PROGRAM MANAGER
FOR ROCKY MOUNTAIN ARSENAL

U.S. ARMY
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— COMMITTED TO PROTECTION OF THE ENVIRONMENT —

Final Corrective Action Management Unit Designation Document Rocky Mountain Arsenal Commerce City, Colorado

Volume I of II

Harding Lawson Associates

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Volume I of II

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June 12, 1996

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PREFACE

On March 15, 1996, the U S Department of the Army (Army) submitted the Draft Final Corrective Action Management Unit (CAMU) Designation Document (Draft Final CDD) to the Colorado Department of Public Health and Environment (CDPHE) The Draft Final CDD was submitted by the Army to allow CDPHE to designate a CAMU at the Rocky Mountain Arsenal in accordance with Section 264 552 (a) of 6 CCR 1007-3 under the authority granted by the Hazardous Waste Management Act In response to the Army's CAMU application, CDPHE and the Army entered into a Compliance Order on Consent No 96-06-07-01 (the Order) on June 7, 1996

Paragraph 17 of the Order states

> "By this order on consent, the Department approves the Draft Final CAMU Designation Document as a corrective measure plan and the designation of a CAMU subject to the findings and conditions set forth in Attachment A, which is hereby incorporated into this Order on Consent "

The sole purpose of this Final CDD is to incorporate the modifications requested by CDPHE in Attachment A of the Order Appendix S of this document includes a complete list of the modifications

1.0 INTRODUCTION

This Corrective Action Management Unit (CAMU) Designation Document (CDD) has been prepared in support of the designation of a CAMU as part of the remedy for cleanup of the Rocky Mountain Arsenal (RMA), located in Adams County, Colorado The CAMU will be designated by the Colorado Department of Public Health and Environment (CDPHE) in accordance with Section 264 552(a) of 6 Code of Colorado Regulations (CCR) 1007-3 under the authority granted to CDPHE by the Colorado Hazardous Waste Management Act (CHWMA) The designation will be part of a corrective action order issued under the authority of 25-15-308 (CRS) The CDD and its appendixes are being submitted to the CDPHE in conformance with Section 264 552(d) of 6 CCR 1007-3

The CDD has been prepared by Harding Lawson Associates (HLA) as a contract deliverable under Delivery Order 0-007 (Task 93-03, Feasibility Study Soil Support Program) of Contract DAAA05-92-D0003 between HLA and the U S Department of the Army (Army) This document has been prepared at the direction of the Army for the sole use of the Army, the signatories of the Federal Facilities Agreement (FFA) of RMA, the State of Colorado (State), Adams County, and Tri-County Health Department, the only intended beneficiaries of this work. This document has been prepared for designation of a CAMU at RMA and should not be used for any other purpose

1.1 Site Background

RMA is located northeast of Denver, Colorado, and is on more than 17,000 acres (27 square miles) (Figure 1) It is located about 10 miles from downtown Denver just north of the former Stapleton International Airport and west of Denver International Airport

1.1.1 Site History

RMA was built in 1942 to manufacture chemical weapons in support of World War II Chemical weapons such as mustard gas, white phosphorus, and napalm were manufactured at RMA. The Army continued with the manufacturing of these munitions until 1969 RMA was then used as a site to destroy these chemical munitions until the 1970s The Army leased RMA facilities to Shell Oil

Company (Shell) and its predecessors from 1952 to 1989 for manufacturing herbicides and pesticides A variety of methods was used for treating and disposing of wastes generated by manufacturing and munitions activities during the production years at RMA Disposal methods included chemical neutralization, incineration, evaporation, and offsite disposal Due to some of the disposal practices that existed during the manufacturing period, contamination of the soil, groundwater, surface water, and structures occurred

Offsite groundwater contamination was first discovered in the mid-1950s on agricultural land north of RMA In an attempt to contain the waste and prevent further offsite migration, the Army built a 93-acre, asphalt-lined storage pond (Basin F) A 12,500-foot deep injection well was also constructed to increase waste disposal capacity Despite these efforts, a significant cleanup action remained to be accomplished The Army began a systematic investigation into the contamination problem in 1984 in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) RMA was placed on the CERCLA National Priorities List for environmental cleanup in 1985 The Army's first and foremost goal was to contain the pollution and prevent additional offpost migration The Installation Restoration Program was created by the Army to address environmental issues at RMA Since 1985, the sole mission at RMA has been remediation of the contamination

1.1.2 Conceptual Remedy

In June 1995, an Agreement for a Conceptual Remedy (the Conceptual Remedy) for the Cleanup of RMA among the State, U S Environmental Protection Agency (EPA), the Army, Shell, and the U S Fish and Wildlife Service (FWS) was signed The Conceptual Remedy represents agreement by the parties relative to specific components of the remedy for the final cleanup of RMA These components of the remedy are included in the (1) Proposed Plan for the RMA Onpost Operable Unit and (2) Final Detailed Analysis of Alternatives Report (DAA) (Foster Wheeler, 1995) The Conceptual Remedy, the Proposed Plan for the Onpost Operable Unit, and the DAA are documents prepared under various authorities of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) The Conceptual Remedy calls for the construction and operation of a new

onsite hazardous waste landfill for disposal of principal threat and human health exceedance soil and debris as those categories of contamination are defined in the DAA.

1.2 Summary of Regulatory Requirements

In the Onpost Operable Unit Detailed Analysis of Alternative Dispute Resolution Agreement dated October 16, 1995 (Dispute Resolution), the State, EPA, Army, Shell, and FWS agreed that a CAMU incorporating the future hazardous waste landfill, the Basin F Waste Pile drying unit, and the appropriate waste staging and/or management area(s) would be designated The Dispute Resolution was developed in accordance with the Federal Facility Agreement (FFA), which exists under CERCLA

The requirements for CAMUs are provided in 6 CCR 1007-3, Subpart S Section 264 552 This regulation provides the basis for designation of a CAMU and outlines the requirements for the CAMU that are to be specified as part of the designation In addition, Section 264 552(a)(3) specifies that where remediation waste placed into a CAMU is hazardous waste, the CAMU shall comply with Part 265, Subparts B,C,D, and E of 6 CCR 1007-3 (Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities [TSDFs]) When such remediation waste are to remain in place after closure, Section 264 552 (a)(3) also requires compliance with the siting requirements for hazardous waste disposal sites, which are found in 6 CCR 1007-2, Part 2 These regulatory requirements are listed below

- Part 265 Subpart B refers to general facility standards for owners and operators of hazardous waste TSDFs
- Part 265 Subpart C refers to preparedness and prevention requirements for TSDFs
- Part 265 Subpart D refers to contingency plan and emergency plan requirements for TSDFs
- Part 265 Subpart E refers to manifest system, record-keeping, and reporting requirements for TSDFs
- Requirements for siting and design of hazardous waste disposal sites which are found in 6 CCR 1007-2, Part 2

Section 4 0 provides a cross-reference of where CAMU related regulatory requirements and/or guidance is located within the CDD

1.3 Overview of the CDD

This CDD will be submitted to the CDPHE in response to Section 264 552(d) of 6 CCR 1007-3 As required in Section 264 552(d), the CDD includes information to enable CDPHE to designate the CAMU The basis or criteria for designation of a CAMU are specified in Section 264 552(c) of 6 CCR 1007 3 The corrective action order incorporating the designation of the CAMU will summarize requirements for design and operation, groundwater monitoring, closure and post-closure, as well as identify remediation wastes to be placed in the landfill These requirements are specified in 264 552(e)

Section 2 0 of this CDD contains a discussion of the basis and justification for the proposed designation of the RMA CAMU Section 3 0 addresses the operational, monitoring, closure, and post-closure requirements that will be developed in detail following designation of the CAMU Section 4 0 provides a cross-reference of regulatory requirements and/or guidance applicable to the CAMU and the location within the CDD where these requirements and/or guidance are addressed Section 5 0 presents a schedule of CAMU waste management activities Section 6 0 provides conclusions to the CDD Section 7 0 provides a list of acronyms used in the CDD Section 8 0 provides the references used to produce the CDD The appendixes to the CDD contain additional information, which is responsive to the design and/or operational requirements for a CAMU specified in 264 552(a)(3) and 264 552(e) The following appendixes are included with the CDD

- **Appendix A.** Part 2 Siting Criteria Compliance Demonstration
- **Appendix B** Design Narrative
- **Appendix C** Guidelines for the Development of an Operations Narrative
- **Appendix D** Guidelines for Development of a Waste Analysis Plan
- **Appendix I** Conceptual Test Fill Work Plan

- **Appendix K.** Guidelines for the Development of a Groundwater Monitoring Plan
- **Appendix L** Guidelines for the Development of a Closure and Post-Closure Plan
- **Appendix P** Preliminary Specifications
- **Appendix R** Final Landfill Site Feasibility Report

Included within Section 5 0 of this document is an outline for various engineering analysis work plans, plan products, and design drawings, which will be developed as part of the CAMU detailed design process Outlines of additional plans pertaining to construction and operation of the CAMU are presented in the Appendixes listed below The design and operational related work plans and products will be submitted to CDPHE for review and approval in accordance with the schedule discussed in Section 5 0 of this document The CDPHE review process may include a public comment period (see Section 5 0)

- **Appendix E** Security Plan Outline
- **Appendix F** Personnel Training Plan Outline
- **Appendix G** Inspection Plan Outline
- **Appendix H.** Construction Quality Assurance Plan Outline
- **Appendix J** Operating Record System Plan Outline
- **Appendix N** Action Leakage Rate and Response Plan Outline
- **Appendix O.** Health and Safety Plan Outline
- **Appendix Q** Contingency Plan Outline

2.0 BASIS FOR DESIGNATION OF THE CAMU

The DAA presents a detailed evaluation of the alternatives for final remedy of the cleanup of RMA The evaluations within the DAA resulted in the selection of a preferred sitewide remedy for the final remediation of the contaminated soil media and structures at RMA The preferred remedy includes the designation of a CAMU by CDPHE The components of the preferred remedy for soil and structures that will be conducted as part of the CAMU are as follows

- Onpost land disposal
- Basin F Waste Pile drying unit
- Related waste staging and/or management areas

A description of the preferred sitewide soil remedy selected within the DAA is presented in Table 2 1 The components of the preferred remedy that will be part of the CAMU waste management activities are highlighted in bold in Table 2 1 In addition, drummed waste generated as a result of RI/FS activities and currently stored in warehouses at RMA may be disposed in the landfill

Section 264 552 (c) of 6 CCR 1007-3 specifies certain decision criteria that are applicable to the designation of a CAMU Each of these criteria are discussed below

2.1 Facilitation of the Remedy

Section 264 552(c)(1) of 6 CCR 1007-3 requires that the CAMU facilitate the implementation of a reliable, effective, protective, and cost-effective remedy

The preferred sitewide remedy for soils, selected by the DAA, includes the creation of an onsite landfill for containment of principal threat and human health exceedance contaminated soil The principal threat and human health exceedance categorization of soil derives from the application of CERCLA related guidance and are fully explained within the DAA The preferred remedy also includes the drying of certain Basin F Waste Pile soil prior to disposal in the landfill For structures,

the preferred Alternative calls for debris from the dismantling of structures with significant contamination history and agent history to be placed in the onsite landfill. As was agreed to within the Dispute Resolution, the onsite landfill and Basin F Waste Pile drying unit are remediation waste management activities that will be connected as part of the CAMU.

In selecting the preferred remedy, the DAA utilized nine evaluation criteria. These criteria are derived from the provisions in the CERCLA Section 121 and are also set forth in the National Contingency Plan (NCP) (codified at 40 Code of Federal Regulations [CFR] 300.430[e][9][iii]). The CERCLA criteria consist of two threshold criteria, five primary balancing criteria, and two modifying criteria (EPA, 1990). One of the threshold criteria and three of the primary balancing criteria are similar to the decision criteria that are applicable to the CAMU under CHWMA. These analogous CERCLA criteria are identified in Table 2.2.

The conclusions within the DAA that support the DAA's determination that the remedy is reliable, effective, protective, and cost-effective can be summarized as follows

- The remedy protects humans and biota by treating some principal threats and providing a physical barrier to prevent exposure through capping and landfilling.
- Mobility of the contaminants is reduced by minimizing the amount of infiltration into contaminated soil below the caps or in the landfill.
- Placement of soil excavated from the Basin F Wastepile and **Former Basin F principal threat soil** in a triple-lined cell provides additional assurance of containment. This additional containment balances the moderate short-term risk during excavation, transportation, and landfilling with the effectiveness of the long-term containment.
- Treatment and/or placement of other contaminated soil such as agent contaminated soil, buried M-pits, hex pits, debris with significant contamination and agent history in double lined cells provides for assurance of containment.
- The consolidation of 1,200,000 BCY of contaminated soil in Basin A, Basin F, and the South Plants Central Processing Area prior to capping these sites lowers the cost of obtaining borrow materials and reduces the area disturbed for borrow.

- The overall effectiveness of the preferred remedy is high since the preferred remedy provides low long-term risk, which compensates for a moderate short-term risk during excavation The cost of this remedy is lower than other remedies that may have been as equally overall effective

The following summarize how the CAMU waste management activities facilitate the implementation of the preferred remedy

- Drying saturated Basin F Waste Pile soil achieves a performance standard of only landfilling material, which passes the EPA paint filter test
- The landfill interrupts exposure pathways and the landfill's containment systems minimize the potential for migration of contaminants to groundwater
- Incorporation of the landfill units into a CAMU provides the regulatory flexibility to construct an onpost landfill
- The CAMU allows for the application of standards that are more appropriate to remediation wastes than as-generated RCRA wastes
- The CAMU expedites the implementation of the preferred remedy by expediting the approval process for the landfill

In addition to the above, an analysis of the long-term containment ability of the contemplated landfill design is presented in Section 2 1 1 of Appendix A to this document. That analysis also indicates that the landfill can be designed in a manner that is protective of human health

2.2 Risks to Human Health and the Environment

Section 264 552(c)(2) requires that the waste management activities associated with the CAMU not create unacceptable risks to humans or to the environment resulting from exposure to hazardous wastes or hazardous constituents

The waste management activities associated with the CAMU will include landfilling and the long-term containment of contaminated soil and debris The CAMU activities will also include the operation of the Basin F Waste Pile drying unit Waste staging/sizing/handling activities related to the landfill and drying of the Basin F Waste Pile soil will also be included within the CAMU

In the context of the federal preambles and Colorado's Statement of Basis and Purpose for CAMUs, an evaluation of short-term effectiveness should be performed within the context of other factors such as the long-term effectiveness of the remedy The DAA evaluated the short-term risk associated with the preferred remedy This evaluation included an assessment relative to the related CERCLA criteria indicated in Table 2 2 The DAA characterized short-term risk associated with the landfill and other CAMU waste management activities as being moderate The DAA further indicates that one or more of the following measures will, to the extent necessary, be utilized to control the short-term risks to an acceptable level

- Temporary enclosures, if necessary, to control odors and emissions
- Use of water or other vapor-and-dust suppressing agents to reduce particulate-related emissions from the landfill
- Use of interim and/or daily covers as material is placed in the landfill
- Use of proper personal protection equipment.
- Use of emission control equipment for the Basin F Waste Pile drying unit

Given the above discussion and the assessments performed within the DAA, it can be concluded that the CAMU waste management activities can be performed in a manner that does not create unacceptable risks to humans or the environment as a result of exposure to hazardous waste or hazardous constituents The short-term risks that may be associated with the CAMU activities, when considered with the long-term effectiveness, do not preclude the implementation of a reliable, effective, and protective remedy

2.3 Justification of Inclusion of Uncontaminated Area

The proposed areal configuration of the CAMU is located in an area of RMA, which is delineated within the DAA as being contaminated This area was identified within the Final Landfill Site Feasibility Study (FS) Soils Support Program (HLA, 1995) as the most protective landfill site within the RMA. A primary consideration in the selection of the preferred site was the protection afforded

by that site's geologic and hydrologic conditions, as compared with other parts of RMA. A summary of the basis of the selection for the site is presented below

The selection of the landfill location was based on landfill siting criteria that were developed through a review of previous landfill siting studies, geologic, hydrologic, and geotechnical data, pertinent regulatory requirements, and consideration of issues relevant to siting a landfill at RMA The criteria developed within the FS were used to screen potential landfill areas to identify an area that met applicable regulatory requirements and provided the most protective location for siting of an onsite landfill A summary of the screening criteria are presented in Table 2 4 RMA features relevant to the screening criteria (e g , groundwater elevations, floodplains) were integrated into maps using a Geographical Information System (GIS) format. The maps were used to identify areas that met the screening criteria In addition, secondary screening criteria were evaluated to further screen out potential landfill locations Based on the screening evaluations, an area occupying the western half of Section 25 and a portion of the eastern half of Section 26 was identified

After the screening analysis, a geological/geotechnical investigation was initiated in the western half of Section 25 to obtain additional information regarding the suitability of the proposed area The investigation results indicated that the area is conducive to the construction of the landfill

Thus, the area identified for the CAMU is the most appropriate location within RMA based on considerations of siting criteria, subsurface conditions, and the protectiveness of human health and the environment.

2.4 Containment of Remediation Waste Remaining After Closure

Section 264 553(a)(3) of 6 CCR 1007-3 requires that where remediation wastes placed into a CAMU are hazardous, and, when such remediation wastes will remain in place after closure of the CAMU, the CAMU shall comply with the requirements for siting of hazardous waste disposal sites, which can be found in 6 CCR 1007-2, Part 2 Basin F Waste Pile soils are hazardous waste Other RMA

waste may also be hazardous. As applied to the proposed CAMU, Section 2.5.3 of Part 2 requires that the landfill be capable of isolating the wastes within the designated disposal area and away from natural environmental pathways that could expose the public for at least 1,000 years.

An analysis is presented m Section 2.1 of Appendix A that demonstrates that the contemplated siting and design of the landfill combined with the geological conditions underlying the landfill area will comply with the 1,000-year isolation requirements.

Appendix L of this document presents guidance for development of a detailed closure plan following design. The detailed closure plan will be submitted to CDPHE for review and approval in accordance with the schedule discussed m Section 5.0 of this document. The closure plan will include closure and post-closure activities that will minimize or eliminate post-closure escape of hazardous waste or hazardous waste decomposition products.

The portion of the proposed CAMU that incorporates the Basin F Waste Pile drying unit and related waste staging/consolidation area(s) will be closed in a manner such that no wastes associated with these CAMU activities will be left in place. **Principal threat soil removal** and capping activities will also take place in the Former Basin F. These Former Basin F activities will be conducted in accordance with a closure plan approved by CDPHE. This closure plan will be reviewed and approved by CDPHE in accordance with regulations promulgated under authority of the CHWMA. The closure plan for former Basin F is not part of the proposed CAMU. Even though a portion of the Former Basin F wastes may be located within the areal configuration of the CAMU, they are not part of the CAMU waste management activities. In addition, the Former Basin F wastes do not meet the definition of remediation wastes as defined in 260.10 of 6 CCR 1007-3 (i.e., these wastes are handled under a closure plan to be approved by CDPHE). Given the above discussion, the Former Basin F wastes are not a consideration relative to the CAMU designation decision criteria.

Given the above discussions, it can be concluded that the proposed CAMU waste management activities that result in remediation wastes remaining in place after closure (the landfill) will control, minimize, or eliminate future releases to the extent necessary to protect human health and the environment

2.5 Expedite Timing of Remedial Activity Implementation

In selecting the preferred alternative (which includes the CAMU waste management activities), the DAA balanced the timing of implementation of the remedial activities with the need to implement a reliable, effective, protective, and cost-effective remedy (Section 264 552[c][1]) The preferred remedy is also consistent with Section 264 552(c)(2) regarding not creating unacceptable risks to humans or the environment

The CAMU expedites implementation of the preferred remedy by expediting the regulatory approval process for the landfill component of that remedy The CAMU (including its timing) also facilitates compliance with the requirements of Section 264 552(c)(1) and (c)(2)

2.6 Application of Treatment Technologies

Section 264 552(c)(6) specifies that, where appropriate, the CAMU shall enable the use of treatment technologies to enhance the long-term effectiveness of remedial actions by reducing the toxicity, mobility, or volume of remediation wastes that will remain in place after closure

The preferred remedy includes treatment of some principal threat material The landfill portion of the CAMU provides for final containment of the treated material The landfill also provides for containment of approximately 1 5 million cubic yards of soil and debris that will be placed in the landfill pursuant to the CERCLA Conceptual Remedy As discussed in Section 2 1 above, the CAMU facilitates the implementation of the preferred remedy The preferred remedy utilizes treatment as well as containment to provide for long-term effectiveness

2.7 Minimization of Land Area Where Remediation Wastes Will Remain in Place

The areal configuration of that portion of the CAMU where remediation wastes will remain in place after closure (i e , the landfill) is shown in Figure 2 of this document. The areal configuration of this portion of the CAMU was selected and minimized taking into account the following considerations

- Sufficient area must be provided to allow for flexibility in the design of the individual landfill cell(s) layout In developing the CAMU areal configuration, the total landfill volumes (waste plus daily cover) contemplated within the DAA were considered, as well as the necessity for flexibility in phasing of the overall remedy The phasing may require that the waste would be contained in several individual landfill cells The area shown in Figure 2 was sized considering the scheduling and sequencing of waste excavation contemplated by the Army at the time that this document was developed
- A minimum of 20 feet will be provided between the bottom of the landfill cells and the groundwater (This separation was based on the analysis of the 1,000-year isolation discussed in Section 2 1 1 of Appendix A)
- A 100-foot separation between the edges of landfill cell covers will be provided
- Height of landfill cell(s) is not a limiting factor
- A contingency factor of 25 percent was included in the analysis to account for uncertainties that may arise in design or scheduling/sequencing of the remedy

Given the above considerations, the area of that portion of the CAMU where remediation wastes will remain in place after closure has been selected in a manner that optimizes compliance with the requirements in Section 264 552(c)(1) for an effective remedy and in Section 264.552(c)(2) for minimization of exposure To the extent possible, given other siting criteria, the CAMU minimizes the land area where remediation wastes will remain in place after closure

3.0 ATTAINMENT OF CAMU REQUIREMENTS

The basis for designation of a CAMU is specified in Section 264 552(c) As discussed in Section 2 0 above, each of the decision criteria for designating the CAMU is achieved for the proposed RMA CAMU The corrective action order incorporating the designation of the CAMU will summarize requirements for the CAMU in accordance with Section 264 552(e) The Section 264 552(e) requirements include the following

- Areal configuration of the CAMU
- Requirements for design, operation, and closure
- Requirements for groundwater monitoring
- Closure and post-closure requirements

In addition to the above, Section 264 552(a)(3) states that where the remediation wastes placed into a CAMU are hazardous, the CAMU shall comply with Subparts B, C, D, and E of Part 265 These subparts specify general operating requirements Implementation of these operating requirements results in the need for the following plans

- Subpart B
  - Waste Analysis Plan (265 13)
  - Personal Training Plan (265 16)
  - Inspection Plan (265 15)
  - Construction Quality Assurance Plan (265 19)
  - Security Plan (265 14)
- Subpart C
  - Health and Safety Plan
- Subpart D
  - Contingency Plan

- Subpart E
  - Operating Record System Plan

As the above items are requirements for the CAMU, it is anticipated that they will be specified in accordance with the same process that is used to respond to Section 264 552(e) The documents and outlines presented in the attached appendixes are intended as a means of facilitating the specification, by CDPHE, of requirements for the CAMU

The various components of the proposed CAMU's waste management activities have not yet been designed Accordingly, it is premature to develop all of the specific details associated with implementation of the CAMU. For those CAMU requirements that are dependent upon completion of design, it is envisioned that the documents contained within the appendixes will be used as a framework or guidance for development of the design and final specific plans The specific plans will be reviewed and approved by CDPHE as part of the design review process These plans will be submitted in accordance with the schedule discussed in Section 5 0

A discussion of the requirements of Section 264 552(e) is presented below

3.1 Areal Configuration of the CAMU

The proposed CAMU boundaries are shown in Figure 2 of this document. Two CAMU locations are proposed One location, which incorporates 50 acres, includes the Basin F Waste Pile drying unit and any related decontamination facilities and/or waste staging/consolidation area(s) that may occur during closure of the waste pile This location is in the vicinity of the Basin F Waste Pile because it is anticipated that the optimal location for the drying process will be near the point of excavation The second CAMU boundary, which incorporates 245 acres, includes the landfill area and any related decontamination facilities and/or waste staging/consolidation areas

The areal extent of the CAMU boundary for the Basin F Waste Pile drying unit has been selected to allow for flexibility in the final location of the CAMU activities to be conducted in this area None of these CAMU activities result in remediation waste that is placed into the CAMU being left in place after closure

The basis for the location and areal extent of that portion of the CAMU that incorporates the landfill are discussed in Sections 2 3 and 2 7 above

3.2 Waste Management Requirements

The requirements for waste management under Section 264 552(e)(2) are anticipated to incorporate the following

- Design of the landfill, Basin F Waste Pile drying unit and associated decontamination facilities and/or waste staging/consolidation area(s)
- Operation of the CAMU waste management facilities
- The requirements related to 265 Subpart B, C, D, and E, which will result in the development of the plans listed in Section 3 0 that are associated with these subparts

Various sections of and appendixes to this document provide guidance for development of the detailed plans that will govern the above waste management requirements A cross reference of the regulatory requirement and the location within the CDD document where the guidance can be found is included in Section 4 0 The detailed plans will be developed as part of the CAMU design process The plans will be submitted to CDPHE for review and approval in accordance with the schedule discussed in Section 5 0

3.2.1 Design Requirements

Appendix B presents a Design Narrative that provides requirements for design The design requirements are presented in terms of performance standards and/or design guidance The performance standards represent design objectives as opposed to specifying a specific design detail The

performance standards are driven by a regulatory requirement and/or guidance, such as the broad requirements of 6 CCR 1007-2, Part 2, Section 2 4

The completion of the design and subsequent review and approval of the design by CDPHE will represent fulfillment of the Section 264 552(e)(2) requirements for design of the CAMU

3.2.2 Operation Requirements

The final details of the operation requirements cannot be effectively developed until after completion of the design Appendix C presents the framework for development of the final operation requirements relative to the CAMU waste management activities The specific operating details will be developed and approved by CDPHE prior to commencing the CAMU waste management activities

3.2.3 Subparts B, C, D, and E Requirements

Appendix D presents a framework for development of a Waste Analysis Plan (WAP) The WAP will address the waste characterizations necessary for operation of the landfill and Basin F Waste Pile drying unit In the absence of design, particularly for the Basin F Waste Pile drying unit, it is not practical to specify the details of the WAP Those details will be developed during the design and will be submitted to CDPHE for review and approval as part of the design review process

Outlines for the other plans that derive from the 265 Subparts B, C, D, and E requirements are also presented in the appendixes to this document The locations of these plan outlines are cross-referenced in Table 4 2 with the regulatory requirement and/or guidance, which is related to a given plan

3.3 Groundwater Monitoring

Appendix K presents the primary elements of the groundwater monitoring program that may be used as guidance for the development of more detailed and specific Groundwater Monitoring Plans It is anticipated that three Groundwater Monitoring Plans will be developed and implemented during the course of the CAMU's waste management activities

The Groundwater Monitoring Program in Appendix K presents the components of the Background Monitoring System The Operational Period Groundwater Monitoring Plan will be developed and submitted for CDPHE approval during the design review process This timing allows for the incorporation of the background data into the development of the operational plan The Post-Closure Period Groundwater Monitoring Plan will be developed and submitted for CDPHE approval just prior to closure

3.4 Closure and Post-Closure Requirements

Appendix L presents a framework for development of the Closure and Post-Closure Plan. Effective development of the details for closure cannot occur until design The specific plans will be developed and submitted for CDPHE approval during the design review process

4.0 CROSS-REFERENCE OF REGULATORY REQUIREMENTS AND/OR GUIDANCE VERSUS LOCATION OF REQUIRED INFORMATION

The regulations for designating a CAMU are given in 6 CCR 1007-3, Section 264 552. Section 264 552(d) of this regulation requires the owner/operator of the CAMU to provide sufficient information to enable CDPHE to designate the CAMU in accordance with the criteria specified in Section 264 552 The purpose of this section is to cross-reference where the required regulatory information is located within the CDD

The subsections below include tables with columns listing the applicable regulation and/or guidance, a brief description or title of the regulation, and the appendix or section of the CDD where the regulation is addressed

4.1 Regulatory Requirements Under 6 CCR 1007-2, Part 2

The remediation waste placed in the landfill portion of the CAMU will be left in place after closure and in some cases that waste will be hazardous Therefore, compliance with the siting requirements for hazardous waste landfills that are found in 6 CCR 1007-3, Part 2 will be applicable

Table 4 1 presents the location in the CDD text and appendixes where the applicable requirements and/or guidance of Part 2 are addressed

4.2 Regulatory Requirements Under 6 CCR 1007-3, Part 265

The remediation waste placed in the landfill portion of the CAMU will in some cases be hazardous Therefore, in addition to compliance with the requirements of Section 264 552 of 6 CCR 1007-3, this CDD will address compliance with Part 265 Subparts B, C, D, and E Part 264 Subpart N, Landfills, also offers guidance related to the design and operation of the landfill portion of the CAMU Table 4 2 presents the location in the CDD text and appendixes where these requirements and/or guidance are addressed

5.0 SCHEDULE OF CAMU ACTIVITIES

Table 5 1 presents an itemization of the various design studies, analyses, drawings, and reports that will be developed as part of the CAMU detailed design process An itemization of the currently contemplated specifications, construction and operational plans for the CAMU is also provided in Table 5 1 As indicated in Section 1 3 of this document, guidance and/or outlines for development of many of the specifications and plans are presented in appendixes to the CDD Table 5 1 also presents an estimated time frame for submission of the plans and design work products to CDPHE for review and approval A schedule of CAMU activities from CDD designation activities through landfill operations is presented in Figure 3 The schedule is preliminary and subject to change due to uncertainties associated with implementation of the remedy

In CAMU working sessions, it was agreed that one additional public comment period would be provided during the CAMU design to provide an opportunity for public comment on the development of the design and operational details of the CAMU The schedule and format for this public comment period will be set by mutual agreement of CDPHE and the Army It is anticipated that the public comment period will be at or after the 30 percent level of design so that the design and operational details will have been substantially developed In the event of significant schedule variations or significant modifications to work plans or designs that had previously been available for a public comment period, the Army and CDPHE will evaluate the need to provide additional opportunity for public comment

6.0 CONCLUSIONS

The proposed CAMU at RMA meets all of the regulatory decision criteria specified in Section 264 552(c) for designation of a CAMU The specific details associated with the requirements for the CAMU waste management activities will be developed and submitted to CDPHE for approval during the design review process A framework for development of the specific details is presented in the various appendixes to this document. Appendix B to this document presents a design narrative, which will be used for developing the design of the facilities associated with the CAMU's waste management activities The design narrative provides the flexibility necessary for the design to meet the intent of the CERCLA Conceptual Remedy, while specifying design parameters that are directly related to specific regulatory requirements for the CAMU under CHWMA

7.0 ACRONYMS

Army	U S Department of the Army
BCY	Bank cubic yards
CAMU	Corrective Action Management Unit
CCR	Code of Colorado Regulations
CDD	CAMU Designation Document
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHWA	Colorado Hazardous Waste Act
Conceptual Remedy	Agreement for a Conceptual Remedy for the Cleanup of the Rocky Mountain Arsenal
CRS	Colorado Revised Statute
DAA	Detailed Analysis of Alternatives
Dispute Resolution	Onpost Operable Unit Detailed Analysis of Alternatives Dispute Resolution Agreement
EPA	U S Environmental Protection Agency
FFA	Federal Facilities Agreement
FS	Feasibility study
FWS	U S Fish and Wildlife Service
GIS	Geographical Information System
HLA	Harding Lawson Associates
NCP	National Contingency Plan
RI/FS	Remedial Investigation/Feasibility Study
RMA	Rocky Mountain Arsenal
Shell	Shell Oil Company
State	State of Colorado
SY	Square yards

TCLP	Toxicity Characteristic Leaching Procedure
TMV	Toxicity, Mobility, Volume
TSDF	Treatment, storage, and disposal facility
WAP	Waste Analysis Plan

8.0 REFERENCES

Agreement for a conceptual remedy for the cleanup of the Rocky Mountain Arsenal between the U S Department of the Army, Shell Oil Company, the State of Colorado, the U S Environmental Protection Agency, and the U S Fish and Wildlife Service 1995 June 13

Foster Wheeler Environmental Corporation 1995 *Final detail analysis of alternatives*, Version 4 1 Prepared for the Program Manager for Rocky Mountain Arsenal, Commerce City, Colorado October

Onpost Operable Unit Detailed Analysis of Alternative Dispute Resolution Agreement between the U S Department of the Army, Shell Oil Company, the State of Colorado, the U S Environmental Protection Agency, the U S Fish and Wildlife Service 1995 October 16

Harding Lawson Associates 1995 *Final landfill site feasibility report*, Rocky Mountain Arsenal, Commerce City, Colorado July

U S Environmental Protection Agency 1990 *Guide to selecting superfund remedial actions* April EPA/9355 0-27/FS

Table 2.1: Description of Preferred Sitewide Soil Remedy*

Medium Groups/ Subgroups	Components of the Preferred Remedy with the CAMU Waste Management Activities in Bold
Munitions Testing	Munitions Screening; off post detonation of UXO; **Landfill debris and soil above TCLP (89,000 BCY).** (Alternative U4a; Section 5.2.4). #
North Plants	**Landfill human health exceedance (220 BCY);** agent screening during excavation; caustic solution washing; cap/cover (soil cover) soil posing risk to biota and processing area footprint (160,000 SY). (Alternative A3; Section 6.2.3). #
Toxic Storage	**Landfill human health exceedance (2,700 BCY);** utilize New Toxic Yards Storage Yard for borrow area; agent screening during site excavation and preparation, caustic washing. (Alternative A3; Section 6.5.3). #
Lake Sediments	**Landfill human health exceedances (19,000 BCY)** and consolidate soil posing risk to biota (19,000 BCY) (Upper Derby Lake); deferral to USFWS for aquatic sediment. (Alternative B5a; Section 7.2.4). #
Surficial soil	**Landfill human health exceedances (87,000 BCY)** consolidate soil posing risk to biota in Basin A/Former Basin F/South Plants (450,000 BCY); Parties to determine action in accordance with Conceptual Remedy for remainder of site. (Alternative B5a; Section 8.2.4). #
Ditches/Drainage Areas	Consolidate soil posing risk to biota in Basin A (52,000 BCY). (Alternative B5a; Section 9.2.4).
Basin A	Cap/cover (concrete/soil cap) principal threat and human health exceedances and soil posing risk to biota (670,000 SY); consolidate soil posing risk to biota (800,000 BCY); and structural debris (160,000 BCY) from other sites. (Alternative 6; Section 10.2.5).
Basin F Waste Pile	**Landfill entire waste pile principal threat exceedance (600,000 BCY) in triple lined cell (with vapor controls) after drying saturated materials.** (Alternative 3; Section 11.2.3). #
Former Basin F	**Landfill principal threat soil (165,000 BCY) in triple lined cell.** (RMA ROD Amendment 10/20/05); cap/cover (RCRA-Equivalent cover) entire site (446,000 SY).
Secondary Basins	**Landfill human health exceedances (32,000 BCY);** cap/cover (soil cover) soil posing risk to biota (500,000 SY). (Alternative 3b; Section 12.2.4). #
Sanitary/Process Water Sewers	Plug remaining manholes. (Alternative 2; Section 13.2.2).
Chemical Sewers	Plug sewer lines in South Plants Central Processing Area and Complex Trenches; **landfill remaining principal threat and human health exceedances (64,000 BCY).** (Alternative 38; Section 13.5.7). #

Table 2.1 (continued)

Medium Groups/ Subgroups	Components of the Preferred Remedy with the CAMU Waste Management Activities in Bold
Complex Trenches	Cap/cover (concrete/soil RCRA-equivalent cap) principal threat and human health exceedances and soil posing risk to biota (390,000 SY) and install a slurry wall around disposal trenches. (Alternative 5, Section 14.2.2).
Shell Trenches	Modify existing cap/cover to be RCRA equivalent (32,000 SY) and modify existing slurry wall around trenches. (Alternative 5a, Section 14.5.3).
Hex Pit	Treatment technologies (including innovative technologies) to be reviewed and remedy to be determined prior to ROD **(3,300 BCY)**.
Sanitary Landfill	**Landfill human health exceedances (14,000 BCY)**; consolidate debris and soil posing risk to biota in Basin A (410,000 BCY). (Alternative 3f, Section 15.2.4).#
Section 36 Lime Basins	Construct in-situ slurry wall around basins; cap/cover (RCRA-Equivalent cover) entire site (63,000 SY). (RMA ROD Amendment 10/20/05)
Buried M-1 Pits	Solidification of principal threat and human health exceedances **(26,000 BCY)** and **Landfill (with vapor controls)**. (Alternative 10, Section 16.5.4). #
South Plants Central Processing	**Landfill principal threat and human health exceedances (110,000 BCY)**; cap/cover (soil cover) entire site including soil Area posing risk to biota (220,000 SY); consolidate soil posing risk to biota from other sites (380,000 BCY). (Alternative 3b, Section 17.2.3). #
South Plants Ditches	**Landfill principal threat and human health exceedances 33,000 BCY**); consolidate soil posing risk to biota into excavated areas or South Plants Central Processing Area (23,000 BCY); cap/cover (soil cover) entire site (120,000 SY). (Alternative 3g, Section 17.5.5). #
South Plants Balance of Areas	**Landfill principal threat and human health exceedances (135,000 BCY)**; consolidate soil posing risk to biota into excavated areas or South Plants Central Processing Area (510,000 BCY); cap/cover (soil cover) entire site (1,700,000 SY). (Alternative 3g, Section 17.8.5). #
Buried Sediments	**Landfill human health exceedances (16,000 BCY).** (Alternative 3, Section 18.2.3). #
Sand Creek Lateral	**Landfill human health exceedances (55,000 BCY)**; consolidate soil posing risk to biota into Basin A (90,000 BCY). (Alternative 3f, Section 18.5.3).#
Section 36 Balance of Areas	**Landfill human health exceedances and debris (142,000 BCY)**; consolidate soil posing risk to biota into Basin A (200,000 BCY); cap/cover (soil cover) entire site (710,000 SY). (Alternative 3g, Section 19.2.4).#

Table 2.1 (continued)

Medium Groups/ Subgroups	Components of the Preferred Remedy with the CAMU Waste Management Activities in Bold
Burial Trenches	**Landfill human health exceedances and debris (85,000 BCY)** (Alternative 3, Section 19 5 2)

BCY Bank cubic yards
CAMU Corrective Action Management Unit
DAA Detailed Analysis of Alternatives
RCRA Resource Conservation and Recovery Act
ROD Record of Decision
SY Square yards
TCLP Toxicity characteristic leaching procedure
USFWS U S Fish and Wildlife Service
UXO Unexploded Ordnance

* This table was derived from Table ES4 3-1 of the Executive Summary (Vol I) of the Final detailed Analysis of Alternatives Report, Version 4 1, October 1995 As indicated on the DAA Preferred Alternative Mass Balance Diagram (October 29, 1995), some of the volume estimates presented in the above tables have been modified and other onsite materials, not included in the above table, will be placed in the landfill These other materials include

- Agent Structures Demolition (120,000 BCY)
- Significant Contaminated Structures (42,000 BCY)
- Caustic Agent Treatment Facility (10,000 BCY)
- Contingent Soil Volume (150,000 BCY)

Alternative designations and section references refer to the DAA.

Table 2.2: CERCLA Evaluation Criteria that are Analogous to Certain CAMU Decision Criteria

Threshold Criteria

- Overall Protection of Human Health and the Environment — This criterion addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (assuming reasonable maximum exposure) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls — Relates to the CAMU decision criteria found at 6 CCR 1007 3 Part 264 552(c)(1)

Primary Balancing Criteria

- Long-term Effectiveness and Permanence — This criterion refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once remediation goals have been met. — Relates to CAMU decision criterion found at 6 CCR 1007-3 Part 264 552(c)(1)

- Short-term Effectiveness — This criterion addresses the period of time needed to achieve protection and any adverse impacts on human health or the environment that may be posed during the construction and implementation period until remediation goals are achieved — Relates to the CAMU decision criteria found at 6 CCR 1007-3 Part 264 552(c)(1) and (c)(2)

Table 2.3: Summary of Analysis of Sitewide Soil Remedy Relative to Those CERCLA Criteria that are Similar to CAMU Designation Criteria

CERCLA Decision Criteria	Preferred Remedy
Overall protection of human health and the environment	Protective Exposures to humans and biota prevented by containing contaminated soil in place and by treating some of the principal threat volume
Long-term effectiveness and permanence	Minimal residual risk. Relies on treatment of some highly contaminated soil, groundwater controls, and capping/landfilling to prevent migration and exposure
Reduction in Toxicity, Mobility, or Volume	Toxicity, mobility, or volume of some highly contaminated soil reduced through treatment, relies on containment for most mobility reduction.
Short-term effectiveness	Moderate short-term risk. Some high-risk sites excavated and transported, potential for releases

Table 2.4: Summary of Rocky Mountain Arsenal Landfill Siting Criteria

Siting Criteria	Landfill Siting Criteria Regulations		Regulatory Criteria Adopted HLA, 1994	
	Description	Citation	Primary Siting Criteria Adopted	Secondary Siting Criteria
Faults	>1,000 feet from a Holocene fault >200 feet from a Holocene fault	6 CCR 1007-3, 264 18(a) 6 CCR 1007 2, 3 1 3	>1,000 feet from a Holocene fault	
Floodplain	Outside 100-year floodplain Not located in "floodplain" as defined in regulation	6 CCR 1007-3, 264 18(b) 6 CCR 1007 2, 3 1 7	Outside 100 year floodplain	
Salt formations	Not within salt formations	6 CCR 1007-3, 264 18(c)	Not within salt formations	
Surface water/groundwater	No waste placed below or into surface water or groundwater No waste placed below or into surface water or groundwater	6 CCR 1007 3, 264 18(d) 6 CCR 1007 2, 3 1 9	No waste placed below or into surface water or groundwater	Maximize depth to groundwater
Airport safety	Notification if facility is within 5 miles of runway	6 CCR 1007 2, 3 1 1	Notification if facility is within 5 miles of runway	
Wetlands	Not located in wetlands	6 CCR 1007 2, 3 1 2	Not within wetland	
Seismic impact zone	Not located in seismic impact zone without demonstration	6 CCR 1007 2, 3 1 4	Not located in seismic impact zone without demonstration	
Unstable areas	Not within unstable area	6 CCR 1007-2, 3 1 5	Not within unstable area	
Topography	Maximize protection from wind and precipitation catchment area	6 CCR 1007-2, 3 1 6	Maximize protection from wind and precipitation catchment area	
Isolation	Isolate waste from public and environment	6 CCR 1007-2, 3 1 8 6 CCR 1007 2 4 1	Isolate waste from public and environment	
Hydrogeology	Reasonable assurance that waste isolated for 1,000 years	6 CCR 1007-2, Part 2, 2 5 3	Reasonable assurance that waste isolated for 1,000 years	Avoid saturated alluvium
Geology	Reasonable assurance that waste isolated for 1,000 years	6 CCR 1007-2, Part 2, 2 5 3	Reasonable assurance that waste isolated for 1,000 years	Minimize depth to bedrock

Table 2.4 (continued)

Siting Criteria	Landfill Siting Criteria Regulations		Regulatory Criteria Adopted HLA, 1994	
	Description	Citation	Primary Siting Criteria Adopted	Secondary Siting Criteria
Location	Within distance controlled by Army to prevent adverse effects to public health	6 CCR 1007-2, Part 2, 2 5 6	Within distance controlled by Army to prevent adverse effects to public health	Centrally located within RMA boundary
Buffer Zone	Noise levels within limits	CRS Sections 25-12-101 to 108	Noise levels within limits	

CCR Code of Colorado Regulations
CRS Colorado Revised Statute
HLA Harding Lawson Associates
RMA Rocky Mountain Arsenal

Table 4.1: Cross-Reference of Regulatory Requirements and/or Guidance - Part 2

Regulatory Section	Requirement and/or Guidance	Where Addressed in CDD: Appendix	Title	Section
2 4 1	Designed in a manner that the design performance will assure long term protection of human health and the environment	A	Part 2 Siting Compliance Demonstration	All
		B	Design Narrative	All
2 4 2	Designed to prevent long-term adverse effects on groundwater	A	Part 2 Siting Compliance Demonstration	3 1
2 4 3	Designed to prevent long-term adverse effects on surface-water quality	A	Part 2 Siting Compliance Demonstration	3 2
		B	Design Narrative	7 0
2 4 4	Designed to prevent long-term adverse effects on air quality	A	Part 2 Siting Compliance Demonstration	3 3
		B	Design Narrative	All
2 4 5	Designed to prevent long-term adverse effects on public health and the environment due to migration of waste constituents in the surface or subsurface environment	A	Part 2 Siting Compliance Demonstration	3 4
		B	Design Narrative	All
2 4 6	Protection of the function and physical integrity of any liner placed in a hazardous disposal site	A	Part 2 Siting Compliance Demonstration	3 5
		B	Design Narrative	All
		G	Inspection Plan	All
		H	Construction Quality Assurance Plan	All
		P	Specifications	All
		Q	Contingency Plan	All
2 4 7	Leachate and runoff control systems designed with sufficient capacity such that the design performance complies with Sections 2 4 1 through 2 4 5	A	Part 2 Siting Compliance Demonstration	3 6
		B	Design Narrative	5 0, 7 0
2 4 8	Design includes a method of closure that provides reasonable assurance of long-term compliance with Sections 2 4 1, 2 4 2, 2 4 4, 2 4 5, and 2 4 7	A	Part 2 Siting Compliance Demonstration	3 7
		B	Design Narrative	4 0
		L	Closure and Post-Closure Plan	All
2 4 9	Design includes systems for monitoring groundwater and surface water and providing quality control of materials in construction	A	Part 2 Siting Compliance Demonstration	3 8
		B	Design Narrative	All
		C	Operations Narrative	All
		G	Inspection Plan	All
		H	Construction Quality Assurance Plan	All
		I	Test Fill Work Plan	All
		K	Guidelines for the Development of a Groundwater Monitoring Plan	All
		P	Specifications	All
2 4 10	Design includes procedures to be followed during construction, including certification by a professional geologist or engineer to demonstrate that the facility is constructed in accordance with the design as approved	A	Part 2 Siting Compliance Demonstration	3 9
		H	Construction Quality Assurance Plan	All
		I	Conceptual Test Fill Work Plan	All
		P	Specifications	All

Table 4.1 (continued)

Regulatory Section	Requirement and/or Guidance	Where Addressed in CDD		
		Appendix	Title	Section
2 5 1	Siting and design demonstrates that the minimum design performance criteria contained in Section 2 4 will be satisfied after site construction and implementation of the proposed design	A	Part 2 Siting Compliance Demonstration	All
		B	Design Narrative	All
		C	Operations Narrative	All
2 5 2	The proposed design, and design performance of a hazardous waste disposal site	C	Operations Narrative	All
2 5 3	Reasonable assurance is provided that hazardous wastes to be disposed will be isolated within the designated disposal area of the site and away from natural environmental pathways that could expose the public for 1,000 years	A	Part 2 Siting Compliance Demonstration	2 1
2 5 4	Design includes a liner whose performance complies with Sections 2 4 1, 2 4 2, 2 4 3, and 2 4 5	A	Part 2 Siting Compliance Demonstration	2 2
		B	Design Narrative	3 0
2 5 5	Design includes a leachate and runoff control system that will provide compliance with Section 2 4	A	Part 2 Siting Compliance Demonstration	2 3
		B	Design Narrative	3 0
2 5 6	The location for disposal and preparation for disposal of hazardous wastes will be within a distance controlled by the owner/operator by an acceptable means to prevent adverse effects on the public health should unexpected discharges of hazardous waste occur	A	Part 2 Siting Compliance Demonstration	2 4

CAMU Corrective Action Management Unit
CDD CAMU Designation Document
CCR Code of Colorado Regulations

Table 4.2: Cross-Reference of Regulatory Requirements and/or Guidance Subparts B, C, D, E, N, and S

Regulatory Section		Regulation and/or Guidance	Where Addressed in CDD Appendix	Title	Section
Subpart B - General Facility Standards					
265 12		Required Notices		Not Applicable	
265 13		General Waste Analysis	D	Guidelines for the Development of a Waste Analysis Plan	All
265 14		Security	E	Security Plan Outline	All
265 15		General Inspection Requirements	G	Inspection Plan Outline	All
265 16		Personnel Training	F	Personnel Training Plan Outline	All
		General Requirements for Ignitable Reactive or Incompatible Waste	C	Guidelines for the Development of an Operations Narrative	2 1 2
265 17			O	Health and Safety Plan Outline	All
265 18		Installation Standards	A	Part 2 Siting Compliance Demonstration	4 0
265 19		Construction Quality Assurance Program	H	Construction Quality Assurance Plan Outline	All
Subpart C - Preparedness and Prevention					
265 30 through 265 37			B	Design Narrative	All
			C	Guidelines for the Development of an Operations Narrative	8 0
			O	Health and Safety Plan Outline	All
			Q	Contingency Plan Outline	All
Subpart D Contingency Plan and Emergency Procedures					All
265 50 through 265 56			Q	Contingency Plan Outline	All
Subpart E Manifest System Record Keeping and Reporting					
265 70 through 265 73			J	Operating Record System Plan Outline	All
Subpart N Landfills					
264 300			B	Design Narrative	All
			C	Guidelines for the Development of an Operations Narrative	All
Subpart S - Corrective Action					
264 552		Corrective Action Management Units			
264 552	(c)(1)	Facilitation of the Remedy	N/A	CDD Text	2 1
264 552	(c)(2)	Risks to Human Health and Environment	N/A	CDD Text	2 2

Table 4.2 (continued)

Regulatory Section		Regulation and/or Guidance	Where Addressed in CDD		
			Appendix	Title	Section
264 552	(c)(3)	Justification for Inclusion of Uncontaminated Areas	N/A	CDD Text	2 3
264 552	(c)(4)	Containment of Remediation Wastes Remaining after Closure	N/A	CDD Text	2 4
264 552	(c)(5)	Timing of Remedial Action Implementation	N/A	CDD Text	2 5
264 552	(c)(6)	Application of Treatment Technologies	N/A	CDD Text	2 6
264 552	(c)(7)	Minimization of Land Area	N/A	CDD Text	2 7
264 552	(e)(1)	Areal Configuration of CAMU	N/A	CDD Text	2 8 1
264.552	(e)(2)	Waste Management Requirements	N/A	CDD Text	2 8 2
264 552	(e)(3)	Groundwater Monitoring	N/A	CDD Text	2 8 3
264 552	(e)(4)	Closure and Post-Closure Requirements	N/A	CDD Text	2 8 4

CAMU Corrective Action Management Unit
CCR Code of Colorado Regulations
CDD CAMU Designation Document
N/A Not applicable

Table 5.1: Preliminary Scope of Work and Schedule of Design Activities for the RMA CAMU

Task/Deliverable	Subtask	Time Frame for Preparation and Submission to CDPHE for Review and Approval[a]
1 0 Design Studies and Evaluations		
	Test Fill Program[b]	Third quarter 1996 through first quarter 1997
	Survey Landfill Area and Borrow Areas	Second quarter 1996 through first quarter 1997
	Waste Sampling and Analysis/Testing, as necessary	Second quarter 1996 through third quarter 1997
	Sampling and Evaluation of Onsite Materials, as necessary	Second quarter 1996 through third quarter 1997
	Sampling and Evaluation of Foundation Materials, as necessary	Second quarter 1996 through third quarter 1997
	Compatibility Evaluations and Testing	Second quarter 1996 through fourth quarter 1997
	Landfill Component Equivalency Evaluations (where applicable)	Second quarter 1996 through third quarter 1997
	Constructability and Cost Evaluations	Second quarter 1996 through fourth quarter 1997
	Value Engineering Analysis	Second quarter 1996 through fourth quarter 1997
2 0 Landfill Design Report		Second quarter 1996 through fourth quarter 1997
Design Basis and Calculations		
	Cell Construction	
	Cell Configuration and Sizing (Landfill Cell Layout Plan)	Second quarter 1996 through third quarter 1997
	Cut and Fill Volume Estimates	Second quarter 1996 through third quarter 1997
	Subgrade Stability, Bearing Capacity, Settlement, Hydrostatic Pressure, and Seismic Evaluations	Second quarter 1996 through third quarter 1997
	Liner System	
	Liner Materials Compatibility Evaluations and Testing	Second quarter 1996 through fourth quarter 1997
	Slope Stability, Bearing Capacity, Settlement, Hydrostatic Pressure, and Seismic Evaluations	Second quarter 1996 through third quarter 1997
	Material Equivalency Demonstration, if applicable	Second quarter 1996 through third quarter 1997
	Leachate Collection and Leak Detection Systems	
	Materials Compatibility Evaluations and Testing	Second quarter 1996 through fourth quarter 1997
	Flow Capacity and Head Buildup to Include HELP Modeling	Second quarter 1996 through third quarter 1997
	Pipe Selection and Sizing	Second quarter 1996 through third quarter 1997
	Sump Configuration and Sizing	Second quarter 1996 through third quarter 1997
	Pump Selection and Sizing	Second quarter 1996 through third quarter 1997
	Material Equivalency Demonstration, if applicable	Second quarter 1996 through third quarter 1997

Table 5.1 (continued)

Task/Deliverable	Subtask	Time Frame for Preparation and Submission to CDPHE for Review and Approval[a]
	Cover System	
	Slope Stability, Bearing Capacity, Settlement, Hydrostatic Pressure, and Seismic Evaluations	Second quarter 1996 through third quarter 1997
	Volume Estimates for Clay(if applicable), Drainage Layer, Biota Barrier, Vegetation Layer and Top Soil	Second quarter 1996 through third quarter 1997
	Infiltration Drainage System Flow Capacity to Include HELP Modeling	Second quarter 1996 through third quarter 1997
	Wind and Water Erosion	Second quarter 1996 through third quarter 1997
	Material Selection Evaluations	Second quarter 1996 through third quarter 1997
	Selection of Vegetation	Second quarter 1996 through third quarter 1997
	Gas Collection/Venting System	
	Gas Production Rates	Second quarter 1996 through third quarter 1997
	Gas Collection System Capacity, Sizing, and Vent Spacing	Second quarter 1996 through third quarter 1997
	Surface Water Drainage Systems	
	Drainage and Retention Structure Selection and Sizing	Second quarter 1996 through third quarter 1997
	Erosion Evaluation	Second quarter 1996 through third quarter 1997
Drawings		Third quarter 1996 through fourth quarter 1997
	Title Sheet	
	Index/List of Drawings	
	Legend, Symbols, Abbreviations, and General Notes	
	Site and Vicinity Maps	
	Existing Site Plans	
	Existing Exploration Plans	
	Limits of Construction and CAMU Boundary Plans	
	Disposal Cell Excavation and Grading Plans	
	Disposal Cell Liner Component Grading Plans	
	Leachate Collection and Leak Detection Piping and Grading Plans	
	Surface Water Collection and Removal Plans	
	Temporary Cover and Waste Grading Plans	
	Disposal Cell Final Grading Plans	
	Disposal Cell Sections and Details	
	Sumps and Pipe Plans, Sections, and Details	
	Sump Electrical Diagrams for Pumps and Connections	
	Borrow Area Excavation, Grading, and Reclamation Plans and Sections	
	Cell Development Sequence	
	Typical Cell Filling Plan, Sections, and Details	
	Access Ramp Details	
	Haul Traffic Control Plans	
	Construction Staging and Decontamination Plans, Sections, and Details	
	Ancillary Facility Plans, Sections, and Details	

Table 5.1 (continued)

Task/Deliverable	Subtask	Time Frame for Preparation and Submission to CDPHE for Review and Approval[a]
Specifications (Appendix P)[c]		Third quarter 1996 through fourth quarter 1997
	Summary of Work	
	Construction Controls	
	Environmental Controls	
	Traffic Regulations and Controls	
	Emission Controls	
	Storm, Surface Water and Erosion Controls	
	Control Measure Procedures	
	Demolition	
	Borrow Area Operations	
	Survey Services	
	Earthwork	
	Low Permeability Layer (Compacted Clay Liner)	
	Drainage Aggregate and Biotic Barrier Layer	
	Top Soil	
	Geotextiles	
	Geomembranes	
	Geosynthetic Clay Liners	
	Geonets	
	Erosion Control Materials	
	Waste Handling and Placement	
	Storm Water Structures and Controls	
	Construction Material Stockpile, Staging, and Treatment Areas	
	Daily Cover	
	Leachate Collection and Removal System Piping and Sump	
	Seeding	
	Pavement and Base Course Materials	
	Concrete	
	Miscellaneous Metals	
	Monitoring Wells	
	Fences	
	Pumps and Equipment	
	Piping	
	Electrical Work	
	Ancillary Facilities	

Table 5.1 (continued)

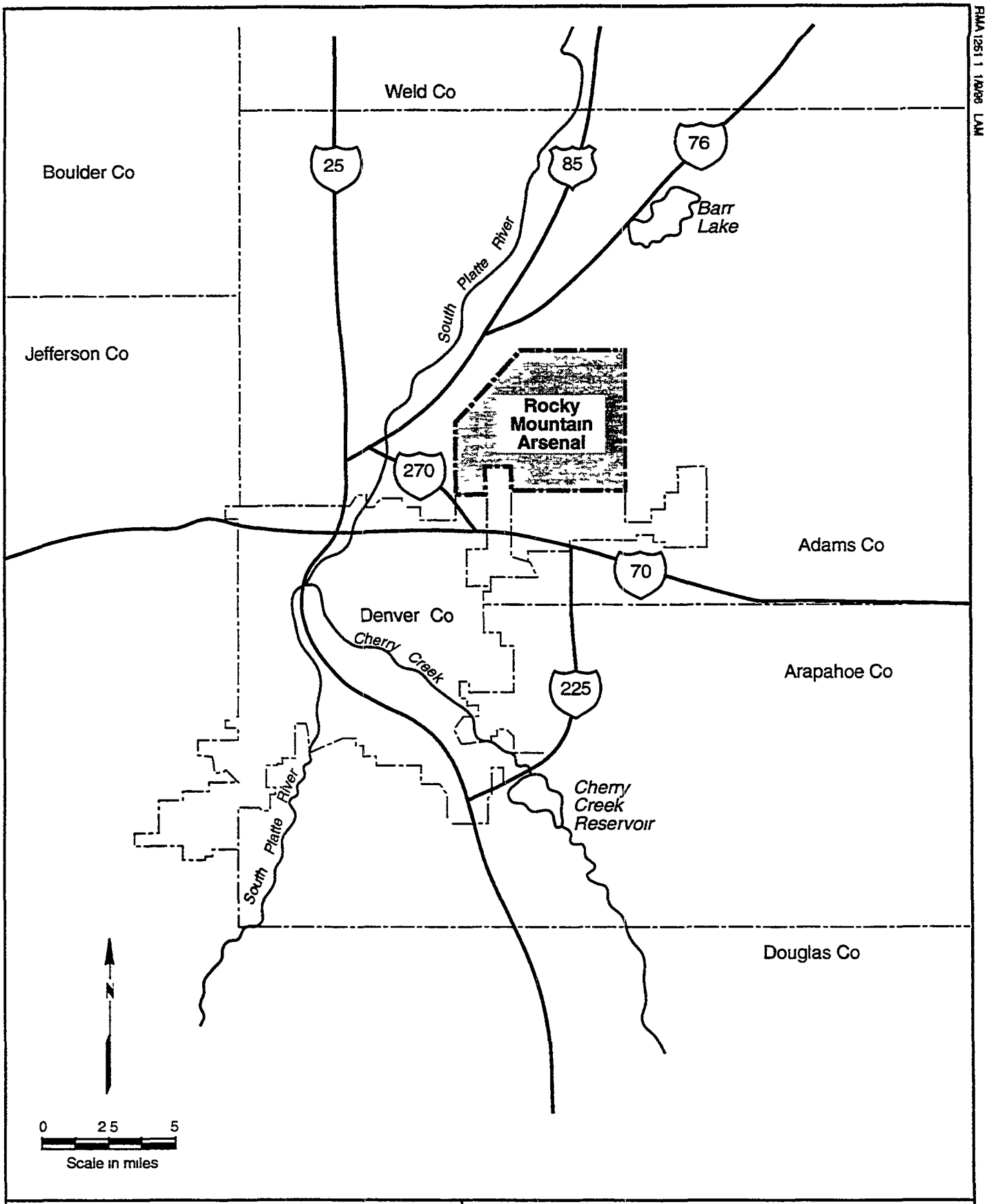
Task/Deliverable	Subtask	Time Frame for Preparation and Submission to CDPHE for Review and Approval[a]
3 0 Construction and Operational Plans		
	Construction Cost Estimate and Schedule	Second quarter 1996 through fourth quarter 1997
	Construction Quality Assurance Plan (Appendix H)[c,d]	Second quarter 1996 through first quarter 1998
	Operation Plan (Appendix C)[c,d]	First quarter 1997 through first quarter 1998
	Air Monitoring Plan	First quarter 1997 through third quarter 1997
	Groundwater Monitoring Plan (Appendix K)[c,d]	First quarter 1997 through third quarter 1997
	Closure Plan (Appendix L)[c,d]	First quarter 1997 through first quarter 1998
	Post Closure Plan (Appendix L)[c,d]	First quarter 1997 through first quarter 1998
	Action Leakage Rate/Response Action Plan (Appendix N)[c,d]	Second quarter 1996 through first quarter 1998
	Inspection Plan (Appendix G)[c,d]	Second quarter 1996 through first quarter 1998
	Personnel Training Plan (Appendix F)[c d]	Second quarter 1996 through first quarter 1998
	Operating Record System Plan (Appendix J)[c d]	Second quarter 1996 through first quarter 1998
	Health and Safety Plan (Appendix O)[c,d]	Second quarter 1996 through first quarter 1998
	Contingency Plan (Appendix Q)[c,d]	Second quarter 1996 through first quarter 1998
	Security Plan (Appendix E)[c,d]	Second quarter 1996 through first quarter 1998
	Waste Analysis Plan (Appendix D)[c,d]	Second quarter 1996 through first quarter 1998

a Time frames are preliminary and subject to change due to uncertainties associated with implementation of the remedy Time frames are in the Federal fiscal year format, i.e , October-December = First Quarter, etc

b Test fill program will be performed as part of the CAMU designation process

c Appendix references refer to the location within the CDD where either guidelines or outlines are presented

d Draft versions of these documents will be produced as part of the 30 percent design Final versions of these documents will be produced during later stages of design or after design



Prepared for
Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by
Harding Lawson Associates

Figure 1

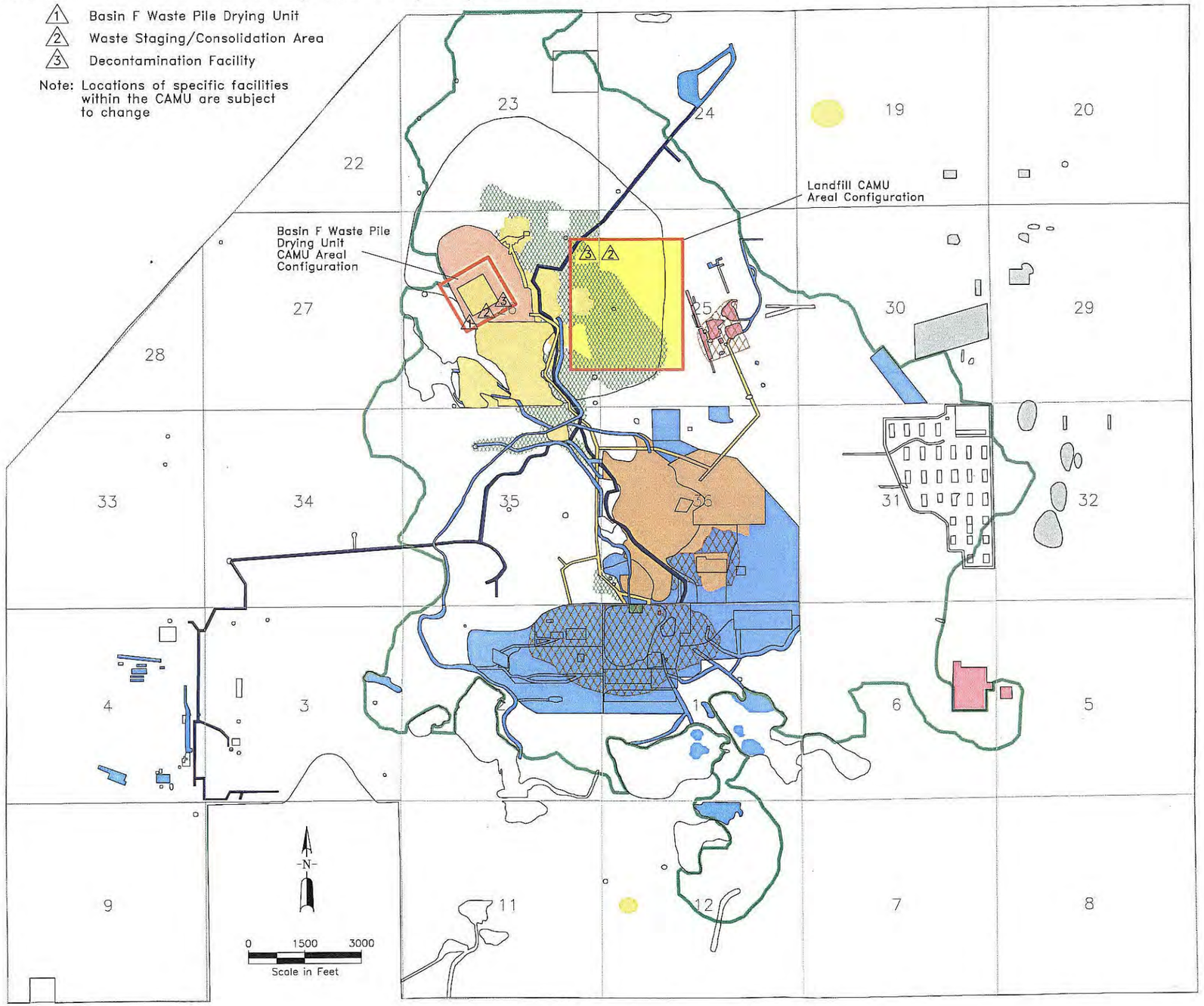
Site Location Map

RMA 1251 1 1/6/98 LAM

Facilities within Corrective Action Management Unit (CAMU) Areal Configuration

1 Basin F Waste Pile Drying Unit
2 Waste Staging/Consolidation Area
3 Decontamination Facility

Note: Locations of specific facilities within the CAMU are subject to change



Explanation

- Arsenal Boundary
- Study Area Report Boundary
- Area of Contamination Boundary
- CAMU Areal Configuration
- Landfill Principal Threat Volume; RCRA–Equivalent Cap
- Caps/Covers
- Direct Solidification/Stabilization
- Hex Pit Excavation
- Landfill Human Health Soil,[1] Consolidation of Biota Soil
- Landfill Human Health Soil[2]
- Landfill Site
- Soil Covers
- Agent Screening Area (Caustic wash/landfill)
- Unexploded Ordnance Screening Area (Detonation/landfill)
- Surficial Soil Consolidation
- Access Restrictions
- 5 Section Number

[1] Refuse from the Sanitary Landfills Medium Group will be consolidated

[2] Wastepile material will be dried prior to landfilling if paint filter test is failed

Prepared for:
Program Manager for
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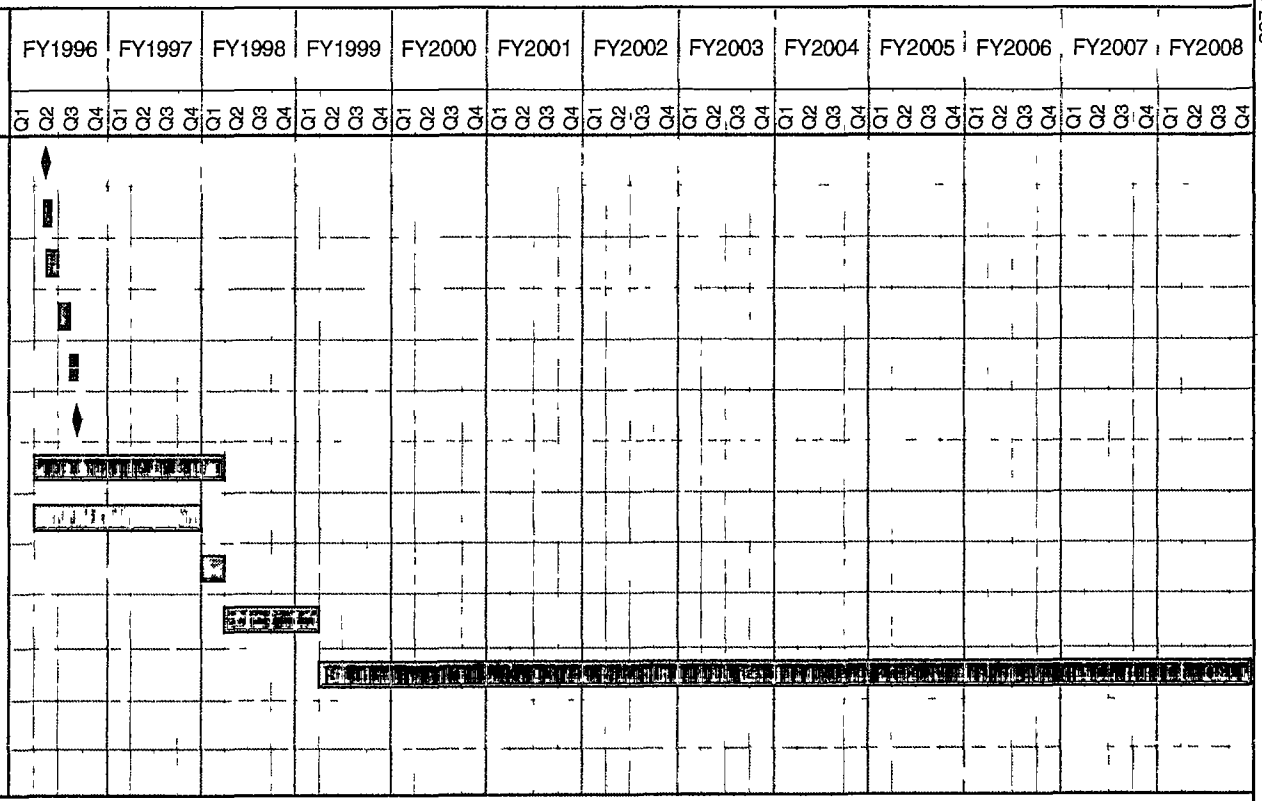
Prepared by: Tetra Tech EC Inc.

