOP FORMS: Borehole Log, 1.8A, 1.8B, 1.10A, 1.10B, 1.10C, 3.2A, 3.3A, 3.4A, 3.5A, 3.6A

Task	Description	SOP Reference	H & S Reference	HOLD POINTS			AUTHORIZATION	
				Admin.	OVD Screen	Rad. Screen	Date	Signature or Initials
1	EG&G approval for intrusive activity			X				
2	Radiological characterization	1.10				X		
3	Screen drill site	1.8,1.16	7.4,7.5			X		
4	Move onto drill site	3.2						
5	Setup exclusion zone	3.2	6.7					
6	Monitor wind speed	1.1	6.8.2					
7	Drill and sample borehole	3.1-3.5,3.11	6.8					
8	Containerize analytical samples							
9	Moisten drill cuttings	1.8	7.7.3					
10	Screen drill cuttings	1.8,1.15,1.16	7.4,7.5		X	X		
11	Containerize drill cuttings	1.8,1.10						
12	Screen core samples	1.15,1.16,3.1	7.4,7.5		X	X		
13	Transport core to logging area							
14	Log and photograph core							
15	Package/box core samples	1.13,3.1						

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ACTIVITY SUMMARY

-DRILLING/WELL COMPLETION

BOREHOLE/WELL DESIGNATION: _____ DATE: _____ / _____
(Initiated) (Completed)

APPLICABLE SOP FORMS: Borehole Log, 1.8A, 1.8B, 1.10A, 1.10B, 1.10C, 3.2A, 3.3A, 3.4A, 3.5A, 3.6A

Task	Description	SOP Reference	H & S Reference	HOLD POINTS			AUTHORIZATION	
				Admin.	OVD Screen	Rad. Screen	Date	Signature or Initials
16	Containerize residual samples with cuttings	1.8,1.10						
17	Construct well or abandon borehole	3.6	6.8					
18	Containerize excess grout	1.8,1.10						
19	Decontaminate personnel and containerize PPE	1.6,1.10,1.12						
20	Approve site closure			X				

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ACTIVITY SUMMARY -

Form 1

-DRILLING/WELL COMPLETION

BOREHOLE/WELL DESIGNATION: _____ DATE: _____ / _____
(Initiated) (Completed)

APPLICABLE SOP FORMS: Borehole Log, 1.8A, 1.8B, 1.10A, 1.10B, 1.10C, 3.2A, 3.3A, 3.4A, 3.5A, 3.6A

EXCLUSION ZONE EGRESS							
Date	Time	Signature or Initials	Rad. Screen	Date	Time	Signature or Initials	Rad. Screen
			X				X
			X				X
			X				X
			X				X
			X				X

Notes: _____

1/3/1/3