Figure 2

Proposed Corrrective Action Management Unit Areal Configuration
Rocky Mountain Arsenal

PROGRAM SCHEDULE

	Start	Finish
Proposed CDD To Parties	January 12 1996	
CDPHE Review	January 12, 1996	March 12 1996
30-Day Public Comment Period	March 16 1996	April 19 1996
30-Day Extension to Public Comment Period	April 20, 1996	May 20 1996
CDPHE Prepares Corrective Action Order	May 21 1996	June 11 1996
CDPHE Issues CDD Designating CAMU	June 11 1996	
Post Designation Submittals[1]	Q2 FY1996	Q1 FY1998
Design[1]	Q2 FY1996	Q4 FY1997
Procurement[1]	Q4 FY1997	Q1 FY1998
Construction[1]	Q1 FY1998	Q1 FY1999
Operation[1]	Q1 FY1999	Q4 FY2008
Closure Activities[2]		
Post-Closure Activities[3]		



CAMU Corrective Action Management Unit

CDD CAMU Designation Document

CDPHE Colorado Department Public Health and Environment

FY Fiscal Year

Q Quarter

1 This schedule is preliminary and subject to change due to uncertainties associated with implementation of the remedy

2 Closure of the CAMU includes the construction phase, certification phase, and post-closure care phase Based on Foster Wheeler's current schedule for remediation, final closure of the CAMU is anticipated to occur at the end of fiscal year 2008 The schedule for remediation is preliminary and subject to change due to uncertainties associated with the funding and implementation of the remedy

3 The Army will perform post-closure care of the landfill for 30 years after certification of final closure If appropriate, the Army may request that the post-closure care period be reduced CDPHE may extend the post-closure care period if it is found that the extended period is necessary to protect human health and the environment

Prepared for
Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by
Harding Lawson Associates

Figure 3

Schedule of CAMU Activities

Appendix A

PART 2 SITING CRITERIA COMPLIANCE DEMONSTRATION

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1.0 INTRODUCTION

This Part 2 Siting Criteria Compliance Demonstration has been prepared as an appendix to the Corrective Action Management Unit (CAMU) Designation Document (CDD) in support of the designation of a CAMU as part of the remedy for the cleanup of the Rocky Mountain Arsenal (RMA), located in Adams County, Colorado The CAMU will be designated by the Colorado Department of Public Health and Environment (CDPHE) in accordance with Section 264 552(a) of 6 Code of Colorado Regulations (CCR) 1007-3 under the authority granted to CDPHE by the Colorado Hazardous Waste Management Act (CHWMA) This designation will be part of a corrective action order issued under the authority of 25-15-308 C R.S The CDD and it appendixes are being submitted to CDPHE in conformance with Section 264 552(d) of 6 CCR 1007-3

This appendix has been prepared by Harding Lawson Associates (HLA) as a contract deliverable under Delivery Order 0007 (Task 93-03, Feasibility Study Soil Support Program) of Contract DAAA05-92-D0003 between HLA and the U S Department of the Army (Army) This appendix has been prepared at the direction of the Army for the sole use of the Army, the signatories of the Federal Facilities Agreement (FFA) of RMA, the State of Colorado (State), Adams County, and Tri-County Health Department, the only intended beneficiaries of this work.

1.1 CAMU Description

The Final Detailed Analysis of Alternatives Report Version 4 1 (DAA) (Foster Wheeler, 1995) proposes the construction of one or more onsite landfill cells for the disposal of contaminated materials The DAA is a document prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) The landfill cells will be located within a CAMU designated in accordance with the provisions of Section 264 552 of 6 Code of Colorado Regulations (CCR) 1007-3 The areal configuration of the CAMU is shown in Figure 2 of the CDD The portion of the CAMU that includes the landfill development area is 245 acres in size and is located in Sections 25 and 26 of RMA between Former Basin F and North Plants Double-lined cells within the landfill will receive principal threat and

human health exceedance materials, as defined in the DAA, from 17 contaminated areas of RMA. In addition, **a** triple-lined **cell** will be constructed to receive remediation waste from the closure of the Basin F Waste Pile and from **Former Basin F, Sand Creek Lateral soil and other compatible remedy related wastes identified in the RMA Remediation Waste Management Plan and the Compliance Order on Consent and amendments thereto.**

1.2 Document Objectives and Organization

6 CCR 1007-3, Section 264.552(a)(3) states that where remediation wastes placed into a CAMU are hazardous waste, the CAMU shall comply with Subparts B, C, D, and E of Part 265 and when such remediation wastes will remain in place after closure of the CAMU, the CAMU shall comply with the requirements for siting of hazardous waste disposal sites found in 6 CCR 1007-2, Part 2. This appendix to the CDD has been prepared to be responsive to those siting requirements. The appendix also addresses 6 CCR 1007-3, Section 265.18. Section 265.18 specifies general facility standards relative to siting.

The requirements are referenced in this appendix as they are addressed. Section 2.0 addresses those aspects of Part 2 that relate to siting and design, Section 3.0 addresses Part 2 Minimum Design Performance Criteria, and Section 4.0 addresses the 6 CCR 1007-3, Section 265.18(a) Installation Standards. Sections 5.0 and 6.0 are the acronyms used throughout the CDD and the bibliography of references used in this document, respectively.

2.0 SITING AND DESIGN (6 CCR 1007-2, PART 2, SECTION 2.5)

An analysis of compliance with Section 2 5 3 of Part 2 requirements for siting and design is presented first to establish that the design and siting of the landfill will provide a reasonable assurance that the waste will be isolated in the disposal site and away from natural environmental pathways that could expose the public for 1,000 years

2.1 Requirement for 1,000-Year Isolation from Natural Environmental Pathways (Section 2.5.3 of Part 2)

Section 2 5 3 of the Part 2 siting regulations requires that reasonable assurance be provided that hazardous wastes can be isolated within the designated disposal area of the site and away from natural environmental pathways that could expose the public for 1,000 years The regulations require such assurance be based on several considerations

The discussion of these considerations has been organized as follows

- The evaluation of waste isolation from usable aquifers is presented in Section 2 1 1 of this appendix This evaluation addresses Sections 2 5 3 (b), (c), and (f) of Part 2 These regulations require that this evaluation consider
  - A combination of planned engineered barriers and the geologic strata surrounding the site
  - The groundwater flow in the immediate area of the site and
  - The geochemical characteristics of the geologic strata at the site relative to the ability of the geologic strata to inhibit migration of waste constituents
- A discussion of the stability of the geomorphic conditions at the site is presented in Section 2 1 2 of this appendix This discussion addresses Section 2 5 3 (a) of Part 2
- A discussion of waste isolation from surface water is presented in Section 2 1 3 of this appendix This discussion addresses Section 2 5 3 (d) of Part 2
- An evaluation of the drainage and erosion considerations at the site is presented in Section 2 1 4 of this appendix This discussion addressed Section 2 5 3 (e) of Part 2

2.1.1 Evaluation of Waste Isolation from Useable Aquifers (Section 2.5.3 [b], [c], and [f] of Part 2)

This section evaluates the isolation of the waste relative to usable aquifers by first presenting the engineered barriers that will be included in the landfill design followed by a summary of the natural geologic conditions and groundwater flow conditions underlying the landfill site An analysis of the ability of these siting and design characteristics to isolate the waste from usable aquifers for at least 1,000 years is then presented

2.1.1.1 Engineered Barriers

The design of the landfill will include the following engineered barriers· the landfill cover, multiple liner systems, and leachate collection/leak detection systems The design parameters for these engineered barriers, which are pertinent to the analysis of the 1,000-year isolation, have been specified in Appendix B

2.1.1.2 Natural Geologic Conditions

The natural geologic strata underlying the landfill area consists of unconsolidated Quaternary alluvium and the Denver Formation The alluvium encountered in the landfill area generally consists of the following two types of material (1) clay and sandy clay and (2) sand, silty sand and clayey sand with occasional gravel

In general, the depth to weathered bedrock (Denver Formation) follows the surface topography in the landfill area and ranges from approximately 5 feet to 60 feet The areas where depth to bedrock is shallowest correspond with areas of high surface topographic elevation The Denver Formation generally consists of three strata (1) claystone with interbedded siltstone, lignite, and sandstone, (2) sandstone, and (3) lignite/lignitic claystone The alluvium is generally underlain by claystone, however, there are areas in the vicinity of the landfill siting area where Denver Formation channel sand units (sandstone) are in contact with the alluvium A cross section grid was constructed across the landfill area and is illustrated in Figure A1 Geologic cross sections are presented in Figures A2 through A14

Attachment A1 presents the boring logs used to supplement existing information to construct the geologic cross sections

The unsaturated zone beneath the landfill, through both adsorption and absorption, will mitigate further movement of waste constituents that may migrate from the landfill units To take advantage of the containment capabilities of the unsaturated zone, a minimum separation between the bottom of the landfill and the top of the underlying groundwater system has been specified in the landfill design parameters presented within Appendix B

2.1.1.3 Underlying Groundwater System

The upper two groundwater flow systems that underlie the proposed landfill location are the unconfined and the confined flow systems The unconfined flow system is the primary flow system of concern because it is the shallowest groundwater system encountered beneath the site The unconfined flow system occurs at depths ranging from 20 to 70 feet below ground surface (bgs) The groundwater flow direction in the unconfined flow system is generally to the northwest A groundwater surface contour map of the area is presented in Figure A15 The low permeabilities (approximately 0 075 ft/day) and moderate gradients of the unconfined flow system (approximately 0 03 ft/ft) indicate that the unconfined flow system has minimal groundwater flow (on the order of 4 feet per year assuming an effective porosity of 0 20)

2.1.1.4 Analysis of 1,000-Year Isolation

The analysis of the effectiveness of the landfill's engineered barriers and the underlying geologic conditions to isolate waste from useable aquifers for at least 1,000 years is discussed below The analysis includes the following steps

- Identification of a scenario for the potential release of waste constituents to the underlying groundwater system
- A discussion of a conceptual model for evaluating the impact of a potential release For purposes of the 1,000-year demonstration, the model addresses the following
  - Leachate generation

- Presence of the waste constituents of concern
- Transport analysis of waste constituents through the liner system
- Transport analysis of waste constituents through the unsaturated zone

• Summary and conclusions of the results of the analysis

Potential Release Mechanisms

For the 1,000-year isolation analysis, it has been assumed that the primary long-term release mechanism to groundwater is the potential for vertical transport of contaminated leachate through several engineered and natural geologic barriers The engineered barriers include multiple liner systems The natural geologic barriers include the underlying unsaturated (vadose) zone followed by the potential for migration through the saturation zone flow system to a point of public exposure

Conceptual Model for Assessing Potential Impact of a Release

In order to assess the 1,000-year isolation, a conceptual model of potential contaminant migration was developed A description of the conceptual model and its assumptions are summarized below

1 Before contaminant migration can occur, leachate must be generated and accumulate on the uppermost liner

2 The first barrier to contaminant migration is the uppermost composite liner system Migration begins when leachate collects on top of the uppermost liner system resulting in a hydraulic head on the liner During the active life and post-closure period, accumulated leachate (waste drainage) is removed until the waste moisture content is reduced to field capacity, thereby eliminating further drainage from the waste As discussed below, post-closure generation of leachate due to infiltration is minimized by the cover system Therefore, long-term hydraulic head is limited to isolated areas where leachate may be "trapped" in portions of the leachate collection/detection system due to clogging of the system

3 If a hydraulic head of leachate occurs, contaminants in the leachate could potentially migrate through the uppermost composite liner In this case, the migration would occur via molecular diffusion in the water phase and through specific defects (i e , pinholes) via advective movement of water Diffusion is movement at the molecular level Advective flow is the bulk movement of water If such movement occurs, contaminants will be subject to sorption onto clay materials thereby reducing the contaminant concentrations as leachate migrates through the layer In the case of triple-lined cells, the same process must repeat itself for the tertiary liner system

4 Only in the unlikely event that the above two steps have occurred does leachate begin to collect and impose a hydraulic head on top of the lowermost liner system

5 For purposes of this conceptual model, contaminants in the leachate are assumed to migrate through the lowermost composite liner via molecular diffusion in the water phase and via

advective movement of water through specific defects The lowermost composite liner in both the double- and triple-lined cells will consist of a flexible membrane liner (FML) underlain by a minimum 3-foot compacted clay layer (CCL) If such movement occurs, contaminants will also be subject to sorption onto the CCL component of the lowermost liner, thereby further reducing the contaminant concentrations

6 The unsaturated zone beneath the landfill cells acts as an additional barrier to the migration of contaminants to groundwater For purposes of this conceptual model, contaminants are assumed to enter the unsaturated zone and migrate via both molecular diffusion in the air phase and advective movement in the water phase Contaminants are subject to sorption onto soil material within the unsaturated zone Contaminants in the air phase are also subject to absorption or repartitioning back into the water and soil phases Contaminants are also subject to chemical and biological degradation in the soil environment

7 The underlying unconfined flow system (the saturated zone) represents the first potential natural environmental pathway that could expose the public For exposure to the public to occur, a contaminant must first migrate via this pathway to a potential receptor. However, potential exposure to a contaminant beyond a point where access to the unconfined system is controlled cannot occur until the contaminant has migrated beyond that point of control At a minimum, access to the unconfined system will not occur within the limits of the CAMU landfill boundary Conservatively, the time for contaminants to move through this pathway to the first conceivable point of exposure to the public is not included in the 1,000-year isolation analysis If contaminants enter the saturated zone, migration via advective water movement and both mechanical and molecular diffusion within the unconfined zone will occur Contaminants will be subject to dilution and degradation within the saturated zone and are subject to sorption onto saturated zone materials

This conceptual model is illustrated in Figure A16 Each component of this conceptual model has a time frame for contaminant migration associated with it If estimates of these time frames add up to more than 1,000 years, then it can be reasonably concluded that a combination of the landfill's engineered components and the natural geologic conditions will isolate the waste from the public in a manner that is protective of human health for 1,000 years In assessing these time frames, the liner systems are assumed to cumulatively include a minimum of 6 feet of compacted clay The analysis presented herein focuses only on the barriers to migration provided by the 6 feet of clay and the underlying unsaturated zone If it can be demonstrated that the time required for migration of contaminants through these two barriers is more than 1,000 years, then any additional components of the engineered barriers and the natural hydrogeologic conditions (migration through the saturated zone) serve to provide additional conservatism in the demonstrated 1 000-year isolation

Creation of Hydraulic Head

In order for a potential release to occur, leachate production has to be of sufficient quantity to impose a hydraulic head on top of the uppermost liner system During the active life, leachate production occurs due to drainage of precipitation through the waste profile It is assumed that this leachate will be removed through routine pumping of the leachate collection system (LCS)

After closure, continued leachate production can potentially occur as a result of these mechanisms (1) consolidation of the waste profile, (2) drainage of precipitation that entered the waste during the active life, and (3) infiltration through the cover

Waste consolidation could potentially generate leachate during the post closure period The waste processing, placement, and compaction procedures that will be employed in the landfill operation will preclude significant post closure consolidation of the waste and consolidation is expected to be substantially completed by the end of the post closure period Any leachate generated during the post closure period will be removed by routine pumping of the LCS

After closure, portions of the waste profile may be saturated from precipitation that occurred during the active life This leachate will continue to drain from the waste until the moisture content of the waste is reduced to field capacity At field capacity, the "suction" in the pore spaces will prevent further drainage It is assumed that drainage will reduce the waste moisture content to field capacity during the post closure period The leachate created by this drainage will be removed from the LCS during the post closure period Therefore, long-term (after post closure) production of leachate from continued waste drainage is not expected to occur

The cover system will be designed to control long-term infiltration using a variety of components that add redundancy to the system The design parameters that are important to the cover's performance relative to providing 1,000-years of isolation are presented in Appendix B Infiltration of precipitation

will be controlled by grading that facilitates runoff and a water balance system that promotes evapotranspiration (Drawing C8 of Appendix B) During normal precipitation events, water will runoff via surface flow and little infiltration will occur The scant infiltration that does occur generally reenters the atmosphere via evapotranspiration from the uppermost vegetation layer In general, it is only during extended precipitation, or extreme precipitation events that significant infiltration below the vegetation layer is expected to occur An extreme event may include multiple components, such as rainfall during or shortly after snowmelt has saturated the surface soil

The layer beneath the vegetation layer will consist of a fine-grained soil designed to provide water storage capacity that is sufficient to contain the infiltration that could occur during extreme or extended precipitation events The water storage layer is underlain by an aggregate layer (biota/drainage layer) that provides a capillary break These two layers together provide physical conditions that are favorable to storage of infiltration near the surface where it can be subsequently removed via evapotranspiration

The capillary break occurs because water in the fine-grained soil will be held by capillary (suction) forces in the small pore spaces of the soil Water held at suction within the fine-grained soil (at a lower hydraulic pressure) cannot flow into the larger pore spaces of the underlying coarse-grained layer (at a higher hydraulic pressure) because there is a net upward vertical hydraulic gradient between the two layers In order for water to overcome the upward vertical gradient and flow downward through the capillary break and onto the underlying composite barrier, infiltration must be sufficient to completely saturate the water storage layer However, when this occurs, the drainage layer immediately above the composite hydraulic barrier will drain away any water before it can accumulate on top of the composite hydraulic barrier, thus adding redundancy to the system The biota layer will be designed to stop burrowing animals from potentially impacting the composite hydraulic barrier (see Appendix B), therefore, the primary potential failure scenario for the cover system is failure of the water storage and drainage layers allowing buildup of hydraulic head on top of the composite hydraulic barrier

EPA's Hydrologic Evaluation of Landfill Performance (HELP) modeling methodology (EPA, 1994) was used to evaluate potential infiltration rates through the composite hydraulic barrier of the cover system, assuming a failure of the drainage layer The HELP model incorporates equations developed by Giroud and Bonaparte (1989) and Giroud and others (1992) that estimate both diffusive and advective flow of water through composite systems Diffusive flow is the movement of the water at the molecular level Advective flow (the bulk movement of the water) is assumed to occur primarily through holes in the FML, which occur both from manufacturing errors (FML pinholes in the HELP model) and from defects in construction

The composite hydraulic barrier will consist of a FML underlain by either a CCL or a geosynthetic clay layer (GCL) The equation used in the HELP methodology assumes that diffusive flow through the intact FML portion of the composite system can be estimated using a form of Darcy's Equation which incorporates an "equivalent hydraulic conductivity" (EPA, 1994) The "equivalent hydraulic conductivity" represents the potential for both liquid and vapor diffusion through the FML The amount of advective flow through holes in the FML is a function of the contact between the FML and the underlying low permeability portion of the composite (either CCL or GCL) system The equations utilized in the HELP methodology allow for the calculation of the advective flow through the composite hydraulic barrier, as discussed in Attachment A2

A spreadsheet model (described in Attachment A2) incorporating the HELP methodology was developed to calculate estimates of diffusive and advective flow through the composite barrier planned for the cover For this analysis, the composite barrier is assumed to employ an FML underlain by a GCL The estimates of flow were calculated assuming a hydraulic head of 1 5 feet As discussed above, hydraulic head buildup on the FML will occur only if both of the overlying water storage and drainage layers fail Failure in the drainage layer would most likely occur due to localized blockage of the drainage material and buildup of water behind the blockage When the water level exceeded the height of the blockage, drainage would resume Therefore, the height of the water buildup and subsequent hydraulic head on

the FML would be limited to the thickness of the drainage layer For purposes of this analysis, a maximum thickness of 1 5 feet was used

It was assumed that the FML in the cover was installed correctly (good construction), and thus included one pinhole per acre and three construction defects per acre (EPA, 1994) It was also assumed that excellent contact existed between the FML and clay component Excellent contact is the applicable assumption for a GCL per HELP model guidance (EPA, 1994) Table A1 presents the results of this analysis, which indicates that even at 1 5 feet of head buildup (due to long-term clogging of the biota/ drainage layer), only 0 001 inches/year of flow would be expected through the composite barrier

These results indicate that even if the water balance and drainage components of the cover system fail early in the 1,000-year period, little if any water will infiltrate through the composite hydraulic barrier in the cover Even if the 0 001 inch/year rate was applied for the entire 1,000-year period, a total of only 1 0 inch of water would have infiltrated through the cover The analysis of the cover's ability to prevent significant post-closure infiltration through the underlying waste profile is believed to be conservative because the mechanisms that mitigate post-closure infiltration into the waste profile work sequentially as follows

- As demonstrated in Appendix B of the CDD, the lack of subsidence, waste consolidation, and excessive erosion will allow for a positive grade throughout the 1,000-year analysis period The positive grade will promote surface-water runoff and minimize infiltration
- The water storage layer is natural material that allows for the retention and subsequent evapo-transportation of excessive infiltration The performance of the water storage layer would be most impacted by erosion that reduces the thickness of the layer Results of erosion loss calculations performed using the Revised Universal Soil Loss Equation (RUSLE) indicate that a design may be completed where approximately 30 inches of the upper soil layer will remain in place after 1,000 years
- The drainage layer provides for removal, by gravity, of water that infiltrates through the water storage area during extreme precipitation events This removal of infiltration will mitigate the build-up of hydraulic head on the underlying composite hydraulic barrier
- The composite hydraulic barrier significantly reduces the potential for hydraulic flow or infiltration into the underlying waste profile The life expectancy of the FML component has been estimated to be in excess of 800 years (Koerner, 1990)

The results of this analysis indicate that the cover will be protective for the 1,000-year period and that no significant leachate production will occur as a result of infiltration through the cover. On the basis of the above discussion, it can be reasonably assumed that there will be no long-term generation of leachate, and the only source of hydraulic head on the liner will be "remnants" of leachate that may remain in the leachate collection system. Identification of potential contaminants of concern in the leachate and analysis of the potential transport of these chemicals through the lowermost liner system and the unsaturated zone are discussed below.

Identification of Waste Constituents of Concern. Potential transport of chemical constituents is dependent on the type and amount of contaminants that may be in the landfill leachate. The waste placed in the triple-lined **cell** will consist of principal threat **and human health exceedance** soils from the Basin F Waste Pile and **Former Basin F, human health exceedance soils from Sand Creek Lateral, and other compatible remedy related wastes identified in the RMA Remediation Waste Management Plan and the Compliance Order on Consent and amendments thereto.** The waste placed in the double-liner cells will come from 17 other RMA locations. Basin F Waste Pile leachate data are likely to be reasonable representations of landfill leachate quality in the triple-lined cells. The existing Basin F Waste Pile leachate data is believed to be conservative because concentrations of volatile organic chemicals (VOCs) and semi-volatile organic chemicals (SVOCs) present in the Basin F Waste Pile should be reduced during excavation and drying of the material. Therefore, current Basin F Waste Pile leachate characterizations are used in the model.

Analytical data from analysis of the Basin F Waste Pile leachate (See Attachment A2) were reviewed versus constituents of concern in groundwater identified in the Detailed Analysis of Alternatives (DAA) (Table 2.2-3 for the North Boundary System, which is near the proposed landfill [Foster Wheeler, 1995]). Contaminants present at elevated levels in the leachate, which were identified as constituents of concern in the DAA, include aldrin, atrazine, arsenic, chloroform, chlorophenylmethyl sulfoxide (CPMSO), chlorophenylmethyl sulfone (CPMSOP), dibromochloropropane (DBCP), dieldrin, and diisopropylmethyl phosphonate (DIMP). The chemicals in the leachate that are basically nonvolatile (arsenic, atrazine) or highly sorptive (aldrin, dieldrin) were screened from the analysis because they are generally not mobile in the unsaturated zone. The remaining constituents (CPMSO, CPMSOZ, chloroform, DBCP, and DIMP)

were present in leachate at elevated concentrations relative to their preliminary remediation goals (PRGs) established within the DAA and are potentially mobile in the unsaturated zone Of these constituents, CPMSO2 was deleted from the evaluation because (1) it was present in lower concentrations than the CPMSO and (2) it is similar to CPMSO with respect to mobility in the unsaturated zone (similar Kds and Henry's constants [Attachment A2]) Therefore, the constituents present in Basin F leachate, which are of potential concern and are included in the transport analysis, are CPMSO, chloroform, DBCP, and DIMP

Contaminated soil from a variety of other RMA locations has been designated for disposal in double-lined landfill cells A review of soil information provided in the DAA indicates that elevated detections of potentially mobile constituents (VOCs and SVOCs) occurred primarily in soil to be placed in the landfill from in the South Plants Central Processing Area (chloroform, DBCP) and Chemical Sewer System (DBCP) (Foster Wheeler, 1995)

A review of soil data from the Rocky Mountain Arsenal Environmental Database (RMAED) was performed for the South Plants Central Processing Area These data indicate that for the upper 5 feet of soil (the soil to be excavated), less than 1 percent of samples had detections of chloroform and less than 3 percent of samples had detections of DBCP These detections are primarily from 1985, with a few detections of DBCP from 1987, with no detections of either compound after 1987 Therefore, it is unlikely that elevated concentrations of chloroform or DBCP will be present in leachate from the South Plants soils

As indicated previously, the Basin F Waste Pile leachate data is believed to be a reasonably conservative estimate of future landfill leachate characteristics The Basin F Waste Pile leachate data is also believed to be a reasonable characterization (particularly for volatile constituents) of future leachate from the South Plants soils for the following reasons

1 Samples from the upper 5 feet of soil in the South Plants Central Processing Area had only a small percentage of detections of VOCs

2 The South Plant soils will undergo excavation, transport and placement that will reduce the concentration in the soils of volatile constituents, such as chloroform The Basin F Waste Pile soils underwent similar handling

3 The concentrations within the leachate will be reduced with time during the active life and post-closure period of the landfill The leachate generated during this period will be removed The leachate remaining after the post-closure period would be expected to exhibit lower concentrations A similar process has occurred in the Basin F Waste Pile

Analysis of Transport Through the Liner System As discussed above, the potential for long-term generation of leachate and corresponding hydraulic head on the liner system will be mitigated by collection of leachate that drains from the waste during the active life and post-closure period of the landfill In addition, the cover system will be designed to effectively eliminate significant additional leachate production that would occur as a result of infiltration through the cover Therefore, the reasonable assumption for a source of hydraulic head on the liner system would be "remnants" of leachate remaining in the waste and/or the leachate collection system after the post-closure period This leachate has the potential to pool in certain areas, possibly as a result of clogging of the leachate collection system or due to differential settlement As discussed above for the cover system, hydraulic head on the liner would generally be limited to the thickness of the drainage layer because of the blockage of the layer (greater head buildup would flow over the blockage and disperse in the leachate collection system) For purposes of this analysis it is assumed that the hydraulic head will be less than 1 foot Except for the sump areas, 1 foot is consistent with the maximum thickness of the leachate collection system contemplated by the design parameters presented in Appendix B The sumps may have a depth greater than 1 foot, however, they represent only a small percentage of the base area, and can be dewatered to less than 1 foot of leachate

There are two primary mechanisms for potential contaminant migration through the liner systems, diffusive transport and advective transport In the liner system, diffusion is caused by random movement of molecules within either the air or water phase in response to concentration gradients (i e , molecules tend to move from areas of high concentration to areas of low concentration) Dispersion due to advective mixing is not considered because of the low rates of advective water movement

Advective transport of contaminants occurs due to the physical or bulk movement of water through the liner As previously described, potential advective movement of water (and thus advective chemical migration) through the composite liner occurs primarily through pinholes or defects in the FML, while diffusion of water (and thus chemicals) is assumed to occur across the entire FML

Contaminants in the landfill can exist in the air phase, liquid phase (i e , in solution), or contaminants may be sorbed onto solid particles The amount of chemical mass in any of these phases is a function of the physical properties of the chemical (Henry's constant, solubility, etc) and the properties of the waste or the liner material (organic carbon content, moisture content, etc) It is assumed that the liner material will be generally saturated after landfill construction (EPA, 1994), therefore, migration of contaminants through the liner systems occurs generally in the water phase Migration through the liner system will be subject to potential sorption onto clay liner materials

It is assumed that vertical migration through the liner systems is the primary pathway for contaminants to reach groundwater Potential horizontal migration (through the sideslopes) would result in longer pathways and require longer time frames Contaminants migrate through the liner system via molecular diffusion in the liquid phase (in solution) and advective water movement

Analysis of Advective Transport. The maximum rate of advective water movement through the liner was evaluated using the HELP model methodology as described in Attachment A2 To achieve a maximum estimate of the advective flow rate, the analysis was performed for only the lowermost liner system, assuming only 3 feet of CCL It has been assumed that the liner will be installed with good construction practices, resulting in one pinhole and three defects per acre (EPA, 1994) Contact between the compacted clay and the FML has conservatively been assumed to be "poor" in HELP model terminology, which is defined as a geomembrane installed with a certain number of wrinkles on a poorly compacted, low permeability surface that does not appear smooth (EPA, 1994) Actual construction practice is expected to result in "good" contact Good contact is defined as a geomembrane installed with

as few wrinkles as possible and low permeability soil with a smooth surface (EPA, 1994) Table A2 presents the results of this analysis, indicating that 1 foot of hydraulic head on the lower most liner system would potentially result in a total of 0 007 inches/year of advective water flow through the lower most composite liner, assuming poor contact

At this low rate, virtually no mass of contaminant would move advectively through the minimum 3-foot compacted clay component of the lower liner within a 1,000-year period (it would take 5,143 years for water to move through 36 inches of clay at 0 007 inches/year) Therefore, diffusion of a contaminant in the liquid phase is assumed to be the dominant transport process within the liner systems Analysis of diffusive transport is discussed below

Analysis of Diffusive Transport. Diffusive migration can be described by solutions to the advective/ dispersive equation A solution was developed by Ogata and Banks (1961) and was applied using the approach described in Attachment 2 This Ogata and Banks analysis was used to estimate a ratio of the concentration (in water) of the constituent at the base of the lowermost liner and (C_L) to Co, the initial concentration of that chemical in the leachate above the liner Because the aqueous diffusive properties of the chemicals of concern are similar, a single analysis was performed using a representative diffusion coefficient (5×10^{-6} cm^2/sec) The analysis ignored any contribution that the FML components of the liner system may have on retarding diffusive transport and only considered the compacted clay component of the liner system For purposes of the model, the cumulative thickness of the CCL component of the liner system was assumed to be six feet Results of this analysis are presented in Figure A17 The analysis also assumes that the presence of leachate will provide a continuous source of contamination for the entire 1,000-year period at a constant concentration This assumption is conservative because organic chemicals are subject to biodegradation For example, published half-life for both chloroform and DBCP are in the range of 6 months to 1 year under aerobic conditions (Geraghty and Miller, 1986) Although conditions within the landfill are likely to be anaerobic over the long term, biodegradation of these constituents will still occur (Kobayashi, H , and Rittman, B.E , 1982)

As shown in Figure A17, the concentration at the bottom of the liner system versus the initial concentration in the leachate (Cl/Co) slowly increases over the 1,000-year period This analysis provided input concentrations for simulating potential contaminant migration through the unsaturated zone

Potential Contaminant Migration Through the Unsaturated Zone. The mechanisms controlling migration of contaminants through the unsaturated zone beneath the landfill include advective movement of water and thus contaminant mass, diffusion of contaminant mass primarily in the vapor phase, and adsorption of contaminant mass onto soil particles and reabsorption back into the liquid phase The Ogata-Banks solution was used in the evaluation of molecular diffusion through the liner because chemical migration was assumed to occur in a single phase (water) Because migration in the unsaturated zone is subject to mechanisms that affect more than one phase (vapor phase diffusion, water phase advective movement, solid phase sorption), a multiphase chemical transport model is more appropriate for the unsaturated zone evaluation Accordingly, EPA's VLEACH model (EPA, 1995) was chosen to evaluate potential contaminant migration in the unsaturated zone because it was designed to simulate these mechanisms VLEACH is a one-dimensional finite difference solution designed to simulate the migration of volatile contaminant through the unsaturated zone The model simulates four processes, liquid-phase advection, vapor phase diffusion, solid phase sorption, and three phase equilibrium

The VLEACH model has been thoroughly reviewed by EPA, and has been verified in a wide variety of applications For example, VLEACH was used to evaluate the potential for VOCs in the unsaturated zone to impact groundwater quality at the Phoenix-Goodyear Airport Superfund site in Arizona In the Arizona study, results of VLEACH calculations were compared to other methods including analytical solutions for unsaturated zone transport and a finite-difference simulation of a field study conducted by the United States Geological Survey (USGS) for a site near Lubbock, Texas (Rosenbloom, et at , 1993) Results were also compared to in situ soil gas samples These comparisons indicate that VLEACH simulations of liquid-phase advection and equilibrium adsorption, and diffusive transport of VOCs within the unsaturated zone produced results consistent with both in situ soil gas samples and other modeling

methodologies The VLEACH model has also been verified against an analytical solution developed by Shan and Stephens (1995) While these applications are not exactly analogous to this study, they do show that the model is an appropriate tool for estimating vadose zone contaminant transport

The VLEACH model is based on the following assumptions (EPA, 1995)

- Contaminant partitioning between phases follows linear relationships
- The three phases present are in equilibrium in each model cell
- The moisture content profile within the unsaturated zone is constant and in steady state with respect to water
- The contaminant is not subject to in situ production or degradation
- The unsaturated soil is homogeneous and behaves as a uniform porous media

Prior to performing VLEACH modeling, the potential for migration of contaminant mass due to advective movement of water was evaluated Conceptually, after the landfill has been constructed, the unsaturated zone underneath the landfill footprint will be isolated from the surface environment and will not be subject to infiltration events An analysis based on Clapp and Hornberger (1978), was used to estimate the long-term moisture content (see Attachment A2)

The rate of advective water movement through the unsaturated zone after the landfill has been constructed was used to identify a range of leakage rates from the liner that could result in advective water movement through 20 feet of vadose zone material in 1,000 years Assumptions used in this approach include

- Total Porosity (θ_s) = 0 40, from HELP model value cited for a silty clay loam (EPA, 1994)
- Vertical Saturated Hydraulic Conductivity (k_s) estimates range from 0 0022 ft/day to 0 70 ft/day, based on a preliminary assessment of slug testing in the saturated portions of the unconfined Denver groundwater flow system (see Attachment A3) The lower limit (0 0022 ft/day) is the geometric mean value for slug testing in clay materials assuming a 10 1 horizontal to vertical anisotropy, while the upper limit is the geometric mean value from slug tests in sand materials, also assuming a 10 1 horizontal to vertical anisotropy The geometric mean value from all the tests was 0 022 ft/day, assuming a 10 1 anisotropy (The final assessment of the slug tests

actually resulted in a lower geometric mean of 0 03 ft/day The modeling conservatively used the higher preliminary value)

- Clapp and Hornberger (1978) soil constant (b) ranges from 5 to 10 5, with a mean of 7 75 for a silty clay loam

This analysis (See Attachment A2 for calculation methodology) indicates that if potential leakage from the lowermost liner is less than approximately 0 04 inches per year, advective water movement will take longer than 1,000 years to migrate through 20 feet of unsaturated zone materials As previously stated, the predicted long-term potential advective flow rate through the lowermost liner is 0 007 inches per year, conservatively assuming poor liner contact Therefore, the potential for chemical transport due to advective water movement is expected to be minimal and would not be a component of potential migration to the groundwater within 1,000 years

The above results indicate that diffusion in the vapor phase and adsorption onto soil particles will be the dominant transport processes in the unsaturated zone beneath the landfill Chemical parameters required to describe these processes include Henry's Constant, which describes a chemical's volatility, the soil-water distribution coefficient (Kd), which describes the soil's sorptive capacity for the chemical, and the free-air diffusion coefficient, which describes a chemical's ability to diffuse in the air phase Soil parameters that impact these processes include total porosity, moisture content, and organic carbon content

Table A3 presents the chemical parameters and Table A4 presents a summary of physical parameters used in the VLEACH simulations The VLEACH evaluation consisted of simulating potential contaminant transport through 20 feet of unsaturated zone for the four chemicals of concern for 1,000 years The model was discretized into 1,000 segments of 0 02 feet each, with a constant input of water at 0 007 inches per year at the top the unsaturated zone The 0 007 inches per year is the predicted potential rate of leakage from the lowermost liner This leakage from the lower liner and into the unsaturated zone was assumed to have a constant average concentration, as discussed below The initial concentration of the chemical constituents modeled was assumed to be zero throughout the soil profile

Chemical mass in the vapor phase was restricted from exiting the model via the upper boundary (i e , vapor transport was constrained to be vertically downward)

Concentration inputs for the VLEACH simulations were based on the Cl/Co ratios predicted for the constituents at the base of the lowermost liner An average input Cl/Co ratio was calculated for 10-year increments for the constituents (Figure A17) VLEACH simulations were thus performed in 10-year increments, with the final concentration profile from one run providing the initial conditions for the subsequent run This technique included the predicted steady increase in concentration (Cl/Co curves) at the top of the unsaturated zone (the base of the lowermost liner) The 10-year increments were based on a sensitivity analysis of several different time increments The VLEACH simulations predicted a ratio of chemical constituent concentrations, Cv/Co, where Cv is the potential constituent concentration (in water) at the bottom of the unsaturated zone and Co is the chemical concentration in the leachate above the lowermost liner

Results of the model simulations are presented in Table A4 Using the PRG value for the chemical and the Cv/Co ratio, a prediction of a threshold concentration was estimated for each constituent The threshold concentration for each constituent represents a concentration in the leachate that would be necessary to result in the occurrence of predicted concentrations at the top of the saturated zone above the PRG for that constituent in 1,000 years or less

Table A4 also presents the range of concentrations of the chemicals of concern that may be present in the future landfill leachate, as evidenced by concentrations measured in Basin F Waste Pile leachate As discussed above, the Basin F Waste Pile leachate data are believed to be the most representative of leachate from all waste sources Also included in the table is the threshold concentrations (discussed above) for each chemical from the VLEACH modeling As shown on the table, the range of potential leachate concentrations for all chemicals are lower than the predicted threshold concentrations Given the degree of conservatism used in the analysis, the comparison of the expected landfill leachate

concentrations with the threshold concentrations predicted by the model are believed to be conservative and provide a reasonable assurance that the concentrations at the top of the saturated zone will not exceed the PRGs for the constituents modeled

Summary of Modeling Results The analytical results of the modeling is summarized below

- Maximum predicted long-term infiltration through the cover — 0 001 in/yr
- Maximum predicted long-term rate of advective water movement through the lowermost liner system with only 3 feet clay — 0 007 in/yr
- Rate of advective water movement through the lowermost liner that would be required to migrate through the unsaturated zone in 1,000 years — 0 04 in/yr
- Threshold concentration of consituents of concern in leachate that must be exceeded to result in potential concentrations, in water, at the top of the saturated zone that would exceed the PRG for that constituent within 1,000 years
  - Chloroform 108,000 µg/l
  - DIMP 1,797,000 µg/l
  - DBCP 1,500 µg/l
  - CPSMO 591,000 µg/l
- The reasonable assumptions for future landfill leachate concentrations based on Basin F Waste Pile data are as follows
  - Chloroform 21 to 610 µg/l
  - DIMP 740 to 1,300 µg/l
  - DBCP 2 to 3 µg/l
  - CPSMO 10,000 to 19,000 µg/l

Conclusions of the 1,000-Year Isolation Analysis The analyses presented above provides reasonable assurance that the landfill can be designed to isolate the waste from public exposure in a manner that is protective of human health for at least 1,000 years after the post-closure period This conclusion is based on the following

- The landfill cover will be designed to restrict infiltration and remain in place for the 1,000-year period, thus no significant leachate production will occur as a result of post-closure infiltration through the cover

- A composite liner system with an FML and 3-foot clay layer with 1 foot of hydraulic head is estimated to transmit water at a rate of 0 007 inches/year (Table A2) It is estimated that a rate of 0 04 inches/year or higher is required for water to move through 20 feet of underlying unsaturated geologic strata in 1,000 years This analysis of advective water movement is based on a conservative assumption that all the geologic strata underlying the landfill area have permeabilities associated with silty sand Much of the strata are clay and claystone units that have permeabilities in the order of four orders of magnitude lower than that used in the analysis This analysis also conservatively assumes poor contact between the FML and clay The anticipated landfill design will result in good contact

- Concentrations of chemical constituents will be reduced if they migrate through the clay layer component of the liner systems This analysis also makes the conservative assumption that the leachate concentrations for the waste constituents above the liner will remain constant throughout the 1,000 years Natural biodegradation of these chemicals will result in a reduction in the leachate concentrations over time The analysis does not take this reduction in concentrations into account

- The analyses of contaminant transport only addresses a cumulative 6 feet of the compacted clay component of the liner system and does not include time frame estimates for migration through any other component of the liner systems, thus adding additional assurance to the analysis

- The analysis of potential contaminant transport within the unsaturated zone indicates that, after 1,000 years, the expected concentration (within the leachate) for each of the most mobile chemicals of concern is significantly below the concentration that would be necessary to result in a concentration at the water table in excess of the chemical's PRG The PRG has been defined within the DAA as a concentration that is protective of human health The analysis is conservative in that it only addresses potential vertical transport immediately beneath the landfill where there is not even a potential for exposure of the public Further reduction of the chemical concentrations would occur during transport via the groundwater pathway to a point where potential exposure could actually occur

- The above analysis indicates that the time for impact via the "natural exposure pathway" represented by groundwater which would potentially expose the public is greater than 1,000 years This assessment did not consider the time for migration through all of the components of the contemplated landfill design and site characteristics that serve to isolate the waste within the CAMU disposal area. If these additional components were considered, then isolation of the waste would be reasonably assured for a period that is substantially in excess of the 1,000-year requirement

2.1.2 Evaluation of Geomorphic Conditions (Section 2.5.3 (a) of Part 2)

The proposed location for the landfill is in the western half of Section 25 and a small portion of Section 26 Figure A18 presents a topographic elevation contour map of the area The ground surface topography in the vicinity ranges in elevation from 5,225 feet above mean sea level (MSL) to 5,280 feet above MSL The area topography consists of gently rolling hills and treeless plains Overall, the area

slopes toward the northwest Geomorphic conditions are not expected to change to the extent that the landfill design would be impacted over the 1,000-year analysis period The onsite soil conditions in regard to geologic and geomorphic conditions are discussed in more detail in Appendix R

2.1.3 Protection of Surface Water (Section 2.5.3(d) of Part 2)

As shown in the 100-year floodplain map of RMA (Figure A19), there are no major drainage channels across the landfill area First Creek is a well-defined channel crossing RMA to the east of the landfill area The landfill will be designed to contain and control runoff that may come in contact with contaminated materials (Appendix B) Therefore, there is reasonable assurance that the waste disposal locations will not impact nor be impacted by surface water Section 2 5 3(d) addresses the protection of surface water relative to the demonstration of 1,000 years of isolation. Protection of surface water during operations is addressed in Appendixes B and C of the CDD

2.1.4 Evaluation of Drainage and Erosion (Section 2.5.3 (e) of Part 2)

The terrain in the landfill area can accommodate drainage ditches and other drainage facilities to allow for conveyance of precipitation away from the disposal area The cover components and configuration (Appendix B) will minimize water and wind erosion by maintaining good vegetative cover, an acceptable slope, and armoring the top of the cover with a soil/gravel admixture Based on the cover design parameters presented in Appendix B, the potential for wind and water erosion was estimated Wind erosion was calculated using the wind erosion equation from the U S Soil Conservation Service (National Agronomy Manual, 1988) The calculated soil loss attributable to wind erosion is 0 003 inches per year, or approximately 3 inches of soil loss to wind erosion over 1,000 years (wind erosion calculation is presented in Attachment A2) Water erosion was calculated using the Revised Universal U S Soil Conservation Society Soil Loss Equation (RUSLE), Version 1 04 (1995) to evaluate the total depth of soil loss over a 1,000-year period of the cover system (water erosion calculations are presented in Attachment A2) The RUSLE analyses indicates that a cover can be designed to restrict the maximum soil loss to approximately 15 5 inches over 1,000 years based on landfill layout design parameters presented in Appendix B thus, reasonably demonstrating that the terrain of the site will accommodate a

cover that can be installed with a vegetative/water balance layer that will remain functional for 1,000 years

2.2 Liner Design (Section 2.5.4 of Part 2)

The landfill design (Appendix B) will include multiple liner systems Section 2 5 4 of Part 2 requires that, if necessary, the design of a hazardous waste disposal site shall include a liner, the performance of which will comply with Sections 2 4 1, 2 4 2, 2 4 3, and 2 4 5 of Part 2 These sections of Part 2 specify long-term performance standards for preventing adverse impacts on human health and the environment Part 2 defines long-term as that period of time after completion of postclosure activities

Section 2 1 1 of this appendix demonstrates that a combination of the landfill's engineered liner systems and the underlying natural geologic conditions will provide for long-term protection. Appendix B to the CDD specifies design performance standards that will provide for liner systems that are equivalent or better than the liner system that was the basis of the demonstration presented in Section 2 1 1 Therefore, the liner systems contemplated by the Appendix B design standard will comply with 6 CCR 1007-2 Part 2, Sections 2 4 1, 2 4 2, 2 4 3, and 2 4 5

2.3 Leachate and Runoff Control System (Section 2.5.5 of Part 2)

The landfill design parameters presented in Appendix B will provide for leachate and runoff control systems that will provide compliance with the minimum design performance criteria specified in 6 CCR 1007-2 Part 2, Section 2 4 The runoff control system will be designed considering the climate of the area including precipitation events The volume and characteristics of the leachate and runoff will also be considered in the management of any leachate or runoff that is collected at the facility

Leachate collected from the landfill leachate collection and leak detection systems will be managed in accordance in accordance with applicable regulations at either an onsite treatment facility or transported to an appropriately permitted offsite facility

2.4 Prevention of Adverse Impacts from Unexpected Discharges (Section 2.5.6 of Part 2)

The location of the landfill will be at least 1 mile from the RMA fenced boundary This 1-mile distance from potential public exposure combined with the 24-hour-day RMA security force and fire department provide an acceptable means to prevent adverse effects on the public health should unexpected discharges of hazardous waste occur A Contingency Plan (See outline in Appendix Q) specific to the landfill will be developed and submitted to CDPHE for review and approval After approval, the contingency plan will be appended to the RMA Contingency Plan to provide the specific procedures to be implemented in the event of an unexpected release The submission to CDPHE of the contingency plan will be in accordance with the schedule discussed in Section 5 of the CDD

2.5 Section 2.5.2 of Part 2, Operational Considerations

Subparts B, C, D, and E of Part 265 of 6 CCR 1007-3 and 264 552(e)(2) of 6 CCR 1007-3 address operational requirements for a CAMU Compliance with these regulations is discussed within Appendix C of the CDD The design and design performance issues addressed by Section 2 5 2 of Part 2 are also addressed within Subparts B, C, D, and E, of 265 and 264 552(e)(2) and therefore, the Section 2 5 2 operational considerations are addressed within the following appendixes of the CDD

Appendix C Guidelines for the Development of an Operations Narrative

Appendix E Security Plan Outline

Appendix H Construction Quality Assurance Plan Outline

Appendix Q Contingency Plan Outline

3.0 MINIMUM DESIGN PERFORMANCE CRITERIA (6 CCR 1007-2, PART 2, SECTION 2.4)

Compliance with the regulatory requirements for minimum design performance criteria for onsite hazardous waste landfills (Section 2 4 of Part 2) is reviewed in this section Section 2 4 1 of Part 2 indicates that the purpose or objective of the Section 2 4 design performance standards is to ensure that landfills will be located and designed in a manner that will assure long-term protection of human health and the environment. Long-term is defined within Part 2 as being that period of time after completion of postclosure activities

3.1 Protection of Groundwater (Section 2.4.2 of Part 2)

The analysis concluding that a landfill design can be implemented whereby waste placed in the proposed landfill will be isolated from groundwater pathways that could potentially expose the public for 1,000 years (Section 2 1 of this Appendix) also demonstrates that the contemplated landfill design and site characteristics will prevent adverse effects on groundwater quality The design parameters presented in Appendix B incorporates the considerations listed in Section 2 4 2 of Part 2 to satisfy the requirement of Section 2 4 2 that the long-term design performance of the liner systems will be such that adverse effects on groundwater quality will be prevented

3.2 Protection of Surface Water (Section 2.4.3 of Part 2)

The analysis concluding that a design can be implemented whereby waste placed in the proposed landfill will be isolated from the public and the environment for 1,000 years (Section 2 1 of this Appendix) also demonstrates that long-term prevention of adverse effects on surface water quality can be achieved The design parameters presented in Appendix B consider the requirements listed in Section 2 4 3 of Part 2 to satisfy the provision that the long-term performance of the landfill facility will prevent adverse effects on surface water quality

3.3 Protection of Air Quality (Section 2.4.4 of Part 2)

This regulation requires that the CAMU landfill units be designed to prevent post-closure adverse effects on air quality Considerations of air quality during operations are addressed within Appendix C of the

CDD It has been demonstrated that a landfill cover can be designed that will remain in place for a minimum of 1,000 years and, therefore, potential air exposure pathways will be significantly limited

In addition, evaluation of existing air quality data, including the Basin F Waste Pile vent system (Ebasco, October, 1994) indicates that the waste pile has not adversely impacted air quality The Basin F waste pile vent system is a passive system that operates in a similar fashion to the passive vent system that is being considered as part of the design of the CAMU landfill Therefore, based on the vent system similarity, waste similarity, and performance of the Basin F pile vent system, it can be concluded that remediation waste left in place after closure of the CAMU will not adversely effect air quality

3.4 Protection of Public Health and the Environment (Section 2.4.5 of Part 2)

Section 2 4 5 of Part 2 requires that the disposal site be designed to prevent long-term adverse effects on public health and the environment due to migration of waste constituents in the surface and subsurface environment Long-term is defined within Part 2 as that period of time after the completion of post-closure As more fully discussed within Section 2 1 of this appendix, the most likely pathway for potential long-term exposure is potential migration through the underlying groundwater The discussions within Section 2 1 fully address this potential pathway and demonstrate that the disposal site can be designed in a manner that isolates the waste from the public and the environment for 1,000 years Therefore, the demonstration of 1,000-year isolation also demonstrates that the performance standard of Section 2 4 5 of Part 2 can also be met

3.5 Protection of the Function and Physical Integrity of Liners (Section 2.4.6 of Part 2)

The landfill design parameters presented in Appendix B address the protection of the function and physical integrity of the landfill liner system

3.6 Leachate and Runoff Control System Capacity (Section 2.4.7 of Part 2)

The design parameters presented in Appendix B provide for landfill leachate and runoff control systems that have sufficient capacity to remove generated leachate to the extent necessary to minimize the

buildup of head on the landfill liner systems It has been reasonably demonstrated (See Section 2 1 of this appendix) that a design can be implemented such that leachate generation during the post-closure period will be minimal and any leachate remaining in the system will be isolated from potential environmental pathways that could expose the public for at least 1,000 years

3.7 Protection During Closure and Post-Closure (Section 2.4.8 of Part 2)

The design parameters (Appendix B), demonstration of 1,000-year isolation (Section 2 1 1 Appendix A), and the final Closure Plan (which will be submitted for CDPHE review and approval) will provide reasonable assurance of long-term compliance with the requirements of Section 2 4 8 of Part 2 Guidelines for development of the final closure plan are presented in Appendix L to the CDD The final plan will be submitted to CDPHE for review and approval in accordance with the schedule discussed in Section 5 of the CDD

3.8 Surface and Groundwater Monitoring (Section 2.4.9 of Part 2)

The design of the landfill will include a system for monitoring groundwater that will be developed in accordance with the guidelines for the Groundwater Monitoring Program presented in Appendix K of the CDD The landfill will be designed to prevent runoff water from contacting the waste, therefore the design performance of preventing adverse effects to surface water will be accomplished Monitoring for performance of the surface-water control system will be provided for in the CAMU Inspection Plan (outlined in Appendix G) The Groundwater Monitoring Program and CAMU Inspection Plan will be submitted to CDPHE for review and approval in accordance with the schedule discussed in Section 5 0 of the CDD

3.9 Construction Quality Assurance/Quality Control (Section 2.4.10 of Part 2)

Quality control of materials in construction of the landfill will be in accordance with the Construction Quality Assurance Plan (CQAP) (outline presented in Appendix H) Construction of the landfill will follow the CQA procedures presented in the CQAP The CQAP will include applicable requirements for supervision during construction and certification by a professional geologist or professional engineer to demonstrate that the facility is constructed in accordance with the design as approved The CQAP will

be submitted to CDPHE for review and approval in accordance with the schedule discussed in Section 5 of the CDD

4.0 INSTALLATION STANDARDS (6 CCR 1007-3 SECTION 265.18)

This section reviews compliance of the CAMU with the general facility installation standards of 6 CCR 1007-3 Section 265 18 The installation standards address general siting requirements for facilities that treat, store, or dispose of hazardous waste These requirements are applicable to the CAMU in accordance with 6 CCR 1007-3 Section 264 552(a)(3)

4.1 Seismic Considerations (Section 265.18 [a])

Section 265 18 (a) states that hazardous waste facilities may not be located within 1,000 feet of a fault that has had displacement in Holocene time (i e , the last 10,000 years) The geology of the proposed site has been reviewed in the Landfill Feasibility Study (FS) and no evidence of faulting during the Holocene Epoch has been established at RMA (HLA, 1995d)

4.2 Floodplains (Section 265.18 [b])

This regulation states that new landfills must be located outside the 100-year floodplain, which is defined as any area subject to a 1 percent or greater chance of flooding in any given year from any source The U S Army Corps of Engineers (COE) produced a 100-year floodplain map of the RMA area (COE, 1983) which is shown in Figure A22 The proposed CAMU landfill development area is outside this 100-year floodplain.

4.3 Salt Dome Formations (Section 265.18 [c])

The placement of any noncontainerized or bulk liquid hazardous waste in any salt dome formation, salt bed formation, underground mine, or cave is prohibited according to this regulation No known salt formations, underground mines, or caves exist at RMA In addition, liquids will not be placed into the CAMU disposal area

4.4 Surface Water and Groundwater (Section 265.18 [d])

This regulation states that hazardous waste disposal facilities shall not place wastes directly under or into surface water or groundwater that has a potential or existing beneficial use or that is in direct communication with an aquifer The landfill design parameters presented in Appendix B require that the

landfill be designed such that the base of the landfill cells will be a minimum of 20 feet above groundwater

5.0 ACRONYMS

ARDL	Applied Research and Development Laboratories
Army	U S Department of the Army
BDL	Below detection limit
bgs	Below ground surface
CAMU	Corrective Action Management Unit
CCR	Code of Colorado Regulations
CDD	CAMU Designation Document
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CCL	Compacted clay layer
C1/C0	Ratio of the concentration of constituent in water at the base of the lowermost liner (C1) to the initial concentration of chemical in leachate above the liner (C0)
CHWMA	Colorado Hazardous Waste Management Act
cm/s	Centimeters per second
COE	U S Army Corps of Engineers
COR	Contracting Officer's Representative
CPMSO	Chlorophenylmethyl sulfoxide
$CPMSO_2$	Chlorophenylmethyl sulfone
CQA	Construction quality assurance
CRS	Colorado Revised Statute
CVAA	Cold vapor atomic adsorption
DAA	Final Detailed Analysis of Alternatives
DBCP	Dibromochloropropane
DIMP	Diisopropylmethyl phosphonate
DMMP	Dimethyl methyl phosphate

EA	Endangerment assessment
Ebasco	Ebasco Services, Inc
ECD	Electron capture detector
EPA	U S Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc
FID	Flame ionization detector
FFA	Federal Facilities Agreement
FML	Flexible membrane liner
FPD	Flame photometric detector
FS	Feasibility study
g	Gram
GC	Gas chromatography
GCL	Geosynthetic clay liner
GC/MS	Gas chromatography/mass spectrometry
GFAA	Graphite furnace atomic adsorption
GMP	Groundwater Monitoring Program
HELP	Hydraulic Evaluation of Landfill Performance
HLA	Harding Lawson Associates
HDPE	High density polyethylene
HPLC	High pressure liquid chromatography
ICP	Inductively coupled plasma spectrophotometry
in/yr	Inches per year
IRA	Interim response action
K	Hydraulic conductivity
Kd	Soil/water partitioning coefficient for compounds in the environment
LCS	Leachate collection system
ml	Milliliter

mil	One-thousandth of an inch
MKE	Morrison-Knudsen Environmental Services, Inc (formerly Morrison-Knudsen Engineers, Inc)
MSL	Mean sea level
NA	Not applicable
NPD	Nitrogen phosphorous detector
PID	Photoionization detector
PCB	Polychlorinated biphenyl
PMRMA	Program Manager for Rocky Mountain Arsenal
PRG	Preliminary remediation goal
RI	Remedial investigation
RMA	Rocky Mountain Arsenal
ROD	Record of Decision
RUSLE	Revised Universal Soil Loss Equation
SCS	Soil Conservation Service
State	State of Colorado
SVE	Soil vapor extraction
SVOC	Semivolatile organic compound
µg/l	Micrograms per liter
USC	United States Code
USCS	Unified Soil Classification System
USFWS	U S Fish and Wildlife Service
USGS	U S Geological Survey
UXO	Unexploded ordnance
VOC	Volatile organic compound
Walsh	J P Walsh and Associates, Inc

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Table A1: Estimates of Potential Advective Water Movement through a Composite System - Landfill Cover Analysis

Geosynthetic Clay Liner	
Thickness of FML (inches) =	0 06
Thickness of Soil Barrier (inches) =	0 25
Saturated K of FML (cm/s) =	2 30E-13
Saturated K of FML (in/day) =	7 82E-09
Saturated K of Soil Barrier Layer (cm/s) =	3 00E-09
Saturated K of Soil Barrier Layer (in/day) =	1 02E-04
Number of Pinholes per acre =	1
Number of Defects per acre =	3

Head on top of liner (inches)	Q, areal through FML (in/yr)	R, pinholes (m)	R, defects (m)	Gradient, pinholes	Gradient, defects	Q, pinholes (in/yr)	Q, defects (in/yr)	Q, total, (in/yr)
12	0 0006	0 5850	0 7456	4 3971	5 9137	0 00004	0 0003	0 0009
18	0 0009	0 7165	0 9131	5 9535	8 0769	0 00008	0 0005	0 0014

cm/s Centimeters per second
FML Flexible membrane liners
in Inches
K Hydraulic conductivity
m Meter
Q Flow
R Radius
yr Year

21907 705011 1
0212031396 RAF

Table A2: Estimates of Potential Advective Water Movement through a Composite System - Lowermost Landfill Liner Analysis

Compacted Clay Liner	
Thickness of FML (inches) =	0 06
Thickness of Soil Barrier (inches) =	36
Saturated K of FML (cm/s) =	2 30e-13
Saturated K of FML (in/day) =	7 82e 09
Saturated K of Soil Barrier Layer (cm/s) =	1 00e-07
Saturated K of Soil Barrier Layer (in/day) =	3 40e-03
Number of Pinholes per acre =	1
Number of Defects per acre =	3

Head on top of liner (inches)	Q, areal through FML (in/yr)	R, pinholes (m)	R, defects (m)	Gradient, pinholes	Gradient, defects	Q, pinholes (in/yr)	Q, defects (in/yr)	Q, total (in/yr)
12	0 0006	1 1145	1 4219	1 0216	1 0301	0 0011	0 0053	0 007

cm/s Centimeters per second
FML Flexible membrane liners
in Inches
m Meters
Q Flow
R Radius
yr Year

21907 705011 1
0212031396 RAF

Table A3: Summary of Chemical Parameters for Compounds Modeled using VLEACH

Compound	Solubility (mg/l)	Source	Henry's Constant	Source
CPMSO	1,100	Offpost EA	5 00E-04	Offpost EA MLE
Dibromochloropropane (DBCP)	1,100	Offpost EA	0 0147	Offpost EA, RME
DIMP	22,000	Offpost EA	8.20E-05	Offpost EA, MLE
Chloroform	7,700	Offpost EA	0 17	Offpost EA, RME

Compound	K_d	Source
CPMSO	0 15	K_d Study, HLA, 1987
Dibromochloropropane (DBCP)	0 49	K_d Study, HLA, 1987
DIMP	0 3	K_d Study, HLA, 1987
Chloroform	0.29	K_d Study, HLA, 1987

cm	Centimeters
CPMSO	4-Chlorophenylmethyl sulfone
DIMP	Diisopropylmethyl phosphonate
EA	Endangerment Assessment
g	Gram
HLA	Harding Lawson Associates
K_d	Soil-water partition coefficient
m	Meter
mg/l	Milligrams per liter
r	Radius
MLE	Most likely exposure
RME	Reasonable maximum exposure

Table A4: Summary of Physical Parameters Used in VLEACH Simulations

	Value	Source
Porosity =	0 4	HELP model, sandy clay loam
Bulk Density (g/cm^3) =	1 6	Assumed
Moisture Content =	0 25	Clapp and Hornberber analysis
Advective Velocity (inches/year) =	0 0068	HELP model result
Fraction Organic Carbon =	0 005	Reasonable low value, RMA SVE study

cm Centimeters
g Grams
HELP Hydrologic evaluation of landfill performance
RMA Rocky Mountain Arsenal
SVE Soil vapor extraction

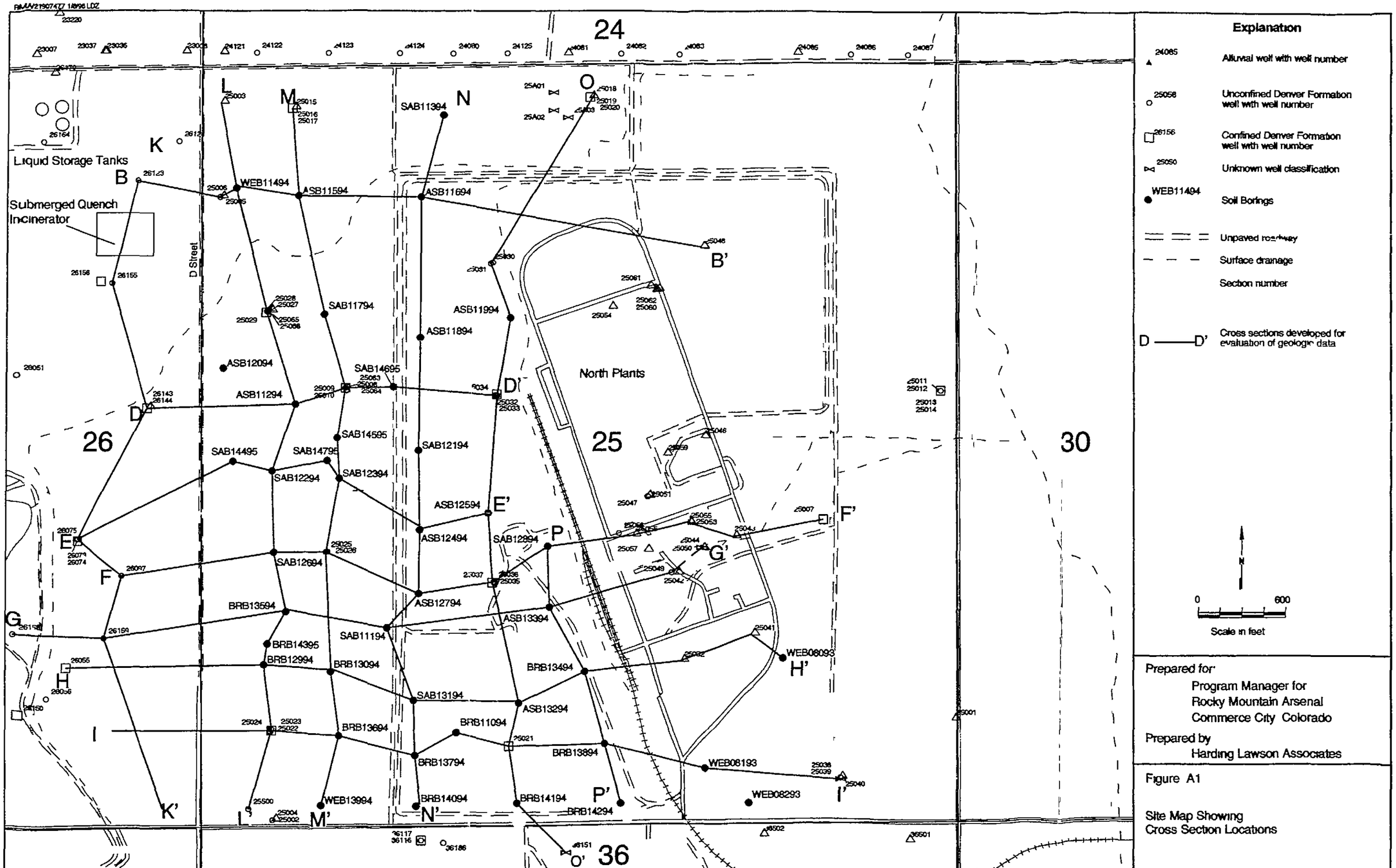
Table A5: Summary of Potential Leachate Concentrations versus Predicted Threshold Concentrations

Constituent	Predicted Cv/Co	PRG from DAA (µg/l)	Predicted Threshold Concentrations* (µg/l)	Characterization of Potential Future Landfill Leachate# (µg/l)
CPMSO	6.1×10^{-5}	36	591,000	10,000 to 19,000
Dibromochloropropane (DBCP)	1.3×10^{-4}	0.2	1,500	2
DIMP	4.5×10^{-6}	8	1,797,000	740 to 1,300
Chloroform	5.6×10^{-5}	6	108,000	21 to 610

CPMSO 4-Chlorophenylmethyl sulfone
Co Concentration of compound in the leachate above the lowermost liner
Cv Predicted concentration of compound at the bottom of the unsaturated zone
DAA Detailed Analysis of Alternatives
DIMP Diisopropylmethyl phosphonate
PRG Preliminary remediation goals
µg/l Micrograms per liter

* The concentration in leachate necessary to result in the occurrence of predicted concentrations at the top of the saturated zone above the PRG for that constituent in 1,000 years or less, assuming a single 3-foot composite clay liner and 20 feet to groundwater

\# Based on Range of Concentrations in Basin F Waste Pile leachate since 1989 (Attachment A2)



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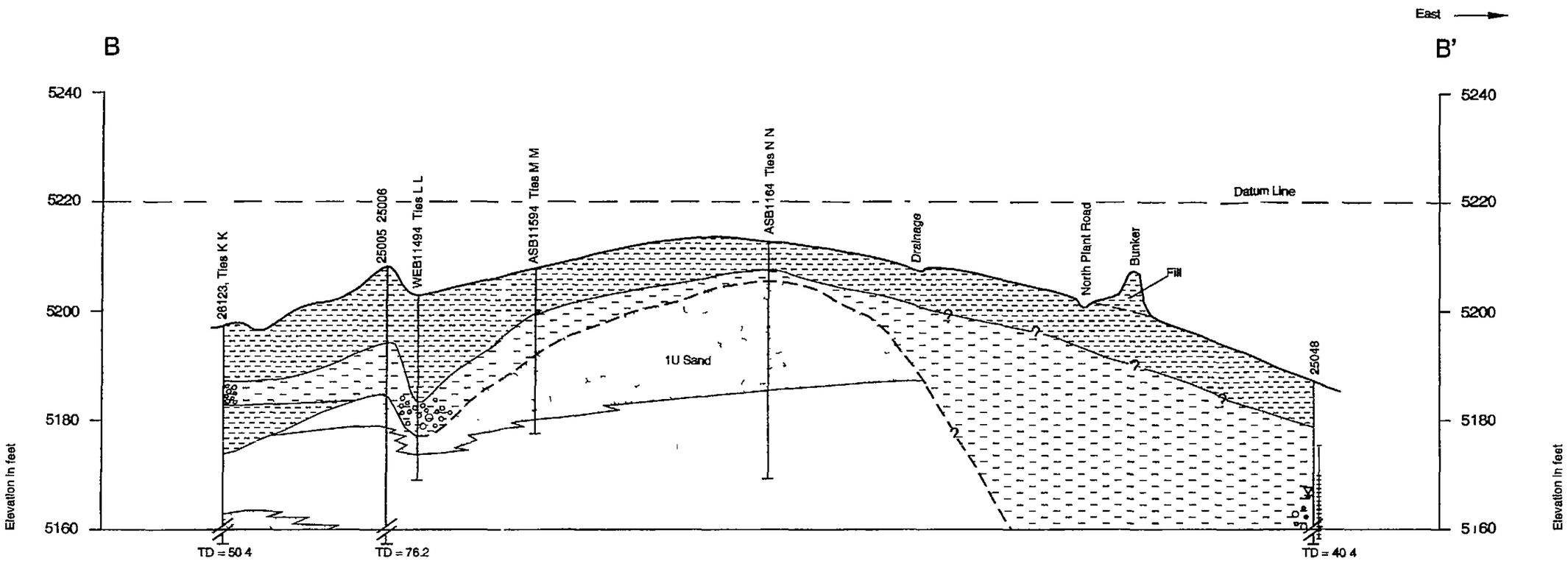
Program Manager for
Rocky Mountain Arsenal
Commerce City Colorado

Prepared by
Harding Lawson Associates

Figure A1

Site Map Showing
Cross Section Locations



Explanation

Alluvium

- Clay sandy clay (CL CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone lignite and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note:
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite, and claystone is unknown.

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

Sand pack

101 — Screened interval with well number

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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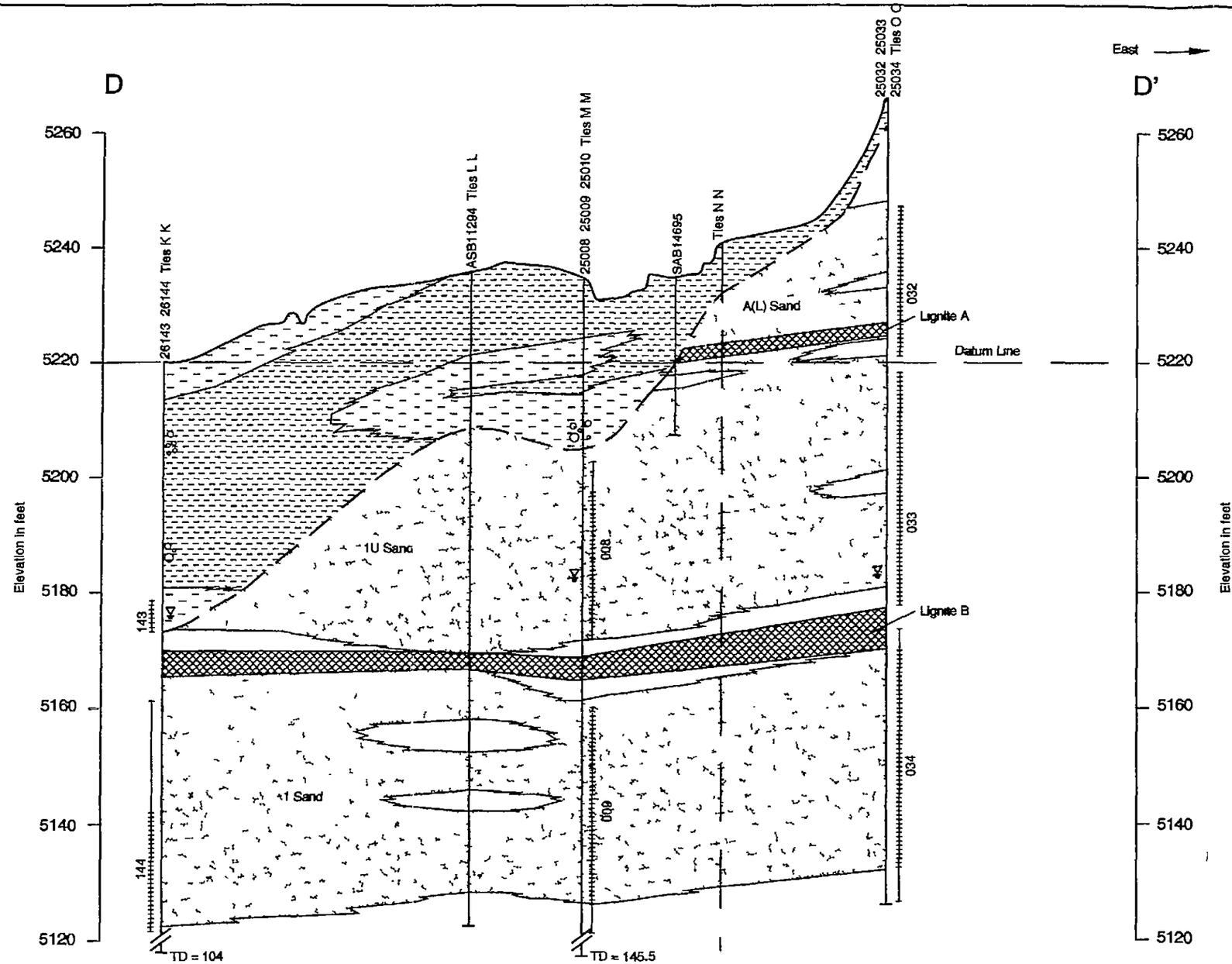
Rocky Mountain Arsenal
Commerce City Colorado
Prepared by:
Harding Lawson Associates

Figure A2

Geologic Cross Section B-B



Explanation

Alluvium

- Clay sandy clay (CL,CH)
- Sand, silty sand, clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone, lignite and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

Sand pack

101 — Screened interval with well number

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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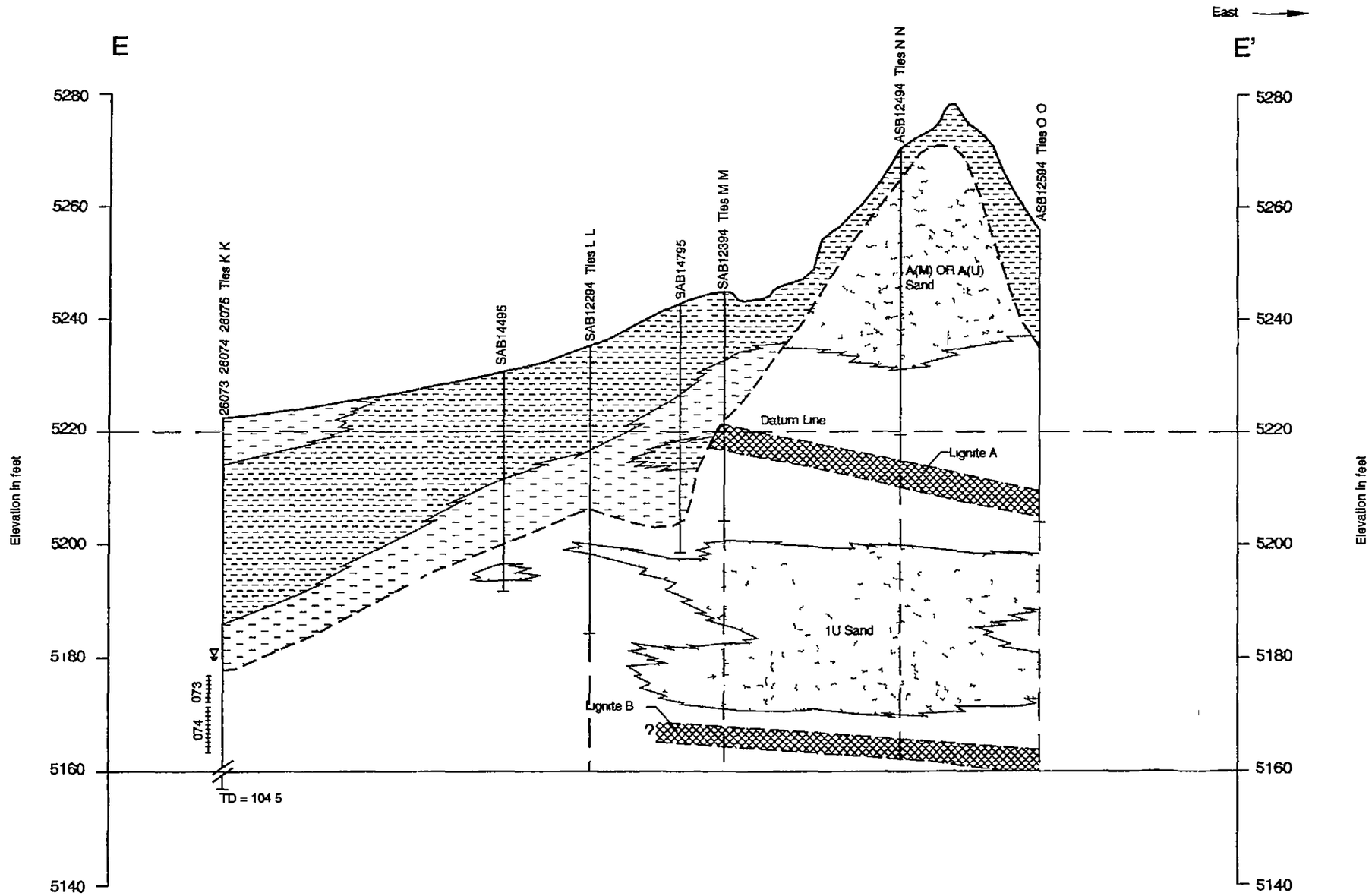
Rocky Mountain Arsenal
Commerce City Colorado
Prepared by
Harding Lawson Associates

Figure A3

Geologic Cross Section D-D'



Explanation

Alluvium:

- Clay sandy clay (CL,CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone lignite and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note.
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

Sand pack

101 — Screened interval with well number

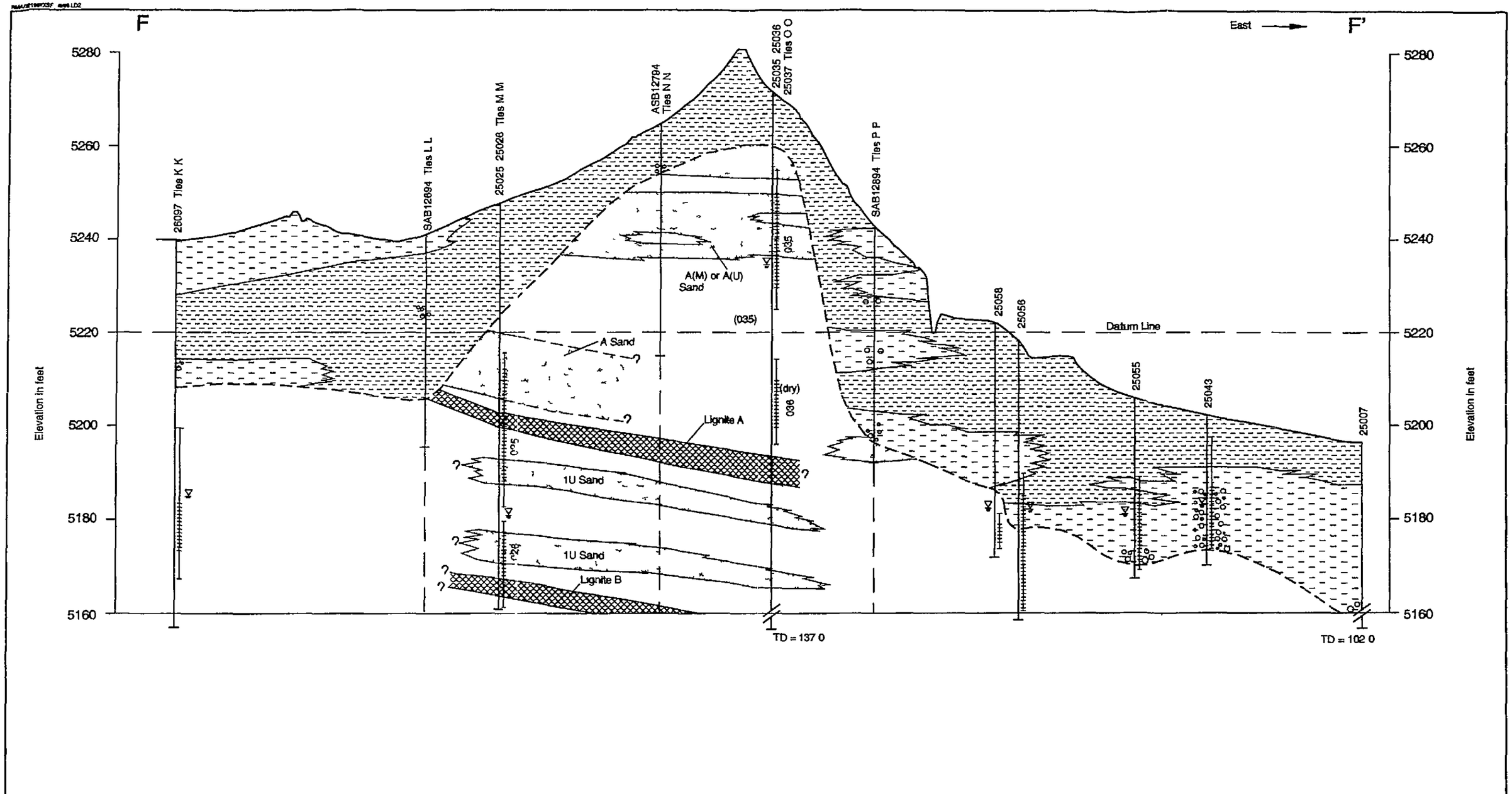
TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

Prepared for
Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by
Harding Lawson Associates

Figure A4

Geologic Cross Section E E



Explanation

Alluvium:

- Clay sandy clay (CL,CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone lignite, and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note:
In areas of no lithologic control, lateral extent of Denver Formation sandstone, lignite and claystone is unknown

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

Sand pack

101 — Screened interval with well number

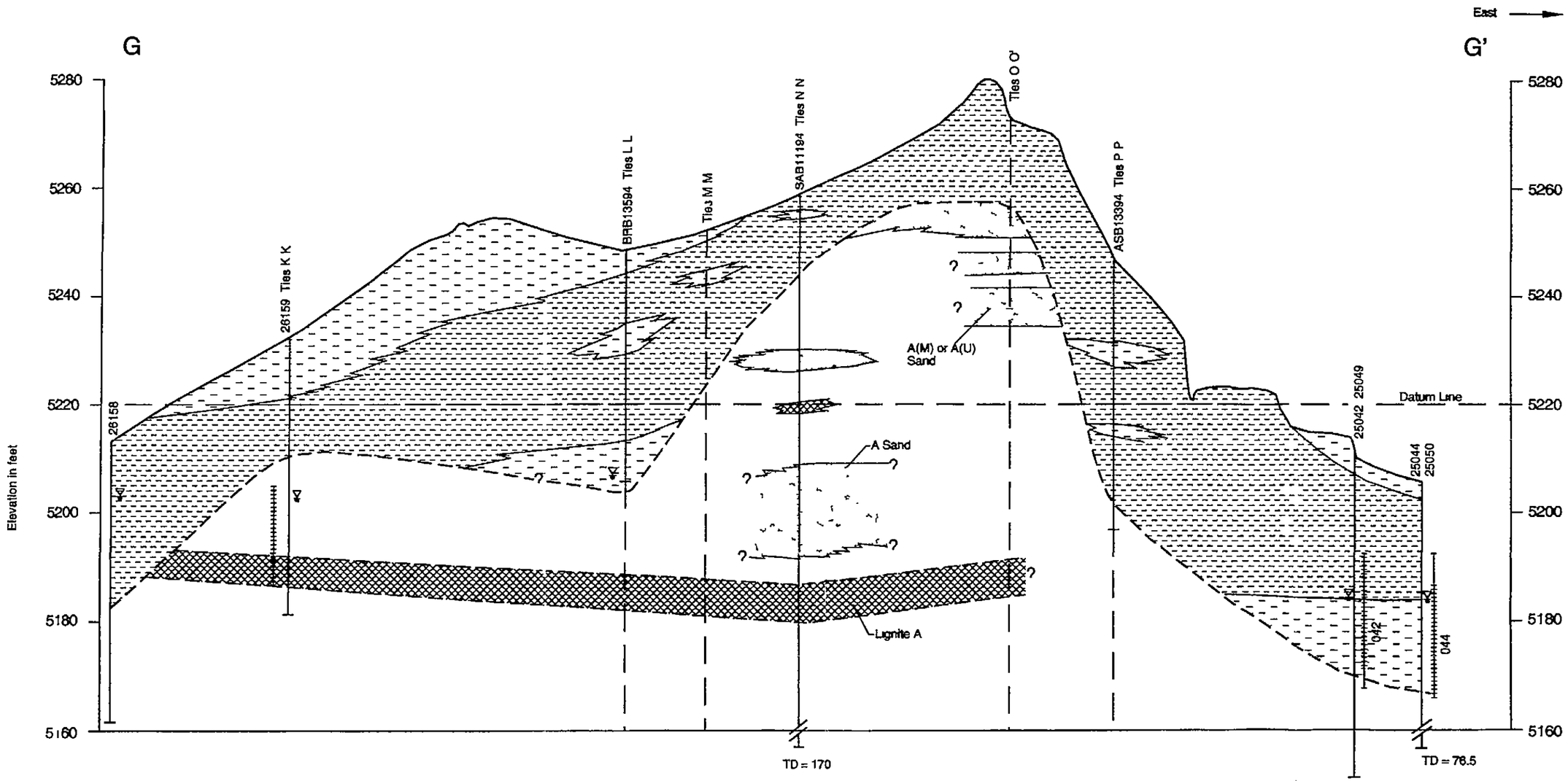
TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

Prepared for
Program Manager for
Rocky Mountain Arsenal
Commerce City Colorado
Prepared by
Harding Lawson Associates

Figure A5

Geologic Cross Section F-F'



Explanation

Alluvium:

- Clay sandy clay (CL,CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone lignite, and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note:
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

Sand pack

101 — Screened interval with well number

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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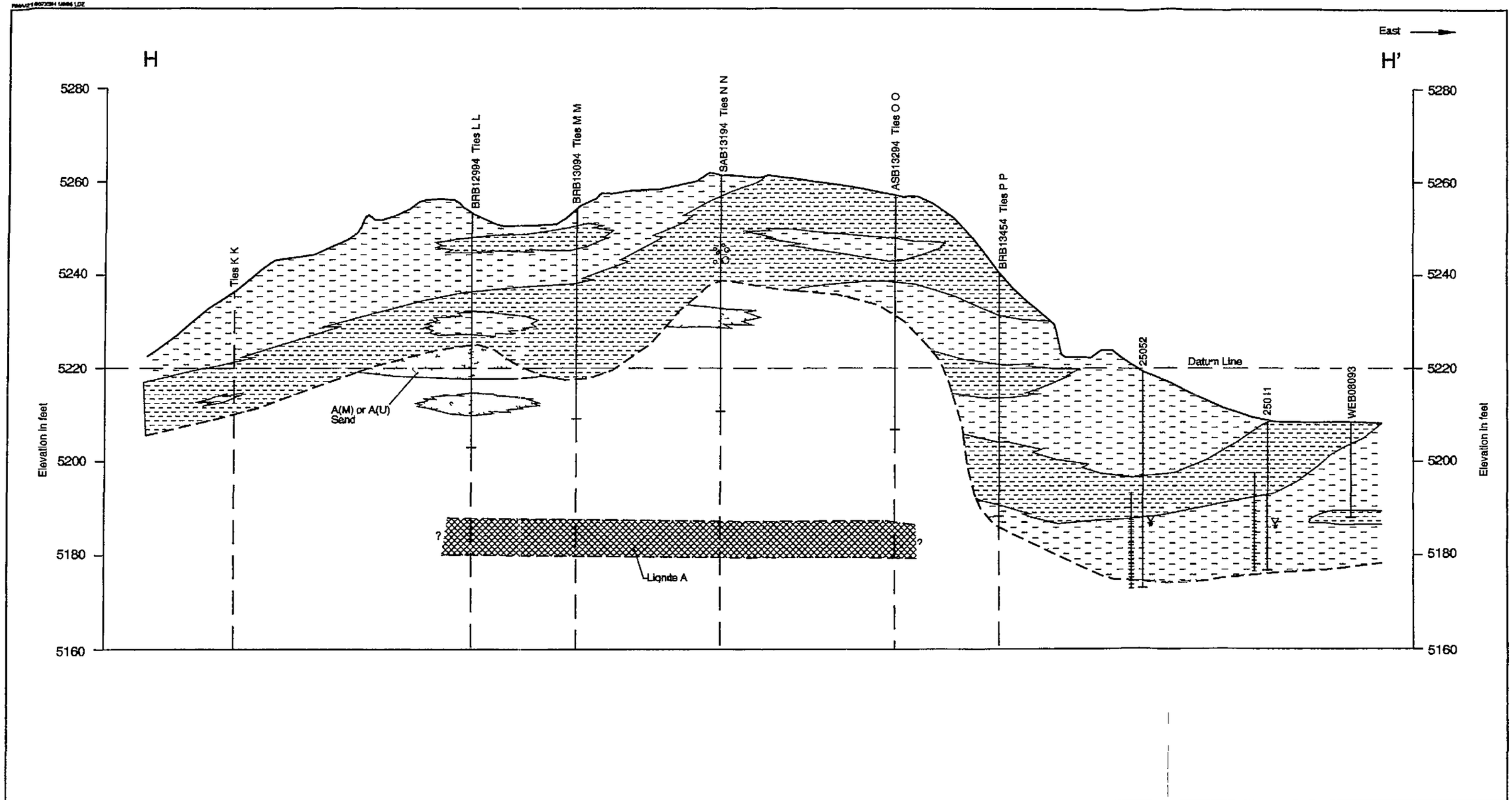
Harding Lawson Associates

Figure A6

Geologic Cross Section G-G'



Explanation

Alluvium:

- Clay sandy clay (CL,CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone lignite, and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite, and claystone is unknown

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

Sand pack

101 — Screened interval with well number

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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Commerce City Colorado
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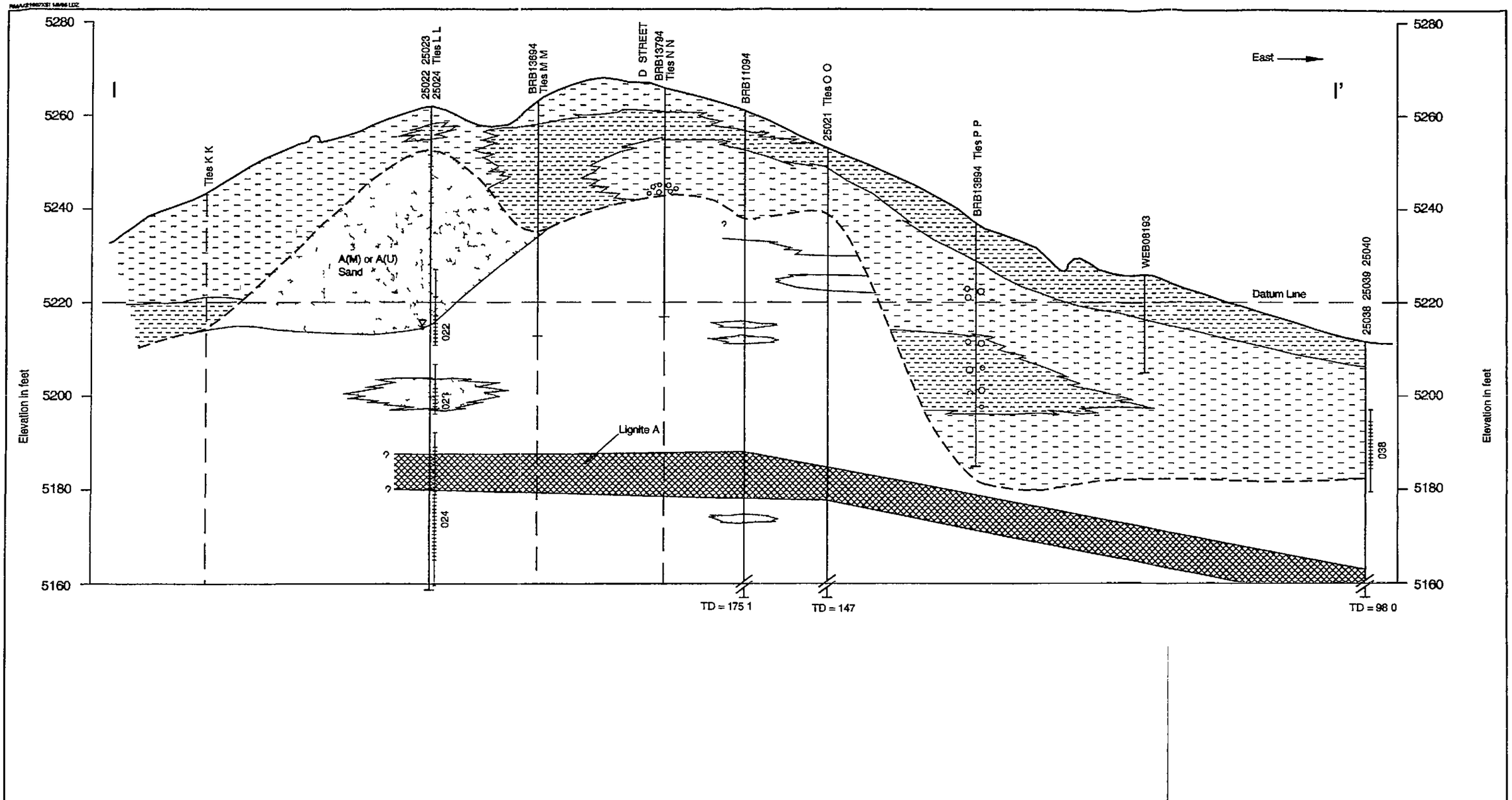
Harding Lawson Associates

Figure A7

Geologic Cross Section H-H'



Explanation

Alluvium:

- Clay sandy clay (CL CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone lignite and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note.
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

101 — Screened interval with well number; Sand pack

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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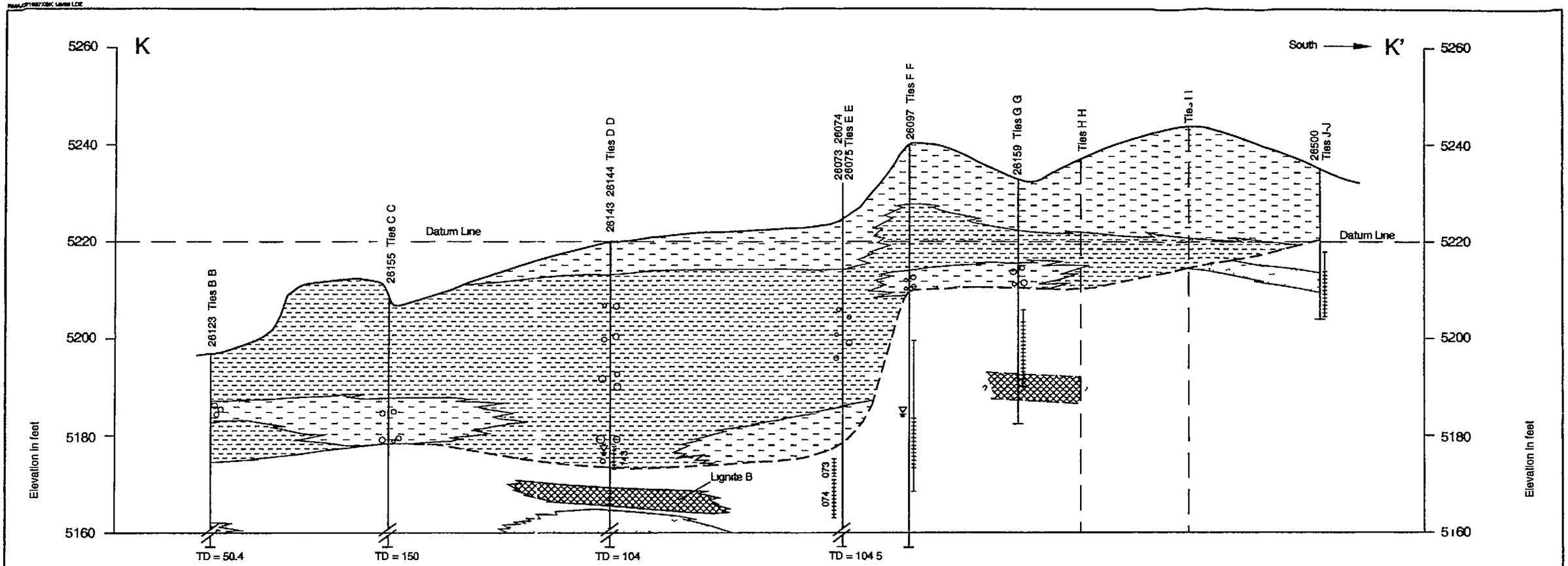
Figure A8

Geologic Cross Section I-I



Explanation

Alluvium:

- Clay sandy clay (CL,CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone lignite and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown.

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

Sand pack

101 — Screened interval with well number

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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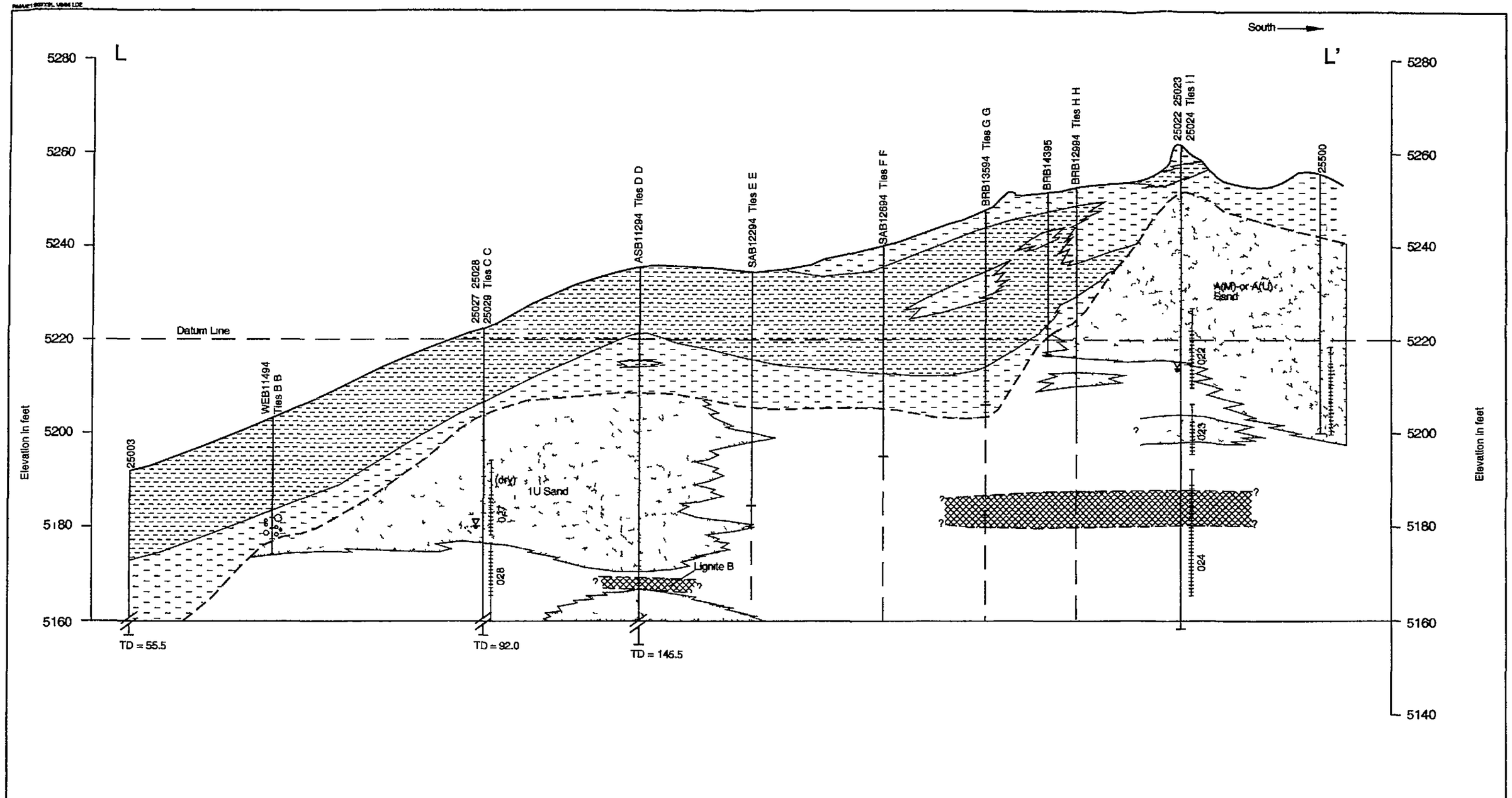
Commerce City Colorado
Prepared by:
Harding Lawson Associates

Figure A9

Geologic Cross Section K K



Explanation

Alluvium

- Clay sandy clay (CL,CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone, lignite and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

Sand pack

101 — Screened interval with well number

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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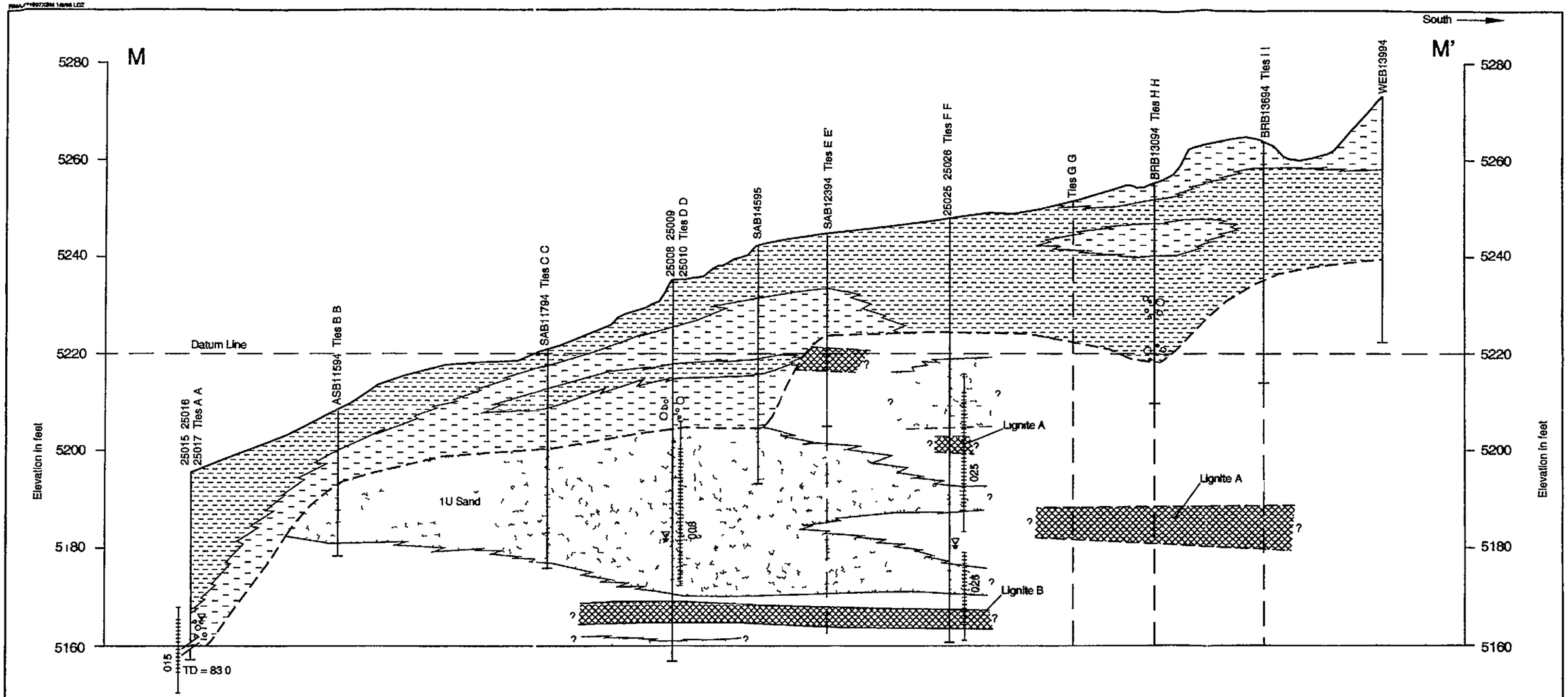
Figure A10

Geologic Cross Section L-L



Explanation

Alluvium:

- Clay sandy clay (CL,CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone lignite and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note.
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown.

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

101 — Sand pack; Screened interval with well number

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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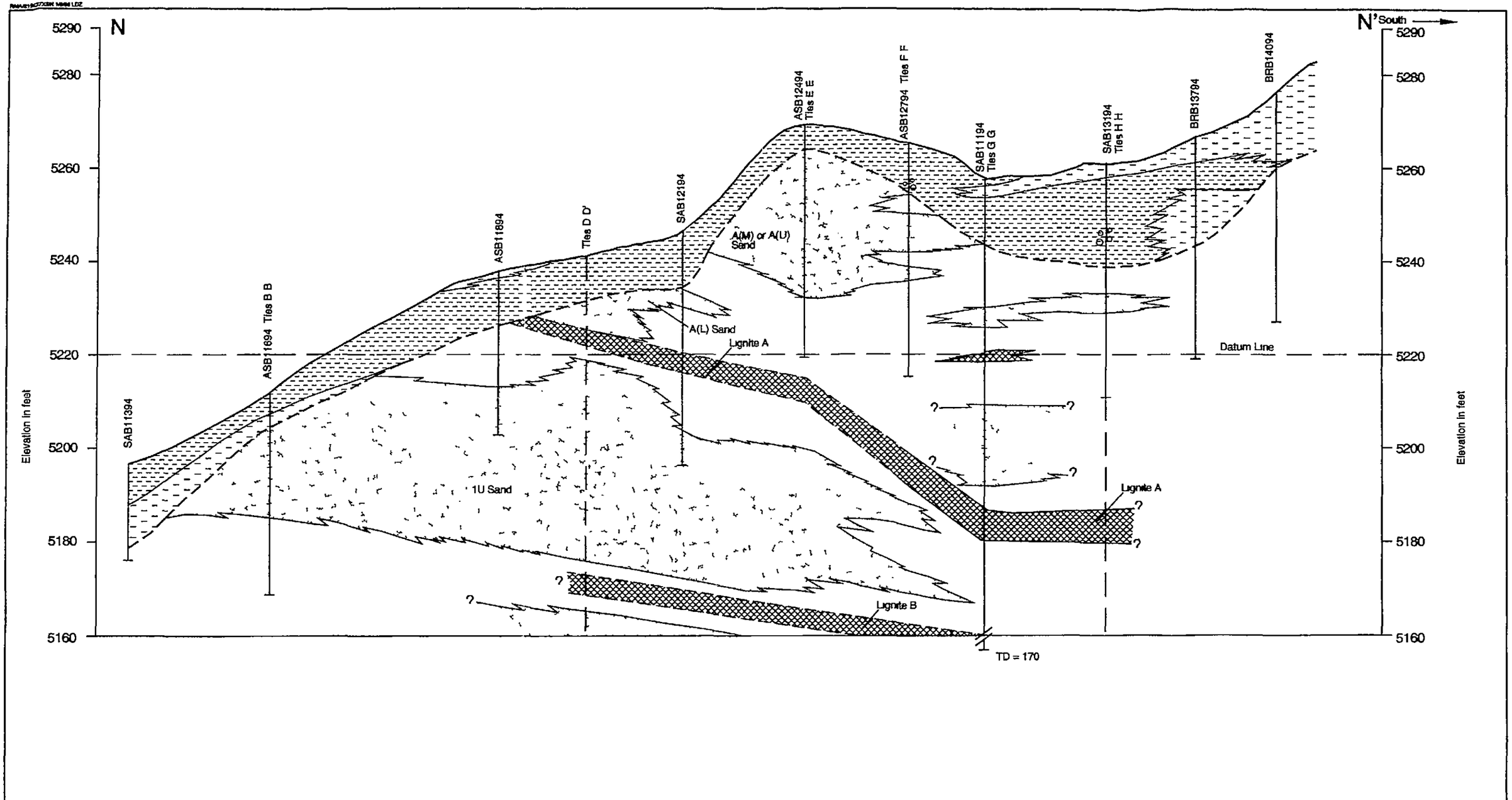
Figure A11

Geologic Cross Section M M



Explanation

Alluvium

- Clay sandy clay (CL,CH)
- Sand silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone lignite and sandstone (see note)

Top of weathered bedrock

Note
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown

SAB11194 — Boring identification

29025 — Monitoring well(s) identification

101 — Sand pack; Screened interval with well number

TD = Total depth in feet

20 — 0 — 0 — 400
Scale in feet
Vertical exaggeration = 20x

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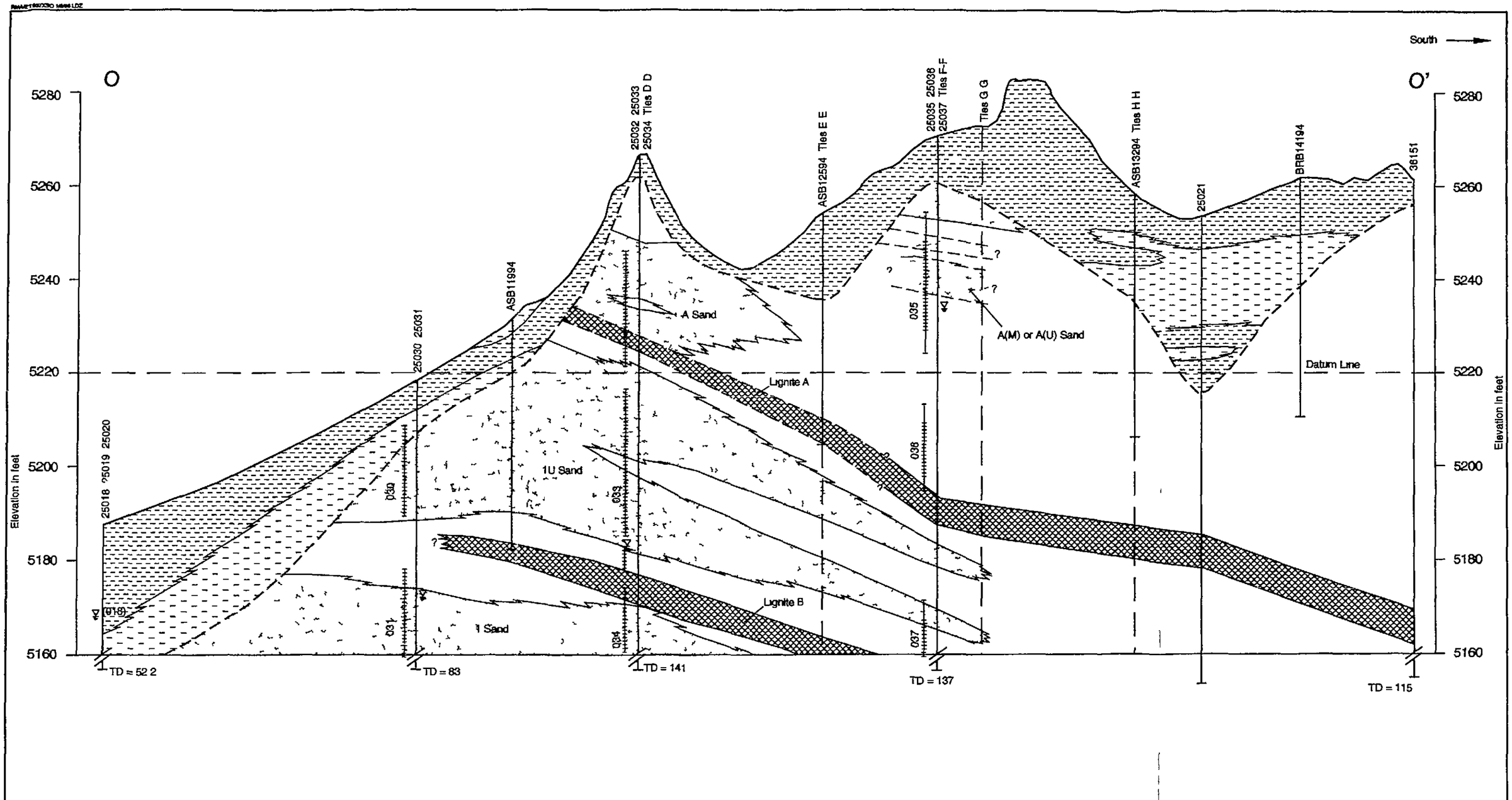
Figure A12

Geologic Cross Section N-N



Explanation

Alluvium

- Clay sandy clay (CL,CH)
- Sand,silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic Claystone
- Sandstone
- Claystone with interbedded siltstone lignite, and sandstone (see note)

Top of weathered bedrock

Maximum recorded groundwater elevation

Note:
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown

SAB1 194 — Boring identification

29025 — Monitoring well(s) identification

101 — Sand pack; Screened interval with well number

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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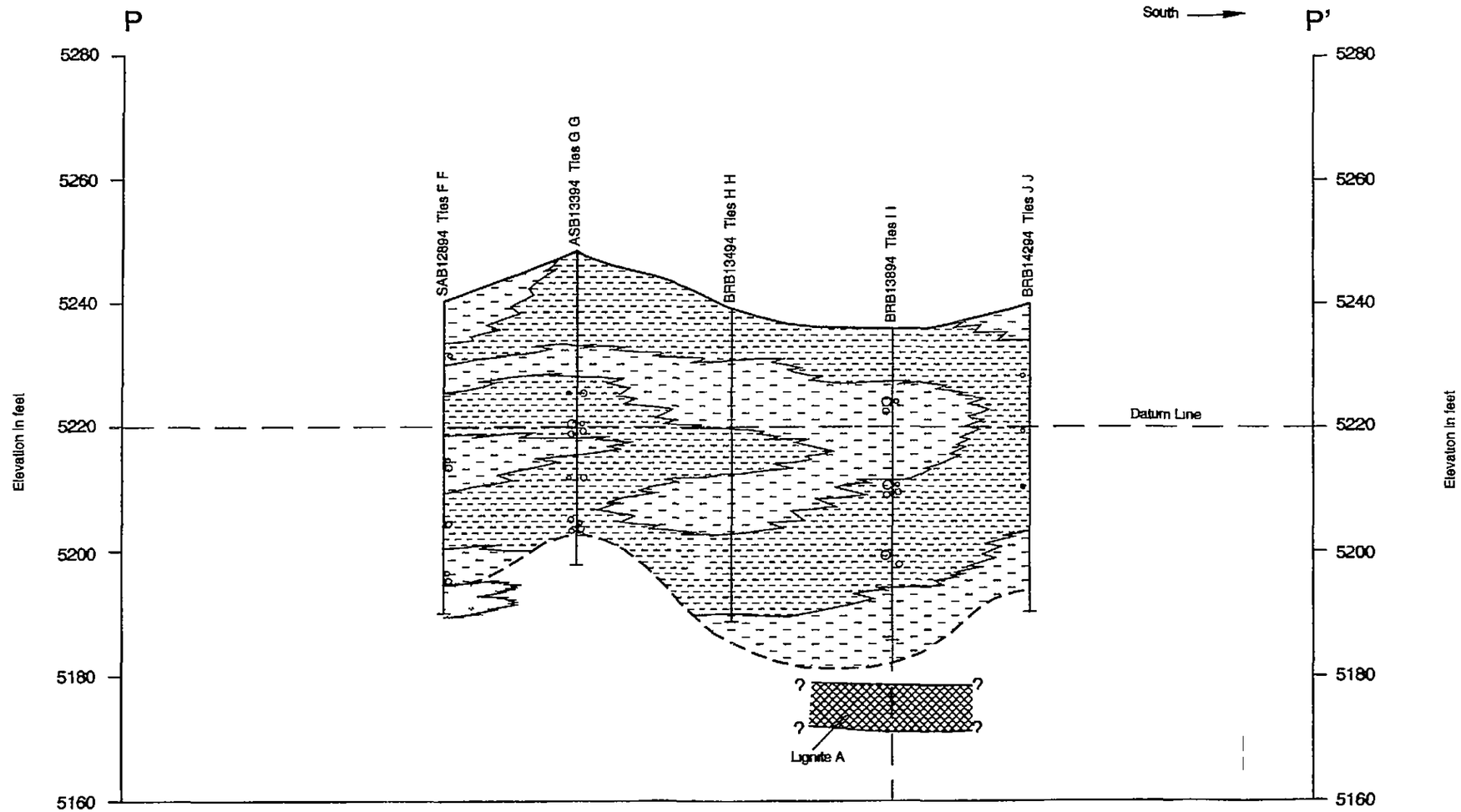
Figure A13

Geologic Cross Section O-O'



Explanation

Alluvium:

- Clay sandy clay (CL,CH)
- Sand, silty sand clayey sand (SP SM SC SW)
- Gravel

Bedrock (Denver Formation)

- Lignite/Lignitic claystone
- Sandstone
- Claystone with interbedded siltstone, lignite and sandstone (see note)

Top of weathered bedrock

Note:
In areas of no lithologic control lateral extent of Denver Formation sandstone lignite and claystone is unknown

SAB11194 — Boring identification

28025 — Monitoring well(s) identification

Sand pack

101 — Screened interval with well number

TD = Total depth in feet

20
0
0
400
Scale in feet
Vertical exaggeration = 20x

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Figure A14

Geologic Cross Section P-P

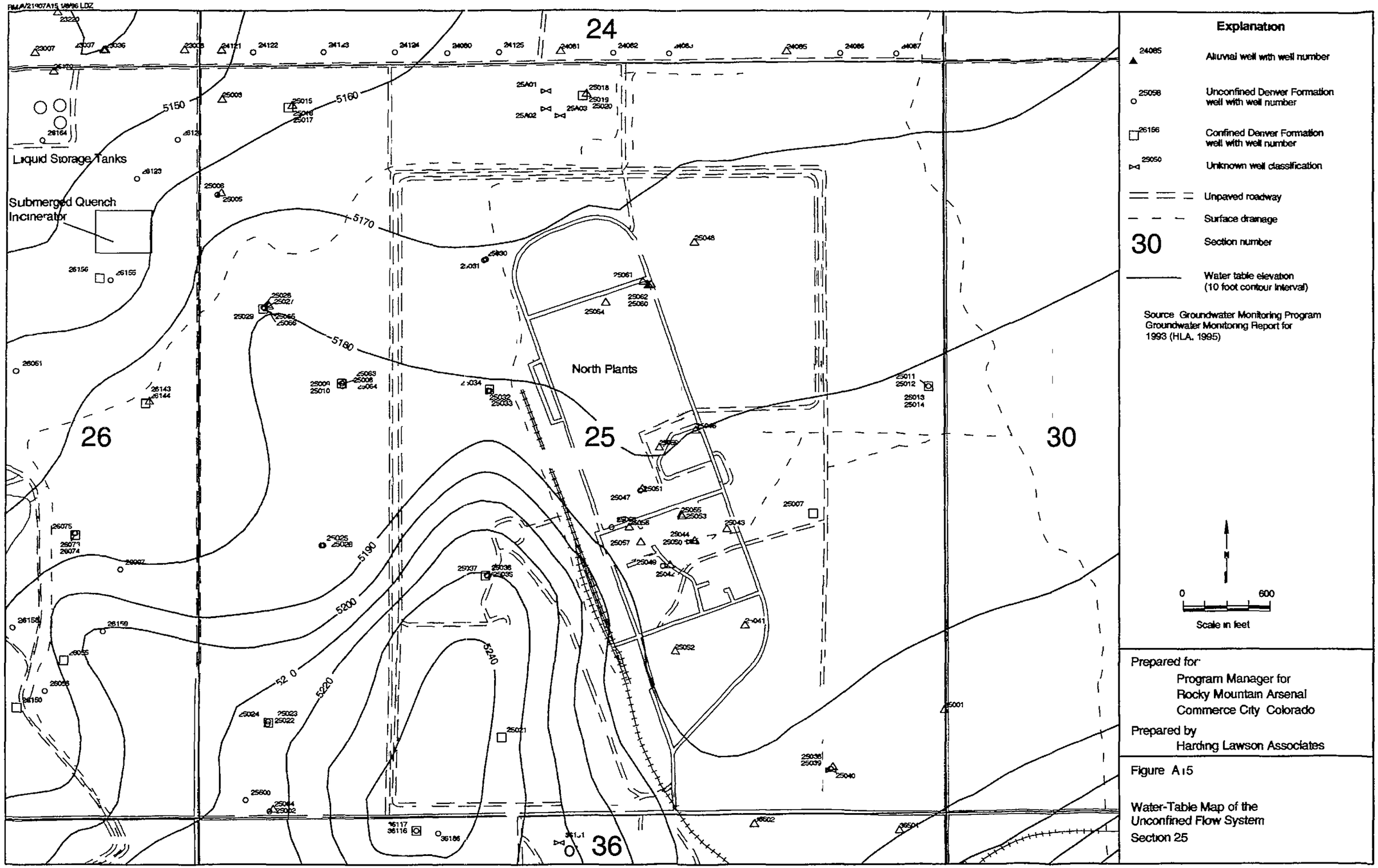
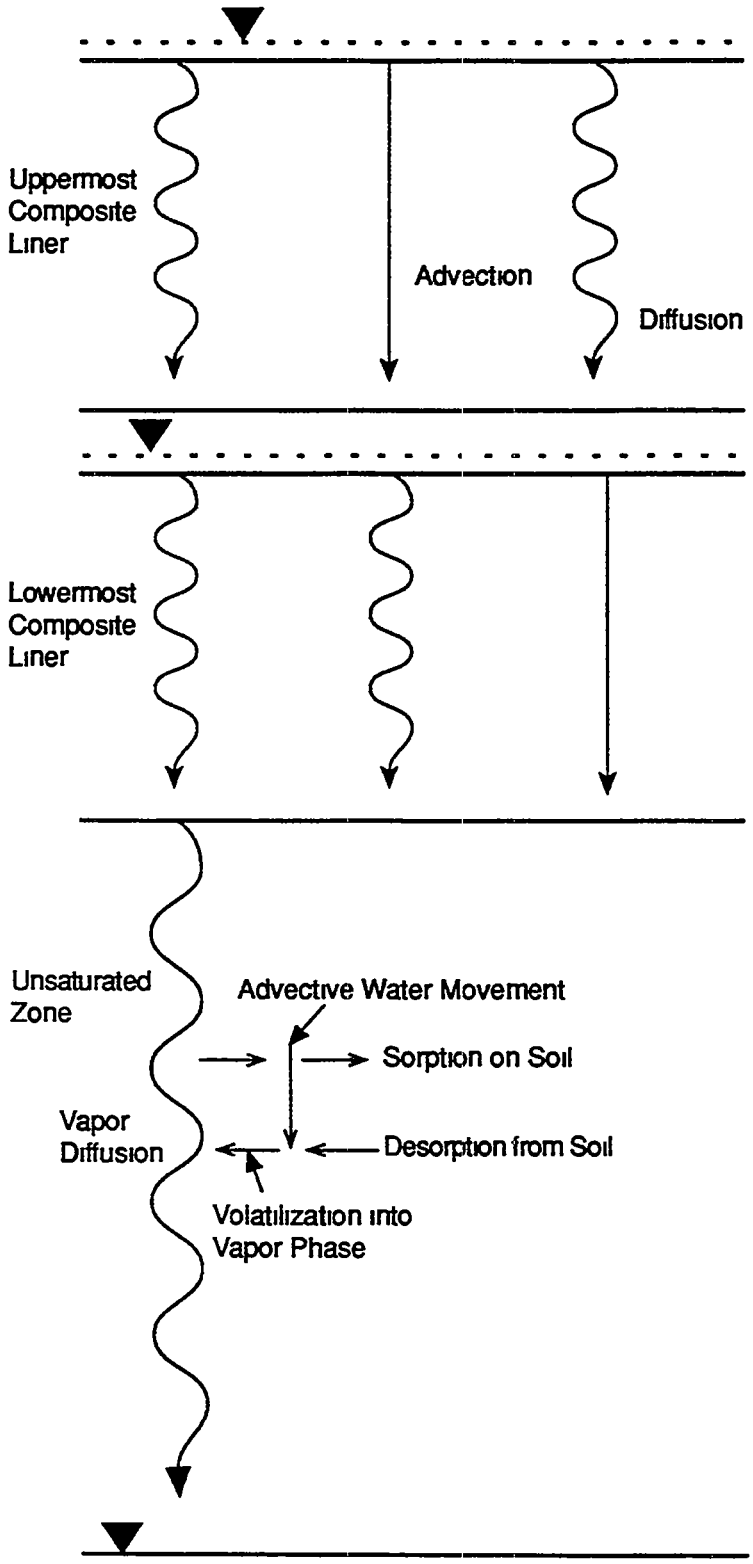


Figure A15

Water-Table Map of the Unconfined Flow System Section 25



1 Leachate collects on top of uppermost liner

2 Potential migration via molecular diffusion in water and advective water movement

3 Leachate collects on top of most lower liner

4 Potential migration via molecular diffusion in water and advective water movement

5 Contaminants potentially enter the unsaturated zone in water phase, migration occurs primarily by vapor phase diffusion, also subject to advective water movement and sorption onto soil particles

6 Contaminants potentially enter groundwater and migrate via unconfined flow system

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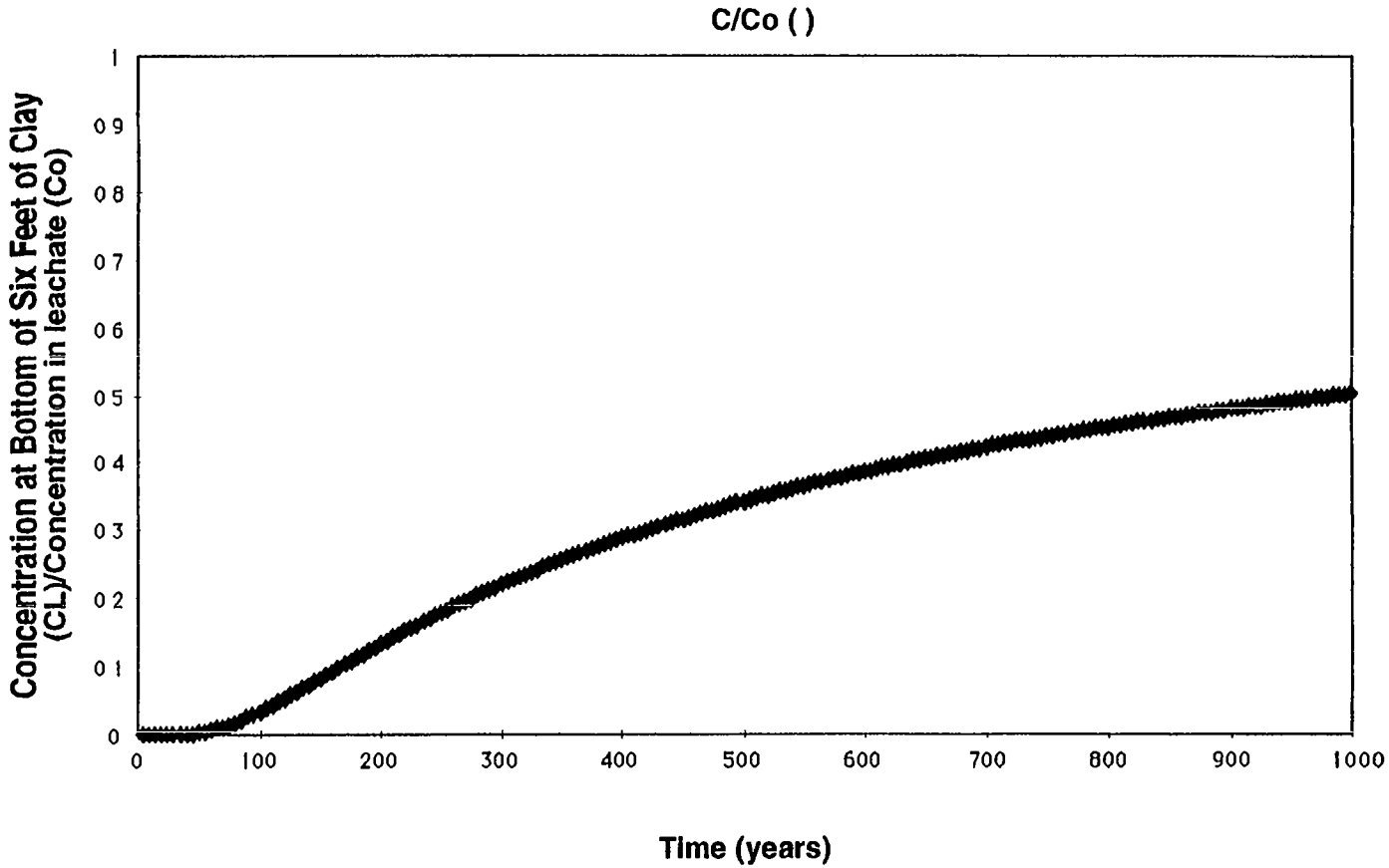
Figure A16

Conceptual Model of Potential Contaminant Migration Through Lower Most Liner and Unsaturated Zone

RMA 1257 4d 01/09/96 ECS



Time (yrs)	Average CL/Co
100	0 01
200	0 08
300	0 18
400	0 26
500	0 32
600	0 36
700	0 40
800	0 44
900	0 47
1000	0 49

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Commerce City, Colorado

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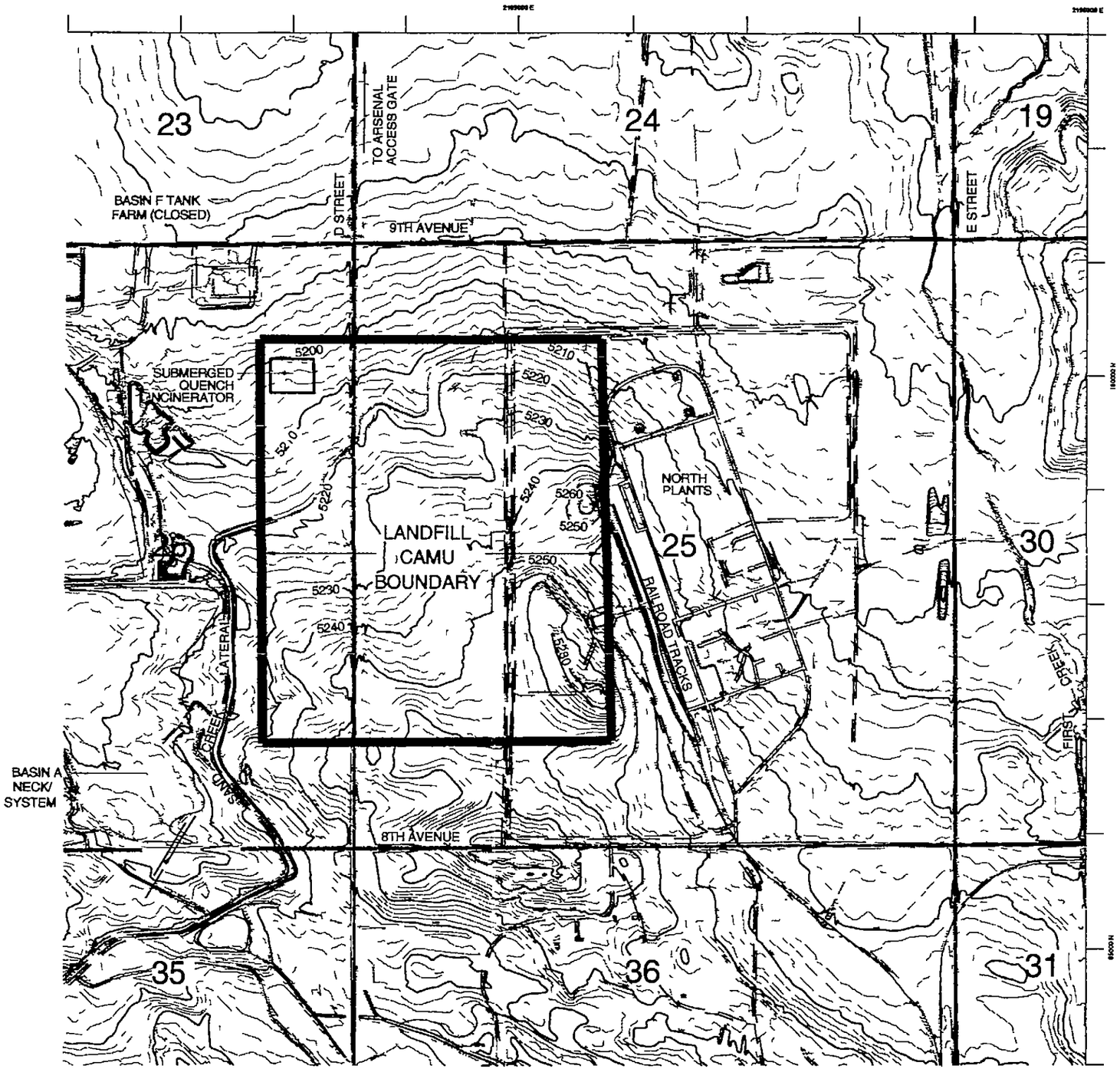
Figure A17

Diffusion of Constituents Through Six Feet of Clay

RMA 1257 4a 02/14/96 LAM



Explanation

Surface topography (2-foot contour interval)

Paved and unpaved roads

25 Section numbers

N

0 500 1000

Scale in feet
Contour Interval = 2 ft

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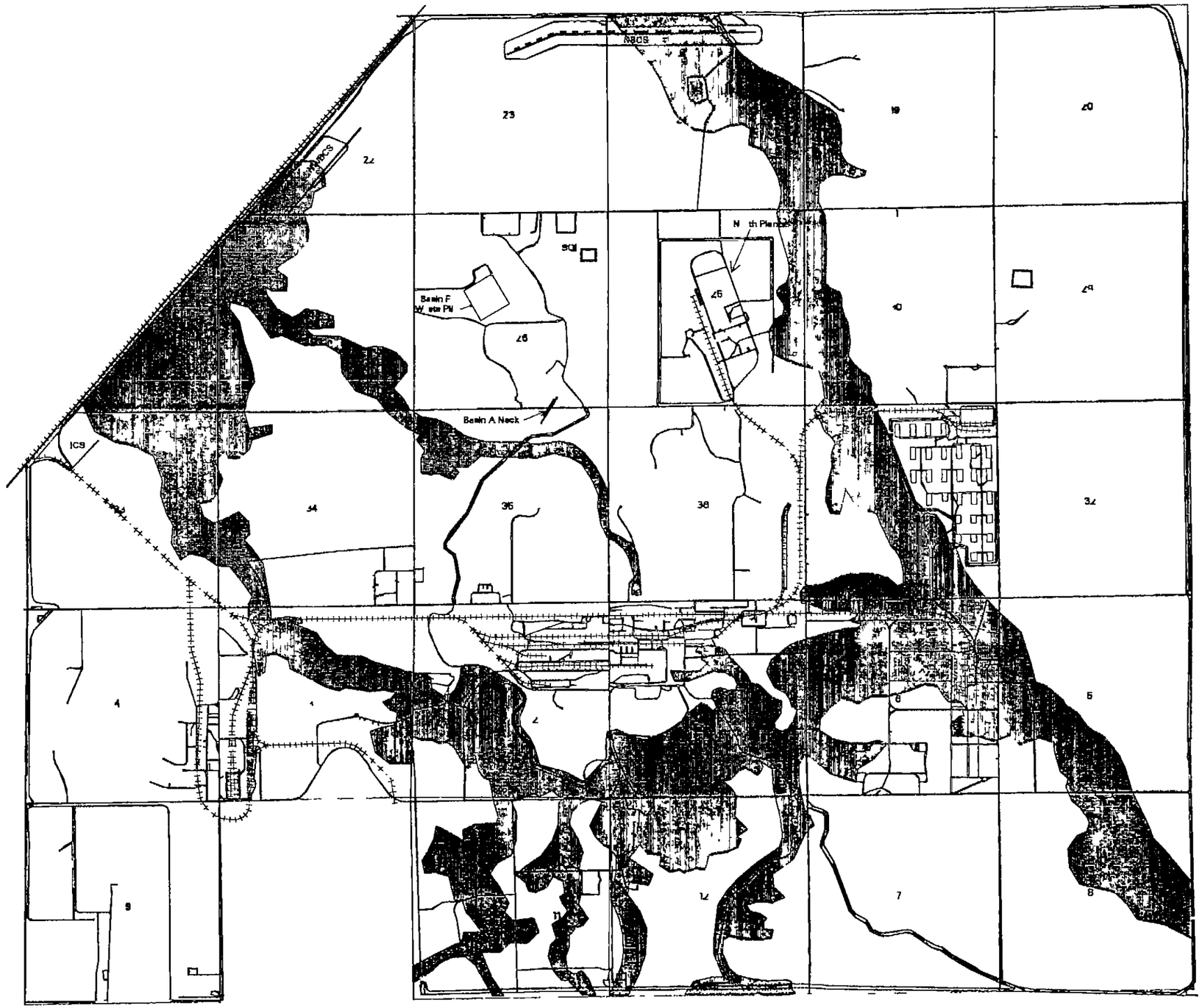
Figure A18

Surface Topography of the Landfill CAMU Boundary and Surrounding Area



Explanation

- 100-Year Floodplain
- Road
- Railroad
- Section line
- 12 — Section number
- NBCS — North Boundary Containment System
- NWBCS — Northwest Boundary Containment System
- ICS — Irondale Containment System
- SQI — Submerged Quench Incinerator

1000 0 2000 4000 FEET

Scale 1 36 000
One inch represents 3 000 feet

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Commerce City, Colorado

Prepared by
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Figure A19

100-Year Floodplain Map
RIC No 84066R01

(U S Army Corps of Engineers 1983)

Attachment A1

SUPPLEMENTAL GEOLOGIC BORING LOGS WITH SURVEY COORDINATES AND UNIFIED SOIL CLASSIFICATION CHART

Table A1.1: Rocky Mountain Arsenal Task 93-03, Geotechnical Boring Coordinates, Elevations, and Total Depths

Boring Number	Northing	Easting	Elevation (feet)	Total Depth (feet)
BRB14395	187135	2184026	5252 16	34 0
SAB14495	188401	2183785	5230 18	39 0
SAB14595	188565	2184509	5242 40	49 5
SAB14695	188921	2184902	5234 71	24 0
SAB14795	188407	2184437	5242 86	43 0

The boreholes were surveyed by a State of Colorado licensed surveyor using the horizontal North American Datum of 1927 (NAD27) and the National Geodetic Vertical Datum of 1929 (NGVD29)

MAJOR DIVISIONS			SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS OVER 50%>No 200 SIEVE SIZE	GRAVELS MORE THAN 1/2 OF COARSE FRACTION> No 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GRAVELS WITH OVER 15% FINES	GM	Silty gravels, gravel-sand mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS MORE THAN 1/2 OF COARSE FRACTION< No 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW	Well-graded sands or gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH OVER 15% FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS OVER 50%<No 200 SIEVE SIZE	SILTS & CLAYS LIQUID LIMIT 50% OR LESS		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LIQUID LIMIT GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils
DEBRIS ZONE*				Metal, concrete, plastic, brick, wood, etc
CONSTRUCTION DEBRIS*				Concrete, wood, rebar, asphalt

SYMBOLS KEY

■	Bulk or classification sample
⊠	No sample recovery
▯	"Undisturbed" sample
▽	First-encountered groundwater level
▼	Static groundwater level
(10YR 4/4)	Munsell soil color chart 1990 edition

GRAIN SIZE CHART

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U S Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76 2
GRAVEL	3" to No 4	76.2 to 4 75
coarse	3" to 3/4"	76.2 to 19 1
fine	3/4" to No 4	19 1 to 4 75
SAND	No 4 to No 200	4.75 to 0.075
coarse	No 4 to No 10	4 75 to 2.00
medium	No 10 to No 40	2 00 to 0 425
fine	No 40 to No 200	0 425 to 0 075
SILT & CLAY	Below No 200	Below 0 075

Source ASTM D 2488-90, based on Unified Soil Classification System
* Not part of ASTM Classification System

SOILCLS2

Prepared for:
Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by:
Harding Lawson Associates

Unified Soil Classification Chart

Equipment Mobile CME-75, Continuous Core Barrel Sampling

Elevation 5252 16 Date 11/13/95

Blows/6"	HNU/OVA (ppm)	Depth (ft.)	Sample	
		0		(CL) SANDY CLAY, fine-grained sand, 10 YR 5/4 - yellowish brown, moist to dry, alluvium (25%)
				(SW) SAND, some clay fine sand, 10 YR 6/4 - light yellowish brown nonplastic, moist alluvium
				(CL) CLAY, little fine-grained sand 10 YR 6/4 - light yellowish brown, nonplastic, dry, alluvium
		5		Becomes stiff calcareous
				Driller notes hard material at 6 5 ft
				(SW) SAND, fine sand, some clay and silt, 10 YR 6/6 - brownish yellow nonplastic , dry, alluvium
				(CL) SANDY CLAY, little fine sand, 10 YR 6/4 - light yellowish brown, nonplastic, dry, calcareous, alluvium
		10		
				Locally very heavy white caliche
		15		
				Some fine sand little very coarse-grained sand and very fine-grained pea gravel
				Color change to 7 5 YR 5/6 - strong brown, becomes hard moist with abundant white caliche veining scattered fine- to medium-grained sand (25%) coarse sand (5%) and very fine gravel
		20		
				Increase in fine- to medium-grained sand (30%) and color change to 10 YR 6/6 - brownish yellow, slightly moist with some little little crystalline caliche or gypsum veining
		25		Decrease in fine-grained sand (25%) with scattered trace coarse-grained sand to (rounded) pebbles (<5%), color change to 10 YR 6/4 - light yellowish brown, sand content decreases with depth

Notes 1 All HNU/OVA readings equal to zero parts per million except as indicated
2 Munsell color chart used

RMA2

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Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by
Harding Lawson Associates

Figure A1.2

Log of Boring BRB14395

Equipment Mobile CME-75, Continuous Core Barrel Sampling

Elevation 5252 16 Date 11/13/95

Blows/6"	HNU/OVA (ppm)	Depth (ft)	Sample	
		25		
		30		(SW) SAND, some clay, fine-grained sand 2 5 Y 6/6 - olive yellow, dense moist alluvium
				CLAYSTONE, 2 5 Y 5/2- grayish brown thinly laminated, fractured to crushed, white caliche coated fractures to 30 feet, locally iron-oxide stain mottling at 31 5 ft, slightly lignitic common trace yellow brown iron-oxide staining on fractures and bedding, minor manganese oxide weathered bedrock, noncalcareous
		35		SANDSTONE, 2 5 Y 6/6 - olive yellow, fine sand, very uniform grain size thinly laminated, weak little strength noncalcareous weathered bedrock
				Total depth = 34 0 ft

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Figure A1.2

Log of Boring BRB14395

Equipment Mobile CME-75, Continuous Core Barrel Sampling

Elevation 5230 18 Date 11/13/95

Blows/6"	HNU/OVA (ppm)	Depth (ft)	Sample	Description
		0		(CL) SANDY CLAY to CLAY, fine-grained sand, 10 YR 6/4 – light yellowish brown, stiff, nonplastic, dry, calcareous alluvium
				Locally sand content increases to 40%
		5		Color changes to 10 YR 5/8 – yellowish brown with minor white caliche veining
		10		Color changes to 10 YR 6/6 – brownish yellow with some fine- to coarse-grained sand (40%)
				Decrease in sand content to 25%
		15		Scattered fine-grained granite gravel, sand content decreases
		20		(SC) CLAYEY SAND, fine- to medium-grained sand (25%), clay matrix 10 YR 6/4 – light yellowish brown, dense, nonplastic, moist, calcareous alluvium
		25		

Notes 1 All HNU/OVA readings equal to zero parts per million except as indicated
2 Munsell color chart used

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Commerce City, Colorado

Prepared by
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Figure A1.1

Log of Boring SAB14495

Equipment Mobile CME-75, Continuous Core Barrel Sampling

Elevation 5230 18 Date 11/13/95

Blows/6"	HNU/OVA (ppm)	Depth (ft)	Sample	
		25		(SW) SAND, fine- to coarse-grained sand, fine gravel, (pink granite gravel) and quartzite pebble, 10 YR 6/4 - light yellowish brown, nonplastic, moist, minor calcium carbonate, alluvium
				(SC) CLAYEY SAND, fine- to coarse-grained sand, some clay (<25%), 10 YR 6/4 - light yellowish brown, moist, calcareous, alluvium
		30		(SW) SAND, fine- to coarse-grained sand, pea gravel, some pebbles, 10 YR 6/4 - light yellowish brown moist, locally calcareous, alluvium
				CLAYSTONE, 5 Y 6/4 - pale olive, fractured, low hardness, iron-oxide stain mottling, weathered bedrock
		35		SANDSTONE, fine-grained sand 5 Y 6/8 - olive yellow, moist, weathered bedrock
				CLAYSTONE, 5 Y 4/2 - olive gray fractured, minor iron-oxide on fractures weathered bedrock
		40		CLAYEY SILTSTONE, very fine-grained sand, 5 Y 8/6 - olive yellow, friable weak moist, weathered bedrock

Total depth = 39 0 ft

RMA2

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Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by:
Harding Lawson Associates

Figure A1.1

Log of Boring SAB14495

Equipment Mobile CME-75, Continuous Core Barrel Sampling

Elevation 5242 40 Date 11/14/95

Blows/6"	HNU/OVA (ppm)	Depth (ft.)	Sample	
		0		(CL) SANDY SILTY CLAY, fine- medium-grained sand (10%) and silt 10 YR 4/6 - dark yellowish brown stiff to hard, plastic, moist, alluvium
				Becomes calcareous, nonplastic, dry and color changes to 10 YR 7/2 - light gray
		5		Sand and silt (<25%), fine- to medium-grained sand, color changes to 10 YR 5/6 - yellowish brown with heavy white caliche
		10		(SP) SAND, fine- to medium-grained sand trace scattered fine gravel, 12 0 to 12 5 ft and clay, 10 YR 6/4 - light yellow brown, dry alluvium
		15		(SW) SAND and GRAVEL, fine- to coarse-grained sand, subangular, fine to coarse gravel some rounded pebbles, trace cobble, 10 YR 6/4 - light yellowish brown, dry, alluvium
		20		
		25		(CL) SILTY CLAY, 10 YR 6/2 - light brownish gray, stiff to hard slightly plastic, moist minor local iron-oxide staining alluvium

Notes 1 All HNU/OVA readings equal to zero parts per million except as indicated
2 Munsell color chart used

RMA2

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Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by:
Harding Lawson Associates

Figure A1.3

Log of Boring SAB14595

Equipment Mobile CME-75, Continuous Core Barrel Sampling

Elevation 5242 40 Date 11/14/95

Blows/6"	HNU/OVA (ppm)	Depth (ft)	Sample	Description
		25		(SW) SAND, fine- to coarse-grained sand, some pea gravel (pink granite) dry alluvium
				(SM) SILTY SAND, fine-grained sand and silt, 10 YR 7/2 – light gray,dry, thin layers alluvium
		30		Increase in clay content (<30%)
				(SW) SAND, fine- to medium-grained sand, some coarse-grained sand, trace silt, 10 YR 6/4 – yellowish brown dry to slightly moist, alluvium
				Fine gravel (pink granite)
		35		Rounded pebbles to small cobbles of white granite and pink granite
				Driller notes hard drilling
				Driller notes hard drilling
		40		SANDSTONE, fine- to medium-grained sand 2 5 Y 6/6 – olive yellow, to 2 5 Y 6/4 – light yellowish brown friable, weak slightly moist to dry weathered bedrock
				Black sand (2%)
		45		
		50		Total depth = 49 5 ft

RMA2

Prepared for:
Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by:
Harding Lawson Associates

Figure A1.3

Log of Boring SAB14595

Equipment Mobile CME-75, Continuous Core Barrel Sampling

Elevation 5234 71 Date 11/14/95

Blows/6"	HNU/OVA (ppm)	Depth (ft.)	Sample	Description
		0		(CL) SILTY CLAY, 10 YR 4/4 – dark yellowish brown, stiff to hard, plastic, moist, rooted alluvium
				Color change to 10 YR 5/4 – yellowish brown
				Some fine- to medium-grained sand (15%), some local white caliche
		5		Increase in fine- to coarse-grained sand (<20%) color change to 10 YR 5/6 – yellowish brown slightly plastic to nonplastic, dry to slightly moist
				Scattered very coarse sand (pink granite), generally <25% sand
		10		Trace scattered gravel (pink granite)
				Thin layer (1) of coarse-grained sand
				(SP) SAND, fine- to medium-grained sand, 2 5 Y 6/4 – light yellowish brown dry to slightly moist, alluvium
		15		(SW) SAND, fine- to very coarse-grained sand 10 YR 6/4 – light yellowish brown, dry, alluvium
				Gravel pebbles, and cobbles
				CLAYSTONE, 5 YR 4/3 – olive, fractured, weathered bedrock
				SILTSTONE, 2 5 Y 6/3 – light yellowish brown, thin laminated friable, light iron-oxide staining along laminations weathered bedrock
				Color change to 2 5 Y 6/6 – olive yellow, fine- to medium-grained sand
		20		
				Total depth = 24 0 ft
		25		

Notes 1 All HNU/OVA readings equal to zero parts per million except as indicated
2 Munsell color chart used

RMA2

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Commerce City, Colorado

Prepared by.
Harding Lawson Associates

Figure A1.4

Log of Boring SAB14695

Equipment Mobile CME-75, Continuous Core Barrel Sampling

Elevation 5242 86 Date 11/14/95

Blows/6"	HNU/OVA (ppm)	Depth (ft)	Sample	
		0		(CL) SANDY CLAY, fine- to medium-grained sand (<15%) some silt 10 YR 6/3 - pale brown hard nonplastic, alluvium
				Color change to 10 YR 4/6 - dark yellowish brown, local white caliche fracture filling
		5		Abundant white caliche fracture filling
				Little to no white caliche sand content increases to 30%
		10		CLAYEY SAND (SC), 10 YR 5/6 - yellowish brown nonplastic, dry, alluvium
		15		(SW) SAND, fine- to coarse-grained sand, 10 YR 6/4 - light yellowish brown, nonplastic dry, coarsens downward some round gravel (pink granite), alluvium
				2-inch fragment of highly oxidized fine sand, 10 YR 4/6 - dark yellowish brown, cemented
		20		
		25		(CL) CLAY, trace silt and fine sand, scattered trace fine gravel (pink granite), 10 YR 6/2 - light brownish gray stiff to hard, plastic moist minor light iron-oxide staining on fractures alluvium

Notes 1 All HNU/OVA readings equal to zero parts per million except as indicated
2 Munsell color chart used

RMA2

Prepared for
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Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by:
Harding Lawson Associates

Figure A1.5

Log of Boring SAB14795

Equipment Mobile CME-75, Continuous Core Barrel Sampling

Elevation 5242.88 Date 11/14/95

Blows/6"	HNU/OVA (ppm)	Depth (ft.)	Sample	
		25		
		30		(SM) SILTY SAND, fine-grained sand some clay, 2.5 Y 6/3 - light yellowish brown plastic, moist, alluvium
				2-inch-thick gray clay layer
				(ML) SANDY SILT, fine- to medium-grained sand, some clay matrix and clay rich layers, alluvium
				Some iron-oxide staining along bedding layers
		35		(SW) SAND, fine-grained sand, uncemented, weak friable also 2-inch fragment of hard cemented sandstone fine- to medium-grained sand, trace rounded gravel (pink granite), contains trace black sand (<%5), alluvium Increase in rounded pebbles gravel, heterolithic pebbles 10 YR 4/6 - dark brown, nonplastic moist local iron -oxide matrix
		40		CLAYSTONE, 10 YR 5/1 - gray little fractured, plastic iron-oxide stained along fractures weathered bedrock
				Silt content increases with depth
				SANDY CLAYSTONE, very fine sand 2.5 Y 6/6 - olive yellow, weak, friable, local heavy iron-oxide fracture filling weathered bedrock
				Total depth = 43.0 ft.
		45		

RMA2

Prepared for
Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared by
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Figure A1.5

Log of Boring SAB14795

Attachment A2

1,000-YEAR ISOLATION SUPPORTING DOCUMENTATION

NARRATIVE DESCRIPTION OF CALCULATION METHODOLOGIES

EPA's HELP Model for Calculating Advective Water Movement Through Composite Liners

A review of the methodology presented in the HELP model documentation (pp 74 through 98, Equations 138 through 168) versus the equations included in the HELP model code was performed to verify consistency between HELP model and results derived using the equations developed by Giroud and Bonaparte (1989) Results of the review indicated a few important differences between the code and the model documentation for Version 3 01 of the HELP model One difference was for the set of equations that estimate the wetted radius of pinhole and defect leaks in the flexible membrane liner (FML), which varies based on contact. Equations 156 and 157 (EPA, 1994) are described as being equivalent in the calculation of the wetted radius R, where R in Equation 156 is in meters and R in Equation 157 is in inches Review of how these equations were coded, along with recalculation of the equivalency factors, indicates that R in Equation 157 is also in meters This also affects subsequent equations presented for the various levels of liner contact

Another difference between the coded equations and those presented in the documentation occurs for Equation 151 (EPA, 1994), which includes a temperature correction factor as reported in the original work of Giroud and Bonaparte, 1989, and Giroud and others, 1992 This temperature correction factor is not included in the coded equation used in the HELP model

After these differences were assessed, the equations developed to estimate diffusive and advective flow of water through FML composites (Equations 138 through 168, applied as appropriate) were incorporated into a spreadsheet model This model was then applied to various levels of head build up on top of compacted clay layer (CCL) and geosynthetic clay liners (GCL) composite liners The calculation of flow through the liner consists of three separate components, diffusive flow (Equation 141), flow through manufacturing defects (or pinholes, Equations 151, 152, and appropriate equations based on liner contact), and flow through installation defects (Equations 151, 152, and appropriate equations based on liner contact) These numbers are calculated on a per acre basis as diffusive flow over an acre, flow

through a single pinhole times the total number of pinholes per acre, and flow through a single defect times the number of defects per acre These values are then added together to estimate the total advective rate of water flow through the liner in inches/year/acre The use of this advective flow rate in a one-dimensional sense in the VLEACH modeling (discussed in Section 2.1 1 4) is thus conservative, as the value is additive over an acre Actual flow values associated with a specific liner location would be less than the value calculated using this methodology Actual flow will likely be more isolated than a unit area of one acre Hydraulic head is assumed to result from isolated "remnants" of leachate which would not necessarily cover an entire acre Given the source of head, only one defect may actually be applicable The acre approach assumes 3 defects and 1 pinhole The use of an acre unit also adds a diffusion component for the entire acre when the area of the head causing the diffusion may actually be less

Solutions to the Advective/Dispersive Equation for Contaminant Transport

The rate a which a chemical "spreads out" in one dimension is described by the advective/dispersive equation (Freeze and Cherry, 1979)

$$\frac{\partial c}{\partial t} = D\frac{\partial^2 c}{\partial X^2} - V\frac{\partial c}{\partial X}$$

where

C = chemical Concentration

D = diffusion Coefficient

X = distance along flowpath

V = advective Velocity

t = time

The solution for a constant source at X = 0 into a media initially at C = 0 was originally present by Ogata and Banks, 1961, and is as follows

$$\frac{C}{C_o} = \frac{1}{2}\left[\mathrm{erfc}\left(\frac{X-Vt}{2\sqrt{Dt}}\right) + \exp\left(\frac{VX}{D}\right)\mathrm{erfc}\left(\frac{X+Vt}{2\sqrt{Dt}}\right)\right]$$

where

erfc = complimentary error function

This equation was developed into a spreadsheet model which was used to predict Cl/Co over time at the bottom of a cumulative six-feet of the compacted clay component of the liner system for the constituents of potential concern.

For estimating diffusive migration in the lower liner, it is necessary to have an estimate of the appropriate diffusion coefficient (D) for a chemical of concern. The diffusion coefficient of a chemical in free water has been related to the chemicals molecular weight (Lyman and others, 1982) However, a variety of factors affect diffusion in saturated soil including adsorption of chemical onto soil, tortuosity of flowpaths, and the physical nature of the soil aggregates that can impact flowpaths (i e , development of soil "crusts" that can act as capillary breaks, presence of entrapped air, etc) (Dragun, 1988) Jury and others (1983), present an effective diffusion coefficient in water that is reduced by a tortuosity factor that is a function of porosity

$$De = \left[\frac{\Theta_w^{10/3}}{\Phi^2}\right] D_w$$

where

De = effective diffusion coefficient

Θ_w = volumetric water content

Φ = total Porosity

D_w = free water diffusion coefficient

Assuming a porosity of 40 percent for the clay and saturated conditions, the effective diffusion coefficient is approximately 30 percent of the free water diffusion coefficient of the chemical It is important to note

that this relationship is based only on a tortuosity factor and conservatively does not include other potential effects

The chemicals of concern identified in Appendix A (chloroform, CPMSO, DIMP, and DBCP) have, in general, similar diffusive properties in water Therefore, a single analysis was performed to estimate the relative concentration input (Cl/Co) at the base of the liner systems for input into the VLEACH modeling A free-water diffusion coefficient of 5×10^{-6} square centimeters per second (4×10^{-5} square meters per day) was used to represent the constituents For the liner system analyzed, it was assumed that there would be a cumulative minimum of 6 feet of compacted clay The FMLs associated with the CCLs were conservatively assumed to have no effect in the diffusion estimated Results of this analysis are presented in Figure A17 of Appendix A.

Rate of Advective Water Movement through the Unsaturated Zone

An analysis based on Clapp and Hornberger, 1978, was used to estimate both the long-term moisture content and rate of advective water movement through the vadose zone after the landfill has been constructed The equations for estimating the long-term soil moisture content and advective water movement in the unsaturated zone are (EPA's RITZ model, EPA, 1988)

$$V_a = V_d/\theta$$

$$\theta = \theta_s[V_d/k_s]^{1/(2b+3)}$$

where

V_a = advective water velocity

V_d = infiltration or recharge rate

θ = long-term soil water content at recharge rate V_d on a volume basis

θ_s = saturated water content of the soil on a volume basis

k_s = saturated hydraulic conductivity of the soil

b = Clapp and Hornberger, 1978, soil constant

These equations were used to identify a range of leakage rates from the liner which could result in advective water movement through 20 feet of vadose zone material in 1,000 years The leakage rates were then compared to predictions of leakage through a single CCL made using the HELP model methodology

Basin F Waste Pile Leachate Analytical Results

Analysis of leachate from the primary and secondary sumps at the Basin F Waste Pile have been performed intermittently since 1989 A historical summary of the results of these analyses are presented in Table A2 1 These data were generated by several laboratories and no review of quality control data has been performed to evaluate the accuracy of the results

Composite samples of Basin F Waste Pile leachate from the primary and secondary sumps were collected on March 30, 1994 for purposes of updating the leachate characterization. The composite leachate samples were obtained from the collection tank at the base of the waste pile and sent to five laboratories for analysis of the following parameters

1 Volatile organic compounds (VOCs) by gas chromatography (GC) with electrolytic conductivity detector (ECD) flame ionization detector (FID), photoionization detector (PID), and gas chromatography/mass spectrometry (GC/MS)

2 Semivolatile organic compounds (SVOCs) by GC/MS

3 Organochlorine pesticides and polychlorinated biphenyls (PCBs) by GC with electron capture detector (ECD), and GC/MS

4 Organosulfur compounds by GC with flame photometric detector (FPD) and GC/MS

5 Organophosphorus compounds by GC with nitrogen phosphorus detector (NPD) and GC/MS

6 Agent degradation products by high pressure liquid chromatography (HPLC) and ion chromatography

7 Total and dissolved metals by inductively coupled plasma (ICP) atomic emission spectroscopy, graphite furnace atomic absorption spectroscopy (GFAA), and cold vapor atomic absorption spectroscopy (CVAA)

8 Anions by ion chromatography

9 General water chemistry parameters by various methods

The specific analytes covered by each method are listed in the leachate data summary tables (Tables A2.2 and A2 3)

The following laboratories performed the analytical work

1 DataChem Laboratories, Salt Lake City, Utah

2 Environmental Science and Engineering, Inc , (ESE) Gainsville, Florida, and Denver, Colorado

3 CKY Incorporated, Torrance, California

4 Inchcape/NDRC Laboratories, Richardson, Texas

5 Applied Research and Development Laboratories, Inc , (ARDL), Mt. Vernon, Illinois

DataChem and ESE were the only PMRMA-certified laboratories in the group at the time of the study The designation 'PMRMA-certified' means that DataChem and ESE have demonstrated proficiency with PMRMA methods, including methods for certain Army-specific parameters, such as DIMP and CPMSO The other laboratories were included in the study because they were recent additions to the PMRMA laboratory program and were working on achieving certification

Each laboratory was requested to analyze duplicate samples of the leachate for each analytical method to provide a measure of analytical variability However, because of analytical difficulties caused by the leachate matrix, full data sets were not provided by all laboratories for all methods, and significant inter- and intralaboratory analytical variability was observed in the data that were reported

Only the data from ESE and DataChem are included in this report because they were the only PMRMA-certified laboratories in the group and their data were deemed to be the most reliable However, it must be noted that even though DataChem and ESE were PMRMA-certified and the data have undergone extensive review, there is still significant analytical uncertainty in the data that is caused by the highly complex nature of the leachate matrix For example, dilutions factors as high as 10,000 were required to bring some analytes within detection range, thus precluding the detection of lower concentration

analytes Also, the high concentrations of some analytes created positive and negative interferences with the detection of other analytes and generally caused the deterioration of overall methods performance Thus, the data shown below are considered to be, at best, an estimate of actual analyte concentrations

The combined results of the GC/MS data are summarized in Table A2 2 and the combined results of the non-GC/MS methods data are summarized in Table A2 3 The data are grouped by analyte type, which corresponds to the various analytical methods If an analyte was not detected the detection limit is reported in the column "Not Detected " If an analyte was detected the range of detections are reported in the column "Detected Results" along with the average and standard deviation of the detected concentration All results are shown in units of micrograms per liter (μg/l)

CALCULATE DEPTH OF TOPSOIL/ADMIX CAP LOST TO WIND EROSION

Use the Wind Erosion Equation (Ton/Acres/Year)

E = IKCLV

E = wind erosion, ton/acre/year

I = soil erodeability tons/acre/year

K = surface roughness factor, dimensionless

C = climatic factor, dimensionless

L = unsheltered field-width factor, dimensionless

V = vegetative cover factor, dimensionless

Reference document National Agronomy Manual March 1988 Soil Conservation Service

I (From Wind Erosion Groups)

Assume Sandy Loam Soil - 86 tons/acre/year Subpart G Exhibit 502 61(a)

K Conservatively assume that the surface roughness factor is 1 0.

C 60 - taken from annual "C" values of the wind erosion equation (interpolated from nearest 10 isoline for Colorado) See attached sheet. Exhibit 502 53(a)

L = 1,000 ft (longest assumed dimension of any surface) dimension of the cover

V Will establish vegetation on cover V for alfalfa is 3,000 lb/acre We will conservatively use 2,000 lb/acre

E 0 5 tons/acre-year (see lookup table)

EROSION IS 0.6 TONS/ACRE/YEAR

This calculation conservatively assumes that this is the erosion rate for 1,000 years Assumption is conservative because if erosion of the cap occurs, the cap will, by design, become armored (topsoil-gravel admix) It is likely that vegetation will decrease at some point in the thousand-year period The decrease in vegetation will be associated with a reduction of wind erosion emissions as the cover armors As topsoil erodes, a gravel surface will be established that forms a "desert pavement."

Average soil density for the ascalon series on the Rocky Mountain Arsenal site is 105 pounds per cubic foot Soil density was taken from "soil vegetation and inventory of the Rocky Mountain Arsenal, Adams County, Colorado, on October 19, 1988, James P Walsh & Associates, Inc

Compute potential soil loss over 1,000 years

$$1 \text{ ton top soil} * \frac{1 \text{ ft}^3}{105 \text{ lb}} * \frac{2{,}000 \text{ lb}}{1 \text{ ton}} * \frac{(12 \text{ in})^3}{(1 \text{ ft})^3}$$

32,914 in^3 per 1 ton of topsoil

$$\frac{0\ 5 \text{ tons}}{\text{Acre-year}} * \frac{1 \text{ acre}}{43{,}560 \text{ ft}^2} * \frac{(1 \text{ ft})^2}{(12 \text{ in})^2} * \frac{32{,}914 \text{ in}^3}{\text{Ton}}$$

0 003 $\frac{\text{in}}{\text{yr}}$ of topsoil loss attributable to wind erosion,

or approximately a 3-inch soil loss attributable to wind erosion over the period of 1,000 years

Table A2.1: Summary of Historical Basin F Waste Pile Leachate Analytical Data

Location	Cell 1 Primary Sump											
Laboratory	RMA	RMA	RMA	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RMA
Date sampled	07/05/89	07/27/89	08/25/89	10/05/89	02/21/90	04/18/90	07/26/90	10/09/90	04/15/91	09/10/91	04/16/92	07/20/93
Unit	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
DMMP (mg/l)	1 8	9 5	9 6	13 0	7 3	7 4	7 6	7 7	4 9	1 3	0 59	0 13
CPMSO2 (mg/l)	3 9	13 0	15 3	15 0	9 0	12 0	14 0	16	15	12	14	1 62
Aldrin (mg/l)	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1,2-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1-Dichloroethene	NA	NA	25 0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1 1-Dichloroethane	NA	NA	BDL	BDL	BDL	BDI	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethane	NA	NA	12 0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloropropane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,3 Dimethylbenzene	NA	NA	43 7	BDL	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethylvinyl ether	NA	NA	31 6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Benzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10	BDL	NA
Carbon tetrachloride	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Methylene chloride	NA	NA	124	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Bromoform	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Chloroform	NA	NA	58 5	33 0	100	82	80	150	130	170	140	NA
Chlorobenzene	NA	NA	18 5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Dicyclopentadiene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Ethylbenzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Toluene	NA	NA	15 0	BDL	BDL	BDL	BDL	35	BDL	31	33	NA
Tetrachloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Trichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Xylenes	NA	NA	35 3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Metal Results (mg/l)												
Calcium (total)	NA	130	27 0	BDL	BDL	BDL	6 1	BDL	BDL	BDL	BDL	NA
Copper (total)	NA	546	210	237	409	331	650	520	467	848	408	NA
Sodium (total)	NA	10,300	74,000	37,000	48,200	54,300	47,600	87,300	70,000	108,000	53,300	NA
Zinc (total)	NA	2 3	1 9	BDL	4 4	3 3	2 2	BDL	3 0	BDL	3 9	NA

Table A2.1 (continued)

Location	Cell 2 Primary Sump											
Laboratory	RMA	RMA	RMA	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RMA
Date sampled	07/05/89	07/27/89	08/25/89	10/05/89	02/21/90	04/18/90	07/26/90	10/09/90	04/15/91	09/10/91	04/16/92	07/20/93
Unit	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
DMMP (mg/l)	11 2	21 1	34 4	9 9	8 5	22	16	20	NA	NA	0 91	0 8
CPMSO2 (mg/l)	12 9	15 5	16 4	14 0	5 1	13	11	16	NA	NA	9 9	1 0
Aldrin (mg/l)	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA	NA	BDL	BDL
1,1,1-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1,2-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1-Dichloroethene	NA	NA	44 8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1-Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloropropane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,3-Dimethylbenzene	NA	NA	BDL	BDL	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethylvinyl ether	NA	NA	72 6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Benzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5	BDL	NA
Carbon tetrachloride	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Methylene chloride	NA	NA	27 6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Bromoform	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Chloroform	NA	NA	54 5	38	BDL	190	130	410	270	610	120	NA
Chlorobenzene	NA	NA	62 2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Dicyclopentadiene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Ethylbenzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Toluene	NA	NA	11 9	BDL	BDL	BDL	BDL	20	BDL	31	BDL	NA
Tetrachloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Trichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Xylenes	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Metal Results (mg/l)												
Calcium (total)	NA	170	35 0	BDL	BDL	BDL	14 1	BDL	NA	NA	NA	NA
Copper (total)	NA	784	320	228	226	300	600	349	NA	NA	NA	NA
Sodium (total)	NA	11,500	84,000	30,800	26,800	44,400	48,000	90,800	NA	NA	NA	NA
Zinc (total)	NA	4 2	4 00	BDL	4 11	3 0	3 0	BDL	NA	NA	NA	NA

Table A2.1 (continued)

Location	Cell 3 Primary Sump											
Laboratory	RMA	RMA	RMA	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RMA
Date sampled	07/05/89	07/27/89	08/25/89	10/05/89	02/21/90	04/18/90	07/20/90	10/09/90	04/15/91	09/10/91	04/16/92	07/20/93
Unit	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
DMMP (mg/l)	9 2	15 2	17 3	23 0	13 0	33	24	18	16	3 3	1 1	1 3
CPMSO2 (mg/l)	9 9	8 5	12 4	16 0	8 8	20	16	13	17	14	11	1 1
Aldrin (mg/l)	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1,2-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1-Dichloroethene	NA	NA	58 5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1 Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloropropane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,3-Dimethylbenzene	NA	NA	BDL	BDL	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethylvinyl ether	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Benzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6	BDL	NA
Carbon tetrachloride	NA	NA	74 8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Methylene chloride	NA	NA	194	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Bromoform	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Chloroform	NA	NA	231	290	BDL	250	200	380	300	340	240	NA
Chlorobenzene	NA	NA	56 1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Dicyclopentadiene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Ethylbenzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Toluene	NA	NA	46 1	BDL	39 0	BDL	BDL	BDL	BDL	BDL	68	NA
Tetrachloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Trichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Xylenes	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Metal Results (mg/l)												
Calcium (total)	NA	210	39 0	BDL	BDL	BDL	11	BDL	BDL	BDL	BDL	NA
Copper (total)	NA	723	50 0	169	203	120	450	307	167	150	176	NA
Sodium (total)	NA	12,800	50,000	45,800	44,100	32,800	49,000	105,000	75,800	122,000	56,900	NA
Zinc (total)	NA	3 7	3 5	BDL	3 5	2 1	2 2	BDL	2 7	BDL	4 9	NA

Table A2.1 (continued)

Location	Cell 1 Secondary Sump											
Laboratory	RMA	RMA	RMA	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RMA
Date sampled	07/05/89	07/27/89	08/25/89	10/05/89	02/21/90	04/18/90	07/26/90	10/09/90	04/15/91	09/10/91	04/16/92	07/20/93
Unit	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
DMMP (mg/l)	2 2	7 5	6 4	9 4	4 6	6 3	BDL	1 3	0 57	BDL	0 34	BDL
CPMSO2 (mg/l)	2 2	7 7	6 4	1 1	4 7	10	12	3 9	6 0	1 2	0 900	0 31
Aldrin (mg/l)	NA	0 06	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0 06	BDL
1,1,1-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	70	BDL	BDL	4	NA
1,1,2-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1-Dichloroethene	NA	NA	27 0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1-Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloropropane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,3-Dimethylbenzene	NA	NA	BDL	BDL	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethylvinyl ether	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Benzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2	NA
Carbon tetrachloride	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Methylene chloride	NA	NA	209 0	1100	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Bromoform	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Chloroform	NA	NA	28 2	BDL	BDL	50	BDL	BDL	39	94	53	NA
Chlorobenzene	NA	NA	35 5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Dicyclopentadiene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Ethylbenzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Toluene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	51	12	NA
Tetrachloroethene	NA	NA	52 9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Trichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Xylenes	NA	NA	26 0	BDL	BDL	BDL	BDL	BDL	BDL	10	BDL	NA
Metal Results (mg/l)												
Calcium (total)	NA	70	5 10	BDL	BDL	BDL	7 2	BDL	BDL	BDL	BDL	NA
Copper (total)	NA	239	99 0	119	120	348	500	64 8	58 5	4 8	8 5	NA
Sodium (total)	NA	9300	45,900	35,000	38,200	60,000	60,200	36,700	28,200	2,670	2,320	NA
Zinc (total)	NA	3 0	1 8	4 5	5 8	3 3	2 4	BDL	BDL	2 0	2 0	NA

Table A2.1 (continued)

Location	Cell 2 Secondary Sump											
Laboratory	RMA	RMA	RMA	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RMA
Date sampled	07/05/89	07/27/89	08/25/89	10/05/89	02/21/90	04/18/90	07/26/90	10/09/90	04/15/91	09/10/91	04/16/92	07/20/93
Unit	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
DMMP (mg/l)	8 1	36 4	18 4	29 0	13 0	30	24	14	18	3 4	1 2	0 4
CPMSO2 (mg/l)	8 2	17 3	12 6	14 0	6 0	15	17	8 9	18	14	11	0 9
Aldrin (mg/l)	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	NA	NA	BDL	BDL	BDL	110	BDL	BDL	7	5	BDL	NA
1,1,2-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1-Dichloroethene	NA	NA	54 3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1 Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2 Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloropropane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,3-Dimethylbenzene	NA	NA	BDL	BDL	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethylvinyl ether	NA	NA	116	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Benzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Carbon tetrachloride	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Methylene chloride	NA	NA	95 9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Bromoform	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA*
Chloroform	NA	NA	38 8	BDL	BDL	BDL	80	96	210	260	51	NA
Chlorobenzene	NA	NA	95 9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Dicyclopentadiene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Ethylbenzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Toluene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7	BDL	NA
Tetrachloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Trichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Xylenes	NA	NA	36 2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Metal Results (mg/l)												
Calcium (total)	NA	220	28 0	BDL	BDL	BDL	14 5	BDL	BDL	BDL	BDL	NA
Copper (total)	NA	854	320	268	404	318	400	591	380	243	302	NA
Sodium (total)	NA	12,100	119,000	34,500	39,900	43,900	48,000	112,000	74,000	152,000	43,500	NA
Zinc (total)	NA	4 0	4 7	3 1	5 7	3 9	2 8	BDL	4 5	BDL	4 0	NA

Table A2.1 (continued)

Location	Cell 3 Secondary Sump											
Laboratory	RMA	RMA	RMA	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RMA
Date sampled	07/05/89	07/27/89	08/25/89	10/05/89	02/21/90	04/18/90	07/26/90	10/09/90	04/15/91	09/10/91	04/16/92	07/20/93
Unit	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
DMMP (mg/l)	7 2	9 5	23 3	23 0	14 0	18 0	24 0	4 3	1 6	0 11	0 3	0 03
CPMSO2 (mg/l)	6 8	13 0	14 3	14 0	8 9	12 0	16 0	10	6 6	3 0	3 5	0 8
Aldrin (mg/l)	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	84	22	BDL	13	NA
1,1,2-Trichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1-Dichloroethene	NA	NA	33 4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,1-Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloroethane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,2-Dichloropropane	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
1,3-Dimethylbenzene	NA	NA	BDL	BDL	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethylvinyl ether	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Benzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Carbon tetrachloride	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Methylene chloride	NA	NA	101	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Bromoform	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Chloroform	NA	NA	BDL	93 0	BDL	100	110	71	120	260	52	NA
Chlorobenzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	24	BDL	NA
Dicyclopentadiene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Ethylbenzene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Toluene	NA	NA	BDL	BDL	BDL	BDL	BDL	30	BDL	BDL	BDL	NA
Tetrachloroethene	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Trichloroethene	NA	NA	BDL	BDL	BDL	50	BDL	BDL	BDL	BDL	BDL	NA
Xylenes	NA	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NA
Metal Results (mg/l)												
Calcium (total)	NA	270	32 0	BDL	BDL	BDL	13 1	BDL	BDL	BDL	BDL	NA
Copper (total)	NA	714	150	150	270	170	200	61 4	76 2	28 6	69 6	NA
Sodium (total)	NA	12,100	128,000	38,400	54,500	56,400	40,200	28,700	31,900	13,800	33,200	NA
Zinc (total)	NA	2 8	4 3	2 5	7 1	2 6	1 8	BDL	BDL	BDL	BDL	NA

NA Not analyzed
BDL Below detection limit

Table A2.2: GC/MS Results by Analyte Group* for Basin F Waste Pile Leachate from March 1994 Sampling

Group/Analyte	Not Detected Reporting Limit	Detected Results Range	Average	Standard Deviation
Organophosphorus Compounds				
Diisopropylmethyl phosphonate		910 to 1,300	1,100	270
Dimethylmethyl phosphate		570 to 880	720	220
Organosulfur Compounds				
1,4-Oxathiane	27			
4-Chlorophenylmethyl sulfide		230 to 310	270	57
4-Chlorophenylmethyl sulfone		15,000 to 19,000	17,000	2,800
4-Chlorophenylmethyl sulfoxide		2,800 to 4,000	3,400	800
Dimethyl disulfide		8		
Dithiane	3			
Organochlorine Pesticides and PCBs				
DDT	18			
DDD	18			
DDE	14			
Aldrin	13			
alpha-Benzenehexachloride	5			
alpha-Endosulfan	23			
Atrazine	6			
beta-Benzenehexachloride	17			
Chlordane	37			
delta-Benzenehexachloride	3			
Dieldrin	26			
Endosulfan sulfate	50			
Endrin	18			
Endrin aldehyde	5			
Endrin ketone	6			
Heptachlor	38			
Heptachlor epoxide	28			
Hexachlorocyclopentadiene	38			
Isodrin	8			
Lindane	7			
Malathion	21			
Methoxychlor	11			
Parathion	37			
PCB 1016	9			
PCB 1221	9			
PCB 1232	9			
PCB 1242	9			

Table A2.2 (continued)

Group/Analyte	Not Detected Reporting Limit	Detected Results Range	Average	Standard Deviation
PCB 1248	9			
PCB 1254	9			
PCB 1260	13			
Supona	19			
Toxaphene	17			
Vapona	9			
Semivolatiles Organic Compounds				
1,2,3-Trichlorobenzene	6			
1,2,4-Trichlorobenzene	2			
1,2-Diphenylhydrazine	13			
1,3-Dinitrobenzene	10			
2,3,6-Trichlorophenol	2			
2,4,5-Trichlorophenol	3			
2,4,6-Trichlorophenol	4			
2,4-Dichlorophenol	8			
2,4-Dimethylphenol	4			
2,4-Dinitrophenol	170			
2,4-Dinitrotoluene	6			
2,6-Dinitroaniline	9			
2,6-Dinitrotoluene	7			
2-Chloronaphthalene	3			
2-Chlorophenol	3			
2-Methyl-4,6-dinitrophenol	50			
2-Methylnaphthalene	1			
2-Methylphenol	4			
2-Nitroaniline	31			
2-Nitrophenol	8			
3,3'-Dichlorobenzidine	5			
3,5-Dinitroaniline	21			
3-Nitroaniline	15			
3-Nitrotoluene	3			
4-Bromophenylphenyl ether	7			
3-Methyl-4-chlorophenol	9			
4-Chloroaniline	1			
4-Chlorophenylphenyl ether	20			
4-Methylphenol	3			
4-Nitroaniline	31			
4-Nitrophenol	96			
Acenaphthene	6			
Acenaphthylene	5			
Anthracene	5			
Benzo[a]anthracene	10			

Table A2.2 (continued)

Group/Analyte	Not Detected Reporting Limit	Detected Results Range	Average	Standard Deviation
Benzo[a]pyrene	6			
Benzo[b]fluoranthene	7			
Benzo[def]phenanthrene	5			
Benzo[g,h,i]perylene	6			
Benzo[k]fluoranthene	10			
Benzoic acid	3			
Benzyl alcohol	4			
beta-Endosulfan	42			
bis(2-Chloroethoxy)methane	7			
bis(2-Chloroethyl)ether	1			
bis(2-Chloroisopropyl)ether	5			
bis(2-Ethylhexyl)phthalate		30 to 38	34	6
Bromacil	3			
Butylbenzyl phthalate	6			
Chlordecone	20			
Chrysene	7			
Di-N-butyl phthalate		120		
Di-N-octyl phthalate	2			
Dibenz[ah]anthracene	10			
Dibenzofuran	5			
Diethyl phthalate	6			
Dimethyl phthalate	2			
Famphur / Famophos	20			
Fluoranthene	5			
Fluorene	7			
Hexachloro-1,3-butadiene	5			
Hexachlorobenzene	5			
Hexachloroethane	6			
Indeno[1,2,3-c,d]pyrene	21			
Isophorone	2			
Mirex	24			
N-Nitrosodi-N-propylamine		810 to 990	900	130
N-Nitrosodimethylamine	10			
N-Nitrosodiphenylamine	4			
Naphthalene	0			
Nitrobenzene	4			
Pentachlorophenol	9			
Phenanthrene	5			
Phenol	2			
Volatile Organic Compounds				
1,1,1-Trichloroethane	1			
1,1,2,2-Tetrachloroethane	2			

Table A2.2 (continued)

Group/Analyte	Not Detected Reporting Limit	Detected Results Range	Average	Standard Deviation
1,1,2-Trichloroethane	1			
1,1-Dichloroethane	1			
1,1-Dichloroethene	1			
1,2-Dichlorobenzene	1			
1,2-Dichloroethane	1			
1,2-Dichloroethylenes (cis and trans isomers)	3			
1,2-Dichloropropane	1			
1,3-Dichlorobenzene	1			
1,3-Dichloropropane	5			
1,3-Dimethylbenzene/ m-Xylene	1			
1,4-Dichlorobenzene	2			
2-Butanone		340 to 450	400	80
2-Chloroethyl vinyl ether	4			
2-Hexanone	1			
Acetone		1,500 to 15,000	8,000	7,000
Acrylonitrile	8			
Benzene	1			
Bicyclo[2,2,1]hepta-2,5-diene	2			
Bromodichloromethane	1			
Bromoform	11			
Bromomethane	5			
Carbon disulfide	5			
Carbon tetrachloride	1			
Chlorobenzene	1			
Chloroethane	8			
Chloroform		21 to 36	30	7
Chloromethane	1			
cis-1,3-Dichloropropene	5			
Dibromochloromethane	1			
Dibromochloropropane	6			
Dichloromethane	1			
Dicyclopentadiene	4			
Ethylbenzene	1			
Methyl isobutyl ketone		5 to 13	9	5
Styrene	5			
Tetrachloroethene	1			
Toluene		6		
trans-1,3-Dichloropropene	5			
Trichloroethene	1			
Trichlorofluoromethane	1			
Vinyl acetate	1			
Vinyl chloride	12			

Table A2.2 (continued)

Group/Analyte	Not Detected Reporting Limit	Detected Results Range	Average	Standard Deviation
Xylenes	2			

* Results in $\mu g/l$

Table A2.3: Non-GC/MS Results by Analyte Group*
for Basin F Waste Pile Leachate
from March, 1994 Sampling

Group/Analyte	Not Detected Reporting Limit	Detected Results Range	Average	Standard Deviation
Agent Degredation Products				
Chloroacetic acid	25,000			
Fluoroacetic acid	25,000			
Isopropylmethyl phosphonic acid		5 6E+06 to 7 3E+06	6 5E+06	
Methylphosphonic acid		1 8E+06 to 2 0E+06	1 9E+06	140,000
Thiodiglycol		27,000 to 29,000	28,000	1,000
Thiodiglycolic acid		540,000 to 580,000	560,000	28,000
Anions				
Chloride		1 5E+08 to 1 9E+08	1 7E+08	1 7E+07
Cyanide		420 to 870	575	210
Fluoride		32,000 to 36,000	34,200	2,000
Nitrate as nitrogen		870,000 to 930,000	900,000	42,000
Nitrite as nitrogen	61,000			
Nitrite plus nitrate		7 6E+0600 to 1 8E+07	1 3E+07	7 4E+06
Sulfate		2 3E+07 to 3 2E+07	2 8E+07	4 7E+06
General Chemistry Parameters				
Alkalinity		1 7E+07 to 3 0E+07	2 6E+07	4 6E+06
Ammonia nitrogen		2 1E+07 to 2 3E+07	2 2E+07	850,000
Chemical oxygen demand		4 9E+07 to 8 2E+08	1 9E+08	2 7E+08
pH		8 05 to 8 45	8 30	
Phosphorus		2 0E+07 to 2 1E+07	2 0E+07	300,000
Specific conductivity		217,000 to 530,000	370,000	170,000
Sulfide		26,000 to 32,000	29,000	5,000
Total hardness		56,000 to 217,000	110,000	83,000
Total organic carbon		1 8E+07 to 4 9E+07	3 3E+07	1 7E+07
Total organic halogens		80,000 to 220,000	144,000	67,000
Total suspended solids		404,000 to 649,000	536,000	125,000
Metals				
Aluminum		380 to 470	430	50
Arsenic		1,100 to 1,400		
Barium		33 to 40	35	3
Cadmium		120 to 140	90	50
Calcium		21,000 to 22,000		
Chromium		280 to 310	300	10
Cobalt		700 to 730	720	20
Copper		240,000 to 250,000		

Table A2.3 (continued)

Group/Analyte	Not Detected Reporting Limit	Detected Results Range	Average	Standard Deviation
Metals (continued)				
Iron		5,840 to 6,100	6,000	130
Lead		60 to 120	90	40
Magnesium		7,000 to 8,200	7,600	500
Manganese		560 to 590	580	20
Mercury		12 to 16		
Nickel		7,200 to 7,600	7,500	180
Potassium		57,000 to 890,000	460,000	420,000
Sodium		9 0E+07 to 1 0E+08		
Zinc		1,800 to 2,600	2,300	320
Organophosphorus Compounds				
Diisopropylmethyl phosphonate		740 to 1,000	860	120
Dimethylmethyl phosphate		4,600 to 5,600	5,200	
Organosulfur Compounds				
1,4-Oxathiane		7 to 85	45	40
4-Chlorophenylmethyl sulfide	6			
4-Chlorophenylmethyl sulfone		10,000 to 16,000	13,000	3,000
4-Chlorophenylmethyl sulfoxide		2,900 to 3,800	3,400	400
Benzothiazole		42 to 44	43	1
Dimethyl disulfide		8 to 11	9	1
Dithiane		16		
Organochlorine Pesticides				
DDT	0 05			
DDD	0 05			
DDE	0 05			
Aldrin		0 7 to 6	3	3
Atrazine		130 to 170	150	30
Chlordane	0 1			
Dieldrin		0 2		
Endrin	0 05			
Hexachlorocyclopentadiene	0 4			
Isodrin	0 05			
Malathion	4			
Parathion		6 to 13	9	5
Supona	8			
Vapona	4			
Volatile Organic Compounds				
1,1,1-Trichloroethane	8			
1,1,2-Trichloroethane	8			

Table A2.3 (continued)

Group/Analyte	Not Detected Reporting Limit	Detected Results Range	Average	Standard Deviation
Volatile Organic Compounds (continued)				
1,1-Dichloroethane	7			
1,1-Dichloroethene	17			
1,2-Dichloroethane	11			
1,2-Dichloroethylenes (cis and trans isomers)	8			
1,3-Dimethylbenzene/ m-Xylene	13			
Benzene	11			
Bicyclo[2,2,1]hepta-2,5-diene	14			
Carbon tetrachloride	10			
Chlorobenzene	8			
Chloroform		18 to 26	22	6
Dibromochloropropane		2		
Dichloromethane	74			
Dicyclopentadiene		42 to 50	46	6
Ethylbenzene	14			
Methyl isobutyl ketone		15		
Tetrachloroethene	7			
Toluene		7 to 11	9	2
Trichloroethene	6			
Vinyl chloride	10			
Xylenes	14			

* Results in $\mu g/l$

Table A2.4: South Plants Area Groundwater Analytical Data Geometric Mean by Well

Analyte	Well 01078 (µg/l)	Well 01513 (µg/l)	Well 01524 (µg/l)	Well 36054 (µg/l)	Well 36168 (µg/l)	Well 36210 (µg/l)	Well 36211 (µg/l)	Well 36212 (µg/l)
Chloroform	44,667	43,081	19 06	280,000	3,046,498	100,000	56,234	354,813
CPMSO	16 73	8 56	16 82	40 26	10 12	75 9	7 8	151 4
DIMP	1 01	—	1 8	3 08	3 84	2 2	0	0
DBCP	2,400	—	2 24	58	26 8	30 2	0	9 6

— Not detected
CPMSO 4-Chlorophenylmethyl sulfone
DIMP Diisopropylmethyl phosphate
DBCP Dibromochloropropane
µg/l Micrograms per liter

VLEACH MODEL RESULTS

```
RMA 93-03 Chloroform Transport, First 100 years
  1
       0.1       100.        50.       100.
      58.0      .17       7700.       0.85
Polygon I
        1.       0.25    .00057        1.6       0.40        .25       .005
      .165        -1.        0.
   80y     100.0
    1    1        0.0
    2    2        0.0
    3    3        0.0
    4    4        0.0
    5    5        0.0
    6    6        0.0
    7    7        0.0
    8    8        0.0
    9    9        0.0
   10   10        0.0
   11   11        0.0
   12   12        0.0
   13   13        0.0
   14   14        0.0
   15   15        0.0
   16   16        0.0
   17   17        0.0
   18   18        0.0
   19   19        0.0
   20   20        0.0
   21   21        0.0
   22   22        0.0
   23   23        0.0
   24   24        0.0
   25   25        0.0
   26   26        0.0
   27   27        0.0
   28   28        0.0
   29   29        0.0
   30   30        0.0
   31   31        0.0
   32   32        0.0
   33   33        0.0
   34   34        0.0
   35   35        0.0
   36   36        0.0
   37   37        0.0
   38   38        0.0
   39   39        0.0
   40   40        0.0
   41   41        0.0
   42   42        0.0
   43   43        0.0
   44   44        0.0
   45   45        0.0
   46   46        0.0
   47   47        0.0
```

48	48	0.0
49	49	0.0
50	50	0.0
51	51	0.0
52	52	0.0
53	53	0.0
54	54	0.0
55	55	0.0
56	56	0.0
57	57	0.0
58	58	0.0
59	59	0.0
60	60	0.0
61	61	0.0
62	62	0.0
63	63	0.0
64	64	0.0
65	65	0.0
66	66	0.0
67	67	0.0
68	68	0.0
69	69	0.0
70	70	0.0
71	71	0.0
72	72	0.0
73	73	0.0
74	74	0.0
75	75	0.0
76	76	0.0
77	77	0.0
78	78	0.0
79	79	0.0
80	80	0.0

```
|-------------------------------------------------------------|
|                VLEACH (Version 2.2, 1995)                   |
|                                                             |
|                          By:                                |
|       Varadhan Ravi and Jeffrey A. Johnson                  |
|                 (USEPA Contractors)                         |
|       Center for Subsurface Modeling Support                |
|       Robert S. Kerr Environmental Research Laboratory      |
|       U.S. Environmental Protection Agency                  |
|       P.O. Box 1198                                         |
|       Ada, OK 74820                                         |
|                                                             |
|       Based on the original VLEACH (version 1.0)            |
|       developed by CH2M Hill, Redding, California           |
|       for USEPA Region IX                                   |
|-------------------------------------------------------------|
```

```
RMA 93-03 Chloroform Transport, First 100 years
  1 polygons.
Timestep =   0.10 years.  Simulation length =  100.00 years.
Printout every  50.00 years.  Vertical profile stored every 100.00 years.
Koc =      58.000    ml/g,      0.20482E-02cu.ft./g
Kh =     0.17000     (dimensionless).
Aqueous solubility =     7700.0     mg/l,      218.04     g/cu.ft
Free air diffusion coefficient = .85000     sq. m/day,  3339.7     sq.ft./yr


Polygon   1
Polygon I
Polygon area =      1.0000    sq. ft.
 80 cells, each cell  0.250 ft. thick.
Soil Properties:
 Bulk density =     1.6000    g/ml,       45307.    g/cu.ft.
 Porosity = 0.4000 Volumetric water content = 0.2500
 Organic carbon content = 0.00500000
Recharge Rate = 0.00057000 ft/yr
Conc. in recharge water =     0.16500    mg/l,      0.46723E-02g/cu.ft
Atmospheric concentration =     -1.0000    mg/l,     -0.28317E-01g/cu.ft
Water table has a fixed concentration of     0.00000    mg/l,      0.00000
   with respect to gas diffusion.
```

Time: 100.000 - Chloroform - 100 years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.84310E-05	0.49594E-04	0.50790E-09
2	0.14556E-05	0.85626E-05	0.87691E-10
3	0.13731E-05	0.80772E-05	0.82720E-10
4	0.13548E-05	0.79692E-05	0.81615E-10
5	0.13370E-05	0.78649E-05	0.80546E-10
6	0.13193E-05	0.77606E-05	0.79478E-10
7	0.13016E-05	0.76563E-05	0.78410E-10
8	0.12838E-05	0.75520E-05	0.77342E-10
9	0.12661E-05	0.74478E-05	0.76275E-10
10	0.12484E-05	0.73436E-05	0.75208E-10
11	0.12307E-05	0.72395E-05	0.74141E-10
12	0.12130E-05	0.71353E-05	0.73074E-10
13	0.11953E-05	0.70312E-05	0.72008E-10
14	0.11776E-05	0.69272E-05	0.70942E-10
15	0.11599E-05	0.68231E-05	0.69877E-10
16	0.11422E-05	0.67191E-05	0.68811E-10
17	0.11246E-05	0.66151E-05	0.67746E-10
18	0.11069E-05	0.65111E-05	0.66682E-10
19	0.10892E-05	0.64072E-05	0.65617E-10
20	0.10716E-05	0.63033E-05	0.64553E-10
21	0.10539E-05	0.61994E-05	0.63489E-10
22	0.10362E-05	0.60955E-05	0.62425E-10
23	0.10186E-05	0.59917E-05	0.61362E-10
24	0.10009E-05	0.58879E-05	0.60299E-10
25	0.98329E-06	0.57841E-05	0.59236E-10
26	0.96566E-06	0.56803E-05	0.58173E-10
27	0.94802E-06	0.55766E-05	0.57111E-10
28	0.93039E-06	0.54729E-05	0.56049E-10
29	0.91277E-06	0.53692E-05	0.54987E-10
30	0.89514E-06	0.52655E-05	0.53926E-10
31	0.87753E-06	0.51619E-05	0.52864E-10
32	0.85991E-06	0.50583E-05	0.51803E-10
33	0.84230E-06	0.49547E-05	0.50742E-10
34	0.82470E-06	0.48511E-05	0.49682E-10
35	0.80709E-06	0.47476E-05	0.48621E-10
36	0.78949E-06	0.46441E-05	0.47561E-10
37	0.77190E-06	0.45406E-05	0.46501E-10
38	0.75431E-06	0.44371E-05	0.45441E-10
39	0.73672E-06	0.43337E-05	0.44382E-10
40	0.71914E-06	0.42302E-05	0.43322E-10
41	0.70156E-06	0.41268E-05	0.42263E-10
42	0.68398E-06	0.40234E-05	0.41204E-10
43	0 66640E-06	0.39200E-05	0.40146E-10
44	0 64883E-06	0.38167E-05	0.39087E-10
45	0.63127E-06	0.37133E-05	0.38029E-10
46	0 61370E-06	0.36100E-05	0.36971E-10
47	0.59614E-06	0.35067E-05	0.35913E-10
48	0.57858E-06	0.34034E-05	0.34855E-10
49	0.56102E-06	0.33001E-05	0.33797E-10
50	0.54347E-06	0.31969E-05	0.32740E-10
51	0.52592E-06	0.30936E-05	0.31683E-10
52	0.50837E-06	0.29904E-05	0.30625E-10
53	0.49082E-06	0.28872E-05	0.29568E-10

54	0.47328E-06	0.27840E-05	0.28512E-10
55	0.45574E-06	0.26808E-05	0.27455E-10
56	0.43820E-06	0.25777E-05	0.26398E-10
57	0.42066E-06	0.24745E-05	0.25342E-10
58	0.40313E-06	0.23713E-05	0 24285E-10
59	0.38560E-06	0.22682E-05	0.23229E-10
60	0.36806E-06	0.21651E-05	0 22173E-10
61	0.35054E-06	0.20620E-05	0 21117E-10
62	0.33301E-06	0.19589E-05	0 20061E-10
63	0.31548E-06	0.18558E-05	0.19005E-10
64	0.29796E-06	0.17527E-05	0 17950E-10
65	0.28043E-06	0.16496E-05	0.16894E-10
66	0.26291E-06	0.15465E-05	0 15838E-10
67	0.24539E-06	0.14435E-05	0.14783E-10
68	0.22787E-06	0.13404E-05	0 13727E-10
69	0.21035E-06	0.12374E-05	0 12672E-10
70	0.19283E-06	0.11343E-05	0.11617E-10
71	0.17531E-06	0.10313E-05	0.10561E-10
72	0.15780E-06	0.92822E-06	0.95061E-11
73	0.14028E-06	0.82518E-06	0 84508E-11
74	0.12276E-06	0.72214E-06	0.73956E-11
75	0.10525E-06	0.61911E-06	0 63404E-11
76	0.87734E-07	0.51608E-06	0 52853E-11
77	0.70218E-07	0.41305E-06	0.42301E-11
78	0.52703E-07	0.31002E-06	0 31749E-11
79	0.35188E-07	0.20699E-06	0.21198E-11
80	0.17672E-07	0.10395E-06	0 10646E-11

```
RMA 93-03 Chloroform Transport, 200 years
  1
       0.1       100.        50.       100.
      58.0       .17       7700.       0.85
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .424        -1.   9.13E-06
   80y      100.0
    1     1  8.10E-01
    2     2  1.40E-01
    3     3  1.32E-01
    4     4  1.30E-01
    5     5  1.28E-01
    6     6  1.27E-01
    7     7  1.25E-01
    8     8  1.23E-01
    9     9  1.22E-01
   10    10  1.20E-01
   11    11  1.18E-01
   12    12  1.17E-01
   13    13  1.15E-01
   14    14  1.13E-01
   15    15  1.11E-01
   16    16  1.10E-01
   17    17  1.08E-01
   18    18  1.06E-01
   19    19  1.05E-01
   20    20  1.03E-01
   21    21  1.01E-01
   22    22  9.96E-02
   23    23  9.79E-02
   24    24  9.62E-02
   25    25  9.45E-02
   26    26  9.28E-02
   27    27  9.11E-02
   28    28  8.94E-02
   29    29  8.77E-02
   30    30  8.60E-02
   31    31  8.43E-02
   32    32  8.26E-02
   33    33  8.09E-02
   34    34  7.92E-02
   35    35  7.75E-02
   36    36  7.59E-02
   37    37  7.42E-02
   38    38  7.25E-02
   39    39  7.08E-02
   40    40  6.91E-02
   41    41  6.74E-02
   42    42  6.57E-02
   43    43  6.40E-02
   44    44  6.23E-02
   45    45  6.07E-02
   46    46  5.90E-02
   47    47  5.73E-02
```

48	48	5.56E-02
49	49	5.39E-02
50	50	5.22E-02
51	51	5.05E-02
52	52	4.88E-02
53	53	4.72E-02
54	54	4.55E-02
55	55	4.38E-02
56	56	4.21E-02
57	57	4.04E-02
58	58	3.87E-02
59	59	3.70E-02
60	60	3.54E-02
61	61	3.37E-02
62	62	3.20E-02
63	63	3.03E-02
64	64	2.86E-02
65	65	2.69E-02
66	66	2.53E-02
67	67	2.36E-02
68	68	2.19E-02
69	69	2.02E-02
70	70	1.85E-02
71	71	1.68E-02
72	72	1.52E-02
73	73	1.35E-02
74	74	1.18E-02
75	75	1.01E-02
76	76	8.43E-03
77	77	6.75E-03
78	78	5.06E-03
79	79	3.38E-03
80	80	1.70E-03

Time: 100.000 - Chloroform - 200 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.21722E-04	0.12777E-03	0.13086E-08
2	0.37976E-05	0.22339E-04	0.22878E-09
3	0.35855E-05	0.21091E-04	0.21600E-09
4	0.35384E-05	0.20814E-04	0.21316E-09
5	0.34928E-05	0.20546E-04	0.21041E-09
6	0.34472E-05	0.20278E-04	0.20767E-09
7	0.34016E-05	0.20009E-04	0.20492E-09
8	0.33560E-05	0.19741E-04	0.20218E-09
9	0.33105E-05	0.19473E-04	0.19943E-09
10	0.32649E-05	0.19205E-04	0.19669E-09
11	0.32194E-05	0.18937E-04	0.19394E-09
12	0.31738E-05	0.18669E-04	0.19120E-09
13	0.31283E-05	0.18402E-04	0.18845E-09
14	0.30827E-05	0.18134E-04	0.18571E-09
15	0.30372E-05	0.17866E-04	0.18297E-09
16	0.29917E-05	0.17598E-04	0.18023E-09
17	0.29462E-05	0.17331E-04	0.17749E-09
18	0.29007E-05	0.17063E-04	0.17474E-09
19	0.28552E-05	0.16795E-04	0.17200E-09
20	0.28097E-05	0.16528E-04	0.16926E-09
21	0.27642E-05	0.16260E-04	0.16652E-09
22	0.27188E-05	0.15993E-04	0.16378E-09
23	0.26733E-05	0.15725E-04	0.16105E-09
24	0.26278E-05	0.15458E-04	0.15831E-09
25	0.25824E-05	0.15191E-04	0.15557E-09
26	0.25369E-05	0.14923E-04	0.15283E-09
27	0.24915E-05	0.14656E-04	0.15009E-09
28	0.24461E-05	0.14389E-04	0.14736E-09
29	0.24006E-05	0.14121E-04	0.14462E-09
30	0.23552E-05	0.13854E-04	0.14188E-09
31	0.23098E-05	0.13587E-04	0.13915E-09
32	0.22644E-05	0.13320E-04	0.13641E-09
33	0.22190E-05	0.13053E-04	0.13368E-09
34	0.21736E-05	0.12786E-04	0.13094E-09
35	0.21282E-05	0.12519E-04	0.12821E-09
36	0.20828E-05	0.12252E-04	0.12547E-09
37	0.20375E-05	0.11985E-04	0.12274E-09
38	0.19921E-05	0.11718E-04	0.12001E-09
39	0.19467E-05	0.11451E-04	0.11727E-09
40	0.19014E-05	0.11184E-04	0.11454E-09
41	0.18560E-05	0.10918E-04	0.11181E-09
42	0.18106E-05	0.10651E-04	0.10908E-09
43	0.17653E-05	0.10384E-04	0.10635E-09
44	0.17200E-05	0.10117E-04	0.10361E-09
45	0.16746E-05	0.98507E-05	0.10088E-09
46	0.16293E-05	0.95840E-05	0.98152E-10
47	0.15840E-05	0.93174E-05	0.95421E-10
48	0.15386E-05	0.90507E-05	0.92690E-10
49	0.14933E-05	0.87841E-05	0.89960E-10
50	0.14480E-05	0.85176E-05	0.87230E-10
51	0.14027E-05	0.82510E-05	0.84500E-10
52	0.13574E-05	0.79845E-05	0.81771E-10
53	0.13121E-05	0.77180E-05	0.79042E-10

54	0.12668E-05	0.74515E-05	0.76313E-10
55	0.12215E-05	0.71851E-05	0.73584E-10
56	0.11762E-05	0.69186E-05	0.70855E-10
57	0.11309E-05	0.66522E-05	0.68126E-10
58	0.10856E-05	0.63858E-05	0.65398E-10
59	0.10403E-05	0.61194E-05	0.62670E-10
60	0.99501E-06	0.58530E-05	0.59942E-10
61	0.94973E-06	0.55866E-05	0.57214E-10
62	0.90445E-06	0.53203E-05	0.54486E-10
63	0.85917E-06	0.50540E-05	0.51759E-10
64	0.81390E-06	0.47876E-05	0.49031E-10
65	0.76862E-06	0.45213E-05	0.46304E-10
66	0.72335E-06	0.42550E-05	0.43576E-10
67	0.67808E-06	0.39887E-05	0.40849E-10
68	0.63281E-06	0.37224E-05	0.38122E-10
69	0.58754E-06	0.34561E-05	0.35395E-10
70	0.54228E-06	0.31899E-05	0.32668E-10
71	0.49701E-06	0.29236E-05	0.29941E-10
72	0.45174E-06	0.26573E-05	0.27214E-10
73	0.40648E-06	0.23911E-05	0.24487E-10
74	0.36121E-06	0.21248E-05	0.21760E-10
75	0.31595E-06	0.18585E-05	0.19034E-10
76	0.27068E-06	0.15923E-05	0.16307E-10
77	0.22542E-06	0.13260E-05	0.13580E-10
78	0.18015E-06	0.10597E-05	0.10853E-10
79	0.13489E-06	0.79346E-06	0.81260E-11
80	0.89622E-07	0.52719E-06	0.53991E-11

```
RMA 93-03 Chloroform Transport, 300 years
  1
       0.1       100.        50.       100.
      58.0       .17       7700.       0.85
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .538        -1.   3.27E-05
   80y      100.0
    1     1  2.09E+00
    2     2  3.65E-01
    3     3  3.44E-01
    4     4  3.40E-01
    5     5  3.36E-01
    6     6  3.31E-01
    7     7  3.27E-01
    8     8  3.22E-01
    9     9  3.18E-01
   10    10  3.14E-01
   11    11  3.09E-01
   12    12  3.05E-01
   13    13  3.01E-01
   14    14  2.96E-01
   15    15  2.92E-01
   16    16  2.87E-01
   17    17  2.83E-01
   18    18  2.79E-01
   19    19  2.74E-01
   20    20  2.70E-01
   21    21  2.66E-01
   22    22  2.61E-01
   23    23  2.57E-01
   24    24  2.52E-01
   25    25  2.48E-01
   26    26  2.44E-01
   27    27  2.39E-01
   28    28  2.35E-01
   29    29  2.31E-01
   30    30  2.26E-01
   31    31  2.22E-01
   32    32  2.18E-01
   33    33  2.13E-01
   34    34  2.09E-01
   35    35  2.04E-01
   36    36  2.00E-01
   37    37  1.96E-01
   38    38  1.91E-01
   39    39  1.87E-01
   40    40  1.83E-01
   41    41  1.78E-01
   42    42  1.74E-01
   43    43  1.70E-01
   44    44  1.65E-01
   45    45  1.61E-01
   46    46  1.57E-01
   47    47  1.52E-01
```

48	48	1.48E-01
49	49	1.43E-01
50	50	1.39E-01
51	51	1.35E-01
52	52	1.30E-01
53	53	1.26E-01
54	54	1.22E-01
55	55	1.17E-01
56	56	1.13E-01
57	57	1.09E-01
58	58	1.04E-01
59	59	1.00E-01
60	60	9.56E-02
61	61	9.12E-02
62	62	8.69E-02
63	63	8.25E-02
64	64	7.82E-02
65	65	7.38E-02
66	66	6.95E-02
67	67	6.51E-02
68	68	6.08E-02
69	69	5.65E-02
70	70	5.21E-02
71	71	4.78E-02
72	72	4.34E-02
73	73	3.91E-02
74	74	3.47E-02
75	75	3.04E-02
76	76	2.60E-02
77	77	2.17E-02
78	78	1.73E-02
79	79	1.30E-02
80	80	8.61E-03

Time: 100.000 - Chloroform - 300 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.27680E-04	0.16282E-03	0.16675E-08
2	0.49374E-05	0.29044E-04	0.29744E-09
3	0.46683E-05	0.27461E-04	0.28123E-09
4	0.46085E-05	0.27109E-04	0.27763E-09
5	0.45506E-05	0.26768E-04	0.27414E-09
6	0.44927E-05	0.26428E-04	0.27065E-09
7	0.44348E-05	0.26087E-04	0.26717E-09
8	0.43770E-05	0.25747E-04	0.26368E-09
9	0.43191E-05	0.25406E-04	0.26019E-09
10	0.42612E-05	0.25066E-04	0.25671E-09
11	0.42034E-05	0.24726E-04	0.25322E-09
12	0.41455E-05	0.24385E-04	0.24974E-09
13	0.40877E-05	0.24045E-04	0.24625E-09
14	0.40298E-05	0.23705E-04	0.24276E-09
15	0.39720E-05	0.23364E-04	0.23928E-09
16	0.39141E-05	0.23024E-04	0.23580E-09
17	0.38563E-05	0.22684E-04	0.23231E-09
18	0.37984E-05	0.22344E-04	0.22883E-09
19	0.37406E-05	0.22003E-04	0.22534E-09
20	0.36827E-05	0.21663E-04	0.22186E-09
21	0.36249E-05	0.21323E-04	0.21837E-09
22	0.35671E-05	0.20983E-04	0.21489E-09
23	0.35093E-05	0.20643E-04	0.21141E-09
24	0.34514E-05	0.20303E-04	0.20792E-09
25	0.33936E-05	0.19962E-04	0.20444E-09
26	0.33358E-05	0.19622E-04	0.20096E-09
27	0.32780E-05	0.19282E-04	0.19747E-09
28	0.32201E-05	0.18942E-04	0.19399E-09
29	0.31623E-05	0.18602E-04	0.19051E-09
30	0.31045E-05	0.18262E-04	0.18702E-09
31	0.30467E-05	0.17922E-04	0.18354E-09
32	0.29889E-05	0.17582E-04	0.18006E-09
33	0.29311E-05	0.17242E-04	0.17658E-09
34	0.28733E-05	0.16902E-04	0.17309E-09
35	0.28155E-05	0.16562E-04	0.16961E-09
36	0.27577E-05	0.16222E-04	0.16613E-09
37	0.26999E-05	0.15882E-04	0.16265E-09
38	0.26421E-05	0.15542E-04	0.15917E-09
39	0.25843E-05	0.15202E-04	0.15569E-09
40	0.25265E-05	0.14862E-04	0.15220E-09
41	0.24688E-05	0.14522E-04	0.14872E-09
42	0.24110E-05	0.14182E-04	0.14524E-09
43	0.23532E-05	0.13842E-04	0.14176E-09
44	0.22954E-05	0.13502E-04	0.13828E-09
45	0.22376E-05	0.13162E-04	0.13480E-09
46	0.21798E-05	0.12823E-04	0.13132E-09
47	0.21221E-05	0.12483E-04	0.12784E-09
48	0.20643E-05	0.12143E-04	0.12436E-09
49	0.20065E-05	0.11803E-04	0.12088E-09
50	0.19487E-05	0.11463E-04	0.11740E-09
51	0.18910E-05	0.11123E-04	0.11392E-09
52	0.18332E-05	0.10783E-04	0.11044E-09
53	0.17754E-05	0.10444E-04	0.10696E-09

54	0.17176E-05	0.10104E-04	0.10348E-09
55	0.16599E-05	0.97640E-05	0.99995E-10
56	0.16021E-05	0.94242E-05	0.96515E-10
57	0.15443E-05	0.90844E-05	0.93035E-10
58	0.14866E-05	0.87446E-05	0.89555E-10
59	0.14288E-05	0.84048E-05	0.86075E-10
60	0.13710E-05	0.80650E-05	0.82595E-10
61	0.13133E-05	0.77252E-05	0.79115E-10
62	0.12555E-05	0.73854E-05	0.75635E-10
63	0.11977E-05	0.70456E-05	0.72155E-10
64	0.11400E-05	0.67058E-05	0.68675E-10
65	0.10822E-05	0.63660E-05	0.65195E-10
66	0.10245E-05	0.60262E-05	0.61715E-10
67	0.96669E-06	0.56864E-05	0.58235E-10
68	0.90892E-06	0.53466E-05	0.54756E-10
69	0.85116E-06	0.50068E-05	0.51276E-10
70	0.79339E-06	0.46670E-05	0.47796E-10
71	0.73563E-06	0.43272E-05	0.44316E-10
72	0.67786E-06	0.39874E-05	0.40836E-10
73	0.62009E-06	0.36476E-05	0.37356E-10
74	0.56233E-06	0.33078E-05	0.33876E-10
75	0.50456E-06	0.29680E-05	0.30396E-10
76	0.44679E-06	0.26282E-05	0.26916E-10
77	0.38902E-06	0.22884E-05	0.23435E-10
78	0.33125E-06	0.19485E-05	0.19955E-10
79	0.27348E-06	0.16087E-05	0.16475E-10
80	0.21570E-06	0.12689E-05	0.12995E-10

```
RMA 93-03 Chloroform Transport, 400 years
  1
       0.1       100.        50.       100.
      58.0       .17       7700.       0.85
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .604        -1.   6.28E-05
   80y      100.0
    1     1  2.66E+00
    2     2  4.74E-01
    3     3  4.49E-01
    4     4  4.43E-01
    5     5  4.37E-01
    6     6  4.32E-01
    7     7  4.26E-01
    8     8  4.21E-01
    9     9  4.15E-01
   10    10  4.09E-01
   11    11  4.04E-01
   12    12  3.98E-01
   13    13  3.93E-01
   14    14  3.87E-01
   15    15  3.82E-01
   16    16  3.76E-01
   17    17  3.71E-01
   18    18  3.65E-01
   19    19  3.59E-01
   20    20  3.54E-01
   21    21  3.48E-01
   22    22  3.43E-01
   23    23  3.37E-01
   24    24  3.32E-01
   25    25  3.26E-01
   26    26  3.20E-01
   27    27  3.15E-01
   28    28  3.09E-01
   29    29  3.04E-01
   30    30  2.98E-01
   31    31  2.93E-01
   32    32  2.87E-01
   33    33  2.82E-01
   34    34  2.76E-01
   35    35  2.71E-01
   36    36  2.65E-01
   37    37  2.59E-01
   38    38  2.54E-01
   39    39  2.48E-01
   40    40  2.43E-01
   41    41  2.37E-01
   42    42  2.32E-01
   43    43  2.26E-01
   44    44  2.21E-01
   45    45  2.15E-01
   46    46  2.09E-01
   47    47  2.04E-01
```

48	48	1.98E-01
49	49	1.93E-01
50	50	1.87E-01
51	51	1.82E-01
52	52	1.76E-01
53	53	1.71E-01
54	54	1.65E-01
55	55	1.59E-01
56	56	1.54E-01
57	57	1.48E-01
58	58	1.43E-01
59	59	1.37E-01
60	60	1.32E-01
61	61	1.26E-01
62	62	1.21E-01
63	63	1.15E-01
64	64	1.10E-01
65	65	1.04E-01
66	66	9.84E-02
67	67	9.29E-02
68	68	8.73E-02
69	69	8.18E-02
70	70	7.62E-02
71	71	7.07E-02
72	72	6.51E-02
73	73	5.96E-02
74	74	5.40E-02
75	75	4.85E-02
76	76	4.29E-02
77	77	3.74E-02
78	78	3.18E-02
79	79	2.63E-02
80	80	2.07E-02

Time: 100.000 - Chloroform - 400 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.31205E-04	0.18356E-03	0.18798E-08
2	0.56736E-05	0.33374E-04	0.34179E-09
3	0.53715E-05	0.31597E-04	0.32359E-09
4	0.53044E-05	0.31202E-04	0.31955E-09
5	0.52393E-05	0.30820E-04	0.31563E-09
6	0.51744E-05	0.30437E-04	0.31172E-09
7	0.51094E-05	0.30055E-04	0.30780E-09
8	0.50444E-05	0.29673E-04	0.30389E-09
9	0.49794E-05	0.29291E-04	0.29997E-09
10	0.49144E-05	0.28908E-04	0.29606E-09
11	0.48495E-05	0.28526E-04	0.29214E-09
12	0.47845E-05	0.28144E-04	0.28823E-09
13	0.47195E-05	0.27762E-04	0.28431E-09
14	0.46545E-05	0.27380E-04	0.28040E-09
15	0.45896E-05	0.26997E-04	0.27649E-09
16	0.45246E-05	0.26615E-04	0.27257E-09
17	0.44596E-05	0.26233E-04	0.26866E-09
18	0.43947E-05	0.25851E-04	0.26474E-09
19	0.43297E-05	0.25469E-04	0.26083E-09
20	0.42647E-05	0.25087E-04	0.25692E-09
21	0.41998E-05	0.24705E-04	0.25300E-09
22	0.41348E-05	0.24322E-04	0.24909E-09
23	0.40698E-05	0.23940E-04	0.24518E-09
24	0.40049E-05	0.23558E-04	0.24126E-09
25	0.39399E-05	0.23176E-04	0.23735E-09
26	0.38750E-05	0.22794E-04	0.23344E-09
27	0.38100E-05	0.22412E-04	0.22952E-09
28	0.37451E-05	0.22030E-04	0.22561E-09
29	0.36801E-05	0.21648E-04	0.22170E-09
30	0.36151E-05	0.21266E-04	0.21778E-09
31	0.35502E-05	0.20883E-04	0.21387E-09
32	0.34852E-05	0.20501E-04	0.20996E-09
33	0.34203E-05	0.20119E-04	0.20605E-09
34	0.33553E-05	0.19737E-04	0.20213E-09
35	0.32904E-05	0.19355E-04	0.19822E-09
36	0.32254E-05	0.18973E-04	0.19431E-09
37	0.31605E-05	0.18591E-04	0.19040E-09
38	0.30955E-05	0.18209E-04	0.18648E-09
39	0.30306E-05	0.17827E-04	0.18257E-09
40	0.29657E-05	0.17445E-04	0.17866E-09
41	0.29007E-05	0.17063E-04	0.17475E-09
42	0.28358E-05	0.16681E-04	0.17083E-09
43	0.27708E-05	0.16299E-04	0.16692E-09
44	0.27059E-05	0.15917E-04	0.16301E-09
45	0.26409E-05	0.15535E-04	0.15910E-09
46	0.25760E-05	0.15153E-04	0.15518E-09
47	0.25111E-05	0.14771E-04	0.15127E-09
48	0.24461E-05	0.14389E-04	0.14736E-09
49	0.23812E-05	0.14007E-04	0.14345E-09
50	0.23162E-05	0.13625E-04	0.13954E-09
51	0.22513E-05	0.13243E-04	0.13562E-09
52	0.21863E-05	0.12861E-04	0.13171E-09
53	0.21214E-05	0.12479E-04	0.12780E-09

54	0.20565E-05	0.12097E-04	0.12389E-09
55	0.19915E-05	0.11715E-04	0.11997E-09
56	0.19266E-05	0.11333E-04	0.11606E-09
57	0.18616E-05	0.10951E-04	0.11215E-09
58	0.17967E-05	0.10569E-04	0.10824E-09
59	0.17318E-05	0.10187E-04	0.10433E-09
60	0.16668E-05	0.98048E-05	0.10041E-09
61	0.16019E-05	0.94228E-05	0.96501E-10
62	0.15369E-05	0.90408E-05	0.92589E-10
63	0.14720E-05	0.86588E-05	0.88676E-10
64	0.14070E-05	0.82768E-05	0.84764E-10
65	0.13421E-05	0.78947E-05	0.80852E-10
66	0.12772E-05	0.75127E-05	0.76939E-10
67	0.12122E-05	0.71307E-05	0.73027E-10
68	0.11473E-05	0.67487E-05	0.69114E-10
69	0.10823E-05	0.63666E-05	0.65202E-10
70	0.10174E-05	0.59846E-05	0.61289E-10
71	0.95243E-06	0.56025E-05	0.57377E-10
72	0.88748E-06	0.52205E-05	0.53464E-10
73	0.82253E-06	0.48384E-05	0.49551E-10
74	0.75758E-06	0.44564E-05	0.45638E-10
75	0.69263E-06	0.40743E-05	0.41726E-10
76	0.62768E-06	0.36922E-05	0.37813E-10
77	0.56272E-06	0.33101E-05	0.33900E-10
78	0.49777E-06	0.29280E-05	0.29987E-10
79	0.43281E-06	0.25459E-05	0.26074E-10
80	0.36785E-06	0.21638E-05	0.22160E-10

RMA 93-03 Chloroform Transport, 500 years

```
  1
       0.1       100.        50.       100.
      58.0       .17       7700.       0.85
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .648        -1.   9.66E-05
   80y      100.0
    1     1  3.00E+00
    2     2  5.45E-01
    3     3  5.16E-01
    4     4  5.10E-01
    5     5  5.03E-01
    6     6  4.97E-01
    7     7  4.91E-01
    8     8  4.85E-01
    9     9  4.78E-01
   10    10  4.72E-01
   11    11  4.66E-01
   12    12  4.60E-01
   13    13  4.53E-01
   14    14  4.47E-01
   15    15  4.41E-01
   16    16  4.35E-01
   17    17  4.28E-01
   18    18  4.22E-01
   19    19  4.16E-01
   20    20  4.10E-01
   21    21  4.04E-01
   22    22  3.97E-01
   23    23  3.91E-01
   24    24  3.85E-01
   25    25  3.79E-01
   26    26  3.72E-01
   27    27  3.66E-01
   28    28  3.60E-01
   29    29  3.54E-01
   30    30  3.47E-01
   31    31  3.41E-01
   32    32  3.35E-01
   33    33  3.29E-01
   34    34  3.22E-01
   35    35  3.16E-01
   36    36  3.10E-01
   37    37  3.04E-01
   38    38  2.97E-01
   39    39  2.91E-01
   40    40  2.85E-01
   41    41  2.79E-01
   42    42  2.72E-01
   43    43  2.66E-01
   44    44  2.60E-01
   45    45  2.54E-01
   46    46  2.48E-01
   47    47  2.41E-01
```

48	48	2.35E-01
49	49	2.29E-01
50	50	2.23E-01
51	51	2.16E-01
52	52	2.10E-01
53	53	2.04E-01
54	54	1.98E-01
55	55	1.91E-01
56	56	1.85E-01
57	57	1.79E-01
58	58	1.73E-01
59	59	1.66E-01
60	60	1.60E-01
61	61	1.54E-01
62	62	1.48E-01
63	63	1.41E-01
64	64	1.35E-01
65	65	1.29E-01
66	66	1.23E-01
67	67	1.16E-01
68	68	1.10E-01
69	69	1.04E-01
70	70	9.77E-02
71	71	9.15E-02
72	72	8.53E-02
73	73	7.90E-02
74	74	7.28E-02
75	75	6.65E-02
76	76	6.03E-02
77	77	5.41E-02
78	78	4.78E-02
79	79	4.16E-02
80	80	3.53E-02

Time: 100.000 - Chloroform - 500 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.33619E-04	0.19776E-03	0.20253E-08
2	0.62296E-05	0.36644E-04	0.37528E-09
3	0.59055E-05	0.34738E-04	0.35576E-09
4	0.58334E-05	0.34314E-04	0.35142E-09
5	0.57637E-05	0.33904E-04	0.34722E-09
6	0.56940E-05	0.33494E-04	0.34302E-09
7	0.56242E-05	0.33084E-04	0.33882E-09
8	0.55545E-05	0.32674E-04	0.33462E-09
9	0.54848E-05	0.32264E-04	0.33042E-09
10	0.54151E-05	0.31853E-04	0.32622E-09
11	0.53454E-05	0.31443E-04	0.32202E-09
12	0.52757E-05	0.31033E-04	0.31782E-09
13	0.52059E-05	0.30623E-04	0.31362E-09
14	0.51362E-05	0.30213E-04	0.30942E-09
15	0.50665E-05	0.29803E-04	0.30522E-09
16	0.49968E-05	0.29393E-04	0.30102E-09
17	0.49271E-05	0.28983E-04	0.29682E-09
18	0.48574E-05	0.28573E-04	0.29262E-09
19	0.47877E-05	0.28163E-04	0.28842E-09
20	0.47180E-05	0.27753E-04	0.28422E-09
21	0.46483E-05	0.27343E-04	0.28002E-09
22	0.45785E-05	0.26933E-04	0.27582E-09
23	0.45088E-05	0.26523E-04	0.27162E-09
24	0.44391E-05	0.26112E-04	0.26742E-09
25	0.43694E-05	0.25702E-04	0.26322E-09
26	0.42997E-05	0.25292E-04	0.25902E-09
27	0.42300E-05	0.24882E-04	0.25483E-09
28	0.41603E-05	0.24472E-04	0.25063E-09
29	0.40906E-05	0.24062E-04	0.24643E-09
30	0.40209E-05	0.23652E-04	0.24223E-09
31	0.39512E-05	0.23242E-04	0.23803E-09
32	0.38815E-05	0.22832E-04	0.23383E-09
33	0.38118E-05	0.22422E-04	0.22963E-09
34	0.37421E-05	0.22012E-04	0.22543E-09
35	0.36724E-05	0.21602E-04	0.22123E-09
36	0.36027E-05	0.21192E-04	0.21703E-09
37	0.35330E-05	0.20782E-04	0.21283E-09
38	0.34633E-05	0.20372E-04	0.20863E-09
39	0.33936E-05	0.19962E-04	0.20444E-09
40	0.33238E-05	0.19552E-04	0.20024E-09
41	0.32541E-05	0.19142E-04	0.19604E-09
42	0.31844E-05	0.18732E-04	0.19184E-09
43	0.31147E-05	0.18322E-04	0.18764E-09
44	0.30450E-05	0.17912E-04	0.18344E-09
45	0.29753E-05	0.17502E-04	0.17924E-09
46	0.29056E-05	0.17092E-04	0.17504E-09
47	0.28359E-05	0.16682E-04	0.17084E-09
48	0.27662E-05	0.16272E-04	0.16664E-09
49	0.26965E-05	0.15862E-04	0.16244E-09
50	0.26268E-05	0.15452E-04	0.15825E-09
51	0.25571E-05	0.15042E-04	0.15405E-09
52	0.24874E-05	0.14632E-04	0.14985E-09
53	0.24177E-05	0.14222E-04	0.14565E-09

54	0.23480E-05	0.13812E-04	0.14145E-09
55	0.22783E-05	0.13402E-04	0.13725E-09
56	0.22086E-05	0.12992E-04	0.13305E-09
57	0.21389E-05	0.12582E-04	0.12885E-09
58	0.20692E-05	0.12172E-04	0.12465E-09
59	0.19995E-05	0.11762E-04	0.12045E-09
60	0.19297E-05	0.11351E-04	0.11625E-09
61	0.18600E-05	0.10941E-04	0.11205E-09
62	0.17903E-05	0.10531E-04	0.10785E-09
63	0.17206E-05	0.10121E-04	0.10365E-09
64	0.16509E-05	0.97112E-05	0.99454E-10
65	0.15812E-05	0.93011E-05	0.95255E-10
66	0.15115E-05	0.88911E-05	0.91055E-10
67	0.14418E-05	0.84810E-05	0.86855E-10
68	0.13721E-05	0.80709E-05	0.82656E-10
69	0.13023E-05	0.76608E-05	0.78456E-10
70	0.12326E-05	0.72507E-05	0 74256E-10
71	0.11629E-05	0.68406E-05	0.70056E-10
72	0.10932E-05	0.64305E-05	0 65856E-10
73	0.10235E-05	0.60203E-05	0.61656E-10
74	0.95374E-06	0.56102E-05	0 57455E-10
75	0.88401E-06	0.52001E-05	0 53255E-10
76	0.81429E-06	0.47899E-05	0 49055E-10
77	0.74456E-06	0.43798E-05	0.44854E-10
78	0.67484E-06	0.39696E-05	0.40654E-10
79	0.60511E-06	0.35595E-05	0 36453E-10
80	0.53538E-06	0.31493E-05	0 32252E-10

```
RMA 93-03 Chloroform Transport, 600 years
  1
       0.1       100.        50.       100.
      58.0       .17       7700.       0.85
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .681        -1.   1.33E-04
   80y      100.0
    1     1  3.23E+00
    2     2  5.99E-01
    3     3  5.67E-01
    4     4  5.60E-01
    5     5  5.54E-01
    6     6  5.47E-01
    7     7  5.40E-01
    8     8  5.34E-01
    9     9  5.27E-01
   10    10  5.20E-01
   11    11  5.14E-01
   12    12  5.07E-01
   13    13  5.00E-01
   14    14  4.93E-01
   15    15  4.87E-01
   16    16  4.80E-01
   17    17  4.73E-01
   18    18  4.67E-01
   19    19  4.60E-01
   20    20  4.53E-01
   21    21  4.47E-01
   22    22  4.40E-01
   23    23  4.33E-01
   24    24  4.27E-01
   25    25  4.20E-01
   26    26  4.13E-01
   27    27  4.06E-01
   28    28  4.00E-01
   29    29  3.93E-01
   30    30  3.86E-01
   31    31  3.80E-01
   32    32  3.73E-01
   33    33  3.66E-01
   34    34  3.60E-01
   35    35  3.53E-01
   36    36  3.46E-01
   37    37  3.39E-01
   38    38  3.33E-01
   39    39  3.26E-01
   40    40  3.19E-01
   41    41  3.13E-01
   42    42  3.06E-01
   43    43  2.99E-01
   44    44  2.93E-01
   45    45  2.86E-01
   46    46  2.79E-01
   47    47  2.72E-01
```

48	48	2.66E-01
49	49	2.59E-01
50	50	2.52E-01
51	51	2.46E-01
52	52	2.39E-01
53	53	2.32E-01
54	54	2.26E-01
55	55	2.19E-01
56	56	2.12E-01
57	57	2.06E-01
58	58	1.99E-01
59	59	1.92E-01
60	60	1.85E-01
61	61	1.79E-01
62	62	1.72E-01
63	63	1.65E-01
64	64	1.59E-01
65	65	1.52E-01
66	66	1.45E-01
67	67	1.39E-01
68	68	1.32E-01
69	69	1.25E-01
70	70	1.18E-01
71	71	1.12E-01
72	72	1.05E-01
73	73	9.83E-02
74	74	9.16E-02
75	75	8.49E-02
76	76	7.82E-02
77	77	7.15E-02
78	78	6.48E-02
79	79	5.81E-02
80	80	5.14E-02

Time: 100.000 - Chloroform - 600 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.35482E-04	0.20872E-03	0.21375E-08
2	0.66991E-05	0.39407E-04	0.40357E-09
3	0.63586E-05	0.37403E-04	0.38306E-09
4	0.62828E-05	0.36958E-04	0.37849E-09
5	0.62095E-05	0.36527E-04	0.37408E-09
6	0.61363E-05	0.36096E-04	0.36966E-09
7	0.60630E-05	0.35665E-04	0.36525E-09
8	0.59897E-05	0.35234E-04	0.36084E-09
9	0.59165E-05	0.34803E-04	0.35642E-09
10	0.58432E-05	0.34372E-04	0.35201E-09
11	0.57699E-05	0.33941E-04	0.34759E-09
12	0.56967E-05	0.33510E-04	0.34318E-09
13	0.56234E-05	0.33079E-04	0.33877E-09
14	0.55501E-05	0.32648E-04	0.33435E-09
15	0.54769E-05	0.32217E-04	0.32994E-09
16	0.54036E-05	0.31786E-04	0.32553E-09
17	0.53304E-05	0.31355E-04	0.32111E-09
18	0.52571E-05	0.30924E-04	0.31670E-09
19	0.51838E-05	0.30493E-04	0.31229E-09
20	0.51106E-05	0.30062E-04	0.30787E-09
21	0.50373E-05	0.29631E-04	0.30346E-09
22	0.49640E-05	0.29200E-04	0.29904E-09
23	0.48908E-05	0.28769E-04	0.29463E-09
24	0.48175E-05	0.28338E-04	0.29022E-09
25	0.47442E-05	0.27907E-04	0.28580E-09
26	0.46710E-05	0.27476E-04	0.28139E-09
27	0.45977E-05	0.27045E-04	0.27698E-09
28	0.45244E-05	0.26614E-04	0.27256E-09
29	0.44512E-05	0.26183E-04	0.26815E-09
30	0.43779E-05	0.25752E-04	0.26374E-09
31	0.43047E-05	0.25322E-04	0.25932E-09
32	0.42314E-05	0.24891E-04	0.25491E-09
33	0.41581E-05	0.24460E-04	0.25050E-09
34	0.40849E-05	0.24029E-04	0.24608E-09
35	0.40116E-05	0.23598E-04	0.24167E-09
36	0.39383E-05	0.23167E-04	0.23726E-09
37	0.38651E-05	0.22736E-04	0.23284E-09
38	0.37918E-05	0.22305E-04	0.22843E-09
39	0.37186E-05	0.21874E-04	0.22401E-09
40	0.36453E-05	0.21443E-04	0.21960E-09
41	0.35720E-05	0.21012E-04	0.21519E-09
42	0.34988E-05	0.20581E-04	0.21077E-09
43	0.34255E-05	0.20150E-04	0.20636E-09
44	0.33522E-05	0.19719E-04	0.20195E-09
45	0.32790E-05	0.19288E-04	0.19753E-09
46	0.32057E-05	0.18857E-04	0.19312E-09
47	0.31324E-05	0.18426E-04	0.18871E-09
48	0.30592E-05	0.17995E-04	0.18429E-09
49	0.29859E-05	0.17564E-04	0.17988E-09
50	0.29126E-05	0.17133E-04	0.17546E-09
51	0.28394E-05	0.16702E-04	0.17105E-09
52	0.27661E-05	0.16271E-04	0.16664E-09
53	0.26928E-05	0.15840E-04	0.16222E-09

54	0.26196E-05	0.15409E-04	0.15781E-09
55	0.25463E-05	0.14978E-04	0.15339E-09
56	0.24730E-05	0.14547E-04	0.14898E-09
57	0.23997E-05	0.14116E-04	0.14457E-09
58	0.23265E-05	0.13685E-04	0.14015E-09
59	0.22532E-05	0.13254E-04	0.13574E-09
60	0.21799E-05	0.12823E-04	0.13132E-09
61	0.21066E-05	0.12392E-04	0.12691E-09
62	0.20334E-05	0.11961E-04	0.12250E-09
63	0.19601E-05	0.11530E-04	0.11808E-09
64	0.18868E-05	0.11099E-04	0.11367E-09
65	0.18135E-05	0.10668E-04	0.10925E-09
66	0.17403E-05	0.10237E-04	0.10484E-09
67	0.16670E-05	0.98057E-05	0.10042E-09
68	0.15937E-05	0.93747E-05	0.96008E-10
69	0.15204E-05	0.89436E-05	0.91593E-10
70	0.14471E-05	0.85125E-05	0.87178E-10
71	0.13738E-05	0.80814E-05	0.82763E-10
72	0.13006E-05	0.76503E-05	0.78348E-10
73	0.12273E-05	0.72192E-05	0.73933E-10
74	0.11540E-05	0.67881E-05	0.69518E-10
75	0.10807E-05	0.63569E-05	0.65103E-10
76	0.10074E-05	0.59258E-05	0.60687E-10
77	0.93409E-06	0.54947E-05	0.56272E-10
78	0.86080E-06	0.50635E-05	0.51857E-10
79	0.78750E-06	0.46324E-05	0.47441E-10
80	0.71420E-06	0.42012E-05	0.43025E-10

```
RMA 93-03 Chloroform Transport, 700 years
  1
       0.1       100.        50.       100.
      58.0       .17       7700.       0.85
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .706        -1.   1.71E-04
   80y      100.0
    1     1  3.41E+00
    2     2  6.44E-01
    3     3  6.11E-01
    4     4  6.04E-01
    5     5  5.97E-01
    6     6  5.90E-01
    7     7  5.83E-01
    8     8  5.75E-01
    9     9  5.68E-01
   10    10  5.61E-01
   11    11  5.54E-01
   12    12  5.47E-01
   13    13  5.40E-01
   14    14  5.33E-01
   15    15  5.26E-01
   16    16  5.19E-01
   17    17  5.12E-01
   18    18  5.05E-01
   19    19  4.98E-01
   20    20  4.91E-01
   21    21  4.84E-01
   22    22  4.77E-01
   23    23  4.70E-01
   24    24  4.63E-01
   25    25  4.56E-01
   26    26  4.49E-01
   27    27  4.42E-01
   28    28  4.35E-01
   29    29  4.28E-01
   30    30  4.21E-01
   31    31  4.14E-01
   32    32  4.07E-01
   33    33  4.00E-01
   34    34  3.92E-01
   35    35  3.85E-01
   36    36  3.78E-01
   37    37  3.71E-01
   38    38  3.64E-01
   39    39  3.57E-01
   40    40  3.50E-01
   41    41  3.43E-01
   42    42  3.36E-01
   43    43  3.29E-01
   44    44  3.22E-01
   45    45  3.15E-01
   46    46  3.08E-01
   47    47  3.01E-01
```

48	48	2.94E-01
49	49	2.87E-01
50	50	2.80E-01
51	51	2.73E-01
52	52	2.66E-01
53	53	2.59E-01
54	54	2.52E-01
55	55	2.45E-01
56	56	2.38E-01
57	57	2.31E-01
58	58	2.24E-01
59	59	2.16E-01
60	60	2.09E-01
61	61	2.02E-01
62	62	1.95E-01
63	63	1.88E-01
64	64	1.81E-01
65	65	1.74E-01
66	66	1.67E-01
67	67	1.60E-01
68	68	1.53E-01
69	69	1.46E-01
70	70	1.39E-01
71	71	1.32E-01
72	72	1.25E-01
73	73	1.18E-01
74	74	1.11E-01
75	75	1.04E-01
76	76	9.68E-02
77	77	8.97E-02
78	78	8.27E-02
79	79	7.57E-02
80	80	6.86E-02

Time: 100.000 - Chloroform - 700 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.36943E-04	0.21731E-03	0.22256E-08
2	0.71050E-05	0.41794E-04	0.42802E-09
3	0.67519E-05	0.39717E-04	0.40675E-09
4	0.66734E-05	0.39255E-04	0.40202E-09
5	0.65974E-05	0.38808E-04	0.39744E-09
6	0.65215E-05	0.38362E-04	0.39287E-09
7	0.64455E-05	0.37915E-04	0.38829E-09
8	0.63696E-05	0.37468E-04	0.38372E-09
9	0.62936E-05	0.37021E-04	0.37914E-09
10	0.62177E-05	0.36574E-04	0.37457E-09
11	0.61417E-05	0.36128E-04	0.36999E-09
12	0.60657E-05	0.35681E-04	0.36541E-09
13	0.59898E-05	0.35234E-04	0.36084E-09
14	0.59138E-05	0.34787E-04	0.35626E-09
15	0.58379E-05	0.34340E-04	0.35169E-09
16	0.57619E-05	0.33894E-04	0.34711E-09
17	0.56860E-05	0.33447E-04	0.34254E-09
18	0.56100E-05	0.33000E-04	0.33796E-09
19	0.55341E-05	0.32553E-04	0.33338E-09
20	0.54581E-05	0.32106E-04	0.32881E-09
21	0.53821E-05	0.31660E-04	0.32423E-09
22	0.53062E-05	0.31213E-04	0.31966E-09
23	0.52302E-05	0.30766E-04	0.31508E-09
24	0.51543E-05	0.30319E-04	0.31051E-09
25	0.50783E-05	0.29872E-04	0.30593E-09
26	0.50024E-05	0.29426E-04	0.30135E-09
27	0.49264E-05	0.28979E-04	0.29678E-09
28	0.48504E-05	0.28532E-04	0.29220E-09
29	0.47745E-05	0.28085E-04	0.28763E-09
30	0.46985E-05	0.27638E-04	0.28305E-09
31	0.46226E-05	0.27192E-04	0.27847E-09
32	0.45466E-05	0.26745E-04	0.27390E-09
33	0.44707E-05	0.26298E-04	0.26932E-09
34	0.43947E-05	0.25851E-04	0.26475E-09
35	0.43187E-05	0.25404E-04	0.26017E-09
36	0.42428E-05	0.24958E-04	0.25560E-09
37	0.41668E-05	0.24511E-04	0.25102E-09
38	0.40909E-05	0.24064E-04	0.24644E-09
39	0.40149E-05	0.23617E-04	0.24187E-09
40	0.39389E-05	0.23170E-04	0.23729E-09
41	0.38630E-05	0.22723E-04	0.23272E-09
42	0.37870E-05	0.22277E-04	0.22814E-09
43	0.37111E-05	0.21830E-04	0.22356E-09
44	0.36351E-05	0.21383E-04	0.21899E-09
45	0.35591E-05	0.20936E-04	0.21441E-09
46	0.34832E-05	0.20489E-04	0.20983E-09
47	0.34072E-05	0.20042E-04	0.20526E-09
48	0.33312E-05	0.19596E-04	0.20068E-09
49	0.32553E-05	0.19149E-04	0.19611E-09
50	0.31793E-05	0.18702E-04	0.19153E-09
51	0.31033E-05	0.18255E-04	0.18695E-09
52	0.30274E-05	0.17808E-04	0.18238E-09
53	0.29514E-05	0.17361E-04	0.17780E-09

54	0.28754E-05	0.16914E-04	0.17322E-09
55	0.27995E-05	0.16467E-04	0 16865E-09
56	0.27235E-05	0.16021E-04	0 16407E-09
57	0.26475E-05	0.15574E-04	0.15949E-09
58	0.25716E-05	0.15127E-04	0.15492E-09
59	0.24956E-05	0.14680E-04	0.15034E-09
60	0.24196E-05	0.14233E-04	0 14576E-09
61	0.23436E-05	0.13786E-04	0.14119E-09
62	0.22677E-05	0.13339E-04	0.13661E-09
63	0.21917E-05	0.12892E-04	0 13203E-09
64	0.21157E-05	0.12445E-04	0 12745E-09
65	0.20397E-05	0.11998E-04	0.12288E-09
66	0.19637E-05	0.11551E-04	0.11830E-09
67	0.18878E-05	0.11104E-04	0 11372E-09
68	0.18118E-05	0.10657E-04	0.10915E-09
69	0.17358E-05	0.10211E-04	0 10457E-09
70	0.16598E-05	0.97635E-05	0 99990E-10
71	0.15838E-05	0.93165E-05	0 95412E-10
72	0.15078E-05	0.88695E-05	0 90835E-10
73	0.14318E-05	0.84225E-05	0.86257E-10
74	0.13558E-05	0.79755E-05	0 81679E-10
75	0.12798E-05	0.75285E-05	0 77101E-10
76	0.12039E-05	0.70815E-05	0.72523E-10
77	0.11279E-05	0.66345E-05	0.67945E-10
78	0.10519E-05	0.61874E-05	0.63366E-10
79	0.97586E-06	0.57403E-05	0.58788E-10
80	0.89986E-06	0.52933E-05	0.54210E-10

```
RMA 93-03 Chloroform Transport, 800 years
  1
       0.1       100.        50.       100.
      58.0       .17       7700.       0.85
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .726        -1.   2.11E-04
   80y      100.0
    1     1  3.55E+00
    2     2  6.83E-01
    3     3  6.49E-01
    4     4  6.41E-01
    5     5  6.34E-01
    6     6  6.27E-01
    7     7  6.19E-01
    8     8  6.12E-01
    9     9  6.05E-01
   10    10  5.97E-01
   11    11  5.90E-01
   12    12  5.83E-01
   13    13  5.75E-01
   14    14  5.68E-01
   15    15  5.61E-01
   16    16  5.54E-01
   17    17  5.46E-01
   18    18  5.39E-01
   19    19  5.32E-01
   20    20  5.24E-01
   21    21  5.17E-01
   22    22  5.10E-01
   23    23  5.03E-01
   24    24  4.95E-01
   25    25  4.88E-01
   26    26  4.81E-01
   27    27  4.73E-01
   28    28  4.66E-01
   29    29  4.59E-01
   30    30  4.51E-01
   31    31  4.44E-01
   32    32  4.37E-01
   33    33  4.30E-01
   34    34  4.22E-01
   35    35  4.15E-01
   36    36  4.08E-01
   37    37  4.00E-01
   38    38  3.93E-01
   39    39  3.86E-01
   40    40  3.78E-01
   41    41  3.71E-01
   42    42  3.64E-01
   43    43  3.57E-01
   44    44  3.49E-01
   45    45  3.42E-01
   46    46  3.35E-01
   47    47  3.27E-01
```

48	48	3.20E-01
49	49	3.13E-01
50	50	3.05E-01
51	51	2.98E-01
52	52	2.91E-01
53	53	2.84E-01
54	54	2.76E-01
55	55	2.69E-01
56	56	2.62E-01
57	57	2.54E-01
58	58	2.47E-01
59	59	2.40E-01
60	60	2.32E-01
61	61	2.25E-01
62	62	2.18E-01
63	63	2.11E-01
64	64	2.03E-01
65	65	1.96E-01
66	66	1.89E-01
67	67	1.81E-01
68	68	1.74E-01
69	69	1.67E-01
70	70	1.59E-01
71	71	1.52E-01
72	72	1.45E-01
73	73	1.38E-01
74	74	1.30E-01
75	75	1.23E-01
76	76	1.16E-01
77	77	1.08E-01
78	78	1.01E-01
79	79	9.38E-02
80	80	8.65E-02

Time: 100.000 - Chloroform - 800 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.38158E-04	0.22446E-03	0.22987E-08
2	0.74756E-05	0.43974E-04	0.45035E-09
3	0.71126E-05	0.41839E-04	0.42848E-09
4	0.70319E-05	0.41364E-04	0.42362E-09
5	0.69537E-05	0.40904E-04	0.41891E-09
6	0.68756E-05	0.40445E-04	0.41420E-09
7	0.67975E-05	0.39985E-04	0.40950E-09
8	0.67194E-05	0.39526E-04	0.40479E-09
9	0.66413E-05	0.39067E-04	0.40009E-09
10	0.65632E-05	0.38607E-04	0.39538E-09
11	0.64851E-05	0.38148E-04	0.39068E-09
12	0.64070E-05	0.37688E-04	0.38597E-09
13	0.63289E-05	0.37229E-04	0.38127E-09
14	0.62508E-05	0.36769E-04	0.37656E-09
15	0.61727E-05	0.36310E-04	0.37186E-09
16	0.60946E-05	0.35850E-04	0.36715E-09
17	0.60165E-05	0.35391E-04	0.36245E-09
18	0.59384E-05	0.34932E-04	0.35774E-09
19	0.58603E-05	0.34472E-04	0.35304E-09
20	0.57821E-05	0.34013E-04	0.34833E-09
21	0.57040E-05	0.33553E-04	0.34362E-09
22	0.56259E-05	0.33094E-04	0.33892E-09
23	0.55478E-05	0.32634E-04	0.33421E-09
24	0.54697E-05	0.32175E-04	0.32951E-09
25	0.53916E-05	0.31715E-04	0.32480E-09
26	0.53135E-05	0.31256E-04	0.32010E-09
27	0.52354E-05	0.30796E-04	0.31539E-09
28	0.51573E-05	0.30337E-04	0.31069E-09
29	0.50792E-05	0.29877E-04	0.30598E-09
30	0.50011E-05	0.29418E-04	0.30128E-09
31	0.49229E-05	0.28959E-04	0.29657E-09
32	0.48448E-05	0.28499E-04	0.29186E-09
33	0.47667E-05	0.28040E-04	0.28716E-09
34	0.46886E-05	0.27580E-04	0.28245E-09
35	0.46105E-05	0.27121E-04	0.27775E-09
36	0.45324E-05	0.26661E-04	0.27304E-09
37	0.44543E-05	0.26202E-04	0.26834E-09
38	0.43762E-05	0.25742E-04	0.26363E-09
39	0.42980E-05	0.25283E-04	0.25892E-09
40	0.42199E-05	0.24823E-04	0.25422E-09
41	0.41418E-05	0.24364E-04	0.24951E-09
42	0.40637E-05	0.23904E-04	0.24481E-09
43	0.39856E-05	0.23445E-04	0.24010E-09
44	0.39075E-05	0.22985E-04	0.23540E-09
45	0.38294E-05	0.22526E-04	0.23069E-09
46	0.37512E-05	0.22066E-04	0.22598E-09
47	0.36731E-05	0.21607E-04	0.22128E-09
48	0.35950E-05	0.21147E-04	0.21657E-09
49	0.35169E-05	0.20687E-04	0.21186E-09
50	0.34388E-05	0.20228E-04	0.20716E-09
51	0.33606E-05	0.19768E-04	0.20245E-09
52	0.32825E-05	0.19309E-04	0.19775E-09
53	0.32044E-05	0.18849E-04	0.19304E-09

54	0.31263E-05	0.18390E-04	0.18833E-09
55	0.30481E-05	0.17930E-04	0.18363E-09
56	0.29700E-05	0.17471E-04	0.17892E-09
57	0.28919E-05	0.17011E-04	0.17421E-09
58	0.28137E-05	0.16551E-04	0.16951E-09
59	0.27356E-05	0.16092E-04	0.16480E-09
60	0.26575E-05	0.15632E-04	0.16009E-09
61	0.25794E-05	0.15173E-04	0.15539E-09
62	0.25012E-05	0.14713E-04	0.15068E-09
63	0.24231E-05	0.14253E-04	0.14597E-09
64	0.23449E-05	0.13794E-04	0.14127E-09
65	0.22668E-05	0.13334E-04	0.13656E-09
66	0.21887E-05	0.12875E-04	0.13185E-09
67	0.21105E-05	0.12415E-04	0.12714E-09
68	0.20324E-05	0.11955E-04	0.12244E-09
69	0.19543E-05	0.11496E-04	0.11773E-09
70	0.18761E-05	0.11036E-04	0.11302E-09
71	0.17980E-05	0.10576E-04	0.10831E-09
72	0.17198E-05	0.10117E-04	0.10361E-09
73	0.16417E-05	0.96569E-05	0.98898E-10
74	0.15635E-05	0.91972E-05	0.94190E-10
75	0.14854E-05	0.87375E-05	0 89482E-10
76	0.14072E-05	0.82777E-05	0.84774E-10
77	0.13291E-05	0.78180E-05	0.80066E-10
78	0.12509E-05	0.73583E-05	0.75358E-10
79	0.11727E-05	0.68985E-05	0.70649E-10
80	0.10946E-05	0.64388E-05	0.65941E-10

```
RMA 93-03 Chloroform Transport, 900 years
  1
       0.1       100.        50.       100.
      58.0       .17       7700.       0.85
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .742        -1.   2.52E-04
   80y      100.0
    1     1  3.67E+00
    2     2  7.18E-01
    3     3  6.83E-01
    4     4  6.76E-01
    5     5  6.68E-01
    6     6  6.61E-01
    7     7  6.53E-01
    8     8  6.46E-01
    9     9  6.38E-01
   10    10  6.31E-01
   11    11  6.23E-01
   12    12  6.16E-01
   13    13  6.08E-01
   14    14  6.01E-01
   15    15  5.93E-01
   16    16  5.86E-01
   17    17  5.78E-01
   18    18  5.71E-01
   19    19  5.63E-01
   20    20  5.56E-01
   21    21  5.48E-01
   22    22  5.41E-01
   23    23  5.33E-01
   24    24  5.26E-01
   25    25  5.18E-01
   26    26  5.11E-01
   27    27  5.03E-01
   28    28  4.96E-01
   29    29  4.88E-01
   30    30  4.80E-01
   31    31  4.73E-01
   32    32  4.65E-01
   33    33  4.58E-01
   34    34  4.50E-01
   35    35  4.43E-01
   36    36  4.35E-01
   37    37  4.28E-01
   38    38  4.20E-01
   39    39  4.13E-01
   40    40  4.05E-01
   41    41  3.98E-01
   42    42  3.90E-01
   43    43  3.83E-01
   44    44  3.75E-01
   45    45  3.68E-01
   46    46  3.60E-01
   47    47  3.53E-01
```

48	48	3.45E-01
49	49	3.38E-01
50	50	3.30E-01
51	51	3.23E-01
52	52	3.15E-01
53	53	3.08E-01
54	54	3.00E-01
55	55	2.93E-01
56	56	2.85E-01
57	57	2.78E-01
58	58	2.70E-01
59	59	2.63E-01
60	60	2.55E-01
61	61	2.48E-01
62	62	2.40E-01
63	63	2.33E-01
64	64	2.25E-01
65	65	2.18E-01
66	66	2.10E-01
67	67	2.03E-01
68	68	1.95E-01
69	69	1.88E-01
70	70	1.80E-01
71	71	1.73E-01
72	72	1.65E-01
73	73	1.58E-01
74	74	1.50E-01
75	75	1.43E-01
76	76	1.35E-01
77	77	1.28E-01
78	78	1.20E-01
79	79	1.13E-01
80	80	1.05E-01

Time: 100.000 - Chloroform - 900 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.39172E-04	0.23043E-03	0.23598E-08
2	0.78154E-05	0.45973E-04	0.47082E-09
3	0.74444E-05	0.43791E-04	0.44847E-09
4	0.73619E-05	0.43305E-04	0.44350E-09
5	0.72820E-05	0.42835E-04	0.43869E-09
6	0.72022E-05	0.42366E-04	0.43388E-09
7	0.71224E-05	0.41896E-04	0.42907E-09
8	0.70426E-05	0.41427E-04	0.42426E-09
9	0.69627E-05	0.40957E-04	0.41945E-09
10	0.68829E-05	0.40488E-04	0.41464E-09
11	0.68031E-05	0.40018E-04	0.40983E-09
12	0.67233E-05	0.39549E-04	0.40503E-09
13	0.66434E-05	0.39079E-04	0.40022E-09
14	0.65636E-05	0.38610E-04	0.39541E-09
15	0.64838E-05	0.38140E-04	0.39060E-09
16	0.64040E-05	0.37670E-04	0.38579E-09
17	0.63241E-05	0.37201E-04	0.38098E-09
18	0.62443E-05	0.36731E-04	0.37617E-09
19	0.61645E-05	0.36262E-04	0.37136E-09
20	0.60847E-05	0.35792E-04	0.36655E-09
21	0.60048E-05	0.35323E-04	0.36175E-09
22	0.59250E-05	0.34853E-04	0.35694E-09
23	0.58452E-05	0.34383E-04	0.35213E-09
24	0.57654E-05	0.33914E-04	0.34732E-09
25	0.56855E-05	0.33444E-04	0.34251E-09
26	0.56057E-05	0.32975E-04	0.33770E-09
27	0.55259E-05	0.32505E-04	0.33289E-09
28	0.54460E-05	0.32035E-04	0.32808E-09
29	0.53662E-05	0.31566E-04	0.32327E-09
30	0.52864E-05	0.31096E-04	0.31846E-09
31	0.52065E-05	0.30627E-04	0.31365E-09
32	0.51267E-05	0.30157E-04	0.30884E-09
33	0.50469E-05	0.29688E-04	0.30404E-09
34	0.49670E-05	0.29218E-04	0.29923E-09
35	0.48872E-05	0.28748E-04	0.29442E-09
36	0.48074E-05	0.28279E-04	0.28961E-09
37	0 47275E-05	0.27809E-04	0.28480E-09
38	0.46477E-05	0.27339E-04	0.27999E-09
39	0.45679E-05	0.26870E-04	0.27518E-09
40	0.44880E-05	0.26400E-04	0.27037E-09
41	0.44082E-05	0.25931E-04	0.26556E-09
42	0.43284E-05	0.25461E-04	0.26075E-09
43	0.42485E-05	0.24991E-04	0.25594E-09
44	0.41687E-05	0.24522E-04	0.25113E-09
45	0.40888E-05	0.24052E-04	0.24632E-09
46	0.40090E-05	0.23582E-04	0.24151E-09
47	0.39292E-05	0.23113E-04	0.23670E-09
48	0.38493E-05	0.22643E-04	0.23189E-09
49	0 37695E-05	0.22173E-04	0.22708E-09
50	0.36896E-05	0.21704E-04	0.22227E-09
51	0.36098E-05	0.21234E-04	0.21746E-09
52	0.35299E-05	0.20764E-04	0.21265E-09
53	0.34501E-05	0.20295E-04	0.20784E-09

54	0.33702E-05	0.19825E-04	0.20303E-09
55	0.32904E-05	0.19355E-04	0.19822E-09
56	0.32105E-05	0.18885E-04	0.19341E-09
57	0.31307E-05	0.18416E-04	0.18860E-09
58	0.30508E-05	0.17946E-04	0.18379E-09
59	0.29710E-05	0.17476E-04	0.17898E-09
60	0.28911E-05	0.17007E-04	0.17417E-09
61	0.28113E-05	0.16537E-04	0.16936E-09
62	0.27314E-05	0.16067E-04	0.16455E-09
63	0.26515E-05	0.15597E-04	0.15973E-09
64	0.25717E-05	0.15127E-04	0.15492E-09
65	0.24918E-05	0.14658E-04	0.15011E-09
66	0.24119E-05	0.14188E-04	0.14530E-09
67	0.23321E-05	0.13718E-04	0.14049E-09
68	0.22522E-05	0.13248E-04	0.13568E-09
69	0.21723E-05	0.12779E-04	0.13087E-09
70	0.20925E-05	0.12309E-04	0.12606E-09
71	0.20126E-05	0.11839E-04	0.12124E-09
72	0.19327E-05	0.11369E-04	0.11643E-09
73	0.18529E-05	0.10899E-04	0.11162E-09
74	0.17730E-05	0.10429E-04	0.10681E-09
75	0.16931E-05	0.99595E-05	0.10200E-09
76	0.16132E-05	0.94896E-05	0.97185E-10
77	0.15334E-05	0.90197E-05	0.92373E-10
78	0.14535E-05	0.85498E-05	0.87561E-10
79	0.13736E-05	0.80799E-05	0.82748E-10
80	0.12937E-05	0.76100E-05	0.77936E-10

```
RMA 93-03 Chloroform Transport, 1000 years
  1
       0.1       100.        50.       100.
      58.0       .17       7700.       0.85
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .756        -1.   2.94E-04
   80y      100.0
    1     1  3.76E+00
    2     2  7.51E-01
    3     3  7.15E-01
    4     4  7.07E-01
    5     5  7.00E-01
    6     6  6.92E-01
    7     7  6.84E-01
    8     8  6.77E-01
    9     9  6.69E-01
   10    10  6.61E-01
   11    11  6.54E-01
   12    12  6.46E-01
   13    13  6.38E-01
   14    14  6.31E-01
   15    15  6.23E-01
   16    16  6.15E-01
   17    17  6.08E-01
   18    18  6.00E-01
   19    19  5.92E-01
   20    20  5.85E-01
   21    21  5.77E-01
   22    22  5.69E-01
   23    23  5.62E-01
   24    24  5.54E-01
   25    25  5.46E-01
   26    26  5.39E-01
   27    27  5.31E-01
   28    28  5.23E-01
   29    29  5.16E-01
   30    30  5.08E-01
   31    31  5.00E-01
   32    32  4.93E-01
   33    33  4.85E-01
   34    34  4.77E-01
   35    35  4.70E-01
   36    36  4.62E-01
   37    37  4.54E-01
   38    38  4.47E-01
   39    39  4.39E-01
   40    40  4.31E-01
   41    41  4.24E-01
   42    42  4.16E-01
   43    43  4.08E-01
   44    44  4.01E-01
   45    45  3.93E-01
   46    46  3.85E-01
   47    47  3.78E-01
```

48	48	3.70E-01
49	49	3.62E-01
50	50	3.55E-01
51	51	3.47E-01
52	52	3.39E-01
53	53	3.31E-01
54	54	3.24E-01
55	55	3.16E-01
56	56	3.08E-01
57	57	3.01E-01
58	58	2.93E-01
59	59	2.85E-01
60	60	2.78E-01
61	61	2.70E-01
62	62	2.62E-01
63	63	2.55E-01
64	64	2.47E-01
65	65	2.39E-01
66	66	2.32E-01
67	67	2.24E-01
68	68	2.16E-01
69	69	2.09E-01
70	70	2.01E-01
71	71	1.93E-01
72	72	1.86E-01
73	73	1.78E-01
74	74	1.70E-01
75	75	1.63E-01
76	76	1.55E-01
77	77	1.47E-01
78	78	1.40E-01
79	79	1.32E-01
80	80	1.24E-01

Time: 100.000 Chloroform - 1000 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.40089E-04	0.23582E-03	0.24151E-08
2	0.81420E-05	0.47894E-04	0.49049E-09
3	0.77640E-05	0.45671E-04	0.46772E-09
4	0.76799E-05	0.45176E-04	0.46266E-09
5	0.75986E-05	0.44698E-04	0.45776E-09
6	0.75173E-05	0.44219E-04	0.45286E-09
7	0.74359E-05	0.43741E-04	0.44796E-09
8	0.73546E-05	0.43262E-04	0.44306E-09
9	0.72733E-05	0.42784E-04	0.43816E-09
10	0.71920E-05	0.42306E-04	0.43326E-09
11	0.71106E-05	0.41827E-04	0.42836E-09
12	0.70293E-05	0.41349E-04	0.42346E-09
13	0.69480E-05	0.40870E-04	0.41856E-09
14	0.68666E-05	0.40392E-04	0.41366E-09
15	0.67853E-05	0.39914E-04	0.40876E-09
16	0.67040E-05	0.39435E-04	0.40386E-09
17	0.66227E-05	0.38957E-04	0.39896E-09
18	0.65413E-05	0.38478E-04	0.39407E-09
19	0.64600E-05	0.38000E-04	0.38917E-09
20	0.63787E-05	0.37522E-04	0.38427E-09
21	0.62973E-05	0.37043E-04	0.37937E-09
22	0.62160E-05	0.36565E-04	0.37447E-09
23	0.61347E-05	0.36086E-04	0.36957E-09
24	0.60533E-05	0.35608E-04	0.36467E-09
25	0.59720E-05	0.35129E-04	0.35977E-09
26	0.58907E-05	0.34651E-04	0.35487E-09
27	0.58093E-05	0.34173E-04	0.34997E-09
28	0.57280E-05	0.33694E-04	0.34507E-09
29	0.56467E-05	0.33216E-04	0.34017E-09
30	0.55653E-05	0.32737E-04	0.33527E-09
31	0.54840E-05	0.32259E-04	0.33037E-09
32	0 54027E-05	0.31780E-04	0.32547E-09
33	0.53213E-05	0.31302E-04	0.32057E-09
34	0.52400E-05	0.30823E-04	0.31567E-09
35	0.51587E-05	0.30345E-04	0.31077E-09
36	0.50773E-05	0.29867E-04	0.30587E-09
37	0.49960E-05	0.29388E-04	0.30097E-09
38	0.49146E-05	0.28910E-04	0.29607E-09
39	0.48333E-05	0.28431E-04	0.29117E-09
40	0.47520E-05	0.27953E-04	0.28627E-09
41	0.46706E-05	0.27474E-04	0.28137E-09
42	0 45893E-05	0.26996E-04	0.27647E-09
43	0.45079E-05	0.26517E-04	0.27157E-09
44	0.44266E-05	0.26039E-04	0.26667E-09
45	0 43452E-05	0.25560E-04	0.26177E-09
46	0.42639E-05	0.25082E-04	0.25687E-09
47	0 41825E-05	0.24603E-04	0.25197E-09
48	0.41012E-05	0.24125E-04	0.24707E-09
49	0 40198E-05	0.23646E-04	0.24216E-09
50	0.39385E-05	0.23168E-04	0.23726E-09
51	0.38571E-05	0.22689E-04	0.23236E-09
52	0.37758E-05	0.22211E-04	0.22746E-09
53	0.36944E-05	0.21732E-04	0.22256E-09

54	0.36131E-05	0.21253E-04	0.21766E-09
55	0.35317E-05	0.20775E-04	0.21276E-09
56	0.34504E-05	0.20296E-04	0.20786E-09
57	0.33690E-05	0.19818E-04	0.20296E-09
58	0.32877E-05	0.19339E-04	0.19806E-09
59	0.32063E-05	0.18861E-04	0.19315E-09
60	0.31249E-05	0.18382E-04	0.18825E-09
61	0.30436E-05	0.17903E-04	0.18335E-09
62	0.29622E-05	0.17425E-04	0.17845E-09
63	0.28808E-05	0.16946E-04	0.17355E-09
64	0.27995E-05	0.16467E-04	0.16865E-09
65	0.27181E-05	0.15989E-04	0.16374E-09
66	0.26367E-05	0.15510E-04	0.15884E-09
67	0.25554E-05	0.15032E-04	0.15394E-09
68	0.24740E-05	0.14553E-04	0.14904E-09
69	0.23926E-05	0.14074E-04	0.14414E-09
70	0.23112E-05	0.13596E-04	0.13923E-09
71	0.22299E-05	0.13117E-04	0.13433E-09
72	0.21485E-05	0.12638E-04	0.12943E-09
73	0.20671E-05	0.12159E-04	0.12453E-09
74	0.19857E-05	0.11681E-04	0.11962E-09
75	0.19043E-05	0.11202E-04	0.11472E-09
76	0.18230E-05	0.10723E-04	0 10982E-09
77	0.17416E-05	0.10245E-04	0 10492E-09
78	0.16602E-05	0.97658E-05	0.10001E-09
79	0.15788E-05	0.92870E-05	0 95110E-10
80	0.14974E-05	0.88083E-05	0.90207E-10

```
RMA 93-03 CPMSO Transport, First 100 years
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .160        -1.        0.
   80y      100.0
    1    1        0.0
    2    2        0.0
    3    3        0.0
    4    4        0.0
    5    5        0.0
    6    6        0.0
    7    7        0.0
    8    8        0.0
    9    9        0.0
   10   10        0.0
   11   11        0.0
   12   12        0.0
   13   13        0.0
   14   14        0.0
   15   15        0.0
   16   16        0.0
   17   17        0.0
   18   18        0.0
   19   19        0.0
   20   20        0.0
   21   21        0.0
   22   22        0.0
   23   23        0.0
   24   24        0.0
   25   25        0.0
   26   26        0.0
   27   27        0.0
   28   28        0.0
   29   29        0.0
   30   30        0.0
   31   31        0.0
   32   32        0.0
   33   33        0.0
   34   34        0.0
   35   35        0.0
   36   36        0.0
   37   37        0.0
   38   38        0.0
   39   39        0.0
   40   40        0.0
   41   41        0.0
   42   42        0.0
   43   43        0.0
   44   44        0.0
   45   45        0.0
   46   46        0.0
   47   47        0.0
```

48	48	0.0
49	49	0.0
50	50	0.0
51	51	0.0
52	52	0.0
53	53	0.0
54	54	0.0
55	55	0.0
56	56	0.0
57	57	0.0
58	58	0.0
59	59	0.0
60	60	0.0
61	61	0.0
62	62	0.0
63	63	0.0
64	64	0.0
65	65	0.0
66	66	0.0
67	67	0.0
68	68	0.0
69	69	0.0
70	70	0.0
71	71	0.0
72	72	0.0
73	73	0.0
74	74	0.0
75	75	0.0
76	76	0.0
77	77	0.0
78	78	0.0
79	79	0.0
80	80	0.0

```
|-------------------------------------------------------------|
|                VLEACH (Version 2.2, 1995)                   |
|                                                             |
|                          By:                                |
|       Varadhan Ravi and Jeffrey A. Johnson                  |
|                 (USEPA Contractors)                         |
|       Center for Subsurface Modeling Support                |
|       Robert S. Kerr Environmental Research Laboratory      |
|       U.S. Environmental Protection Agency                  |
|       P.O. Box 1198                                         |
|       Ada, OK 74820                                         |
|                                                             |
|       Based on the original VLEACH (version 1.0)            |
|       developed by CH2M Hill, Redding, California           |
|       for USEPA Region IX                                   |
|-------------------------------------------------------------|
```

```
RMA 93-03 CPMSO Transport, First 100 years
  1 polygons.
Timestep =   0.10 years.  Simulation length =  100.00 years.
Printout every  50.00 years.  Vertical profile stored every 100.00 years.
Koc =       30.000    ml/g,      0.10594E-02cu.ft./g
Kh =     0.50000E-03 (dimensionless).
Aqueous solubility =     1100.0     mg/l,      31.149     g/cu.ft
Free air diffusion coefficient = .58000     sq. m/day,  2278.8     sq.ft./yr


Polygon   1
Polygon I
Polygon area =      1.0000    sq. ft.
 80 cells, each cell  0.250 ft. thick.
Soil Properties:
 Bulk density =     1.6000    g/ml,       45307.    g/cu.ft.
 Porosity = 0 4000 Volumetric water content = 0.2500
 Organic carbon content = 0.00500000
Recharge Rate = 0.00057000 ft/yr
Conc. in recharge water =     0.16000    mg/l,      0.45307E-02g/cu.ft
Atmospheric concentration =     -1.0000    mg/l,     -0.28317E-01g/cu.ft
Water table has a fixed concentration of     0.00000    mg/l,      0.00000    g/
   with respect to gas diffusion.
```

Time: 100.000 - CPMSO - 100 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.78971E-06	0.15794E-02	0.83664E-08
2	0.16834E-06	0.33668E-03	0.17834E-08
3	0.28081E-07	0.56163E-04	0.29750E-09
4	0.64397E-08	0.12879E-04	0.68224E-10
5	0.37517E-08	0.75033E-05	0.39747E-10
6	0.33210E-08	0.66421E-05	0.35184E-10
7	0.31138E-08	0.62277E-05	0.32989E-10
8	0.29341E-08	0.58683E-05	0.31085E-10
9	0.27658E-08	0.55315E-05	0.29301E-10
10	0.26071E-08	0.52142E-05	0.27621E-10
11	0.24576E-08	0.49151E-05	0.26036E-10
12	0.23166E-08	0.46331E-05	0.24542E-10
13	0.21837E-08	0.43673E-05	0.23134E-10
14	0.20584E-08	0.41167E-05	0.21807E-10
15	0.19402E-08	0.38805E-05	0.20556E-10
16	0.18289E-08	0.36578E-05	0.19376E-10
17	0.17239E-08	0.34479E-05	0.18264E-10
18	0.16250E-08	0.32499E-05	0.17215E-10
19	0.15317E-08	0.30633E-05	0.16227E-10
20	0.14437E-08	0.28875E-05	0.15295E-10
21	0.13608E-08	0.27216E-05	0.14417E-10
22	0.12826E-08	0.25653E-05	0.13589E-10
23	0.12090E-08	0.24179E-05	0.12808E-10
24	0.11395E-08	0.22789E-05	0.12072E-10
25	0.10740E-08	0.21479E-05	0.11378E-10
26	0.10122E-08	0.20244E-05	0.10724E-10
27	0.95399E-09	0.19080E-05	0.10107E-10
28	0.89909E-09	0.17982E-05	0 95253E-11
29	0.84733E-09	0.16947E-05	0.89769E-11
30	0.79853E-09	0.15971E-05	0.84599E-11
31	0.75251E-09	0.15050E-05	0 79723E-11
32	0.70911E-09	0.14182E-05	0.75126E-11
33	0.66819E-09	0.13364E-05	0 70791E-11
34	0.62960E-09	0.12592E-05	0 66702E-11
35	0.59321E-09	0.11864E-05	0.62847E-11
36	0.55889E-09	0.11178E-05	0.59210E-11
37	0.52651E-09	0.10530E-05	0.55781E-11
38	0.49598E-09	0.99195E-06	0 52545E-11
39	0.46717E-09	0.93434E-06	0.49494E-11
40	0.43999E-09	0.87999E-06	0.46614E-11
41	0.41435E-09	0.82871E-06	0 43898E-11
42	0.39016E-09	0.78032E-06	0 41335E-11
43	0.36732E-09	0.73465E-06	0.38916E-11
44	0.34577E-09	0.69154E-06	0.36632E-11
45	0.32543E-09	0.65085E-06	0 34477E-11
46	0.30622E-09	0.61243E-06	0 32442E-11
47	0.28807E-09	0.57615E-06	0 30520E-11
48	0.27094E-09	0.54188E-06	0.28704E-11
49	0.25475E-09	0.50949E-06	0 26989E-11
50	0.23945E-09	0.47889E-06	0 25368E-11
51	0.22498E-09	0.44996E-06	0 23835E-11
52	0.21130E-09	0.42259E-06	0 22386E-11
53	0.19835E-09	0.39671E-06	0.21014E-11

54	0.18610E-09	0.37220E-06	0.19716E-11
55	0.17450E-09	0.34900E-06	0.18487E-11
56	0.16351E-09	0.32701E-06	0.17322E-11
57	0.15308E-09	0.30617E-06	0.16218E-11
58	0.14320E-09	0.28639E-06	0.15171E-11
59	0.13381E-09	0.26762E-06	0.14176E-11
60	0.12489E-09	0.24977E-06	0.13231E-11
61	0.11640E-09	0.23280E-06	0.12332E-11
62	0.10832E-09	0.21664E-06	0.11476E-11
63	0.10062E-09	0.20124E-06	0.10660E-11
64	0.93270E-10	0.18654E-06	0.98813E-12
65	0.86245E-10	0.17249E-06	0.91371E-12
66	0.79522E-10	0.15904E-06	0.84248E-12
67	0.73076E-10	0.14615E-06	0.77419E-12
68	0.66885E-10	0.13377E-06	0.70860E-12
69	0.60927E-10	0.12185E-06	0.64548E-12
70	0.55182E-10	0.11036E-06	0.58462E-12
71	0.49630E-10	0.99260E-07	0.52580E-12
72	0.44251E-10	0.88502E-07	0.46881E-12
73	0.39026E-10	0.78053E-07	0.41346E-12
74	0.33938E-10	0.67876E-07	0.35955E-12
75	0.28968E-10	0.57936E-07	0.30689E-12
76	0.24099E-10	0.48197E-07	0.25531E-12
77	0.19314E-10	0.38628E-07	0.20462E-12
78	0.14596E-10	0.29193E-07	0.15464E-12
79	0.99296E-11	0.19859E-07	0.10520E-12
80	0.52976E-11	0.10595E-07	0.56124E-13

```
RMA 93-03 CPMSO Transport, 200 years
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25    .00057        1.6       0.40        .25       .005
      .417        -1.  8.68E-07
   80y      100.0
    1     1  1.71E+01
    2     2  3.64E+00
    3     3  6.07E-01
    4     4  1.39E-01
    5     5  8.12E-02
    6     6  7.18E-02
    7     7  6.74E-02
    8     8  6.35E-02
    9     9  5.98E-02
   10    10  5.64E-02
   11    11  5.32E-02
   12    12  5.01E-02
   13    13  4.72E-02
   14    14  4.45E-02
   15    15  4.20E-02
   16    16  3.96E-02
   17    17  3.73E-02
   18    18  3.51E-02
   19    19  3.31E-02
   20    20  3.12E-02
   21    21  2.94E-02
   22    22  2.77E-02
   23    23  2.62E-02
   24    24  2.46E-02
   25    25  2.32E-02
   26    26  2.19E-02
   27    27  2.06E-02
   28    28  1.94E-02
   29    29  1.83E-02
   30    30  1.73E-02
   31    31  1.63E-02
   32    32  1.53E-02
   33    33  1.45E-02
   34    34  1.36E-02
   35    35  1.28E-02
   36    36  1.21E-02
   37    37  1.14E-02
   38    38  1.07E-02
   39    39  1.01E-02
   40    40  9.52E-03
   41    41  8.96E-03
   42    42  8.44E-03
   43    43  7.95E-03
   44    44  7.48E-03
   45    45  7.04E-03
   46    46  6.62E-03
   47    47  6.23E-03
```

48	48	5.86E-03
49	49	5.51E-03
50	50	5.18E-03
51	51	4.87E-03
52	52	4.57E-03
53	53	4.29E-03
54	54	4.03E-03
55	55	3.77E-03
56	56	3.54E-03
57	57	3.31E-03
58	58	3.10E-03
59	59	2.89E-03
60	60	2.70E-03
61	61	2.52E-03
62	62	2.34E-03
63	63	2.18E-03
64	64	2.02E-03
65	65	1.87E-03
66	66	1.72E-03
67	67	1.58E-03
68	68	1.45E-03
69	69	1.32E-03
70	70	1.19E-03
71	71	1.07E-03
72	72	9.57E-04
73	73	8.44E-04
74	74	7.34E-04
75	75	6.27E-04
76	76	5.21E-04
77	77	4.18E-04
78	78	3.16E-04
79	79	2.15E-04
80	80	1.15E-04

Time: 100.000 - CPMSO - 200 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.24905E-05	0.49810E-02	0 26385E-07
2	0.73503E-06	0.14701E-02	0.77872E-08
3	0.18396E-06	0.36792E-03	0.19489E-08
4	0.51260E-07	0.10252E-03	0 54307E-09
5	0.24034E-07	0.48068E-04	0.25462E-09
6	0.18535E-07	0.37071E-04	0.19637E-09
7	0.16880E-07	0.33760E-04	0.17883E-09
8	0.15850E-07	0.31699E-04	0.16792E-09
9	0.14946E-07	0.29892E-04	0.15834E-09
10	0.14103E-07	0.28205E-04	0.14941E-09
11	0.13309E-07	0.26617E-04	0 14100E-09
12	0.12558E-07	0.25115E-04	0 13304E-09
13	0.11848E-07	0.23697E-04	0 12553E-09
14	0.11180E-07	0.22360E-04	0 11845E-09
15	0.10551E-07	0.21102E-04	0 11178E-09
16	0.99568E-08	0.19914E-04	0.10549E-09
17	0.93948E-08	0.18790E-04	0 99531E-10
18	0.88630E-08	0.17726E-04	0.93898E-10
19	0.83626E-08	0.16725E-04	0 88596E-10
20	0.78906E-08	0.15781E-04	0 83596E-10
21	0.74450E-08	0.14890E-04	0 78875E-10
22	0.70243E-08	0.14049E-04	0.74418E-10
23	0.66297E-08	0.13259E-04	0 70238E-10
24	0.62539E-08	0.12508E-04	0 66256E-10
25	0.59000E-08	0.11800E-04	0.62507E-10
26	0.55673E-08	0.11135E-04	0.58982E-10
27	0.52519E-08	0.10504E-04	0 55640E-10
28	0.49540E-08	0.99080E-05	0 52484E-10
29	0.46738E-08	0.93475E-05	0.49515E-10
30	0.44106E-08	0.88212E-05	0.46727E-10
31	0.41612E-08	0.83225E-05	0.44086E-10
32	0.39239E-08	0.78478E-05	0 41571E-10
33	0.37026E-08	0.74052E-05	0.39227E-10
34	0.34916E-08	0.69831E-05	0 36991E-10
35	0.32922E-08	0.65844E-05	0.34879E-10
36	0.31056E-08	0.62111E-05	0.32901E-10
37	0.29291E-08	0.58581E-05	0.31031E-10
38	0.27611E-08	0.55222E-05	0.29252E-10
39	0.26034E-08	0.52069E-05	0.27582E-10
40	0.24548E-08	0.49095E-05	0.26007E-10
41	0.23140E-08	0.46280E-05	0.24515E-10
42	0.21811E-08	0.43622E-05	0.23107E-10
43	0.20556E-08	0.41111E-05	0.21777E-10
44	0.19368E-08	0.38737E-05	0.20519E-10
45	0 18246E-08	0.36492E-05	0.19331E-10
46	0.17185E-08	0.34369E-05	0.18206E-10
47	0.16182E-08	0.32364E-05	0.17144E-10
48	0.15234E-08	0.30469E-05	0.16140E-10
49	0.14338E-08	0.28676E-05	0.15190E-10
50	0.13490E-08	0.26979E-05	0.14291E-10
51	0.12688E-08	0.25375E-05	0.13442E-10
52	0.11927E-08	0.23853E-05	0.12635E-10
53	0.11206E-08	0.22412E-05	0.11872E-10

54	0.10525E-08	0.21050E-05	0.11150E-10
55	0.98763E-09	0.19753E-05	0.10463E-10
56	0.92637E-09	0.18527E-05	0.98143E-11
57	0.86808E-09	0.17362E-05	0.91967E-11
58	0.81282E-09	0.16256E-05	0.86113E-11
59	0.76010E-09	0.15202E-05	0.80528E-11
60	0.71009E-09	0.14202E-05	0.75229E-11
61	0.66256E-09	0.13251E-05	0.70194E-11
62	0.61708E-09	0.12342E-05	0.65376E-11
63	0.57388E-09	0.11478E-05	0.60799E-11
64	0.53254E-09	0.10651E-05	0.56419E-11
65	0.49300E-09	0.98600E-06	0.52230E-11
66	0.45498E-09	0.90995E-06	0.48202E-11
67	0.41852E-09	0.83703E-06	0.44339E-11
68	0.38361E-09	0.76722E-06	0.40641E-11
69	0.34993E-09	0.69985E-06	0.37072E-11
70	0.31726E-09	0.63453E-06	0.33612E-11
71	0.28575E-09	0.57150E-06	0.30273E-11
72	0.25533E-09	0.51067E-06	0.27051E-11
73	0.22574E-09	0.45149E-06	0.23916E-11
74	0.19689E-09	0.39378E-06	0.20859E-11
75	0.16870E-09	0.33740E-06	0.17873E-11
76	0.14106E-09	0.28211E-06	0.14944E-11
77	0.11390E-09	0.22780E-06	0.12067E-11
78	0.87130E-10	0.17426E-06	0.92309E-12
79	0.60646E-10	0.12129E-06	0.64250E-12
80	0.34369E-10	0.68737E-07	0.36411E-12

RMA 93-03 CPMSO Transport, 300 years

```
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25    .00057        1.6      0.40       .25      .005
      .533        -1.  5.23E-06
   80y     100.0
    1    1  5.39E+01
    2    2  1.59E+01
    3    3  3.98E+00
    4    4  1.11E+00
    5    5  5.20E-01
    6    6  4.01E-01
    7    7  3.65E-01
    8    8  3.43E-01
    9    9  3.23E-01
   10   10  3.05E-01
   11   11  2.88E-01
   12   12  2.72E-01
   13   13  2.56E-01
   14   14  2.42E-01
   15   15  2.28E-01
   16   16  2.15E-01
   17   17  2.03E-01
   18   18  1.92E-01
   19   19  1.81E-01
   20   20  1.71E-01
   21   21  1.61E-01
   22   22  1.52E-01
   23   23  1.43E-01
   24   24  1.35E-01
   25   25  1.28E-01
   26   26  1.20E-01
   27   27  1.14E-01
   28   28  1.07E-01
   29   29  1.01E-01
   30   30  9.54E-02
   31   31  9.00E-02
   32   32  8.49E-02
   33   33  8.01E-02
   34   34  7.55E-02
   35   35  7.12E-02
   36   36  6.72E-02
   37   37  6.34E-02
   38   38  5.97E-02
   39   39  5.63E-02
   40   40  5.31E-02
   41   41  5.01E-02
   42   42  4.72E-02
   43   43  4.45E-02
   44   44  4.19E-02
   45   45  3.95E-02
   46   46  3.72E-02
   47   47  3.50E-02
```

48	48	3.30E-02
49	49	3.10E-02
50	50	2.92E-02
51	51	2.74E-02
52	52	2.58E-02
53	53	2.42E-02
54	54	2.28E-02
55	55	2.14E-02
56	56	2.00E-02
57	57	1.88E-02
58	58	1.76E-02
59	59	1.64E-02
60	60	1.54E-02
61	61	1.43E-02
62	62	1.33E-02
63	63	1.24E-02
64	64	1.15E-02
65	65	1.07E-02
66	66	9.84E-03
67	67	9.05E-03
68	68	8.30E-03
69	69	7.57E-03
70	70	6.86E-03
71	71	6.18E-03
72	72	5.52E-03
73	73	4.88E-03
74	74	4.26E-03
75	75	3.65E-03
76	76	3.05E-03
77	77	2.46E-03
78	78	1.88E-03
79	79	1.31E-03
80	80	7.43E-04

Time: 100.000 - CPMSO - 300 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.39958E-05	0.79916E-02	0.42333E-07
2	0.16078E-05	0.32156E-02	0.17034E-07
3	0.54832E-06	0.10966E-02	0.58091E-08
4	0.18551E-06	0.37101E-03	0.19653E-08
5	0.81875E-07	0.16375E-03	0.86741E-09
6	0.55045E-07	0.11009E-03	0.58317E-09
7	0.47360E-07	0.94720E-04	0.50175E-09
8	0.43894E-07	0.87789E-04	0.46503E-09
9	0.41319E-07	0.82639E-04	0.43775E-09
10	0.39016E-07	0.78032E-04	0.41335E-09
11	0.36863E-07	0.73727E-04	0.39054E-09
12	0.34834E-07	0.69668E-04	0.36905E-09
13	0.32895E-07	0.65791E-04	0.34850E-09
14	0.31081E-07	0.62161E-04	0.32928E-09
15	0.29357E-07	0.58713E-04	0.31101E-09
16	0.27726E-07	0.55453E-04	0.29374E-09
17	0.26194E-07	0.52387E-04	0.27750E-09
18	0.24757E-07	0.49513E-04	0.26228E-09
19	0.23388E-07	0.46776E-04	0.24778E-09
20	0.22098E-07	0.44197E-04	0.23412E-09
21	0.20869E-07	0.41737E-04	0.22109E-09
22	0.19712E-07	0.39423E-04	0.20883E-09
23	0.18610E-07	0.37219E-04	0.19716E-09
24	0.17576E-07	0.35152E-04	0.18620E-09
25	0.16617E-07	0.33234E-04	0.17605E-09
26	0.15684E-07	0.31368E-04	0.16616E-09
27	0.14826E-07	0.29652E-04	0.15707E-09
28	0.13997E-07	0.27994E-04	0.14829E-09
29	0.13216E-07	0.26433E-04	0.14002E-09
30	0.12484E-07	0.24969E-04	0.13226E-09
31	0.11792E-07	0.23583E-04	0.12493E-09
32	0.11136E-07	0.22272E-04	0.11798E-09
33	0.10516E-07	0.21033E-04	0.11141E-09
34	0.99291E-08	0.19858E-04	0.10519E-09
35	0.93743E-08	0.18749E-04	0.99315E-10
36	0.88517E-08	0.17703E-04	0.93778E-10
37	0.83578E-08	0.16716E-04	0.88546E-10
38	0.78881E-08	0.15776E-04	0.83569E-10
39	0.74449E-08	0.14890E-04	0.78874E-10
40	0.70269E-08	0.14054E-04	0.74446E-10
41	0.66325E-08	0.13265E-04	0.70267E-10
42	0.62582E-08	0.12516E-04	0.66302E-10
43	0.59044E-08	0.11809E-04	0.62553E-10
44	0.55688E-08	0.11138E-04	0.58998E-10
45	0.52522E-08	0.10504E-04	0.55643E-10
46	0.49523E-08	0.99046E-05	0.52466E-10
47	0.46676E-08	0.93351E-05	0.49450E-10
48	0.43996E-08	0.87993E-05	0.46611E-10
49	0.41440E-08	0.82881E-05	0.43903E-10
50	0.39032E-08	0.78063E-05	0.41351E-10
51	0.36733E-08	0.73466E-05	0.38916E-10
52	0.34571E-08	0.69143E-05	0.36626E-10
53	0.32510E-08	0.65020E-05	0.34442E-10

54	0.30576E-08	0.61152E-05	0.32393E-10
55	0.28733E-08	0.57467E-05	0.30441E-10
56	0.26960E-08	0.53920E-05	0.28562E-10
57	0.25297E-08	0.50594E-05	0.26800E-10
58	0.23713E-08	0.47426E-05	0.25123E-10
59	0.22188E-08	0.44375E-05	0.23506E-10
60	0.20762E-08	0.41523E-05	0.21996E-10
61	0.19380E-08	0.38760E-05	0.20532E-10
62	0.18060E-08	0.36121E-05	0.19134E-10
63	0.16815E-08	0.33631E-05	0.17815E-10
64	0.15622E-08	0.31243E-05	0.16550E-10
65	0.14491E-08	0.28981E-05	0.15352E-10
66	0.13389E-08	0.26778E-05	0.14185E-10
67	0.12330E-08	0.24660E-05	0.13063E-10
68	0.11315E-08	0.22631E-05	0.11988E-10
69	0.10337E-08	0.20674E-05	0.10952E-10
70	0.93905E-09	0.18781E-05	0.99486E-11
71	0.84751E-09	0.16950E-05	0.89788E-11
72	0.75876E-09	0.15175E-05	0.80386E-11
73	0.67251E-09	0.13450E-05	0.71248E-11
74	0.58854E-09	0.11771E-05	0.62352E-11
75	0.50642E-09	0.10128E-05	0.53651E-11
76	0.42583E-09	0.85166E-06	0.45114E-11
77	0.34658E-09	0.69315E-06	0.36717E-11
78	0.26847E-09	0.53695E-06	0.28443E-11
79	0.19135E-09	0.38270E-06	0.20272E-11
80	0.11485E-09	0.22970E-06	0.12168E-11

```
RMA 93-03 CPMSO Transport, 400 years
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25     .00057       1.6      0.40       .25      .005
      .600        -1.   1.63E-05
   80y     100.0
    1    1  8.64E+01
    2    2  3.48E+01
    3    3  1.19E+01
    4    4  4.01E+00
    5    5  1.77E+00
    6    6  1.19E+00
    7    7  1.02E+00
    8    8  9.49E-01
    9    9  8.94E-01
   10   10  8.44E-01
   11   11  7.97E-01
   12   12  7.53E-01
   13   13  7.12E-01
   14   14  6.72E-01
   15   15  6.35E-01
   16   16  6.00E-01
   17   17  5.67E-01
   18   18  5.36E-01
   19   19  5.06E-01
   20   20  4.78E-01
   21   21  4.51E-01
   22   22  4.26E-01
   23   23  4.03E-01
   24   24  3.80E-01
   25   25  3.59E-01
   26   26  3.39E-01
   27   27  3.21E-01
   28   28  3.03E-01
   29   29  2.86E-01
   30   30  2.70E-01
   31   31  2.55E-01
   32   32  2.41E-01
   33   33  2.27E-01
   34   34  2.15E-01
   35   35  2.03E-01
   36   36  1.91E-01
   37   37  1.81E-01
   38   38  1.71E-01
   39   39  1.61E-01
   40   40  1.52E-01
   41   41  1.43E-01
   42   42  1.35E-01
   43   43  1.28E-01
   44   44  1.20E-01
   45   45  1.14E-01
   46   46  1.07E-01
   47   47  1.01E-01
```

48	48	9.52E-02
49	49	8.96E-02
50	50	8.44E-02
51	51	7.95E-02
52	52	7.48E-02
53	53	7.03E-02
54	54	6.61E-02
55	55	6.22E-02
56	56	5.83E-02
57	57	5.47E-02
58	58	5.13E-02
59	59	4.80E-02
60	60	4.49E-02
61	61	4.19E-02
62	62	3.91E-02
63	63	3.64E-02
64	64	3.38E-02
65	65	3.13E-02
66	66	2.90E-02
67	67	2.67E-02
68	68	2.45E-02
69	69	2.24E-02
70	70	2.03E-02
71	71	1.83E-02
72	72	1.64E-02
73	73	1.45E-02
74	74	1.27E-02
75	75	1.10E-02
76	76	9.21E-03
77	77	7.50E-03
78	78	5.81E-03
79	79	4.14E-03
80	80	2.48E-03

Time: 100.000 - CPMSO - 400 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.51553E-05	0.10311E-01	0.54617E-07
2	0.25486E-05	0.50972E-02	0.27001E-07
3	0.10867E-05	0.21735E-02	0.11513E-07
4	0.43862E-06	0.87725E-03	0.46469E-08
5	0.19985E-06	0.39969E-03	0.21172E-08
6	0.12255E-06	0.24511E-03	0.12984E-08
7	0.97974E-07	0.19595E-03	0.10380E-08
8	0.88483E-07	0.17697E-03	0.93742E-09
9	0.82840E-07	0.16568E-03	0.87763E-09
10	0.78195E-07	0.15639E-03	0.82842E-09
11	0.73927E-07	0.14785E-03	0.78321E-09
12	0.69920E-07	0.13984E-03	0 74076E-09
13	0.66151E-07	0.13230E-03	0 70082E-09
14	0.62561E-07	0.12512E-03	0 66279E-09
15	0.59172E-07	0.11834E-03	0 62689E-09
16	0.55971E-07	0.11194E-03	0 59298E-09
17	0.52946E-07	0.10589E-03	0 56093E-09
18	0.50089E-07	0.10018E-03	0 53066E-09
19	0.47371E-07	0.94741E-04	0 50186E-09
20	0.44800E-07	0.89600E-04	0.47463E-09
21	0.42357E-07	0.84713E-04	0 44874E-09
22	0.40052E-07	0.80104E-04	0 42433E-09
23	0.37892E-07	0.75784E-04	0 40144E-09
24	0.35825E-07	0.71650E-04	0.37954E-09
25	0.33875E-07	0.67750E-04	0 35888E-09
26	0.32031E-07	0.64062E-04	0.33935E-09
27	0.30309E-07	0.60618E-04	0.32110E-09
28	0.28665E-07	0.57330E-04	0 30369E-09
29	0.27100E-07	0.54201E-04	0 28711E-09
30	0.25620E-07	0.51239E-04	0.27142E-09
31	0.24222E-07	0.48444E-04	0.25662E-09
32	0.22905E-07	0.45810E-04	0.24266E-09
33	0.21642E-07	0.43285E-04	0.22929E-09
34	0.20470E-07	0.40939E-04	0.21686E-09
35	0.19356E-07	0.38711E-04	0.20506E-09
36	0.18280E-07	0.36560E-04	0.19367E-09
37	0.17287E-07	0.34574E-04	0.18314E-09
38	0.16347E-07	0.32694E-04	0.17318E-09
39	0.15440E-07	0.30880E-04	0.16358E-09
40	0.14586E-07	0.29172E-04	0.15453E-09
41	0.13768E-07	0.27537E-04	0.14587E-09
42	0.13002E-07	0.26005E-04	0.13775E-09
43	0.12296E-07	0.24591E-04	0.13027E-09
44	0.11600E-07	0.23200E-04	0.12289E-09
45	0.10965E-07	0.21931E-04	0.11617E-09
46	0.10346E-07	0.20692E-04	0.10961E-09
47	0.97631E-08	0.19526E-04	0.10343E-09
48	0.92117E-08	0.18423E-04	0.97592E-10
49	0.86860E-08	0.17372E-04	0.92022E-10
50	0.81886E-08	0.16377E-04	0.86753E-10
51	0.77183E-08	0.15437E-04	0.81770E-10
52	0.72711E-08	0.14542E-04	0.77032E-10
53	0.68448E-08	0.13690E-04	0.72516E-10

54	0.64410E-08	0.12882E-04	0.68239E-10
55	0.60601E-08	0.12120E-04	0.64203E-10
56	0.56941E-08	0.11388E-04	0.60326E-10
57	0.53466E-08	0.10693E-04	0.56643E-10
58	0.50170E-08	0.10034E-04	0.53151E-10
59	0.47018E-08	0.94036E-05	0.49813E-10
60	0.44017E-08	0.88034E-05	0.46633E-10
61	0.41145E-08	0.82290E-05	0.43590E-10
62	0.38412E-08	0.76825E-05	0.40695E-10
63	0.35799E-08	0.71598E-05	0.37927E-10
64	0.33291E-08	0.66582E-05	0.35270E-10
65	0.30882E-08	0.61763E-05	0.32717E-10
66	0.28591E-08	0.57182E-05	0.30290E-10
67	0.26377E-08	0.52754E-05	0.27945E-10
68	0.24240E-08	0.48481E-05	0.25681E-10
69	0.22183E-08	0.44367E-05	0.23502E-10
70	0.20180E-08	0.40360E-05	0.21379E-10
71	0.18240E-08	0.36479E-05	0.19324E-10
72	0.16368E-08	0.32737E-05	0.17341E-10
73	0.14540E-08	0.29080E-05	0.15404E-10
74	0.12765E-08	0.25530E-05	0.13524E-10
75	0.11050E-08	0.22099E-05	0.11706E-10
76	0.93449E-09	0.18690E-05	0.99003E-11
77	0.76690E-09	0.15338E-05	0.81248E-11
78	0.60185E-09	0.12037E-05	0.63762E-11
79	0.43872E-09	0.87744E-06	0.46480E-11
80	0.27688E-09	0.55376E-06	0.29333E-11

```
RMA 93-03 CPMSO Transport, 500 years
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25     .00057        1.6       0 40        .25       .005
      .645        -1.   3.68E-05
   80y      100.0
    1     1  1.12E+02
    2     2  5.51E+01
    3     3  2.35E+01
    4     4  9.49E+00
    5     5  4.32E+00
    6     6  2.65E+00
    7     7  2.12E+00
    8     8  1.91E+00
    9     9  1.79E+00
   10    10  1.69E+00
   11    11  1.60E+00
   12    12  1.51E+00
   13    13  1.43E+00
   14    14  1.35E+00
   15    15  1.28E+00
   16    16  1.21E+00
   17    17  1.15E+00
   18    18  1.08E+00
   19    19  1.02E+00
   20    20  9.69E-01
   21    21  9.16E-01
   22    22  8.66E-01
   23    23  8.20E-01
   24    24  7.75E-01
   25    25  7.33E-01
   26    26  6.93E-01
   27    27  6.56E-01
   28    28  6.20E-01
   29    29  5.86E-01
   30    30  5.54E-01
   31    31  5.24E-01
   32    32  4.95E-01
   33    33  4.68E-01
   34    34  4.43E-01
   35    35  4.19E-01
   36    36  3.95E-01
   37    37  3.74E-01
   38    38  3.54E-01
   39    39  3.34E-01
   40    40  3.16E-01
   41    41  2.98E-01
   42    42  2.81E-01
   43    43  2.66E-01
   44    44  2.51E-01
   45    45  2.37E-01
   46    46  2.24E-01
   47    47  2.11E-01
```

48	48	1.99E-01
49	49	1.88E-01
50	50	1.77E-01
51	51	1.67E-01
52	52	1.57E-01
53	53	1.48E-01
54	54	1.39E-01
55	55	1.31E-01
56	56	1.23E-01
57	57	1.16E-01
58	58	1.09E-01
59	59	1.02E-01
60	60	9.52E-02
61	61	8.90E-02
62	62	8.31E-02
63	63	7.74E-02
64	64	7.20E-02
65	65	6.68E-02
66	66	6.18E-02
67	67	5.71E-02
68	68	5.24E-02
69	69	4.80E-02
70	70	4.37E-02
71	71	3.95E-02
72	72	3.54E-02
73	73	3.15E-02
74	74	2.76E-02
75	75	2.39E-02
76	76	2.02E-02
77	77	1.66E-02
78	78	1.30E-02
79	79	9.49E-03
80	80	5.99E-03

Time: 100.000 - CPMSO - 500 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.60355E-05	0.12071E-01	0.63942E-07
2	0.34226E-05	0.68452E-02	0.36260E-07
3	0.17122E-05	0.34245E-02	0.18140E-07
4	0.80038E-06	0.16008E-02	0.84795E-08
5	0.39152E-06	0.78304E-03	0.41479E-08
6	0.23169E-06	0.46337E-03	0.24546E-08
7	0.17354E-06	0.34708E-03	0.18385E-08
8	0.15089E-06	0.30178E-03	0.15986E-08
9	0.13944E-06	0.27888E-03	0.14773E-08
10	0.13127E-06	0.26254E-03	0.13907E-08
11	0.12421E-06	0.24842E-03	0.13159E-08
12	0.11754E-06	0.23509E-03	0.12453E-08
13	0.11132E-06	0.22265E-03	0.11794E-08
14	0.10537E-06	0.21075E-03	0.11164E-08
15	0.99843E-07	0.19969E-03	0.10578E-08
16	0.94564E-07	0.18913E-03	0.10018E-08
17	0.89689E-07	0.17938E-03	0.95020E-09
18	0.84805E-07	0.16961E-03	0.89846E-09
19	0.80196E-07	0.16039E-03	0.84962E-09
20	0.76012E-07	0.15202E-03	0.80530E-09
21	0.72009E-07	0.14402E-03	0.76289E-09
22	0.68183E-07	0.13637E-03	0.72235E-09
23	0.64582E-07	0.12916E-03	0 68421E-09
24	0.61148E-07	0.12230E-03	0 64782E-09
25	0.57896E-07	0.11579E-03	0 61337E-09
26	0.54811E-07	0.10962E-03	0 58068E-09
27	0.51908E-07	0.10382E-03	0.54993E-09
28	0.49142E-07	0.98283E-04	0 52062E-09
29	0.46514E-07	0.93027E-04	0 49278E-09
30	0.44026E-07	0.88052E-04	0 46643E-09
31	0.41678E-07	0.83357E-04	0.44156E-09
32	0.39442E-07	0.78884E-04	0 41786E-09
33	0.37328E-07	0.74657E-04	0 39547E-09
34	0.35343E-07	0.70685E-04	0 37443E-09
35	0.33460E-07	0.66920E-04	0 35448E-09
36	0.31641E-07	0.63282E-04	0.33522E-09
37	0 29945E-07	0.59890E-04	0 31725E-09
38	0.28350E-07	0.56701E-04	0 30035E-09
39	0.26815E-07	0.53630E-04	0 28409E-09
40	0.25371E-07	0.50742E-04	0 26879E-09
41	0.23986E-07	0.47972E-04	0.25411E-09
42	0.22665E-07	0.45330E-04	0.24012E-09
43	0.21438E-07	0.42875E-04	0.22712E-09
44	0.20267E-07	0.40534E-04	0 21471E-09
45	0.19155E-07	0.38310E-04	0 20293E-09
46	0.18108E-07	0 36215E-04	0 19184E-09
47	0.17100E-07	0.34200E-04	0 18116E-09
48	0.16145E-07	0.32289E-04	0 17104E-09
49	0.15249E-07	0.30498E-04	0 16155E-09
50	0.14389E-07	0.28779E-04	0 15245E-09
51	0.13578E-07	0.27156E-04	0 14385E-09
52	0.12798E-07	0.25597E-04	0.13559E-09
53	0.12064E-07	0.24128E-04	0 12781E-09

54	0.11359E-07	0.22719E-04	0.12034E-09
55	0.10698E-07	0.21397E-04	0.11334E-09
56	0.10065E-07	0.20129E-04	0.10663E-09
57	0.94728E-08	0.18946E-04	0.10036E-09
58	0.89066E-08	0.17813E-04	0.94359E-10
59	0.83558E-08	0.16712E-04	0.88524E-10
60	0.78223E-08	0.15645E-04	0.82872E-10
61	0.73174E-08	0.14635E-04	0.77523E-10
62	0.68379E-08	0.13676E-04	0.72443E-10
63	0.63783E-08	0.12757E-04	0.67574E-10
64	0.59388E-08	0.11878E-04	0.62917E-10
65	0.55169E-08	0.11034E-04	0.58448E-10
66	0.51111E-08	0.10222E-04	0.54149E-10
67	0.47232E-08	0.94464E-05	0.50039E-10
68	0.43461E-08	0.86922E-05	0.46044E-10
69	0.39836E-08	0.79673E-05	0.42204E-10
70	0.36330E-08	0.72660E-05	0.38489E-10
71	0.32920E-08	0.65840E-05	0.34876E-10
72	0.29597E-08	0.59194E-05	0.31356E-10
73	0.26381E-08	0.52763E-05	0.27949E-10
74	0.23229E-08	0.46459E-05	0.24610E-10
75	0.20166E-08	0.40332E-05	0.21365E-10
76	0.17155E-08	0.34310E-05	0.18175E-10
77	0.14199E-08	0.28397E-05	0.15043E-10
78	0.11274E-08	0.22548E-05	0.11944E-10
79	0.83901E-09	0.16780E-05	0.88888E-11
80	0.55305E-09	0.11061E-05	0.58592E-11

```
RMA 93-03 CPMSO Transport, 600 years
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25    .00057        1.6       0.40        .25       .005
      .678        -1.  6.95E-05
   80y      100.0
    1     1  1.31E+02
    2     2  7.40E+01
    3     3  3.70E+01
    4     4  1.73E+01
    5     5  8.47E+00
    6     6  5.01E+00
    7     7  3.75E+00
    8     8  3.26E+00
    9     9  3.02E+00
   10    10  2.84E+00
   11    11  2.69E+00
   12    12  2.54E+00
   13    13  2.41E+00
   14    14  2.28E+00
   15    15  2.16E+00
   16    16  2.05E+00
   17    17  1.94E+00
   18    18  1.83E+00
   19    19  1.73E+00
   20    20  1.64E+00
   21    21  1.56E+00
   22    22  1.47E+00
   23    23  1.40E+00
   24    24  1.32E+00
   25    25  1.25E+00
   26    26  1.19E+00
   27    27  1.12E+00
   28    28  1.06E+00
   29    29  1.01E+00
   30    30  9.52E-01
   31    31  9.02E-01
   32    32  8.53E-01
   33    33  8.07E-01
   34    34  7.64E-01
   35    35  7.24E-01
   36    36  6.84E-01
   37    37  6.48E-01
   38    38  6.13E-01
   39    39  5.80E-01
   40    40  5.49E-01
   41    41  5.19E-01
   42    42  4.90E-01
   43    43  4.64E-01
   44    44  4.38E-01
   45    45  4.14E-01
   46    46  3.92E-01
   47    47  3.70E-01
```

48	48	3.49E-01
49	49	3.30E-01
50	50	3.11E-01
51	51	2.94E-01
52	52	2.77E-01
53	53	2.61E-01
54	54	2.46E-01
55	55	2.31E-01
56	56	2.18E-01
57	57	2.05E-01
58	58	1.93E-01
59	59	1.81E-01
60	60	1.69E-01
61	61	1.58E-01
62	62	1.48E-01
63	63	1.38E-01
64	64	1.28E-01
65	65	1.19E-01
66	66	1.11E-01
67	67	1.02E-01
68	68	9.40E-02
69	69	8.62E-02
70	70	7.86E-02
71	71	7.12E-02
72	72	6.40E-02
73	73	5.71E-02
74	74	5.02E-02
75	75	4.36E-02
76	76	3.71E-02
77	77	3.07E-02
78	78	2.44E-02
79	79	1.81E-02
80	80	1.20E-02

Time: 100.000 - CPMSO - 600 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.66921E-05	0.13384E-01	0.70899E-07
2	0.41729E-05	0.83457E-02	0.44209E-07
3	0.23493E-05	0.46985E-02	0 24889E-07
4	0.12357E-05	0.24713E-02	0.13091E-07
5	0.65458E-06	0.13092E-02	0.69349E-08
6	0.38918E-06	0.77836E-03	0.41231E-08
7	0.27860E-06	0.55719E-03	0 29516E-08
8	0.23288E-06	0.46576E-03	0.24672E-08
9	0.21133E-06	0.42267E-03	0.22390E-08
10	0.19772E-06	0.39544E-03	0 20947E-08
11	0.18689E-06	0.37378E-03	0.19800E-08
12	0.17693E-06	0.35386E-03	0.18745E-08
13	0.16778E-06	0.33556E-03	0.17775E-08
14	0.15906E-06	0.31812E-03	0.16852E-08
15	0.15082E-06	0.30164E-03	0 15979E-08
16	0.14312E-06	0.28624E-03	0.15163E-08
17	0.13572E-06	0.27144E-03	0.14378E-08
18	0.12850E-06	0.25699E-03	0 13613E-08
19	0.12167E-06	0.24334E-03	0 12890E-08
20	0.11535E-06	0.23069E-03	0.12220E-08
21	0.10954E-06	0.21908E-03	0.11605E-08
22	0.10376E-06	0.20751E-03	0.10992E-08
23	0.98499E-07	0.19700E-03	0.10435E-08
24	0.93313E-07	0.18663E-03	0.98859E-09
25	0.88416E-07	0.17683E-03	0.93670E-09
26	0.83963E-07	0.16793E-03	0.88953E-09
27	0.79495E-07	0.15899E-03	0.84219E-09
28	0.75280E-07	0.15056E-03	0.79754E-09
29	0.71493E-07	0.14299E-03	0.75743E-09
30	0.67727E-07	0.13545E-03	0.71753E-09
31	0.64175E-07	0.12835E-03	0.67990E-09
32	0.60797E-07	0.12159E-03	0.64410E-09
33	0.57593E-07	0.11519E-03	0.61016E-09
34	0.54570E-07	0.10914E-03	0.57813E-09
35	0.51728E-07	0.10346E-03	0.54802E-09
36	0.48989E-07	0.97978E-04	0.51901E-09
37	0.46416E-07	0.92831E-04	0.49174E-09
38	0.43969E-07	0.87937E-04	0.46582E-09
39	0.41645E-07	0.83289E-04	0.44120E-09
40	0.39446E-07	0.78892E-04	0.41791E-09
41	0.37348E-07	0.74695E-04	0.39567E-09
42	0.35335E-07	0.70670E-04	0.37435E-09
43	0.33454E-07	0.66907E-04	0.35442E-09
44	0.31649E-07	0.63298E-04	0.33530E-09
45	0.29940E-07	0.59880E-04	0.31720E-09
46	0.28341E-07	0.56681E-04	0.30025E-09
47	0.26803E-07	0.53606E-04	0.28396E-09
48	0.25328E-07	0.50656E-04	0.26833E-09
49	0.23945E-07	0.47890E-04	0.25368E-09
50	0.22616E-07	0.45233E-04	0.23960E-09
51	0.21370E-07	0.42740E-04	0.22640E-09
52	0.20173E-07	0.40346E-04	0.21372E-09
53	0.19030E-07	0.38061E-04	0.20161E-09

54	0.17948E-07	0.35895E-04	0.19014E-09
55	0.16901E-07	0.33801E-04	0.17905E-09
56	0.15927E-07	0.31853E-04	0.16873E-09
57	0.14995E-07	0.29991E-04	0.15887E-09
58	0.14112E-07	0.28224E-04	0.14951E-09
59	0.13258E-07	0.26517E-04	0.14046E-09
60	0.12423E-07	0.24846E-04	0.13162E-09
61	0.11628E-07	0.23256E-04	0.12319E-09
62	0.10884E-07	0.21767E-04	0.11530E-09
63	0.10166E-07	0.20333E-04	0.10771E-09
64	0.94644E-08	0.18929E-04	0.10027E-09
65	0.87993E-08	0.17599E-04	0.93222E-10
66	0.81812E-08	0.16362E-04	0.86675E-10
67	0.75624E-08	0.15125E-04	0.80118E-10
68	0.69690E-08	0.13938E-04	0.73832E-10
69	0.63984E-08	0.12797E-04	0.67787E-10
70	0.58451E-08	0.11690E-04	0.61925E-10
71	0.53069E-08	0.10614E-04	0.56223E-10
72	0.47831E-08	0.95661E-05	0.50673E-10
73	0.42753E-08	0.85507E-05	0.45294E-10
74	0.37768E-08	0.75535E-05	0.40012E-10
75	0.32911E-08	0.65821E-05	0.34867E-10
76	0.28153E-08	0.56306E-05	0.29826E-10
77	0.23473E-08	0.46946E-05	0.24868E-10
78	0.18860E-08	0.37721E-05	0.19981E-10
79	0.14284E-08	0.28568E-05	0.15133E-10
80	0.97759E-09	0.19552E-05	0.10357E-10

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RMA 93-03 CPMSO Transport, 700 years
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25     .00057       1.6      0.40       .25      .005
      .703        -1.   1.17E 04
   80y      100.0
    1    1  1.45E+02
    2    2  9.03E+01
    3    3  5.08E+01
    4    4  2.67E+01
    5    5  1.42E+01
    6    6  8.42E+00
    7    7  6.03E+00
    8    8  5.04E+00
    9    9  4.57E+00
   10   10  4.28E+00
   11   11  4.04E+00
   12   12  3.83E+00
   13   13  3.63E+00
   14   14  3.44E+00
   15   15  3.26E+00
   16   16  3.10E+00
   17   17  2.94E+00
   18   18  2.78E+00
   19   19  2.63E+00
   20   20  2.50E+00
   21   21  2.37E+00
   22   22  2.24E+00
   23   23  2.13E+00
   24   24  2.02E+00
   25   25  1.91E+00
   26   26  1.82E+00
   27   27  1.72E+00
   28   28  1.63E+00
   29   29  1.55E+00
   30   30  1.46E+00
   31   31  1.39E+00
   32   32  1.32E+00
   33   33  1.25E+00
   34   34  1.18E+00
   35   35  1.12E+00
   36   36  1.06E+00
   37   37  1.00E+00
   38   38  9.51E-01
   39   39  9.01E-01
   40   40  8.53E-01
   41   41  8.08E-01
   42   42  7.64E-01
   43   43  7.24E-01
   44   44  6.85E-01
   45   45  6.48E-01
   46   46  6.13E-01
   47   47  5.80E-01
```

48	48	5.48E-01
49	49	5.18E-01
50	50	4.89E-01
51	51	4.62E-01
52	52	4.36E-01
53	53	4.12E-01
54	54	3.88E-01
55	55	3.66E-01
56	56	3.45E-01
57	57	3.24E-01
58	58	3.05E-01
59	59	2.87E-01
60	60	2.69E-01
61	61	2.52E-01
62	62	2.35E-01
63	63	2.20E-01
64	64	2.05E-01
65	65	1.90E-01
66	66	1.77E-01
67	67	1.64E-01
68	68	1.51E-01
69	69	1.38E-01
70	70	1.26E-01
71	71	1.15E-01
72	72	1.03E-01
73	73	9.25E-02
74	74	8.17E-02
75	75	7.12E-02
76	76	6.09E-02
77	77	5.08E-02
78	78	4 08E-02
79	79	3.09E-02
80	80	2.11E-02

Time: 100.000 - CPMSO - 700 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.71844E-05	0.14369E-01	0.76114E-07
2	0.47917E-05	0.95833E-02	0.50764E-07
3	0.29485E-05	0.58971E-02	0.31238E-07
4	0.17045E-05	0.34090E-02	0.18058E-07
5	0.97477E-06	0.19495E-02	0 10327E-07
6	0.59540E-06	0.11908E-02	0 63079E-08
7	0.41703E-06	0.83406E-03	0.44182E-08
8	0.33684E-06	0.67368E-03	0.35686E-08
9	0.29868E-06	0.59736E-03	0.31643E-08
10	0.27686E-06	0.55371E-03	0.29331E-08
11	0.26080E-06	0.52160E-03	0.27630E-08
12	0.24709E-06	0.49419E-03	0.26178E-08
13	0.23445E-06	0.46890E-03	0.24838E-08
14	0.22250E-06	0.44499E-03	0.23572E-08
15	0.21115E-06	0.42230E-03	0.22370E-08
16	0.20065E-06	0.40130E-03	0.21257E-08
17	0.19059E-06	0.38118E-03	0.20192E-08
18	0.18077E-06	0.36154E-03	0.19151E-08
19	0.17137E-06	0.34274E-03	0.18156E-08
20	0.16275E-06	0.32549E-03	0.17242E-08
21	0.15453E-06	0.30906E-03	0.16371E-08
22	0.14652E-06	0.29303E-03	0.15522E-08
23	0.13915E-06	0.27829E-03	0.14742E-08
24	0.13214E-06	0.26428E-03	0.13999E-08
25	0.12531E-06	0.25063E-03	0.13276E-08
26	0.11911E-06	0.23822E-03	0.12619E-08
27	0.11300E-06	0.22600E-03	0.11972E-08
28	0.10719E-06	0.21438E-03	0.11356E-08
29	0.10182E-06	0.20365E-03	0.10788E-08
30	0.96446E-07	0.19289E-03	0.10218E-08
31	0.91574E-07	0.18315E-03	0.97017E-09
32	0.86999E-07	0.17400E-03	0.92169E-09
33	0.82557E-07	0.16511E-03	0.87464E-09
34	0.78203E-07	0.15641E-03	0.82851E-09
35	0.74175E-07	0.14835E-03	0.78583E-09
36	0.70334E-07	0.14067E-03	0.74514E-09
37	0.66588E-07	0.13318E-03	0.70546E-09
38	0.63186E-07	0.12637E-03	0.66942E-09
39	0.59949E-07	0.11990E-03	0.63512E-09
40	0.56838E-07	0.11368E-03	0.60216E-09
41	0.53883E-07	0.10777E-03	0.57086E-09
42	0.51046E-07	0.10209E-03	0.54080E-09
43	0.48380E-07	0.96760E-04	0.51255E-09
44	0.45837E-07	0.91674E-04	0.48561E-09
45	0.43412E-07	0.86824E-04	0.45992E-09
46	0.41108E-07	0.82216E-04	0.43551E-09
47	0.38924E-07	0.77847E-04	0.41237E-09
48	0.36833E-07	0.73665E-04	0.39022E-09
49	0.34846E-07	0.69692E-04	0.36917E-09
50	0.32946E-07	0.65892E-04	0.34904E-09
51	0.31147E-07	0.62294E-04	0.32998E-09
52	0.29431E-07	0.58861E-04	0.31180E-09
53	0.27811E-07	0.55623E-04	0.29464E-09

54	0.26247E-07	0.52494E-04	0.27807E-09
55	0.24765E-07	0.49530E-04	0.26237E-09
56	0.23357E-07	0.46714E-04	0.24745E-09
57	0.21990E-07	0.43980E-04	0.23297E-09
58	0.20699E-07	0.41397E-04	0.21929E-09
59	0.19477E-07	0.38954E-04	0.20634E-09
60	0.18292E-07	0.36584E-04	0.19379E-09
61	0.17154E-07	0.34309E-04	0.18174E-09
62	0.16046E-07	0.32092E-04	0.17000E-09
63	0.15007E-07	0.30014E-04	0.15899E-09
64	0.14007E-07	0.28014E-04	0.14840E-09
65	0.13027E-07	0.26053E-04	0.13801E-09
66	0.12110E-07	0.24221E-04	0.12830E-09
67	0.11230E-07	0.22460E-04	0.11897E-09
68	0.10366E-07	0.20732E-04	0.10982E-09
69	0.95139E-08	0.19028E-04	0.10079E-09
70	0.86963E-08	0.17393E-04	0.92132E-10
71	0.79242E-08	0.15848E-04	0.83952E-10
72	0.71495E-08	0.14299E-04	0.75745E-10
73	0.64110E-08	0.12822E-04	0.67921E-10
74	0.56867E-08	0.11373E-04	0.60247E-10
75	0.49758E-08	0.99515E-05	0.52715E-10
76	0.42780E-08	0.85561E-05	0.45323E-10
77	0.35926E-08	0.71851E-05	0.38061E-10
78	0.29161E-08	0.58321E-05	0.30894E-10
79	0.22466E-08	0.44933E-05	0.23802E-10
80	0.15833E-08	0.31665E-05	0.16774E-10

```
RMA 93-03 CPMSO Transport, 800 years
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .723        -1.   1.83E-04
   80y      100.0
    1     1  1.55E+02
    2     2  1.04E+02
    3     3  6.38E+01
    4     4  3.69E+01
    5     5  2.11E+01
    6     6  1.29E+01
    7     7  9.02E+00
    8     8  7.29E+00
    9     9  6.46E+00
   10    10  5.99E+00
   11    11  5.64E+00
   12    12  5.34E+00
   13    13  5.07E+00
   14    14  4.81E+00
   15    15  4.57E+00
   16    16  4.34E+00
   17    17  4.12E+00
   18    18  3.91E+00
   19    19  3.71E+00
   20    20  3.52E+00
   21    21  3.34E+00
   22    22  3.17E+00
   23    23  3.01E+00
   24    24  2.86E+00
   25    25  2.71E+00
   26    26  2.58E+00
   27    27  2.44E+00
   28    28  2.32E+00
   29    29  2.20E+00
   30    30  2.09E+00
   31    31  1.98E+00
   32    32  1.88E+00
   33    33  1.79E+00
   34    34  1.69E+00
   35    35  1.60E+00
   36    36  1.52E+00
   37    37  1.44E+00
   38    38  1.37E+00
   39    39  1.30E+00
   40    40  1.23E+00
   41    41  1.17E+00
   42    42  1.10E+00
   43    43  1.05E+00
   44    44  9.91E-01
   45    45  9.39E-01
   46    46  8.89E-01
   47    47  8.42E-01
```

48	48	7.97E-01
49	49	7.54E-01
50	50	7.13E-01
51	51	6.74E-01
52	52	6.37E-01
53	53	6.02E-01
54	54	5.68E-01
55	55	5.36E-01
56	56	5.05E-01
57	57	4.76E-01
58	58	4.48E-01
59	59	4.21E-01
60	60	3.96E-01
61	61	3.71E-01
62	62	3.47E-01
63	63	3.25E-01
64	64	3.03E-01
65	65	2.82E-01
66	66	2.62E-01
67	67	2.43E-01
68	68	2.24E-01
69	69	2.06E-01
70	70	1.88E-01
71	71	1.71E-01
72	72	1.55E-01
73	73	1.39E-01
74	74	1.23E-01
75	75	1.08E-01
76	76	9.25E-02
77	77	7.77E-02
78	78	6.31E-02
79	79	4.86E-02
80	80	3.42E-02

Time: 100.000 - CPMSO - 800 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.75517E-05	0.15103E-01	0.80005E-07
2	0.52934E-05	0.10587E-01	0.56080E-07
3	0.34855E-05	0.69709E-02	0.36926E-07
4	0.21747E-05	0.43493E-02	0.23039E-07
5	0.13295E-05	0.26590E-02	0.14085E-07
6	0.84319E-06	0.16864E-02	0.89330E-08
7	0.58877E-06	0.11775E-02	0.62376E-08
8	0.46402E-06	0.92803E-03	0.49160E-08
9	0.40230E-06	0.80459E-03	0.42621E-08
10	0.36828E-06	0.73656E-03	0.39017E-08
11	0.34527E-06	0.69054E-03	0.36579E-08
12	0.32663E-06	0.65327E-03	0.34605E-08
13	0.31010E-06	0.62020E-03	0.32853E-08
14	0.29461E-06	0.58922E-03	0.31212E-08
15	0.28007E-06	0.56013E-03	0.29671E-08
16	0.26627E-06	0.53253E-03	0.28209E-08
17	0.25310E-06	0.50620E-03	0.26814E-08
18	0.24053E-06	0.48105E-03	0.25482E-08
19	0.22854E-06	0.45708E-03	0.24212E-08
20	0.21713E-06	0.43426E-03	0.23004E-08
21	0.20629E-06	0.41258E-03	0.21855E-08
22	0.19601E-06	0.39202E-03	0.20766E-08
23	0.18628E-06	0.37256E-03	0.19735E-08
24	0.17710E-06	0.35419E-03	0.18762E-08
25	0.16820E-06	0.33641E-03	0.17820E-08
26	0.15997E-06	0.31995E-03	0.16948E-08
27	0.15186E-06	0.30372E-03	0.16089E-08
28	0.14431E-06	0.28862E-03	0.15289E-08
29	0.13709E-06	0.27418E-03	0.14524E-08
30	0.13028E-06	0.26055E-03	0.13802E-08
31	0.12370E-06	0.24739E-03	0.13105E-08
32	0.11750E-06	0.23499E-03	0.12448E-08
33	0.11176E-06	0.22352E-03	0.11840E-08
34	0.10601E-06	0.21202E-03	0.11231E-08
35	0.10051E-06	0.20103E-03	0.10649E-08
36	0.95444E-07	0.19089E-03	0.10112E-08
37	0 90593E-07	0.18119E-03	0.95977E-09
38	0.86097E-07	0.17219E-03	0.91214E-09
39	0.81795E-07	0.16359E-03	0.86656E-09
40	0.77588E-07	0.15518E-03	0.82200E-09
41	0.73701E-07	0.14740E-03	0.78081E-09
42	0.69743E-07	0.13949E-03	0.73888E-09
43	0.66254E-07	0.13251E-03	0.70192E-09
44	0.62806E-07	0.12561E-03	0.66539E-09
45	0.59532E-07	0.11906E-03	0.63070E-09
46	0.56424E-07	0.11285E-03	0.59778E-09
47	0.53478E-07	0.10696E-03	0.56657E-09
48	0.50671E-07	0.10134E-03	0.53683E-09
49	0.47991E-07	0.95981E-04	0.50843E-09
50	0.45431E-07	0.90862E-04	0.48131E-09
51	0.42990E-07	0.85981E-04	0.45545E-09
52	0.40666E-07	0.81333E-04	0.43083E-09
53	0.38457E-07	0.76915E-04	0.40743E-09

54	0.36336E-07	0.72673E-04	0.38496E-09
55	0.34315E-07	0.68630E-04	0.36354E-09
56	0.32376E-07	0.64751E-04	0.34300E-09
57	0.30532E-07	0.61064E-04	0.32346E-09
58	0.28767E-07	0.57533E-04	0.30476E-09
59	0.27069E-07	0.54139E-04	0.28678E-09
60	0.25461E-07	0.50922E-04	0.26974E-09
61	0.23902E-07	0.47803E-04	0.25322E-09
62	0.22394E-07	0.44789E-04	0.23725E-09
63	0.20969E-07	0.41938E-04	0.22215E-09
64	0.19588E-07	0.39177E-04	0.20753E-09
65	0.18256E-07	0.36512E-04	0.19341E-09
66	0.16977E-07	0.33954E-04	0.17986E-09
67	0.15753E-07	0.31505E-04	0.16689E-09
68	0.14557E-07	0.29114E-04	0.15422E-09
69	0.13402E-07	0.26804E-04	0.14199E-09
70	0.12271E-07	0.24543E-04	0.13001E-09
71	0.11179E-07	0.22358E-04	0.11844E-09
72	0.10134E-07	0.20267E-04	0.10736E-09
73	0.91116E-08	0.18223E-04	0.96531E-10
74	0.81005E-08	0.16201E-04	0.85819E-10
75	0.71219E-08	0.14244E-04	0.75452E-10
76	0.61486E-08	0.12297E-04	0.65140E-10
77	0.51949E-08	0.10390E-04	0.55036E-10
78	0.42577E-08	0.85154E-05	0.45107E-10
79	0.33305E-08	0.66611E-05	0.35285E-10
80	0.24105E-08	0.48209E-05	0.25537E-10

```
RMA 93-03 CPMSO Transport, 900 years
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25    .00057        1.6       0.40        .25       .005
      .740        -1.  2.68E-04
   80y      100.0
    1     1  1.63E+02
    2     2  1.15E+02
    3     3  7.54E+01
    4     4  4.70E+01
    5     5  2.88E+01
    6     6  1.82E+01
    7     7  1.27E+01
    8     8  1.00E+01
    9     9  8.70E+00
   10    10  7.97E+00
   11    11  7.47E+00
   12    12  7.07E+00
   13    13  6.71E+00
   14    14  6.37E+00
   15    15  6.06E+00
   16    16  5.76E+00
   17    17  5.47E+00
   18    18  5.20E+00
   19    19  4.94E+00
   20    20  4.70E+00
   21    21  4.46E+00
   22    22  4.24E+00
   23    23  4.03E+00
   24    24  3.83E+00
   25    25  3.64E+00
   26    26  3.46E+00
   27    27  3.28E+00
   28    28  3.12E+00
   29    29  2.97E+00
   30    30  2.82E+00
   31    31  2.68E+00
   32    32  2.54E+00
   33    33  2.42E+00
   34    34  2.29E+00
   35    35  2.17E+00
   36    36  2.06E+00
   37    37  1.96E+00
   38    38  1.86E+00
   39    39  1.77E+00
   40    40  1.68E+00
   41    41  1.59E+00
   42    42  1.51E+00
   43    43  1.43E+00
   44    44  1.36E+00
   45    45  1.29E+00
   46    46  1.22E+00
   47    47  1.16E+00
```

48	48	1.10E+00
49	49	1.04E+00
50	50	9.83E-01
51	51	9.30E-01
52	52	8.80E-01
53	53	8.32E-01
54	54	7.86E-01
55	55	7.42E-01
56	56	7.00E-01
57	57	6.60E-01
58	58	6.22E-01
59	59	5.86E-01
60	60	5.51E-01
61	61	5.17E-01
62	62	4.84E-01
63	63	4.54E-01
64	64	4.24E-01
65	65	3.95E-01
66	66	3.67E-01
67	67	3.41E-01
68	68	3.15E-01
69	69	2.90E-01
70	70	2.65E-01
71	71	2.42E-01
72	72	2.19E-01
73	73	1.97E-01
74	74	1.75E-01
75	75	1.54E-01
76	76	1.33E-01
77	77	1.12E-01
78	78	9.21E-02
79	79	7.20E-02
80	80	5.21E-02

Time: 100.000 - CPMSO - 900 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.78537E-05	0.15707E-01	0.83205E-07
2	0.57007E-05	0.11401E-01	0.60396E-07
3	0.39496E-05	0.78993E-02	0.41844E-07
4	0.26173E-05	0.52346E-02	0.27728E-07
5	0.16974E-05	0.33949E-02	0.17983E-07
6	0.11193E-05	0.22386E-02	0.11858E-07
7	0.78893E-06	0.15779E-02	0.83582E-08
8	0.61297E-06	0.12259E-02	0.64940E-08
9	0.52207E-06	0.10441E-02	0.55310E-08
10	0.47199E-06	0.94397E-03	0.50004E-08
11	0.43976E-06	0.87951E-03	0.46589E-08
12	0.41525E-06	0.83050E-03	0.43993E-08
13	0.39411E-06	0.78822E-03	0.41753E-08
14	0.37459E-06	0.74918E-03	0.39686E-08
15	0.35646E-06	0.71293E-03	0.37765E-08
16	0.33925E-06	0.67849E-03	0.35941E-08
17	0.32271E-06	0.64543E-03	0.34189E-08
18	0.30705E-06	0.61410E-03	0.32530E-08
19	0.29211E-06	0.58422E-03	0.30947E-08
20	0.27804E-06	0.55607E-03	0.29456E-08
21	0.26442E-06	0.52885E-03	0.28014E-08
22	0.25155E-06	0.50309E-03	0.26650E-08
23	0.23933E-06	0.47867E-03	0.25356E-08
24	0.22770E-06	0.45541E-03	0.24124E-08
25	0.21663E-06	0.43327E-03	0.22951E-08
26	0.20611E-06	0.41222E-03	0.21836E-08
27	0.19588E-06	0.39176E-03	0.20752E-08
28	0.18632E-06	0.37263E-03	0.19739E-08
29	0.17737E-06	0.35474E-03	0.18791E-08
30	0.16872E-06	0.33744E-03	0.17875E-08
31	0.16047E-06	0.32095E-03	0.17001E-08
32	0.15246E-06	0.30492E-03	0.16152E-08
33	0.14509E-06	0.29017E-03	0.15371E-08
34	0.13780E-06	0.27560E-03	0.14599E-08
35	0.13080E-06	0.26160E-03	0.13858E-08
36	0.12424E-06	0.24849E-03	0.13163E-08
37	0.11817E-06	0.23633E-03	0.12519E-08
38	0.11232E-06	0.22464E-03	0.11900E-08
39	0.10684E-06	0.21368E-03	0.11319E-08
40	0.10156E-06	0.20312E-03	0.10760E-08
41	0.96379E-07	0.19276E-03	0.10211E-08
42	0.91524E-07	0.18305E-03	0.96964E-09
43	0.86853E-07	0.17371E-03	0.92015E-09
44	0.82523E-07	0.16505E-03	0.87428E-09
45	0.78375E-07	0.15675E-03	0.83034E-09
46	0.74314E-07	0.14863E-03	0.78730E-09
47	0.70561E-07	0.14112E-03	0.74755E-09
48	0.66978E-07	0.13396E-03	0.70959E-09
49	0.63473E-07	0.12695E-03	0.67245E-09
50	0.60094E-07	0.12019E-03	0.63666E-09
51	0.56896E-07	0.11379E-03	0.60278E-09
52	0.53871E-07	0.10774E-03	0.57073E-09
53	0.50984E-07	0.10197E-03	0.54014E-09

54	0.48219E-07	0.96437E-04	0.51085E-09
55	0.45570E-07	0.91141E-04	0.48279E-09
56	0.43037E-07	0.86073E-04	0.45595E-09
57	0.40616E-07	0.81231E-04	0.43030E-09
58	0.38305E-07	0.76611E-04	0.40582E-09
59	0.36104E-07	0.72208E-04	0.38250E-09
60	0.33985E-07	0.67971E-04	0.36005E-09
61	0.31936E-07	0.63872E-04	0.33834E-09
62	0.29952E-07	0.59903E-04	0.31732E-09
63	0.28080E-07	0.56160E-04	0.29749E-09
64	0.26268E-07	0.52537E-04	0.27830E-09
65	0.24511E-07	0.49022E-04	0.25968E-09
66	0.22810E-07	0.45620E-04	0.24166E-09
67	0.21192E-07	0.42383E-04	0.22451E-09
68	0.19616E-07	0.39232E-04	0.20782E-09
69	0.18086E-07	0.36173E-04	0.19161E-09
70	0.16583E-07	0.33167E-04	0.17569E-09
71	0.15146E-07	0.30292E-04	0.16046E-09
72	0.13744E-07	0.27488E-04	0.14561E-09
73	0.12383E-07	0.24766E-04	0.13119E-09
74	0.11044E-07	0.22088E-04	0.11700E-09
75	0.97409E-08	0.19482E-04	0.10320E-09
76	0.84574E-08	0.16915E-04	0.89600E-10
77	0.71829E-08	0.14366E-04	0.76098E-10
78	0.59415E-08	0.11883E-04	0.62947E-10
79	0.47122E-08	0.94244E-05	0.49923E-10
80	0.34918E-08	0.69836E-05	0.36993E-10

```
RMA 93-03 CPMSO Transport, 1000 years
  1
       0.1       100.        50.       100.
      30.0      .0005      1100.       0.58
Polygon I
        1.       0.25    .00057        1.6       0.40        .25       .005
      .754        -1.  3.77E-04
   80y      100.0
    1     1  1.70E+02
    2     2  1.23E+02
    3     3  8.54E+01
    4     4  5.66E+01
    5     5  3.67E+01
    6     6  2.42E+01
    7     7  1.71E+01
    8     8  1.33E+01
    9     9  1.13E+01
   10    10  1.02E+01
   11    11  9.51E+00
   12    12  8.98E+00
   13    13  8.52E+00
   14    14  8.10E+00
   15    15  7.71E+00
   16    16  7.34E+00
   17    17  6.98E+00
   18    18  6.64E+00
   19    19  6.32E+00
   20    20  6.01E+00
   21    21  5.72E+00
   22    22  5.44E+00
   23    23  5.18E+00
   24    24  4.93E+00
   25    25  4.69E+00
   26    26  4.46E+00
   27    27  4.24E+00
   28    28  4.03E+00
   29    29  3.84E+00
   30    30  3.65E+00
   31    31  3.47E+00
   32    32  3.30E+00
   33    33  3.14E+00
   34    34  2.98E+00
   35    35  2.83E+00
   36    36  2.69E+00
   37    37  2.56E+00
   38    38  2.43E+00
   39    39  2.31E+00
   40    40  2.20E+00
   41    41  2.08E+00
   42    42  1.98E+00
   43    43  1.88E+00
   44    44  1.79E+00
   45    45  1.70E+00
   46    46  1.61E+00
   47    47  1.53E+00
```

48	48	1.45E+00
49	49	1.37E+00
50	50	1.30E+00
51	51	1.23E+00
52	52	1.17E+00
53	53	1.10E+00
54	54	1.04E+00
55	55	9.86E-01
56	56	9.31E-01
57	57	8.79E-01
58	58	8.29E-01
59	59	7.81E-01
60	60	7.35E-01
61	61	6.91E-01
62	62	6.48E-01
63	63	6.07E-01
64	64	5.68E-01
65	65	5.30E-01
66	66	4.93E-01
67	67	4.58E-01
68	68	4.24E-01
69	69	3.91E-01
70	70	3.59E-01
71	71	3.28E-01
72	72	2.97E-01
73	73	2.68E-01
74	74	2.39E-01
75	75	2.11E-01
76	76	1.83E-01
77	77	1.55E-01
78	78	1.29E-01
79	79	1.02E-01
80	80	7.55E-02

Time: 100.000 - CPMSO - 1000 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.81154E-05	0.16231E-01	0.85977E-07
2	0.60178E-05	0.12036E-01	0.63754E-07
3	0.43351E-05	0.86703E-02	0.45928E-07
4	0.30195E-05	0.60391E-02	0.31990E-07
5	0.20582E-05	0.41165E-02	0.21806E-07
6	0.14124E-05	0.28247E-02	0.14963E-07
7	0.10149E-05	0.20298E-02	0.10752E-07
8	0.78652E-06	0.15730E-02	0.83327E-08
9	0.65959E-06	0.13192E-02	0.69879E-08
10	0.58779E-06	0.11756E-02	0.62272E-08
11	0.54346E-06	0.10869E-02	0.57576E-08
12	0.51153E-06	0.10231E-02	0.54193E-08
13	0.48507E-06	0.97013E-03	0.51389E-08
14	0.46135E-06	0.92269E-03	0.48876E-08
15	0.43938E-06	0.87876E-03	0.46550E-08
16	0.41866E-06	0.83733E-03	0.44355E-08
17	0.39877E-06	0.79754E-03	0.42247E-08
18	0.37980E-06	0.75959E-03	0.40237E-08
19	0.36181E-06	0.72362E-03	0.38331E-08
20	0.34458E-06	0.68915E-03	0.36506E-08
21	0.32822E-06	0.65645E-03	0.34773E-08
22	0.31259E-06	0.62517E-03	0.33116E-08
23	0.29781E-06	0.59562E-03	0.31551E-08
24	0.28373E-06	0.56745E-03	0.30059E-08
25	0.27024E-06	0.54048E-03	0.28630E-08
26	0.25732E-06	0.51464E-03	0.27261E-08
27	0.24495E-06	0.48991E-03	0.25951E-08
28	0.23313E-06	0.46627E-03	0.24699E-08
29	0.22211E-06	0.44421E-03	0.23531E-08
30	0.21148E-06	0.42295E-03	0.22405E-08
31	0.20129E-06	0.40258E-03	0.21325E-08
32	0.19160E-06	0.38320E-03	0.20299E-08
33	0.18242E-06	0.36485E-03	0.19327E-08
34	0.17351E-06	0.34702E-03	0.18382E-08
35	0.16499E-06	0.32998E-03	0.17479E-08
36	0.15694E-06	0.31388E-03	0.16627E-08
37	0.14939E-06	0.29877E-03	0.15827E-08
38	0.14208E-06	0.28415E-03	0.15052E-08
39	0.13514E-06	0.27027E-03	0.14317E-08
40	0.12866E-06	0.25731E-03	0.13630E-08
41	0.12215E-06	0.24431E-03	0.12941E-08
42	0.11614E-06	0.23229E-03	0.12305E-08
43	0.11042E-06	0.22084E-03	0.11698E-08
44	0.10507E-06	0.21013E-03	0.11131E-08
45	0.99908E-07	0.19982E-03	0.10585E-08
46	0.94843E-07	0.18969E-03	0.10048E-08
47	0.90095E-07	0.18019E-03	0.95450E-09
48	0.85523E-07	0.17105E-03	0.90606E-09
49	0.81035E-07	0.16207E-03	0.85851E-09
50	0.76854E-07	0.15371E-03	0.81422E-09
51	0.72842E-07	0.14568E-03	0.77172E-09
52	0.69156E-07	0.13831E-03	0.73266E-09
53	0.65387E-07	0.13077E-03	0.69273E-09

54	0.61823E-07	0.12365E-03	0.65498E-09
55	0.58545E-07	0.11709E-03	0.62024E-09
56	0.55374E-07	0.11075E-03	0.58665E-09
57	0.52324E-07	0.10465E-03	0.55434E-09
58	0.49396E-07	0.98791E-04	0.52331E-09
59	0.46582E-07	0.93164E-04	0.49350E-09
60	0.43880E-07	0.87760E-04	0.46488E-09
61	0.41288E-07	0.82575E-04	0.43742E-09
62	0.38779E-07	0.77557E-04	0.41083E-09
63	0.36364E-07	0.72728E-04	0.38525E-09
64	0.34051E-07	0.68103E-04	0.36075E-09
65	0.31816E-07	0.63633E-04	0.33707E-09
66	0.29646E-07	0.59292E-04	0.31408E-09
67	0.27562E-07	0.55124E-04	0.29200E-09
68	0.25548E-07	0.51096E-04	0.27066E-09
69	0.23594E-07	0.47188E-04	0.24996E-09
70	0.21697E-07	0.43394E-04	0.22986E-09
71	0.19854E-07	0.39708E-04	0.21034E-09
72	0.18040E-07	0.36080E-04	0.19112E-09
73	0.16291E-07	0.32583E-04	0.17260E-09
74	0.14577E-07	0.29155E-04	0.15444E-09
75	0.12904E-07	0.25807E-04	0.13671E-09
76	0.11251E-07	0.22502E-04	0.11920E-09
77	0.96088E-08	0.19218E-04	0.10180E-09
78	0.80229E-08	0.16046E-04	0.84997E-10
79	0.64404E-08	0.12881E-04	0.68232E-10
80	0.48682E-08	0.97363E-05	0.51575E-10

```
RMA 93-03 DBCP Transport, First 100 years
  1
       0.1       100.       50.       100.
      98.0      .0147     1100.       0.68
Polygon I
        1.       0.25    .00057       1.6       0.40        .25       .005
      .079        -1.        0.
   80y     100.0
    1    1        0.0
    2    2        0.0
    3    3        0.0
    4    4        0.0
    5    5        0.0
    6    6        0.0
    7    7        0.0
    8    8        0.0
    9    9        0.0
   10   10        0.0
   11   11        0.0
   12   12        0.0
   13   13        0.0
   14   14        0.0
   15   15        0.0
   16   16        0.0
   17   17        0.0
   18   18        0.0
   19   19        0.0
   20   20        0.0
   21   21        0.0
   22   22        0.0
   23   23        0.0
   24   24        0.0
   25   25        0.0
   26   26        0.0
   27   27        0.0
   28   28        0.0
   29   29        0.0
   30   30        0.0
   31   31        0.0
   32   32        0.0
   33   33        0.0
   34   34        0.0
   35   35        0.0
   36   36        0.0
   37   37        0.0
   38   38        0.0
   39   39        0.0
   40   40        0.0
   41   41        0.0
   42   42        0.0
   43   43        0.0
   44   44        0.0
   45   45        0.0
   46   46        0.0
   47   47        0.0
```

48	48	0.0
49	49	0.0
50	50	0.0
51	51	0.0
52	52	0.0
53	53	0.0
54	54	0.0
55	55	0.0
56	56	0.0
57	57	0.0
58	58	0.0
59	59	0.0
60	60	0.0
61	61	0.0
62	62	0.0
63	63	0.0
64	64	0.0
65	65	0.0
66	66	0.0
67	67	0.0
68	68	0.0
69	69	0.0
70	70	0.0
71	71	0.0
72	72	0.0
73	73	0.0
74	74	0.0
75	75	0.0
76	76	0.0
77	77	0.0
78	78	0.0
79	79	0.0
80	80	0.0

```
-----------------------------------------------------------
                VLEACH (Version 2.2, 1995)

                          By:
        Varadhan Ravi and Jeffrey A. Johnson
                  (USEPA Contractors)
        Center for Subsurface Modeling Support
        Robert S. Kerr Environmental Research Laboratory
        U.S. Environmental Protection Agency
        P.O. Box 1198
        Ada, OK 74820

        Based on the original VLEACH (version 1.0)
        developed by CH2M Hill, Redding, California
        for USEPA Region IX
-----------------------------------------------------------
```

```
RMA 93-03 DBCP Transport, First 100 years
  1 polygons.
Timestep =   0.10 years.  Simulation length =  100.00 years.
Printout every  50.00 years.  Vertical profile stored every 100.00 years.
Koc =      98.000    ml/g,      0.34608E-02cu.ft./g
Kh =     0.14700E-01 (dimensionless).
Aqueous solubility =     1100.0     mg/l,      31.149     g/cu.ft
Free air diffusion coefficient = .68000     sq. m/day,  2671.7     sq.ft./yr


Polygon   1
Polygon I
Polygon area =      1.0000    sq. ft.
 80 cells, each cell  0.250 ft. thick.
Soil Properties:
 Bulk density =     1.6000    g/ml,       45307.    g/cu.ft.
 Porosity = 0.4000 Volumetric water content = 0.2500
 Organic carbon content = 0.00500000
Recharge Rate = 0.00057000 ft/yr
Conc. in recharge water =     0.79000E-01mg/l,      0.22370E-02g/cu.ft
Atmospheric concentration =     -1.0000    mg/l,     -0.28317E-01g/cu.ft
Water table has a fixed concentration of     0.00000    mg/l,      0.00000
   with respect to gas diffusion.
```

Time: 100.000 - DBCP - 100 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.29446E-05	0.20032E-03	0.34663E-08
2	0.35793E-06	0.24349E-04	0.42134E-09
3	0.16607E-06	0.11298E-04	0.19549E-09
4	0.14923E-06	0.10152E-04	0.17567E-09
5	0.14295E-06	0.97247E-05	0.16828E-09
6	0.13739E-06	0.93464E-05	0.16173E-09
7	0.13206E-06	0.89836E-05	0.15545E-09
8	0.12692E-06	0.86343E-05	0.14941E-09
9	0.12198E-06	0.82980E-05	0.14359E-09
10	0.11722E-06	0.79742E-05	0.13799E-09
11	0.11264E-06	0.76626E-05	0.13259E-09
12	0.10823E-06	0.73626E-05	0.12740E-09
13	0.10399E-06	0.70739E-05	0.12241E-09
14	0.99901E-07	0.67960E-05	0.11760E-09
15	0.95969E-07	0.65285E-05	0.11297E-09
16	0.92184E-07	0.62710E-05	0.10851E-09
17	0.88542E-07	0.60233E-05	0.10423E-09
18	0.85037E-07	0.57849E-05	0.10010E-09
19	0.81664E-07	0.55554E-05	0.96131E-10
20	0.78419E-07	0.53346E-05	0.92310E-10
21	0.75295E-07	0.51221E-05	0.88634E-10
22	0.72289E-07	0.49177E-05	0.85095E-10
23	0.69397E-07	0.47209E-05	0.81691E-10
24	0.66614E-07	0.45316E-05	0.78415E-10
25	0.63936E-07	0.43494E-05	0.75262E-10
26	0.61359E-07	0.41741E-05	0.72228E-10
27	0.58879E-07	0.40054E-05	0.69309E-10
28	0.56492E-07	0.38430E-05	0.66500E-10
29	0.54196E-07	0.36868E-05	0.63797E-10
30	0.51986E-07	0.35365E-05	0.61195E-10
31	0.49859E-07	0.33918E-05	0.58692E-10
32	0.47812E-07	0.32525E-05	0.56282E-10
33	0.45842E-07	0.31185E-05	0.53963E-10
34	0.43945E-07	0.29895E-05	0.51730E-10
35	0.42120E-07	0.28653E-05	0.49581E-10
36	0.40362E-07	0.27457E-05	0.47513E-10
37	0.38670E-07	0.26306E-05	0.45521E-10
38	0.37041E-07	0.25198E-05	0.43603E-10
39	0.35472E-07	0.24131E-05	0.41756E-10
40	0.33961E-07	0.23102E-05	0.39977E-10
41	0.32505E-07	0.22112E-05	0.38263E-10
42	0.31102E-07	0.21158E-05	0.36612E-10
43	0.29750E-07	0.20238E-05	0.35021E-10
44	0.28448E-07	0.19352E-05	0.33487E-10
45	0.27191E-07	0.18498E-05	0.32008E-10
46	0.25980E-07	0.17674E-05	0.30583E-10
47	0.24812E-07	0.16879E-05	0.29207E-10
48	0.23684E-07	0.16112E-05	0.27880E-10
49	0.22596E-07	0.15372E-05	0.26599E-10
50	0.21546E-07	0.14657E-05	0.25362E-10
51	0.20531E-07	0.13966E-05	0.24168E-10
52	0.19550E-07	0.13299E-05	0.23013E-10
53	0.18602E-07	0.12654E-05	0.21897E-10

```
RMA 93-03 DBCP Transport, 200 years
  1
       0.1       100.        50.       100.
      98.0      .0147      1100.       0.68
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .287        -1.   3.29E-06
   80y      100.0
    1     1  4.59E+00
    2     2  5.58E-01
    3     3  2.59E-01
    4     4  2.33E-01
    5     5  2.23E-01
    6     6  2.14E-01
    7     7  2.06E-01
    8     8  1.98E-01
    9     9  1.90E-01
   10    10  1.83E-01
   11    11  1.76E-01
   12    12  1.69E-01
   13    13  1.62E-01
   14    14  1.56E-01
   15    15  1.50E-01
   16    16  1.44E-01
   17    17  1.38E-01
   18    18  1.33E-01
   19    19  1.27E-01
   20    20  1.22E-01
   21    21  1.17E-01
   22    22  1.13E-01
   23    23  1.08E-01
   24    24  1.04E-01
   25    25  9.96E-02
   26    26  9.56E-02
   27    27  9.17E-02
   28    28  8.80E-02
   29    29  8.44E-02
   30    30  8.10E-02
   31    31  7.77E-02
   32    32  7.45E-02
   33    33  7.14E-02
   34    34  6.85E-02
   35    35  6.56E-02
   36    36  6.29E-02
   37    37  6.03E-02
   38    38  5.77E-02
   39    39  5.53E-02
   40    40  5.29E-02
   41    41  5.06E-02
   42    42  4.85E-02
   43    43  4.64E-02
   44    44  4.43E-02
   45    45  4.24E-02
   46    46  4.05E-02
   47    47  3.87E-02
```

54	0.17684E-07	0.12030E-05	0.20817E-10
55	0.16797E-07	0.11426E-05	0.19772E-10
56	0.15937E-07	0.10842E-05	0.18760E-10
57	0.15104E-07	0.10275E-05	0.17780E-10
58	0.14297E-07	0.97256E-06	0.16829E-10
59	0.13513E-07	0.91926E-06	0.15907E-10
60	0.12752E-07	0.86750E-06	0.15011E-10
61	0.12013E-07	0.81720E-06	0.14141E-10
62	0.11294E-07	0.76828E-06	0.13294E-10
63	0.10594E-07	0.72065E-06	0.12470E-10
64	0.99112E-08	0.67423E-06	0.11667E-10
65	0.92457E-08	0.62896E-06	0.10884E-10
66	0.85958E-08	0.58475E-06	0.10119E-10
67	0.79604E-08	0.54152E-06	0.93706E-11
68	0.73385E-08	0.49922E-06	0.86385E-11
69	0.67290E-08	0.45776E-06	0.79211E-11
70	0.61309E-08	0.41707E-06	0.72170E-11
71	0.55432E-08	0.37709E-06	0.65252E-11
72	0.49649E-08	0.33775E-06	0.58445E-11
73	0.43951E-08	0.29898E-06	0.51736E-11
74	0.38326E-08	0.26072E-06	0.45116E-11
75	0.32767E-08	0.22291E-06	0.38572E-11
76	0.27263E-08	0.18547E-06	0.32093E-11
77	0.21806E-08	0.14834E-06	0.25669E-11
78	0.16385E-08	0.11146E-06	0.19288E-11
79	0.10992E-08	0.74777E-07	0.12940E-11
80	0.56178E-09	0.38216E-07	0.66130E-12

Time: 100.000 - DBCP - 200 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.11117E-04	0.75628E-03	0.13087E-07
2	0.15441E-05	0.10504E-03	0.18177E-08
3	0.77962E-06	0.53035E-04	0.91773E-09
4	0.70490E-06	0.47952E-04	0.82977E-09
5	0.67780E-06	0.46109E-04	0.79787E-09
6	0.65433E-06	0.44512E-04	0.77024E-09
7	0.63181E-06	0.42980E-04	0.74373E-09
8	0.61002E-06	0.41498E-04	0.71809E-09
9	0.58892E-06	0.40063E-04	0.69325E-09
10	0.56855E-06	0.38677E-04	0.66927E-09
11	0.54884E-06	0.37336E-04	0.64606E-09
12	0.52975E-06	0.36037E-04	0.62359E-09
13	0.51126E-06	0.34780E-04	0.60183E-09
14	0.49342E-06	0.33566E-04	0.58083E-09
15	0.47616E-06	0.32392E-04	0.56051E-09
16	0.45945E-06	0.31255E-04	0.54084E-09
17	0.44327E-06	0.30154E-04	0.52180E-09
18	0.42766E-06	0.29093E-04	0.50342E-09
19	0.41251E-06	0.28062E-04	0.48558E-09
20	0.39788E-06	0.27067E-04	0.46836E-09
21	0.38373E-06	0.26104E-04	0.45171E-09
22	0.37009E-06	0.25176E-04	0.43566E-09
23	0.35684E-06	0.24275E-04	0.42006E-09
24	0.34406E-06	0.23406E-04	0.40501E-09
25	0.33168E-06	0.22563E-04	0.39043E-09
26	0.31970E-06	0.21749E-04	0.37634E-09
27	0.30812E-06	0.20961E-04	0.36271E-09
28	0.29692E-06	0.20199E-04	0.34952E-09
29	0.28609E-06	0.19462E-04	0.33677E-09
30	0.27561E-06	0.18749E-04	0.32443E-09
31	0.26547E-06	0.18059E-04	0.31249E-09
32	0.25565E-06	0.17391E-04	0.30094E-09
33	0.24616E-06	0.16745E-04	0.28976E-09
34	0.23697E-06	0.16120E-04	0.27895E-09
35	0.22807E-06	0.15515E-04	0.26848E-09
36	0.21947E-06	0.14930E-04	0.25835E-09
37	0.21114E-06	0.14363E-04	0.24854E-09
38	0.20307E-06	0.13814E-04	0.23904E-09
39	0.19526E-06	0.13283E-04	0.22985E-09
40	0.18769E-06	0.12768E-04	0.22094E-09
41	0.18036E-06	0.12269E-04	0.21231E-09
42	0.17326E-06	0.11786E-04	0.20395E-09
43	0.16638E-06	0.11318E-04	0.19586E-09
44	0.15971E-06	0.10864E-04	0.18800E-09
45	0.15324E-06	0.10425E-04	0.18039E-09
46	0.14697E-06	0.99981E-05	0.17301E-09
47	0.14089E-06	0.95843E-05	0.16585E-09
48	0.13498E-06	0.91826E-05	0.15890E-09
49	0.12925E-06	0.87927E-05	0.15215E-09
50	0.12369E-06	0.84143E-05	0.14560E-09
51	0.11828E-06	0.80465E-05	0.13924E-09
52	0.11303E-06	0.76892E-05	0.13305E-09
53	0.10792E-06	0.73416E-05	0.12704E-09

48	48	3.69E-02
49	49	3.52E-02
50	50	3.36E-02
51	51	3.20E-02
52	52	3.05E-02
53	53	2.90E-02
54	54	2.76E-02
55	55	2.62E-02
56	56	2.48E-02
57	57	2.35E-02
58	58	2.23E-02
59	59	2.11E-02
60	60	1.99E-02
61	61	1.87E-02
62	62	1.76E-02
63	63	1.65E-02
64	64	1.54E-02
65	65	1.44E-02
66	66	1.34E-02
67	67	1.24E-02
68	68	1.14E-02
69	69	1.05E-02
70	70	9.55E-03
71	71	8.64E-03
72	72	7.74E-03
73	73	6.85E-03
74	74	5.97E-03
75	75	5.11E-03
76	76	4.25E-03
77	77	3.40E-03
78	78	2.55E-03
79	79	1.71E-03
80	80	8.75E-04

```
RMA 93-03 DBCP Transport, 300 years
  1
       0.1       100.        50.       100.
      98.0      .0147      1100.       0.68
Polygon I
        1.       0.25    .00057        1.6       0.40        .25       .005
      .412        -1.  2.27E-05
   80y      100.0
    1     1  1.73E+01
    2     2  2.41E+00
    3     3  1.21E+00
    4     4  1.10E+00
    5     5  1.06E+00
    6     6  1.02E+00
    7     7  9.84E-01
    8     8  9.51E-01
    9     9  9.18E-01
   10    10  8.86E-01
   11    11  8.55E-01
   12    12  8.25E-01
   13    13  7.97E-01
   14    14  7.69E-01
   15    15  7.42E-01
   16    16  7.16E-01
   17    17  6.91E-01
   18    18  6.66E-01
   19    19  6.43E-01
   20    20  6.20E-01
   21    21  5.98E-01
   22    22  5.77E-01
   23    23  5.56E-01
   24    24  5.36E-01
   25    25  5.17E-01
   26    26  4.98E-01
   27    27  4.80E-01
   28    28  4.63E-01
   29    29  4.46E-01
   30    30  4.29E-01
   31    31  4.14E-01
   32    32  3.98E-01
   33    33  3.84E-01
   34    34  3.69E-01
   35    35  3.55E-01
   36    36  3.42E-01
   37    37  3.29E-01
   38    38  3.16E-01
   39    39  3.04E-01
   40    40  2.92E-01
   41    41  2.81E-01
   42    42  2.70E-01
   43    43  2.59E-01
   44    44  2.49E-01
   45    45  2.39E-01
   46    46  2.29E-01
   47    47  2.20E-01
```

54	0.10295E-06	0.70037E-05	0.12119E-09
55	0.98118E-07	0.66747E-05	0.11550E-09
56	0.93405E-07	0.63541E-05	0.10995E-09
57	0.88816E-07	0.60419E-05	0.10455E-09
58	0.84346E-07	0.57379E-05	0.99288E-10
59	0.79985E-07	0.54411E-05	0.94154E-10
60	0.75725E-07	0.51513E-05	0.89139E-10
61	0.71560E-07	0.48680E-05	0.84237E-10
62	0.67492E-07	0.45913E-05	0.79448E-10
63	0.63511E-07	0.43205E-05	0.74762E-10
64	0.59611E-07	0.40552E-05	0.70171E-10
65	0.55793E-07	0.37954E-05	0.65676E-10
66	0.52047E-07	0.35406E-05	0.61267E-10
67	0.48367E-07	0.32902E-05	0.56935E-10
68	0.44748E-07	0.30441E-05	0.52675E-10
69	0.41192E-07	0.28022E-05	0.48490E-10
70	0.37687E-07	0.25638E-05	0.44364E-10
71	0.34232E-07	0.23287E-05	0.40296E-10
72	0.30821E-07	0.20967E-05	0.36281E-10
73	0.27450E-07	0.18674E-05	0.32313E-10
74	0.24114E-07	0.16404E-05	0.28386E-10
75	0.20811E-07	0.14157E-05	0.24497E-10
76	0.17533E-07	0.11927E-05	0.20639E-10
77	0.14278E-07	0.97132E-06	0.16808E-10
78	0.11041E-07	0.75111E-06	0.12997E-10
79	0.78184E-08	0.53187E-06	0.92035E-11
80	0.46053E-08	0.31329E-06	0.54212E-11

Time: 100.00 - DBCP - 300 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.17009E-04	0.11570E-02	0.20022E-07
2	0.28797E-05	0.19590E-03	0.33899E-08
3	0.16246E-05	0.11052E-03	0.19124E-08
4	0.14844E-05	0.10098E-03	0.17474E-08
5	0.14350E-05	0.97621E-04	0.16892E-08
6	0.13931E-05	0.94768E-04	0.16399E-08
7	0.13528E-05	0.92024E-04	0.15924E-08
8	0.13136E-05	0.89362E-04	0.15463E-08
9	0.12755E-05	0.86766E-04	0.15014E-08
10	0.12383E-05	0.84235E-04	0.14576E-08
11	0.12020E-05	0.81769E-04	0.14149E-08
12	0.11667E-05	0.79366E-04	0.13734E-08
13	0.11323E-05	0.77029E-04	0.13329E-08
14	0.10988E-05	0.74750E-04	0.12935E-08
15	0.10662E-05	0.72530E-04	0.12551E-08
16	0.10344E-05	0.70367E-04	0.12176E-08
17	0.10034E-05	0.68261E-04	0.11812E-08
18	0.97324E-06	0.66207E-04	0.11457E-08
19	0.94389E-06	0.64210E-04	0.11111E-08
20	0.91527E-06	0.62263E-04	0.10774E-08
21	0.88740E-06	0.60368E-04	0.10446E-08
22	0.86028E-06	0.58522E-04	0.10127E-08
23	0.83382E-06	0.56723E-04	0.98153E-09
24	0.80807E-06	0.54971E-04	0.95122E-09
25	0.78300E-06	0.53266E-04	0.92171E-09
26	0.75856E-06	0.51603E-04	0.89294E-09
27	0.73477E-06	0.49984E-04	0.86493E-09
28	0.71162E-06	0.48409E-04	0.83768E-09
29	0.68904E-06	0.46874E-04	0.81111E-09
30	0.66701E-06	0.45375E-04	0.78517E-09
31	0.64563E-06	0.43920E-04	0.76000E-09
32	0.62472E-06	0.42498E-04	0.73539E-09
33	0.60443E-06	0.41117E-04	0.71150E-09
34	0.58458E-06	0.39767E-04	0.68814E-09
35	0.56525E-06	0.38452E-04	0.66539E-09
36	0.54645E-06	0.37174E-04	0.64326E-09
37	0.52811E-06	0.35926E-04	0.62167E-09
38	0.51020E-06	0.34708E-04	0.60059E-09
39	0.49277E-06	0.33522E-04	0.58007E-09
40	0.47576E-06	0.32365E-04	0.56004E-09
41	0.45920E-06	0.31238E-04	0.54055E-09
42	0.44303E-06	0.30138E-04	0.52152E-09
43	0.42724E-06	0.29064E-04	0.50292E-09
44	0.41186E-06	0.28017E-04	0.48482E-09
45	0.39683E-06	0.26995E-04	0.46713E-09
46	0.38214E-06	0.25996E-04	0.44984E-09
47	0.36784E-06	0.25023E-04	0.43300E-09
48	0.35379E-06	0.24067E-04	0.41646E-09
49	0.34009E-06	0.23136E-04	0.40034E-09
50	0.32676E-06	0.22228E-04	0.38464E-09
51	0.31365E-06	0.21337E-04	0.36922E-09
52	0.30087E-06	0.20467E-04	0.35416E-09
53	0.28835E-06	0.19616E-04	0.33943E-09

48	48	2.10E-01
49	49	2.01E-01
50	50	1.93E-01
51	51	1.84E-01
52	52	1.76E-01
53	53	1.68E-01
54	54	1.60E-01
55	55	1.53E-01
56	56	1.46E-01
57	57	1.38E-01
58	58	1.31E-01
59	59	1.25E-01
60	60	1.18E-01
61	61	1.12E-01
62	62	1.05E-01
63	63	9.90E-02
64	64	9.29E-02
65	65	8.69E-02
66	66	8.11E-02
67	67	7.54E-02
68	68	6.97E-02
69	69	6.42E-02
70	70	5.87E-02
71	71	5.33E-02
72	72	4.80E-02
73	73	4.28E-02
74	74	3.76E-02
75	75	3.24E-02
76	76	2.73E-02
77	77	2.22E-02
78	78	1.72E-02
79	79	1.22E-02
80	80	7.18E-03

```
RMA 93-03 DBCP Transport, 400 years
  1
       0.1       100.        50.       100.
      98.0      .0147      1100.       0.68
Polygon I
        1.       0.25    .00057        1.6       0.40        .25       .005
      .489        -1.  7.46E-05
   80y      100.0
    1     1  2.65E+01
    2     2  4.49E+00
    3     3  2.53E+00
    4     4  2.31E+00
    5     5  2.24E+00
    6     6  2.17E+00
    7     7  2.11E+00
    8     8  2.05E+00
    9     9  1.99E+00
   10    10  1.93E+00
   11    11  1.87E+00
   12    12  1.82E+00
   13    13  1.76E+00
   14    14  1.71E+00
   15    15  1.66E+00
   16    16  1.61E+00
   17    17  1.56E+00
   18    18  1.52E+00
   19    19  1.47E+00
   20    20  1.43E+00
   21    21  1.38E+00
   22    22  1.34E+00
   23    23  1.30E+00
   24    24  1.26E+00
   25    25  1.22E+00
   26    26  1.18E+00
   27    27  1.14E+00
   28    28  1.11E+00
   29    29  1.07E+00
   30    30  1.04E+00
   31    31  1.01E+00
   32    32  9.73E-01
   33    33  9.42E-01
   34    34  9.11E-01
   35    35  8.81E-01
   36    36  8.52E-01
   37    37  8.23E-01
   38    38  7.95E-01
   39    39  7.68E-01
   40    40  7.41E-01
   41    41  7.16E-01
   42    42  6.90E-01
   43    43  6.66E-01
   44    44  6.42E-01
   45    45  6.18E-01
   46    46  5.95E-01
   47    47  5.73E-01
```

54	0.27608E-06	0.18781E-04	0.32499E-09
55	0.26411E-06	0.17967E-04	0.31089E-09
56	0.25238E-06	0.17169E-04	0.29709E-09
57	0.24081E-06	0.16381E-04	0.28346E-09
58	0.22949E-06	0.15612E-04	0.27014E-09
59	0.21845E-06	0.14860E-04	0.25714E-09
60	0.20755E-06	0.14119E-04	0.24431E-09
61	0.19687E-06	0.13393E-04	0.23175E-09
62	0.18633E-06	0.12675E-04	0.21933E-09
63	0.17599E-06	0.11972E-04	0.20716E-09
64	0.16581E-06	0.11280E-04	0.19518E-09
65	0.15578E-06	0.10598E-04	0.18338E-09
66	0.14591E-06	0.99257E-05	0.17175E-09
67	0.13617E-06	0.92631E-05	0.16029E-09
68	0.12655E-06	0.86087E-05	0.14897E-09
69	0.11705E-06	0.79627E-05	0.13779E-09
70	0.10766E-06	0.73239E-05	0.12673E-09
71	0.98371E-07	0.66919E-05	0.11580E-09
72	0.89175E-07	0.60663E-05	0.10497E-09
73	0.80064E-07	0.54465E-05	0.94247E-10
74	0.71024E-07	0.48316E-05	0.83606E-10
75	0.62046E-07	0.42208E-05	0.73038E-10
76	0.53128E-07	0.36141E-05	0.62539E-10
77	0.44257E-07	0.30107E-05	0.52097E-10
78	0.35430E-07	0.24102E-05	0.41706E-10
79	0.26633E-07	0.18118E-05	0.31351E-10
80	0.17858E-07	0.12148E-05	0.21021E-10

Time: 100.000 - DBCP - 400 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.20963E-04	0.14261E-02	0.24677E-07
2	0.40383E-05	0.27471E-03	0.47537E-08
3	0.24651E-05	0.16769E-03	0.29017E-08
4	0.22769E-05	0.15489E-03	0.26803E-08
5	0.22109E-05	0.15040E-03	0.26026E-08
6	0.21555E-05	0.14663E-03	0.25373E-08
7	0.21023E-05	0.14301E-03	0.24747E-08
8	0.20502E-05	0.13947E-03	0.24134E-08
9	0.19991E-05	0.13599E-03	0.23532E-08
10	0.19488E-05	0.13257E-03	0.22941E-08
11	0.18995E-05	0.12922E-03	0.22360E-08
12	0.18517E-05	0.12597E-03	0.21797E-08
13	0.18043E-05	0.12274E-03	0.21239E-08
14	0.17582E-05	0.11960E-03	0.20696E-08
15	0.17131E-05	0.11653E-03	0.20165E-08
16	0.16688E-05	0.11352E-03	0.19644E-08
17	0.16253E-05	0.11056E-03	0.19132E-08
18	0.15832E-05	0.10770E-03	0.18637E-08
19	0.15415E-05	0.10486E-03	0.18145E-08
20	0.15009E-05	0.10211E-03	0.17668E-08
21	0.14607E-05	0.99367E-04	0.17195E-08
22	0.14217E-05	0.96712E-04	0.16735E-08
23	0.13835E-05	0.94114E-04	0.16286E-08
24	0.13460E-05	0.91565E-04	0.15844E-08
25	0.13092E-05	0.89063E-04	0.15412E-08
26	0.12731E-05	0.86607E-04	0.14987E-08
27	0.12377E-05	0.84196E-04	0.14569E-08
28	0.12035E-05	0.81871E-04	0.14167E-08
29	0.11695E-05	0.79557E-04	0.13767E-08
30	0.11366E-05	0.77319E-04	0.13379E-08
31	0.11044E-05	0.75130E-04	0.13001E-08
32	0.10724E-05	0.72953E-04	0.12624E-08
33	0.10413E-05	0.70834E-04	0.12257E-08
34	0.10107E-05	0.68758E-04	0.11898E-08
35	0.98084E-06	0.66724E-04	0.11546E-08
36	0.95156E-06	0.64732E-04	0.11201E-08
37	0.92282E-06	0.62777E-04	0.10863E-08
38	0.89466E-06	0.60861E-04	0.10531E-08
39	0.86707E-06	0.58984E-04	0.10207E-08
40	0.83998E-06	0.57141E-04	0.98878E-09
41	0.81348E-06	0.55339E-04	0.95759E-09
42	0.78741E-06	0.53566E-04	0.92690E-09
43	0.76191E-06	0.51830E-04	0.89688E-09
44	0.73686E-06	0.50126E-04	0.86739E-09
45	0.71224E-06	0.48451E-04	0.83841E-09
46	0.68809E-06	0.46809E-04	0.80998E-09
47	0.66441E-06	0.45198E-04	0.78211E-09
48	0.64113E-06	0.43615E-04	0.75471E-09
49	0.61830E-06	0.42061E-04	0.72783E-09
50	0.59583E-06	0.40533E-04	0.70139E-09
51	0.57378E-06	0.39033E-04	0.67543E-09
52	0.55209E-06	0.37557E-04	0.64989E-09
53	0.53072E-06	0.36103E-04	0.62474E-09

48	48	5.51E-01
49	49	5.30E-01
50	50	5.09E-01
51	51	4.89E-01
52	52	4.69E-01
53	53	4.49E-01
54	54	4.30E-01
55	55	4.12E-01
56	56	3.93E-01
57	57	3.75E-01
58	58	3.58E-01
59	59	3.40E-01
60	60	3.23E-01
61	61	3.07E-01
62	62	2.90E-01
63	63	2.74E-01
64	64	2.58E-01
65	65	2.43E-01
66	66	2.27E-01
67	67	2.12E-01
68	68	1.97E-01
69	69	1.82E-01
70	70	1.68E-01
71	71	1.53E-01
72	72	1.39E-01
73	73	1.25E-01
74	74	1.11E-01
75	75	9.67E-02
76	76	8.28E-02
77	77	6.90E-02
78	78	5.52E-02
79	79	4.15E-02
80	80	2.78E-02

RMA 93-03 DBCP Transport, 500 years

```
  1
       0.1       100.        50.       100.
      98.0      .0147      1100.       0.68
Polygon I
        1.       0.25    .00057        1.6       0.40        .25       .005
      .543        -1.  1.69E-04
   80y      100.0
    1     1  3.27E+01
    2     2  6.29E+00
    3     3  3.84E+00
    4     4  3.55E+00
    5     5  3.45E+00
    6     6  3.36E+00
    7     7  3.28E+00
    8     8  3.19E+00
    9     9  3.11E+00
   10    10  3.04E+00
   11    11  2.96E+00
   12    12  2.89E+00
   13    13  2.81E+00
   14    14  2.74E+00
   15    15  2.67E+00
   16    16  2.60E+00
   17    17  2.53E+00
   18    18  2.47E+00
   19    19  2.40E+00
   20    20  2.34E+00
   21    21  2.28E+00
   22    22  2.22E+00
   23    23  2.16E+00
   24    24  2.10E+00
   25    25  2.04E+00
   26    26  1.98E+00
   27    27  1.93E+00
   28    28  1.88E+00
   29    29  1.82E+00
   30    30  1.77E+00
   31    31  1.72E+00
   32    32  1.67E+00
   33    33  1.62E+00
   34    34  1.57E+00
   35    35  1.53E+00
   36    36  1.48E+00
   37    37  1.44E+00
   38    38  1.39E+00
   39    39  1.35E+00
   40    40  1.31E+00
   41    41  1.27E+00
   42    42  1.23E+00
   43    43  1.19E+00
   44    44  1.15E+00
   45    45  1.11E+00
   46    46  1.07E+00
   47    47  1.04E+00
```

54	0.50973E-06	0.34675E-04	0.60003E-09
55	0.48912E-06	0.33273E-04	0.57576E-09
56	0.46875E-06	0.31888E-04	0.55179E-09
57	0.44871E-06	0.30525E-04	0.52820E-09
58	0.42902E-06	0.29185E-04	0.50502E-09
59	0.40954E-06	0.27860E-04	0.48209E-09
60	0.39036E-06	0.26555E-04	0.45951E-09
61	0.37148E-06	0.25271E-04	0.43729E-09
62	0.35279E-06	0.23999E-04	0.41529E-09
63	0.33436E-06	0.22746E-04	0.39360E-09
64	0.31615E-06	0.21507E-04	0.37216E-09
65	0.29820E-06	0.20285E-04	0.35102E-09
66	0.28038E-06	0.19073E-04	0.33004E-09
67	0.26278E-06	0.17876E-04	0.30933E-09
68	0.24535E-06	0.16690E-04	0.28881E-09
69	0.22808E-06	0.15515E-04	0.26848E-09
70	0.21101E-06	0.14354E-04	0.24838E-09
71	0.19402E-06	0.13198E-04	0.22839E-09
72	0.17719E-06	0.12054E-04	0.20858E-09
73	0.16050E-06	0.10918E-04	0.18893E-09
74	0.14390E-06	0.97888E-05	0.16939E-09
75	0.12737E-06	0.86643E-05	0.14993E-09
76	0.11093E-06	0.75465E-05	0.13059E-09
77	0.94580E-07	0.64340E-05	0.11134E-09
78	0.78286E-07	0.53256E-05	0.92154E-10
79	0.62045E-07	0.42207E-05	0.73036E-10
80	0.45841E-07	0.31184E-05	0.53962E-10

Time: 100.000 - DBCP - 500 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.23862E-04	0.16233E-02	0.28090E-07
2	0.50196E-05	0.34147E-03	0.59088E-08
3	0.32343E-05	0.22002E-03	0.38073E-08
4	0.30146E-05	0.20508E-03	0.35487E-08
5	0.29368E-05	0.19978E-03	0.34570E-08
6	0.28719E-05	0.19537E-03	0.33806E-08
7	0.28094E-05	0.19112E-03	0.33071E-08
8	0.27474E-05	0.18690E-03	0.32341E-08
9	0.26868E-05	0.18278E-03	0.31628E-08
10	0.26278E-05	0.17876E-03	0.30933E-08
11	0.25691E-05	0.17477E-03	0.30242E-08
12	0.25118E-05	0.17087E-03	0.29568E-08
13	0.24548E-05	0.16699E-03	0.28897E-08
14	0.23991E-05	0.16320E-03	0.28241E-08
15	0.23443E-05	0.15948E-03	0.27596E-08
16	0.22904E-05	0.15581E-03	0.26961E-08
17	0.22372E-05	0.15219E-03	0.26335E-08
18	0.21854E-05	0.14867E-03	0.25725E-08
19	0.21339E-05	0.14516E-03	0.25119E-08
20	0.20836E-05	0.14174E-03	0.24527E-08
21	0.20341E-05	0.13838E-03	0.23945E-08
22	0.19854E-05	0.13506E-03	0.23371E-08
23	0.19374E-05	0.13180E-03	0.22806E-08
24	0.18901E-05	0.12858E-03	0.22250E-08
25	0.18435E-05	0.12541E-03	0.21701E-08
26	0.17976E-05	0.12228E-03	0.21160E-08
27	0.17529E-05	0.11924E-03	0.20634E-08
28	0.17090E-05	0.11626E-03	0.20117E-08
29	0.16651E-05	0.11328E-03	0.19601E-08
30	0.16224E-05	0.11037E-03	0.19098E-08
31	0.15804E-05	0.10751E-03	0.18604E-08
32	0.15390E-05	0.10469E-03	0.18116E-08
33	0.14982E-05	0.10192E-03	0.17636E-08
34	0.14580E-05	0.99181E-04	0.17162E-08
35	0.14189E-05	0.96525E-04	0.16703E-08
36	0.13799E-05	0.93874E-04	0.16244E-08
37	0.13420E-05	0.91294E-04	0.15798E-08
38	0.13041E-05	0.88716E-04	0.15351E-08
39	0.12672E-05	0.86207E-04	0.14917E-08
40	0.12310E-05	0.83741E-04	0.14491E-08
41	0.11952E-05	0.81309E-04	0.14070E-08
42	0.11600E-05	0.78910E-04	0.13655E-08
43	0.11252E-05	0.76544E-04	0.13245E-08
44	0.10909E-05	0.74208E-04	0.12841E-08
45	0.10570E-05	0.71903E-04	0.12442E-08
46	0.10235E-05	0.69628E-04	0.12048E-08
47	0.99112E-06	0.67423E-04	0.11667E-08
48	0.95858E-06	0.65210E-04	0.11284E-08
49	0.92662E-06	0.63035E-04	0.10908E-08
50	0.89516E-06	0.60895E-04	0.10537E-08
51	0.86416E-06	0.58787E-04	0.10172E-08
52	0.83355E-06	0.56704E-04	0.98121E-09
53	0.80335E-06	0.54650E-04	0.94566E-09

48	48	9.99E-01
49	49	9.63E-01
50	50	9.28E-01
51	51	8.94E-01
52	52	8.60E-01
53	53	8.27E-01
54	54	7.94E-01
55	55	7.62E-01
56	56	7.30E-01
57	57	6.99E-01
58	58	6.69E-01
59	59	6.38E-01
60	60	6.08E-01
61	61	5.79E-01
62	62	5.50E-01
63	63	5.21E-01
64	64	4.93E-01
65	65	4.65E-01
66	66	4.37E-01
67	67	4.09E-01
68	68	3.82E-01
69	69	3.55E-01
70	70	3.29E-01
71	71	3.02E-01
72	72	2.76E-01
73	73	2.50E-01
74	74	2.24E-01
75	75	1.98E-01
76	76	1.73E-01
77	77	1.47E-01
78	78	1.22E-01
79	79	9.67E-02
80	80	7.14E-02

```
RMA 93-03 DBCP Transport, 600 years
  1
       0.1       100.        50.       100.
      98.0      .0147      1100.       0.68
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .583        -1.   3.08E-04
   80y      100.0
    1     1  3.72E+01
    2     2  7.82E+00
    3     3  5.04E+00
    4     4  4.70E+00
    5     5  4.58E+00
    6     6  4.48E+00
    7     7  4.38E+00
    8     8  4.28E+00
    9     9  4.19E+00
   10    10  4.09E+00
   11    11  4.00E+00
   12    12  3.91E+00
   13    13  3.83E+00
   14    14  3.74E+00
   15    15  3.65E+00
   16    16  3.57E+00
   17    17  3.49E+00
   18    18  3.41E+00
   19    19  3.33E+00
   20    20  3.25E+00
   21    21  3.17E+00
   22    22  3.09E+00
   23    23  3.02E+00
   24    24  2.95E+00
   25    25  2.87E+00
   26    26  2.80E+00
   27    27  2.73E+00
   28    28  2.66E+00
   29    29  2.59E+00
   30    30  2.53E+00
   31    31  2.46E+00
   32    32  2.40E+00
   33    33  2.33E+00
   34    34  2.27E+00
   35    35  2.21E+00
   36    36  2.15E+00
   37    37  2.09E+00
   38    38  2.03E+00
   39    39  1.97E+00
   40    40  1.92E+00
   41    41  1.86E+00
   42    42  1.81E+00
   43    43  1.75E+00
   44    44  1.70E+00
   45    45  1.65E+00
   46    46  1.59E+00
   47    47  1.54E+00
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54	0.77351E-06	0.52620E-04	0.91054E-09
55	0.74407E-06	0.50617E-04	0.87588E-09
56	0.71496E-06	0.48636E-04	0.84161E-09
57	0.68622E-06	0.46682E-04	0.80778E-09
58	0.65786E-06	0.44752E-04	0.77440E-09
59	0.62974E-06	0.42839E-04	0.74129E-09
60	0.60194E-06	0.40948E-04	0.70857E-09
61	0.57448E-06	0.39080E-04	0.67625E-09
62	0.54729E-06	0.37231E-04	0.64424E-09
63	0.52034E-06	0.35397E-04	0.61252E-09
64	0.49369E-06	0.33584E-04	0.58114E-09
65	0.46726E-06	0.31787E-04	0.55004E-09
66	0.44105E-06	0.30004E-04	0.51918E-09
67	0.41504E-06	0.28234E-04	0.48856E-09
68	0.38927E-06	0.26481E-04	0.45823E-09
69	0.36369E-06	0.24741E-04	0.42812E-09
70	0.33834E-06	0.23016E-04	0.39827E-09
71	0.31309E-06	0.21299E-04	0.36855E-09
72	0.28803E-06	0.19594E-04	0.33906E-09
73	0.26312E-06	0.17899E-04	0.30973E-09
74	0.23832E-06	0.16212E-04	0.28054E-09
75	0.21363E-06	0.14533E-04	0.25148E-09
76	0.18910E-06	0.12864E-04	0.22260E-09
77	0.16461E-06	0.11198E-04	0.19377E-09
78	0.14024E-06	0.95403E-05	0.16509E-09
79	0.11593E-06	0.78864E-05	0.13647E-09
80	0.91667E-07	0.62359E-05	0.10791E-09

Time: 100.000 - DBCP - 600 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.26100E-04	0.17755E-02	0.30724E-07
2	0.58603E-05	0.39866E-03	0.68984E-08
3	0.39243E-05	0.26696E-03	0.46195E-08
4	0.36824E-05	0.25050E-03	0.43347E-08
5	0.35960E-05	0.24463E-03	0.42331E-08
6	0.35245E-05	0.23976E-03	0.41489E-08
7	0.34550E-05	0.23503E-03	0.40671E-08
8	0.33863E-05	0.23036E-03	0.39862E-08
9	0.33191E-05	0.22579E-03	0.39071E-08
10	0.32521E-05	0.22123E-03	0.38282E-08
11	0.31864E-05	0.21676E-03	0.37509E-08
12	0.31216E-05	0.21236E-03	0.36746E-08
13	0.30582E-05	0.20804E-03	0.36000E-08
14	0.29950E-05	0.20374E-03	0.35256E-08
15	0.29325E-05	0.19949E-03	0.34520E-08
16	0.28713E-05	0.19533E-03	0.33799E-08
17	0.28109E-05	0.19122E-03	0.33089E-08
18	0.27513E-05	0.18716E-03	0.32387E-08
19	0.26923E-05	0.18315E-03	0.31693E-08
20	0.26341E-05	0.17919E-03	0.31007E-08
21	0.25765E-05	0.17527E-03	0.30330E-08
22	0.25196E-05	0.17140E-03	0.29660E-08
23	0.24640E-05	0.16762E-03	0.29005E-08
24	0.24092E-05	0.16389E-03	0.28360E-08
25	0.23544E-05	0.16016E-03	0.27715E-08
26	0.23007E-05	0.15651E-03	0.27083E-08
27	0.22478E-05	0.15291E-03	0.26460E-08
28	0.21955E-05	0.14935E-03	0.25845E-08
29	0.21438E-05	0.14584E-03	0.25236E-08
30	0.20934E-05	0.14241E-03	0.24642E-08
31	0.20430E-05	0.13898E-03	0.24049E-08
32	0.19937E-05	0.13563E-03	0.23469E-08
33	0.19445E-05	0.13228E-03	0.22889E-08
34	0.18963E-05	0.12900E-03	0.22322E-08
35	0.18488E-05	0.12577E-03	0.21763E-08
36	0.18019E-05	0.12258E-03	0.21211E-08
37	0.17554E-05	0.11942E-03	0.20664E-08
38	0.17095E-05	0.11629E-03	0.20124E-08
39	0.16641E-05	0.11321E-03	0.19589E-08
40	0.16198E-05	0.11019E-03	0.19068E-08
41	0.15755E-05	0.10718E-03	0.18546E-08
42	0.15322E-05	0.10423E-03	0.18036E-08
43	0.14889E-05	0.10128E-03	0.17526E-08
44	0.14465E-05	0.98399E-04	0.17027E-08
45	0.14046E-05	0.95553E-04	0.16535E-08
46	0.13626E-05	0.92695E-04	0.16040E-08
47	0.13215E-05	0.89899E-04	0.15556E-08
48	0.12809E-05	0.87139E-04	0.15079E-08
49	0.12408E-05	0.84408E-04	0.14606E-08
50	0.12010E-05	0.81703E-04	0.14138E-08
51	0.11623E-05	0.79066E-04	0.13682E-08
52	0.11234E-05	0.76421E-04	0.13224E-08
53	0.10848E-05	0.73793E-04	0.12769E-08

48	48	1.49E+00
49	49	1.44E+00
50	50	1.39E+00
51	51	1.35E+00
52	52	1.30E+00
53	53	1.25E+00
54	54	1.21E+00
55	55	1.16E+00
56	56	1.11E+00
57	57	1.07E+00
58	58	1.03E+00
59	59	9.81E-01
60	60	9.38E-01
61	61	8.95E-01
62	62	8.53E-01
63	63	8.11E-01
64	64	7.69E-01
65	65	7.28E-01
66	66	6.87E-01
67	67	6.47E-01
68	68	6.07E-01
69	69	5.67E-01
70	70	5.27E-01
71	71	4.88E-01
72	72	4.49E-01
73	73	4.10E-01
74	74	3.71E-01
75	75	3.33E-01
76	76	2.95E-01
77	77	2.57E-01
78	78	2.19E-01
79	79	1.81E-01
80	80	1.43E-01

```
RMA 93-03 DBCP Transport, 700 years
  1
       0.1       100.        50.       100.
      98.0      .0147      1100.       0.68
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .614        -1.   4.90E-04
   80y      100.0
    1     1  4.07E+01
    2     2  9.13E+00
    3     3  6.11E+00
    4     4  5.74E+00
    5     5  5.60E+00
    6     6  5.49E+00
    7     7  5.38E+00
    8     8  5.28E+00
    9     9  5.17E+00
   10    10  5.07E+00
   11    11  4.97E+00
   12    12  4.86E+00
   13    13  4.77E+00
   14    14  4.67E+00
   15    15  4.57E+00
   16    16  4.47E+00
   17    17  4.38E+00
   18    18  4.29E+00
   19    19  4.20E+00
   20    20  4.10E+00
   21    21  4.01E+00
   22    22  3.93E+00
   23    23  3.84E+00
   24    24  3.75E+00
   25    25  3.67E+00
   26    26  3.59E+00
   27    27  3.50E+00
   28    28  3.42E+00
   29    29  3.34E+00
   30    30  3.26E+00
   31    31  3.18E+00
   32    32  3.11E+00
   33    33  3.03E+00
   34    34  2.95E+00
   35    35  2.88E+00
   36    36  2.81E+00
   37    37  2.74E+00
   38    38  2.66E+00
   39    39  2.59E+00
   40    40  2.52E+00
   41    41  2.46E+00
   42    42  2.39E+00
   43    43  2.32E+00
   44    44  2.25E+00
   45    45  2.19E+00
   46    46  2.12E+00
   47    47  2.06E+00
```

54	0.10471E-05	0.71229E-04	0.12325E-08
55	0.10092E-05	0.68655E-04	0.11880E-08
56	0.97160E-06	0.66095E-04	0.11437E-08
57	0.93488E-06	0.63597E-04	0.11005E-08
58	0.89861E-06	0.61130E-04	0.10578E-08
59	0.86209E-06	0.58646E-04	0.10148E-08
60	0.82611E-06	0.56198E-04	0.97245E-09
61	0.79046E-06	0.53773E-04	0.93049E-09
62	0.75515E-06	0.51370E-04	0.88892E-09
63	0.72010E-06	0.48986E-04	0.84766E-09
64	0.68529E-06	0.46618E-04	0.80669E-09
65	0.65077E-06	0.44270E-04	0.76606E-09
66	0.61649E-06	0.41938E-04	0.72570E-09
67	0.58248E-06	0.39625E-04	0.68567E-09
68	0.54868E-06	0.37325E-04	0.64588E-09
69	0.51507E-06	0.35039E-04	0.60631E-09
70	0.48163E-06	0.32764E-04	0.56695E-09
71	0.44842E-06	0.30505E-04	0.52786E-09
72	0.41538E-06	0.28257E-04	0.48896E-09
73	0.38248E-06	0.26019E-04	0.45024E-09
74	0.34972E-06	0.23790E-04	0.41167E-09
75	0.31713E-06	0.21574E-04	0.37331E-09
76	0.28467E-06	0.19366E-04	0.33510E-09
77	0.25231E-06	0.17164E-04	0.29701E-09
78	0.22004E-06	0.14969E-04	0.25902E-09
79	0.18785E-06	0.12779E-04	0.22112E-09
80	0.15572E-06	0.10593E-04	0.18330E-09

Time: 100.000 - DBCP - 700 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.27902E-04	0.18981E-02	0.32844E-07
2	0.65910E-05	0.44837E-03	0.77586E-08
3	0.45411E-05	0.30892E-03	0.53456E-08
4	0.42829E-05	0.29136E-03	0.50417E-08
5	0.41900E-05	0.28503E-03	0.49322E-08
6	0.41132E-05	0.27981E-03	0.48418E-08
7	0.40385E-05	0.27473E-03	0.47539E-08
8	0.39652E-05	0.26974E-03	0.46676E-08
9	0.38921E-05	0.26477E-03	0.45816E-08
10	0.38203E-05	0.25988E-03	0.44970E-08
11	0.37492E-05	0.25505E-03	0.44134E-08
12	0.36783E-05	0.25022E-03	0.43299E-08
13	0.36091E-05	0.24552E-03	0.42485E-08
14	0.35403E-05	0.24083E-03	0.41674E-08
15	0.34720E-05	0.23619E-03	0.40870E-08
16	0.34043E-05	0.23158E-03	0.40074E-08
17	0.33379E-05	0.22707E-03	0.39292E-08
18	0.32723E-05	0.22261E-03	0.38520E-08
19	0.32074E-05	0.21819E-03	0.37755E-08
20	0.31424E-05	0.21377E-03	0.36991E-08
21	0.30786E-05	0.20943E-03	0.36240E-08
22	0.30161E-05	0.20518E-03	0.35504E-08
23	0.29538E-05	0.20094E-03	0.34771E-08
24	0.28919E-05	0.19673E-03	0.34043E-08
25	0.28313E-05	0.19261E-03	0.33329E-08
26	0.27714E-05	0.18853E-03	0.32623E-08
27	0.27114E-05	0.18445E-03	0.31917E-08
28	0.26525E-05	0.18044E-03	0.31224E-08
29	0.25943E-05	0.17648E-03	0.30539E-08
30	0.25366E-05	0.17256E-03	0.29860E-08
31	0.24795E-05	0.16868E-03	0.29188E-08
32	0.24236E-05	0.16487E-03	0.28529E-08
33	0.23677E-05	0.16107E-03	0.27871E-08
34	0.23122E-05	0.15729E-03	0.27218E-08
35	0.22578E-05	0.15359E-03	0.26577E-08
36	0.22040E-05	0.14993E-03	0.25945E-08
37	0.21508E-05	0.14631E-03	0.25318E-08
38	0.20974E-05	0.14268E-03	0.24690E-08
39	0.20450E-05	0.13912E-03	0.24073E-08
40	0.19932E-05	0.13559E-03	0.23463E-08
41	0.19424E-05	0.13214E-03	0.22865E-08
42	0.18917E-05	0.12868E-03	0.22268E-08
43	0.18412E-05	0.12525E-03	0.21674E-08
44	0.17912E-05	0.12185E-03	0.21085E-08
45	0.17422E-05	0.11852E-03	0.20508E-08
46	0.16932E-05	0.11518E-03	0.19931E-08
47	0.16450E-05	0.11190E-03	0.19364E-08
48	0.15974E-05	0.10866E-03	0.18803E-08
49	0.15495E-05	0.10541E-03	0.18240E-08
50	0.15025E-05	0.10221E-03	0.17687E-08
51	0.14560E-05	0.99047E-04	0.17139E-08
52	0.14099E-05	0.95909E-04	0.16596E-08
53	0.13641E-05	0.92794E-04	0.16057E-08

48	48	2.00E+00
49	49	1.93E+00
50	50	1.87E+00
51	51	1.81E+00
52	52	1.75E+00
53	53	1.69E+00
54	54	1.63E+00
55	55	1.57E+00
56	56	1.51E+00
57	57	1.46E+00
58	58	1.40E+00
59	59	1.34E+00
60	60	1.29E+00
61	61	1.23E+00
62	62	1.18E+00
63	63	1.12E+00
64	64	1.07E+00
65	65	1.01E+00
66	66	9.61E-01
67	67	9.08E-01
68	68	8.55E-01
69	69	8.03E-01
70	70	7.50E-01
71	71	6.99E-01
72	72	6.47E-01
73	73	5.96E-01
74	74	5.45E-01
75	75	4.94E-01
76	76	4.44E-01
77	77	3.93E-01
78	78	3.43E-01
79	79	2.93E-01
80	80	2.43E-01

RMA 93-03 DBCP Transport, 800 years

```
  1
       0.1       100.        50.       100.
      98.0      .0147      1100.       0.68
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .639        -1.   7.11E-04
   80y      100.0
    1     1  4.35E+01
    2     2  1.03E+01
    3     3  7.08E+00
    4     4  6.67E+00
    5     5  6.53E+00
    6     6  6.41E+00
    7     7  6.29E+00
    8     8  6.18E+00
    9     9  6.06E+00
   10    10  5.95E+00
   11    11  5.84E+00
   12    12  5.73E+00
   13    13  5.62E+00
   14    14  5.52E+00
   15    15  5.41E+00
   16    16  5.30E+00
   17    17  5.20E+00
   18    18  5.10E+00
   19    19  5.00E+00
   20    20  4.90E+00
   21    21  4.80E+00
   22    22  4.70E+00
   23    23  4.60E+00
   24    24  4.51E+00
   25    25  4.41E+00
   26    26  4.32E+00
   27    27  4.23E+00
   28    28  4.13E+00
   29    29  4.04E+00
   30    30  3.95E+00
   31    31  3.86E+00
   32    32  3.78E+00
   33    33  3.69E+00
   34    34  3.60E+00
   35    35  3.52E+00
   36    36  3.43E+00
   37    37  3.35E+00
   38    38  3.27E+00
   39    39  3.19E+00
   40    40  3.11E+00
   41    41  3.03E+00
   42    42  2.95E+00
   43    43  2.87E+00
   44    44  2.79E+00
   45    45  2.71E+00
   46    46  2.64E+00
   47    47  2.56E+00
```

54	0.13186E-05	0.89703E-04	0.15522E-08
55	0.12735E-05	0.86633E-04	0.14991E-08
56	0.12287E-05	0.83586E-04	0.14464E-08
57	0.11848E-05	0.80601E-04	0.13947E-08
58	0.11408E-05	0.77605E-04	0.13429E-08
59	0.10969E-05	0.74620E-04	0.12912E-08
60	0.10539E-05	0.71695E-04	0.12406E-08
61	0.10107E-05	0.68756E-04	0.11898E-08
62	0.96826E-06	0.65868E-04	0.11398E-08
63	0.92556E-06	0.62963E-04	0.10895E-08
64	0.88360E-06	0.60109E-04	0.10401E-08
65	0.84138E-06	0.57237E-04	0.99043E-09
66	0.79994E-06	0.54418E-04	0.94165E-09
67	0.75860E-06	0.51605E-04	0.89298E-09
68	0.71742E-06	0.48804E-04	0.84451E-09
69	0.67649E-06	0.46020E-04	0.79633E-09
70	0.63569E-06	0.43244E-04	0.74830E-09
71	0.59518E-06	0.40488E-04	0.70061E-09
72	0.55479E-06	0.37741E-04	0.65307E-09
73	0.51460E-06	0.35007E-04	0.60576E-09
74	0.47457E-06	0.32284E-04	0.55864E-09
75	0.43467E-06	0.29569E-04	0.51167E-09
76	0.39495E-06	0.26867E-04	0.46491E-09
77	0.35529E-06	0.24169E-04	0.41823E-09
78	0.31578E-06	0.21482E-04	0.37172E-09
79	0.27637E-06	0.18801E-04	0.32533E-09
80	0.23705E-06	0.16126E-04	0.27904E-09

Time: 100.000 - DBCP - 800 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.29399E-04	0.19999E-02	0.34607E-07
2	0.72362E-05	0.49226E-03	0.85181E-08
3	0.50961E-05	0.34667E-03	0.59989E-08
4	0.48240E-05	0.32816E-03	0.56786E-08
5	0.47265E-05	0.32153E-03	0.55637E-08
6	0.46455E-05	0.31602E-03	0.54685E-08
7	0.45665E-05	0.31065E-03	0.53755E-08
8	0.44889E-05	0.30537E-03	0.52841E-08
9	0.44114E-05	0.30010E-03	0.51929E-08
10	0.43350E-05	0.29490E-03	0.51030E-08
11	0.42594E-05	0.28976E-03	0.50140E-08
12	0.41845E-05	0.28466E-03	0.49257E-08
13	0.41101E-05	0.27960E-03	0.48382E-08
14	0.40370E-05	0.27462E-03	0.47521E-08
15	0.39640E-05	0.26966E-03	0.46662E-08
16	0.38914E-05	0.26472E-03	0.45808E-08
17	0.38201E-05	0.25987E-03	0.44968E-08
18	0.37495E-05	0.25507E-03	0.44137E-08
19	0.36795E-05	0.25030E-03	0.43313E-08
20	0.36100E-05	0.24558E-03	0.42495E-08
21	0.35411E-05	0.24089E-03	0.41684E-08
22	0.34728E-05	0.23625E-03	0.40880E-08
23	0.34050E-05	0.23164E-03	0.40083E-08
24	0.33385E-05	0.22711E-03	0.39299E-08
25	0.32719E-05	0.22258E-03	0.38515E-08
26	0.32064E-05	0.21812E-03	0.37744E-08
27	0.31416E-05	0.21371E-03	0.36981E-08
28	0.30766E-05	0.20929E-03	0.36217E-08
29	0.30127E-05	0.20495E-03	0.35464E-08
30	0.29494E-05	0.20064E-03	0.34719E-08
31	0.28866E-05	0.19637E-03	0.33980E-08
32	0.28249E-05	0.19217E-03	0.33254E-08
33	0.27633E-05	0.18798E-03	0.32528E-08
34	0.27020E-05	0.18381E-03	0.31806E-08
35	0.26417E-05	0.17971E-03	0.31097E-08
36	0.25815E-05	0.17561E-03	0.30388E-08
37	0.25222E-05	0.17158E-03	0.29690E-08
38	0.24635E-05	0.16758E-03	0.28999E-08
39	0.24052E-05	0.16362E-03	0.28313E-08
40	0.23474E-05	0.15969E-03	0.27633E-08
41	0.22900E-05	0.15578E-03	0.26957E-08
42	0.22331E-05	0.15191E-03	0.26286E-08
43	0.21765E-05	0.14806E-03	0.25621E-08
44	0.21203E-05	0.14424E-03	0.24960E-08
45	0.20646E-05	0.14045E-03	0.24303E-08
46	0.20098E-05	0.13672E-03	0.23659E-08
47	0.19550E-05	0.13299E-03	0.23013E-08
48	0.19010E-05	0.12932E-03	0.22378E-08
49	0.18469E-05	0.12564E-03	0.21741E-08
50	0.17937E-05	0.12202E-03	0.21114E-08
51	0.17409E-05	0.11843E-03	0.20493E-08
52	0.16885E-05	0.11486E-03	0.19876E-08
53	0.16364E-05	0.11132E-03	0.19262E-08

48	48	2.49E+00
49	49	2.41E+00
50	50	2.34E+00
51	51	2.27E+00
52	52	2.20E+00
53	53	2.13E+00
54	54	2.05E+00
55	55	1.98E+00
56	56	1.91E+00
57	57	1.85E+00
58	58	1.78E+00
59	59	1.71E+00
60	60	1.64E+00
61	61	1.57E+00
62	62	1.51E+00
63	63	1.44E+00
64	64	1.38E+00
65	65	1.31E+00
66	66	1.25E+00
67	67	1.18E+00
68	68	1.12E+00
69	69	1.05E+00
70	70	9.91E-01
71	71	9.27E-01
72	72	8.64E-01
73	73	8.02E-01
74	74	7.39E-01
75	75	6.77E-01
76	76	6.15E-01
77	77	5.54E-01
78	78	4.92E-01
79	79	4.31E-01
80	80	3.69E-01

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RMA 93-03 DBCP Transport, 900 years
  1
       0.1       100.        50.       100.
      98.0      .0147      1100.       0.68
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .660        -1.   9.67E-04
   80y      100.0
    1     1  4.58E+01
    2     2  1.13E+01
    3     3  7.94E+00
    4     4  7.52E+00
    5     5  7.36E+00
    6     6  7.24E+00
    7     7  7.12E+00
    8     8  6.99E+00
    9     9  6.87E+00
   10    10  6.75E+00
   11    11  6.64E+00
   12    12  6.52E+00
   13    13  6.40E+00
   14    14  6.29E+00
   15    15  6.18E+00
   16    16  6.06E+00
   17    17  5.95E+00
   18    18  5.84E+00
   19    19  5.73E+00
   20    20  5.63E+00
   21    21  5.52E+00
   22    22  5.41E+00
   23    23  5.31E+00
   24    24  5.20E+00
   25    25  5.10E+00
   26    26  5.00E+00
   27    27  4.90E+00
   28    28  4.79E+00
   29    29  4.69E+00
   30    30  4.60E+00
   31    31  4.50E+00
   32    32  4.40E+00
   33    33  4.31E+00
   34    34  4.21E+00
   35    35  4.12E+00
   36    36  4.02E+00
   37    37  3.93E+00
   38    38  3.84E+00
   39    39  3.75E+00
   40    40  3.66E+00
   41    41  3.57E+00
   42    42  3.48E+00
   43    43  3.39E+00
   44    44  3.30E+00
   45    45  3.22E+00
   46    46  3.13E+00
   47    47  3.05E+00
```

54	0.15840E-05	0.10775E-03	0.18646E-08
55	0.15324E-05	0.10424E-03	0.18039E-08
56	0.14812E-05	0.10076E-03	0.17436E-08
57	0.14310E-05	0.97348E-04	0.16845E-08
58	0.13806E-05	0.93919E-04	0.16252E-08
59	0.13303E-05	0.90500E-04	0.15660E-08
60	0.12804E-05	0.87099E-04	0.15072E-08
61	0.12306E-05	0.83716E-04	0.14486E-08
62	0.11818E-05	0.80392E-04	0.13911E-08
63	0.11327E-05	0.77053E-04	0.13333E-08
64	0.10843E-05	0.73763E-04	0.12764E-08
65	0.10357E-05	0.70456E-04	0.12192E-08
66	0.98779E-06	0.67197E-04	0.11628E-08
67	0.93960E-06	0.63918E-04	0.11060E-08
68	0.89211E-06	0.60687E-04	0.10501E-08
69	0.84431E-06	0.57436E-04	0.99388E-09
70	0.79726E-06	0.54235E-04	0.93849E-09
71	0.75021E-06	0.51034E-04	0.88310E-09
72	0.70333E-06	0.47845E-04	0.82792E-09
73	0.65668E-06	0.44672E-04	0.77301E-09
74	0.61013E-06	0.41505E-04	0.71821E-09
75	0.56376E-06	0.38351E-04	0.66363E-09
76	0.51754E-06	0.35207E-04	0.60922E-09
77	0.47150E-06	0.32075E-04	0.55502E-09
78	0.42552E-06	0.28947E-04	0.50089E-09
79	0.37968E-06	0.25829E-04	0.44694E-09
80	0.33389E-06	0.22714E-04	0.39304E-09

Time: 100.000 - DBCP - 900 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.30682E-04	0.20872E-02	0.36117E-07
2	0.78087E-05	0.53121E-03	0.91920E-08
3	0.55956E-05	0.38065E-03	0.65868E-08
4	0.53138E-05	0.36148E-03	0.62551E-08
5	0.52117E-05	0.35454E-03	0.61349E-08
6	0.51276E-05	0.34882E-03	0.60360E-08
7	0.50457E-05	0.34324E-03	0.59395E-08
8	0.49639E-05	0.33768E-03	0.58432E-08
9	0.48831E-05	0.33219E-03	0.57482E-08
10	0.48031E-05	0.32674E-03	0.56539E-08
11	0.47242E-05	0.32137E-03	0.55611E-08
12	0.46454E-05	0.31601E-03	0.54683E-08
13	0.45670E-05	0.31068E-03	0.53761E-08
14	0.44898E-05	0.30543E-03	0.52852E-08
15	0.44133E-05	0.30022E-03	0.51951E-08
16	0.43367E-05	0.29501E-03	0.51049E-08
17	0.42611E-05	0.28987E-03	0.50160E-08
18	0.41862E-05	0.28478E-03	0.49278E-08
19	0.41118E-05	0.27972E-03	0.48403E-08
20	0.40386E-05	0.27474E-03	0.47541E-08
21	0.39654E-05	0.26976E-03	0.46679E-08
22	0.38926E-05	0.26480E-03	0.45822E-08
23	0.38209E-05	0.25993E-03	0.44978E-08
24	0.37492E-05	0.25505E-03	0.44134E-08
25	0.36786E-05	0.25024E-03	0.43302E-08
26	0.36085E-05	0.24547E-03	0.42477E-08
27	0.35389E-05	0.24074E-03	0.41658E-08
28	0.34692E-05	0.23600E-03	0.40837E-08
29	0.34004E-05	0.23132E-03	0.40028E-08
30	0.33329E-05	0.22673E-03	0.39233E-08
31	0.32653E-05	0.22213E-03	0.38437E-08
32	0.31981E-05	0.21756E-03	0.37646E-08
33	0.31319E-05	0.21305E-03	0.36867E-08
34	0.30657E-05	0.20855E-03	0.36088E-08
35	0.30004E-05	0.20411E-03	0.35319E-08
36	0.29351E-05	0.19966E-03	0.34550E-08
37	0.28706E-05	0.19528E-03	0.33792E-08
38	0.28068E-05	0.19094E-03	0.33040E-08
39	0.27433E-05	0.18662E-03	0.32293E-08
40	0.26803E-05	0.18233E-03	0.31551E-08
41	0.26176E-05	0.17807E-03	0.30813E-08
42	0.25554E-05	0.17383E-03	0.30080E-08
43	0.24935E-05	0.16962E-03	0.29352E-08
44	0.24320E-05	0.16544E-03	0.28628E-08
45	0.23715E-05	0.16133E-03	0.27916E-08
46	0.23109E-05	0.15720E-03	0.27202E-08
47	0.22511E-05	0.15314E-03	0.26499E-08
48	0.21912E-05	0.14906E-03	0.25794E-08
49	0.21321E-05	0.14504E-03	0.25098E-08
50	0.20729E-05	0.14101E-03	0.24401E-08
51	0.20145E-05	0.13704E-03	0.23714E-08
52	0.19565E-05	0.13310E-03	0.23031E-08
53	0.18989E-05	0.12918E-03	0.22353E-08

48	48	2.96E+00
49	49	2.88E+00
50	50	2.79E+00
51	51	2.71E+00
52	52	2.63E+00
53	53	2.55E+00
54	54	2.47E+00
55	55	2.39E+00
56	56	2.31E+00
57	57	2.23E+00
58	58	2.15E+00
59	59	2.07E+00
60	60	2.00E+00
61	61	1.92E+00
62	62	1.84E+00
63	63	1.76E+00
64	64	1.69E+00
65	65	1.61E+00
66	66	1.54E+00
67	67	1.46E+00
68	68	1.39E+00
69	69	1.32E+00
70	70	1.24E+00
71	71	1.17E+00
72	72	1.10E+00
73	73	1.02E+00
74	74	9.51E-01
75	75	8.78E-01
76	76	8.06E-01
77	77	7.35E-01
78	78	6.63E-01
79	79	5.92E-01
80	80	5.20E-01

```
RMA 93-03 DBCP Transport, 1000 years
  1
       0.1       100.        50.       100.
      98.0      .0147      1100.       0.68
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .678        -1.   1.25E-03
   80y      100.0
    1     1  4.78E+01
    2     2  1.22E+01
    3     3  8.72E+00
    4     4  8.28E+00
    5     5  8.12E+00
    6     6  7.99E+00
    7     7  7.86E+00
    8     8  7.73E+00
    9     9  7.61E+00
   10    10  7.48E+00
   11    11  7.36E+00
   12    12  7.24E+00
   13    13  7.12E+00
   14    14  7.00E+00
   15    15  6.88E+00
   16    16  6.76E+00
   17    17  6.64E+00
   18    18  6.52E+00
   19    19  6.41E+00
   20    20  6.29E+00
   21    21  6.18E+00
   22    22  6.07E+00
   23    23  5.95E+00
   24    24  5.84E+00
   25    25  5.73E+00
   26    26  5.62E+00
   27    27  5.51E+00
   28    28  5.41E+00
   29    29  5.30E+00
   30    30  5.19E+00
   31    31  5.09E+00
   32    32  4.98E+00
   33    33  4.88E+00
   34    34  4.78E+00
   35    35  4.68E+00
   36    36  4.57E+00
   37    37  4.47E+00
   38    38  4.37E+00
   39    39  4.27E+00
   40    40  4.18E+00
   41    41  4.08E+00
   42    42  3.98E+00
   43    43  3.89E+00
   44    44  3.79E+00
   45    45  3.70E+00
   46    46  3.60E+00
   47    47  3.51E+00
```

54	0.18416E-05	0.12528E-03	0.21679E-08
55	0.17846E-05	0.12140E-03	0.21007E-08
56	0.17279E-05	0.11754E-03	0.20340E-08
57	0.16715E-05	0.11370E-03	0.19676E-08
58	0.16153E-05	0.10989E-03	0.19015E-08
59	0.15594E-05	0.10608E-03	0.18357E-08
60	0.15044E-05	0.10234E-03	0.17709E-08
61	0.14492E-05	0.98586E-04	0.17059E-08
62	0.13941E-05	0.94838E-04	0.16411E-08
63	0.13393E-05	0.91106E-04	0.15765E-08
64	0.12852E-05	0.87431E-04	0.15129E-08
65	0.12310E-05	0.83739E-04	0.14490E-08
66	0.11774E-05	0.80095E-04	0.13860E-08
67	0.11236E-05	0.76433E-04	0.13226E-08
68	0.10704E-05	0.72817E-04	0.12600E-08
69	0.10176E-05	0.69223E-04	0.11978E-08
70	0.96433E-06	0.65601E-04	0.11352E-08
71	0.91174E-06	0.62023E-04	0.10733E-08
72	0.85944E-06	0.58465E-04	0.10117E-08
73	0.80669E-06	0.54877E-04	0.94960E-09
74	0.75464E-06	0.51336E-04	0.88833E-09
75	0.70262E-06	0.47797E-04	0.82709E-09
76	0.65076E-06	0.44269E-04	0.76604E-09
77	0.59909E-06	0.40755E-04	0.70522E-09
78	0.54750E-06	0.37245E-04	0.64449E-09
79	0.49606E-06	0.33746E-04	0.58394E-09
80	0.44467E-06	0.30250E-04	0.52345E-09

Time: 100.000 - DBCP - 1000 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.31805E-04	0.21636E-02	0.37440E-07
2	0.83264E-05	0.56642E-03	0.98015E-08
3	0.60510E-05	0.41164E-03	0.71230E-08
4	0.57603E-05	0.39186E-03	0.67807E-08
5	0.56551E-05	0.38470E-03	0.66570E-08
6	0.55680E-05	0.37878E-03	0.65544E-08
7	0.54829E-05	0.37299E-03	0.64542E-08
8	0.53984E-05	0.36724E-03	0.63548E-08
9	0.53151E-05	0.36157E-03	0.62567E-08
10	0.52318E-05	0.35591E-03	0.61586E-08
11	0.51495E-05	0.35031E-03	0.60618E-08
12	0.50679E-05	0.34475E-03	0.59656E-08
13	0.49867E-05	0.33923E-03	0.58701E-08
14	0.49061E-05	0.33375E-03	0.57752E-08
15	0.48259E-05	0.32830E-03	0.56809E-08
16	0.47463E-05	0.32288E-03	0.55871E-08
17	0.46671E-05	0.31749E-03	0.54939E-08
18	0.45884E-05	0.31214E-03	0.54013E-08
19	0.45109E-05	0.30686E-03	0.53100E-08
20	0.44333E-05	0.30158E-03	0.52186E-08
21	0.43567E-05	0.29637E-03	0.51284E-08
22	0.42806E-05	0.29120E-03	0.50390E-08
23	0.42045E-05	0.28602E-03	0.49493E-08
24	0.41292E-05	0.28090E-03	0.48607E-08
25	0.40546E-05	0.27582E-03	0.47729E-08
26	0.39804E-05	0.27078E-03	0.46855E-08
27	0.39067E-05	0.26576E-03	0.45987E-08
28	0.38340E-05	0.26082E-03	0.45132E-08
29	0.37613E-05	0.25587E-03	0.44276E-08
30	0.36889E-05	0.25094E-03	0.43423E-08
31	0.36175E-05	0.24609E-03	0.42583E-08
32	0.35460E-05	0.24123E-03	0.41742E-08
33	0.34755E-05	0.23643E-03	0.40912E-08
34	0.34055E-05	0.23167E-03	0.40088E-08
35	0.33359E-05	0.22693E-03	0.39269E-08
36	0.32661E-05	0.22218E-03	0.38447E-08
37	0.31972E-05	0.21750E-03	0.37636E-08
38	0.31288E-05	0.21284E-03	0.36830E-08
39	0.30608E-05	0.20821E-03	0.36030E-08
40	0.29937E-05	0.20366E-03	0.35241E-08
41	0.29266E-05	0.19909E-03	0.34451E-08
42	0.28597E-05	0.19454E-03	0.33663E-08
43	0.27938E-05	0.19006E-03	0.32887E-08
44	0.27278E-05	0.18556E-03	0.32110E-08
45	0.26626E-05	0.18113E-03	0.31342E-08
46	0.25972E-05	0.17668E-03	0.30573E-08
47	0.25327E-05	0.17229E-03	0.29813E-08
48	0.24680E-05	0.16789E-03	0.29052E-08
49	0.24041E-05	0.16355E-03	0.28300E-08
50	0.23407E-05	0.15923E-03	0.27554E-08
51	0.22776E-05	0.15494E-03	0.26811E-08
52	0.22148E-05	0.15067E-03	0.26072E-08
53	0.21523E-05	0.14642E-03	0.25336E-08

48	48	3.41E+00
49	49	3.32E+00
50	50	3.23E+00
51	51	3.14E+00
52	52	3.05E+00
53	53	2.96E+00
54	54	2.87E+00
55	55	2.78E+00
56	56	2.69E+00
57	57	2.60E+00
58	58	2.52E+00
59	59	2.43E+00
60	60	2.34E+00
61	61	2.26E+00
62	62	2.17E+00
63	63	2.09E+00
64	64	2.00E+00
65	65	1.92E+00
66	66	1.83E+00
67	67	1.75E+00
68	68	1.67E+00
69	69	1.59E+00
70	70	1.50E+00
71	71	1.42E+00
72	72	1.34E+00
73	73	1.26E+00
74	74	1.18E+00
75	75	1.09E+00
76	76	1.01E+00
77	77	9.34E-01
78	78	8.53E-01
79	79	7.73E-01
80	80	6.93E-01

```
RMA 93-03 DIMP, First 100 years
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .089        -1.        0.
   80y      100.0
    1    1        0.0
    2    2        0.0
    3    3        0.0
    4    4        0.0
    5    5        0.0
    6    6        0.0
    7    7        0.0
    8    8        0.0
    9    9        0.0
   10   10        0.0
   11   11        0.0
   12   12        0.0
   13   13        0.0
   14   14        0.0
   15   15        0.0
   16   16        0.0
   17   17        0.0
   18   18        0.0
   19   19        0.0
   20   20        0.0
   21   21        0.0
   22   22        0.0
   23   23        0.0
   24   24        0.0
   25   25        0.0
   26   26        0.0
   27   27        0.0
   28   28        0.0
   29   29        0.0
   30   30        0.0
   31   31        0.0
   32   32        0.0
   33   33        0.0
   34   34        0.0
   35   35        0.0
   36   36        0.0
   37   37        0.0
   38   38        0.0
   39   39        0.0
   40   40        0.0
   41   41        0.0
   42   42        0.0
   43   43        0.0
   44   44        0.0
   45   45        0.0
   46   46        0.0
   47   47        0.0
```

54	0.20901E-05	0.14219E-03	0.24604E-08
55	0.20282E-05	0.13797E-03	0.23875E-08
56	0.19666E-05	0.13378E-03	0.23150E-08
57	0.19052E-05	0.12961E-03	0.22427E-08
58	0.18448E-05	0.12549E-03	0.21716E-08
59	0.17841E-05	0.12137E-03	0.21001E-08
60	0.17235E-05	0.11725E-03	0.20288E-08
61	0.16638E-05	0.11318E-03	0.19586E-08
62	0.16039E-05	0.10911E-03	0.18880E-08
63	0.15447E-05	0.10508E-03	0.18183E-08
64	0.14852E-05	0.10103E-03	0.17483E-08
65	0.14264E-05	0.97035E-04	0.16791E-08
66	0.13674E-05	0.93018E-04	0.16096E-08
67	0.13090E-05	0.89049E-04	0.15409E-08
68	0.12510E-05	0.85102E-04	0.14726E-08
69	0.11932E-05	0.81168E-04	0.14045E-08
70	0.11349E-05	0.77206E-04	0.13360E-08
71	0.10773E-05	0.73288E-04	0.12682E-08
72	0.10200E-05	0.69389E-04	0.12007E-08
73	0.96289E-06	0.65503E-04	0.11335E-08
74	0.90592E-06	0.61627E-04	0.10664E-08
75	0.84847E-06	0.57719E-04	0.99878E-09
76	0.79165E-06	0.53854E-04	0.93189E-09
77	0.73532E-06	0.50022E-04	0.86558E-09
78	0.67887E-06	0.46182E-04	0.79914E-09
79	0.62255E-06	0.42350E-04	0.73283E-09
80	0.56633E-06	0.38526E-04	0.66666E-09

```
|-------------------------------------------------------------|
|                VLEACH (Version 2.2, 1995)                   |
|                                                             |
|                          By:                                |
|        Varadhan Ravi and Jeffrey A. Johnson                 |
|                  (USEPA Contractors)                        |
|        Center for Subsurface Modeling Support               |
|        Robert S. Kerr Environmental Research Laboratory     |
|        U.S. Environmental Protection Agency                 |
|        P.O. Box 1198                                        |
|        Ada, OK 74820                                        |
|                                                             |
|        Based on the original VLEACH (version 1.0)           |
|        developed by CH2M Hill, Redding, California          |
|        for USEPA Region IX                                  |
|---------------------------- ----------------------------|
```

```
RMA 93-03 DIMP, First 100 years
  1 polygons.
Timestep =   0.10 years.  Simulation length =  100.00 years.
Printout every  50.00 years.  Vertical profile stored every 100.00 years.
Koc =       60.000    ml/g,      0.21189E-02cu.ft./g
Kh =     0.82000E-04 (dimensionless).
Aqueous solubility =     22000.     mg/l,      622.97     g/cu.ft
Free air diffusion coefficient = .52000     sq. m/day,  2043.1     sq.ft./yr


Polygon   1
Polygon I
Polygon area =      1.0000    sq. ft.
 80 cells, each cell  0.250 ft. thick.
Soil Properties:
 Bulk density =     1.6000    g/ml,       45307.    g/cu.ft.
 Porosity = 0.4000 Volumetric water content = 0.2500
 Organic carbon content = 0.00500000
Recharge Rate = 0.00057000 ft/yr
Conc. in recharge water =     0.89000E-01mg/l,      0.25202E-02g/cu.ft
Atmospheric concentration =     -1.0000    mg/l,     -0.28317E-01g/cu.ft
Water table has a fixed concentration of     0.00000    mg/l,      0.00000    g/
   with respect to gas diffusion.
```

48	48	0.0
49	49	0.0
50	50	0.0
51	51	0.0
52	52	0.0
53	53	0.0
54	54	0.0
55	55	0.0
56	56	0.0
57	57	0.0
58	58	0.0
59	59	0.0
60	60	0.0
61	61	0.0
62	62	0.0
63	63	0.0
64	64	0.0
65	65	0.0
66	66	0.0
67	67	0.0
68	68	0.0
69	69	0.0
70	70	0.0
71	71	0.0
72	72	0.0
73	73	0.0
74	74	0.0
75	75	0.0
76	76	0.0
77	77	0.0
78	78	0.0
79	79	0.0
80	80	0.0

Time: 100.000 - DIMP - 100 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.55013E-07	0.67089E-03	0.71077E-08
2	0.81592E-08	0.99503E-04	0.10542E-08
3	0.85479E-09	0.10424E-04	0 11044E-09
4	0.91442E-10	0.11151E-05	0 11814E-10
5	0.30013E-10	0.36601E-06	0.38777E-11
6	0.24649E-10	0.30059E-06	0.31846E-11
7	0.22941E-10	0.27977E-06	0 29639E-11
8	0.21514E-10	0.26237E-06	0.27797E-11
9	0.20184E-10	0.24615E-06	0.26078E-11
10	0.18937E-10	0.23093E-06	0.24466E-11
11	0.17766E-10	0.21666E-06	0 22953E-11
12	0.16668E-10	0.20326E-06	0.21534E-11
13	0.15637E-10	0.19070E-06	0.20203E-11
14	0.14670E-10	0.17891E-06	0.18954E-11
15	0.13763E-10	0.16785E-06	0.17782E-11
16	0.12912E-10	0.15747E-06	0.16683E-11
17	0.12114E-10	0.14773E-06	0.15651E-11
18	0.11365E-10	0.13860E-06	0.14683E-11
19	0.10662E-10	0.13002E-06	0.13775E-11
20	0.10003E-10	0.12198E-06	0.12923E-11
21	0.93838E-11	0.11444E-06	0.12124E-11
22	0.88033E-11	0.10736E-06	0.11374E-11
23	0.82587E-11	0.10072E-06	0.10670E-11
24	0.77476E-11	0.94483E-07	0.10010E-11
25	0.72681E-11	0.88636E-07	0.93904E-12
26	0.68182E-11	0.83149E-07	0.88091E-12
27	0.63960E-11	0.78001E-07	0.82636E-12
28	0.59999E-11	0.73170E-07	0.77519E-12
29	0.56282E-11	0.68637E-07	0.72716E-12
30	0.52795E-11	0.64384E-07	0.68210E-12
31	0.49522E-11	0.60392E-07	0.63982E-12
32	0.46451E-11	0.56647E-07	0.60014E-12
33	0.43569E-11	0.53132E-07	0.56290E-12
34	0.40864E-11	0.49834E-07	0.52796E-12
35	0.38325E-11	0.46738E-07	0.49516E-12
36	0.35943E-11	0.43833E-07	0.46438E-12
37	0.33707E-11	0.41106E-07	0.43549E-12
38	0.31608E-11	0.38547E-07	0.40838E-12
39	0.29638E-11	0.36144E-07	0.38293E-12
40	0.27789E-11	0.33889E-07	0.35903E-12
41	0.26053E-11	0.31772E-07	0.33660E-12
42	0.24422E-11	0.29783E-07	0.31554E-12
43	0.22892E-11	0.27917E-07	0.29576E-12
44	0.21454E-11	0.26164E-07	0.27719E-12
45	0.20104E-11	0.24517E-07	0.25974E-12
46	0.18835E-11	0.22970E-07	0.24335E-12
47	0.17644E-11	0.21517E-07	0.22796E-12
48	0.16524E-11	0.20151E-07	0.21349E-12
49	0.15471E-11	0.18867E-07	0.19989E-12
50	0.14482E-11	0.17661E-07	0.18710E-12
51	0.13551E-11	0.16526E-07	0.17508E-12
52	0.12676E-11	0.15458E-07	0.16377E-12
53	0.11852E-11	0.14453E-07	0.15312E-12

54	0.11076E-11	0.13508E-07	0.14310E-12
55	0.10346E-11	0.12617E-07	0.13367E-12
56	0.96572E-12	0.11777E-07	0.12477E-12
57	0.90082E-12	0.10986E-07	0.11638E-12
58	0.83958E-12	0.10239E-07	0.10847E-12
59	0.78175E-12	0.95336E-08	0.10100E-12
60	0.72711E-12	0.88672E-08	0.93943E-13
61	0.67543E-12	0.82370E-08	0.87266E-13
62	0.62650E-12	0.76403E-08	0.80944E-13
63	0.58012E-12	0.70747E-08	0.74952E-13
64	0.53611E-12	0.65379E-08	0.69265E-13
65	0.49427E-12	0.60277E-08	0.63860E-13
66	0.45445E-12	0.55421E-08	0.58715E-13
67	0.41648E-12	0.50790E-08	0.53809E-13
68	0.38020E-12	0.46366E-08	0.49122E-13
69	0.34547E-12	0.42131E-08	0.44635E-13
70	0.31215E-12	0.38067E-08	0.40330E-13
71	0.28010E-12	0.34158E-08	0.36189E-13
72	0.24919E-12	0.30389E-08	0.32195E-13
73	0.21929E-12	0.26743E-08	0.28332E-13
74	0.19029E-12	0.23206E-08	0.24585E-13
75	0.16206E-12	0.19763E-08	0.20938E-13
76	0.13449E-12	0.16401E-08	0.17376E-13
77	0.10747E-12	0.13106E-08	0.13885E-13
78	0.80883E-13	0.98637E-09	0.10450E-13
79	0.54628E-13	0.66619E-09	0.70578E-14
80	0.28595E-13	0.34872E-09	0.36944E-14

```
RMA 93-03 DIMP, 200 years
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .308        -1.   2.92E-08
   80y      100.0
    1     1  1.08E+01
    2     2  1.60E+00
    3     3  1.68E-01
    4     4  1.80E-02
    5     5  5.90E-03
    6     6  4.84E-03
    7     7  4.51E-03
    8     8  4.23E-03
    9     9  3.97E-03
   10    10  3.72E-03
   11    11  3.49E-03
   12    12  3.28E-03
   13    13  3.07E-03
   14    14  2.88E-03
   15    15  2.70E-03
   16    16  2.54E-03
   17    17  2.38E-03
   18    18  2.23E-03
   19    19  2.09E-03
   20    20  1.97E-03
   21    21  1.84E-03
   22    22  1.73E-03
   23    23  1.62E-03
   24    24  1.52E-03
   25    25  1.43E-03
   26    26  1.34E-03
   27    27  1.26E-03
   28    28  1.18E-03
   29    29  1.11E-03
   30    30  1.04E-03
   31    31  9.73E-04
   32    32  9.13E-04
   33    33  8.56E-04
   34    34  8.03E-04
   35    35  7.53E-04
   36    36  7.06E-04
   37    37  6.62E-04
   38    38  6.21E-04
   39    39  5.82E-04
   40    40  5.46E-04
   41    41  5.12E-04
   42    42  4.80E-04
   43    43  4.50E-04
   44    44  4.22E-04
   45    45  3.95E-04
   46    46  3.70E-04
   47    47  3.47E-04
```

48	48	3.25E-04
49	49	3.04E-04
50	50	2.85E-04
51	51	2.66E-04
52	52	2.49E-04
53	53	2.33E-04
54	54	2.18E-04
55	55	2.03E-04
56	56	1.90E-04
57	57	1.77E-04
58	58	1.65E-04
59	59	1.54E-04
60	60	1.43E-04
61	61	1.33E-04
62	62	1.23E-04
63	63	1.14E-04
64	64	1.05E-04
65	65	9.71E-05
66	66	8.93E-05
67	67	8.18E-05
68	68	7.47E-05
69	69	6.79E-05
70	70	6.13E-05
71	71	5.50E-05
72	72	4.90E-05
73	73	4.31E-05
74	74	3.74E-05
75	75	3.18E-05
76	76	2.64E-05
77	77	2.11E-05
78	78	1.59E-05
79	79	1.07E-05
80	80	5.62E-06

Time: 100.000 - DIMP - 200 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.22999E-06	0.28047E-02	0.29714E-07
2	0.46502E-07	0.56710E-03	0.60081E-08
3	0.73916E-08	0.90141E-04	0.95499E-09
4	0.11174E-08	0.13627E-04	0.14437E-09
5	0.27375E-09	0.33384E-05	0.35368E-10
6	0.16824E-09	0.20518E-05	0.21737E-10
7	0.14906E-09	0.18178E-05	0.19258E-10
8	0.13910E-09	0.16963E-05	0.17971E-10
9	0.13046E-09	0.15910E-05	0.16855E-10
10	0.12239E-09	0.14926E-05	0.15813E-10
11	0.11483E-09	0.14004E-05	0.14836E-10
12	0.10776E-09	0.13142E-05	0.13923E-10
13	0.10109E-09	0.12328E-05	0.13061E-10
14	0.94846E-10	0.11567E-05	0.12254E-10
15	0.88983E-10	0.10852E-05	0.11497E-10
16	0.83514E-10	0.10185E-05	0.10790E-10
17	0.78355E-10	0.95555E-06	0.10123E-10
18	0.73506E-10	0.89641E-06	0.94969E-11
19	0.68956E-10	0.84093E-06	0.89091E-11
20	0.64729E-10	0.78938E-06	0.83630E-11
21	0.60713E-10	0.74040E-06	0.78440E-11
22	0.56970E-10	0.69475E-06	0.73604E-11
23	0.53443E-10	0.65174E-06	0.69048E-11
24	0.50140E-10	0.61146E-06	0.64780E-11
25	0.47056E-10	0.57386E-06	0.60796E-11
26	0.44148E-10	0.53839E-06	0.57038E-11
27	0.41429E-10	0.50523E-06	0.53526E-11
28	0.38863E-10	0.47394E-06	0.50211E-11
29	0.36469E-10	0.44475E-06	0.47118E-11
30	0.34212E-10	0.41722E-06	0.44202E-11
31	0.32085E-10	0.39128E-06	0.41453E-11
32	0.30096E-10	0.36703E-06	0.38884E-11
33	0.28231E-10	0.34428E-06	0.36474E-11
34	0.26481E-10	0.32294E-06	0.34214E-11
35	0.24839E-10	0.30291E-06	0.32092E-11
36	0.23297E-10	0.28411E-06	0.30099E-11
37	0.21849E-10	0.26645E-06	0.28229E-11
38	0.20492E-10	0.24990E-06	0.26475E-11
39	0.19216E-10	0.23434E-06	0.24827E-11
40	0.18020E-10	0.21975E-06	0.23281E-11
41	0.16897E-10	0.20606E-06	0.21830E-11
42	0.15841E-10	0.19319E-06	0.20467E-11
43	0.14851E-10	0.18110E-06	0.19187E-11
44	0.13921E-10	0.16976E-06	0.17985E-11
45	0.13045E-10	0.15908E-06	0.16854E-11
46	0.12222E-10	0.14905E-06	0.15791E-11
47	0.11452E-10	0.13965E-06	0.14796E-11
48	0.10727E-10	0.13081E-06	0.13859E-11
49	0.10044E-10	0.12248E-06	0.12976E-11
50	0.94036E-11	0.11468E-06	0.12149E-11
51	0.87983E-11	0.10730E-06	0.11367E-11
52	0.82309E-11	0.10038E-06	0.10634E-11
53	0.76976E-11	0.93874E-07	0.99453E-12

54	0.71960E-11	0.87756E-07	0.92971E-12
55	0.67203E-11	0.81955E-07	0.86826E-12
56	0.62752E-11	0.76527E-07	0.81075E-12
57	0.58539E-11	0.71389E-07	0.75632E-12
58	0.54567E-11	0.66545E-07	0.70500E-12
59	0.50830E-11	0.61988E-07	0.65672E-12
60	0.47281E-11	0.57659E-07	0.61086E-12
61	0.43932E-11	0.53575E-07	0.56760E-12
62	0.40745E-11	0.49689E-07	0.52642E-12
63	0.37737E-11	0.46020E-07	0.48755E-12
64	0.34869E-11	0.42523E-07	0.45050E-12
65	0.32163E-11	0.39223E-07	0.41554E-12
66	0.29583E-11	0.36077E-07	0.38221E-12
67	0.27119E-11	0.33072E-07	0.35038E-12
68	0.24766E-11	0.30203E-07	0.31998E-12
69	0.22514E-11	0.27456E-07	0.29088E-12
70	0.20351E-11	0.24818E-07	0.26293E-12
71	0.18271E-11	0.22282E-07	0.23607E-12
72	0.16269E-11	0.19840E-07	0.21019E-12
73	0.14330E-11	0.17476E-07	0.18514E-12
74	0.12449E-11	0.15182E-07	0.16084E-12
75	0.10617E-11	0.12947E-07	0.13717E-12
76	0.88294E-12	0.10768E-07	0.11408E-12
77	0.70785E-12	0.86323E-08	0.91453E-13
78	0.53568E-12	0.65326E-08	0.69209E-13
79	0.36546E-12	0.44568E-08	0.47217E-13
80	0.19693E-12	0.24016E-08	0.25443E-13

```
RMA 93-03 DIMP, 300 years
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .432        -1.   1.94E-07
   80y      100.0
    1    1  4.52E+01
    2    2  9.14E+00
    3    3  1.45E+00
    4    4  2.20E-01
    5    5  5.38E-02
    6    6  3.31E-02
    7    7  2.93E-02
    8    8  2.73E-02
    9    9  2.56E-02
   10   10  2.40E-02
   11   11  2.26E-02
   12   12  2.12E-02
   13   13  1.99E-02
   14   14  1.86E-02
   15   15  1.75E-02
   16   16  1.64E-02
   17   17  1.54E-02
   18   18  1.44E-02
   19   19  1.35E-02
   20   20  1.27E-02
   21   21  1.19E-02
   22   22  1.12E-02
   23   23  1.05E-02
   24   24  9.85E-03
   25   25  9.25E-03
   26   26  8.67E-03
   27   27  8.14E-03
   28   28  7.64E-03
   29   29  7.17E-03
   30   30  6.72E-03
   31   31  6.30E-03
   32   32  5.91E-03
   33   33  5.55E-03
   34   34  5.20E-03
   35   35  4.88E-03
   36   36  4.58E-03
   37   37  4.29E-03
   38   38  4.03E-03
   39   39  3.78E-03
   40   40  3.54E-03
   41   41  3.32E-03
   42   42  3.11E-03
   43   43  2.92E-03
   44   44  2.74E-03
   45   45  2.56E-03
   46   46  2.40E-03
   47   47  2.25E-03
```

48	48	2.11E-03
49	49	1.97E-03
50	50	1.85E-03
51	51	1.73E-03
52	52	1.62E-03
53	53	1.51E-03
54	54	1.41E-03
55	55	1.32E-03
56	56	1.23E-03
57	57	1.15E-03
58	58	1.07E-03
59	59	9.99E-04
60	60	9.29E-04
61	61	8.63E-04
62	62	8.01E-04
63	63	7.42E-04
64	64	6.85E-04
65	65	6.32E-04
66	66	5.81E-04
67	67	5.33E-04
68	68	4.87E-04
69	69	4.42E-04
70	70	4.00E-04
71	71	3.59E-04
72	72	3.20E-04
73	73	2.82E-04
74	74	2.45E-04
75	75	2.09E-04
76	76	1.74E-04
77	77	1.39E-04
78	78	1.05E-04
79	79	7.18E-05
80	80	3.87E-05

Time: 100.000 - DIMP - 300 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.43280E-06	0.52781E-02	0.55918E-07
2	0.12502E-06	0.15246E-02	0.16152E-07
3	0.28248E-07	0.34449E-03	0.36497E-08
4	0.56314E-08	0.68676E-04	0.72758E-09
5	0.13220E-08	0.16123E-04	0.17081E-09
6	0.60392E-09	0.73649E-05	0.78026E-10
7	0.47766E-09	0.58251E-05	0.61713E-10
8	0.43705E-09	0.53299E-05	0.56467E-10
9	0.40885E-09	0.49860E-05	0.52824E-10
10	0.38347E-09	0.46765E-05	0.49544E-10
11	0.36012E-09	0.43917E-05	0.46527E-10
12	0.33801E-09	0.41220E-05	0.43670E-10
13	0.31723E-09	0.38686E-05	0.40986E-10
14	0.29744E-09	0.36273E-05	0.38429E-10
15	0.27921E-09	0.34050E-05	0.36074E-10
16	0.26198E-09	0.31949E-05	0.33848E-10
17	0.24587E-09	0.29985E-05	0.31767E-10
18	0.23056E-09	0.28117E-05	0.29788E-10
19	0.21626E-09	0.26373E-05	0.27940E-10
20	0.20303E-09	0.24760E-05	0.26232E-10
21	0.19050E-09	0.23232E-05	0.24613E-10
22	0.17888E-09	0.21814E-05	0.23111E-10
23	0.16786E-09	0.20470E-05	0.21687E-10
24	0.15750E-09	0.19208E-05	0.20349E-10
25	0.14782E-09	0.18027E-05	0.19098E-10
26	0.13868E-09	0.16912E-05	0.17918E-10
27	0.13014E-09	0.15871E-05	0.16814E-10
28	0.12213E-09	0.14894E-05	0 15779E-10
29	0.11461E-09	0.13976E-05	0 14807E-10
30	0.10751E-09	0.13111E-05	0.13890E-10
31	0.10085E-09	0.12299E-05	0 13030E-10
32	0.94612E-10	0.11538E-05	0.12224E-10
33	0.88785E-10	0.10827E-05	0 11471E-10
34	0.83279E-10	0.10156E-05	0 10760E-10
35	0.78128E-10	0.95279E-06	0 10094E-10
36	0.73302E-10	0.89393E-06	0 94706E-11
37	0.68743E-10	0.83832E-06	0 88815E-11
38	0.64497E-10	0.78655E-06	0 83330E-11
39	0.60502E-10	0.73783E-06	0.78168E-11
40	0.56726E-10	0.69178E-06	0 73290E-11
41	0.53193E-10	0.64870E-06	0 68725E-11
42	0.49868E-10	0.60814E-06	0 64429E-11
43	0.46768E-10	0.57034E-06	0.60424E-11
44	0.43858E-10	0.53485E-06	0 56664E-11
45	0.41084E-10	0.50102E-06	0 53080E-11
46	0.38498E-10	0.46949E-06	0.49739E-11
47	0.36077E-10	0.43997E-06	0 46612E-11
48	0.33808E-10	0.41229E-06	0 43679E-11
49	0.31644E-10	0.38590E-06	0.40884E-11
50	0.29643E-10	0.36150E-06	0 38299E-11
51	0.27746E-10	0.33837E-06	0 35848E-11
52	0.25966E-10	0.31666E-06	0 33548E-11
53	0.24269E-10	0.29596E-06	0 31355E-11

54	0.22677E-10	0.27655E-06	0.29299E-11
55	0.21196E-10	0.25848E-06	0.27385E-11
56	0.19786E-10	0.24129E-06	0.25563E-11
57	0.18469E-10	0.22523E-06	0.23861E-11
58	0.17214E-10	0.20993E-06	0.22240E-11
59	0.16041E-10	0.19563E-06	0.20725E-11
60	0.14927E-10	0.18204E-06	0.19286E-11
61	0.13871E-10	0.16916E-06	0.17921E-11
62	0.12873E-10	0.15699E-06	0.16632E-11
63	0.11926E-10	0.14544E-06	0.15409E-11
64	0.11024E-10	0.13444E-06	0.14243E-11
65	0.10169E-10	0.12402E-06	0.13139E-11
66	0.93551E-11	0.11409E-06	0.12087E-11
67	0.85805E-11	0.10464E-06	0.11086E-11
68	0.78406E-11	0.95617E-07	0.10130E-11
69	0.71288E-11	0.86936E-07	0.92103E-12
70	0.64490E-11	0.78646E-07	0.83320E-12
71	0.57942E-11	0.70661E-07	0.74860E-12
72	0.51643E-11	0.62979E-07	0.66722E-12
73	0.45546E-11	0.55544E-07	0.58846E-12
74	0.39626E-11	0.48325E-07	0.51197E-12
75	0.33864E-11	0.41298E-07	0.43753E-12
76	0.28245E-11	0.34445E-07	0.36492E-12
77	0.22715E-11	0.27701E-07	0.29347E-12
78	0.17285E-11	0.21079E-07	0.22332E-12
79	0.11942E-11	0.14564E-07	0.15429E-12
80	0.66455E-12	0.81043E-08	0.85859E-13

```
RMA 93-03 DIMP, 400 years
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .509        -1.   6.31E-07
   80y      100.0
    1     1  8.50E+01
    2     2  2.46E+01
    3     3  5.55E+00
    4     4  1.11E+00
    5     5  2.60E-01
    6     6  1.19E-01
    7     7  9.39E-02
    8     8  8.59E-02
    9     9  8.03E-02
   10    10  7.54E-02
   11    11  7.08E-02
   12    12  6.64E-02
   13    13  6.23E-02
   14    14  5.84E-02
   15    15  5.49E-02
   16    16  5.15E-02
   17    17  4.83E-02
   18    18  4.53E-02
   19    19  4.25E-02
   20    20  3.99E-02
   21    21  3.74E-02
   22    22  3.51E-02
   23    23  3.30E-02
   24    24  3.09E-02
   25    25  2.90E-02
   26    26  2.72E-02
   27    27  2.56E-02
   28    28  2.40E-02
   29    29  2.25E-02
   30    30  2.11E-02
   31    31  1.98E-02
   32    32  1.86E-02
   33    33  1.74E-02
   34    34  1.64E-02
   35    35  1.54E-02
   36    36  1.44E-02
   37    37  1.35E-02
   38    38  1.27E-02
   39    39  1.19E-02
   40    40  1.11E-02
   41    41  1.05E-02
   42    42  9.80E-03
   43    43  9.19E-03
   44    44  8.62E-03
   45    45  8.07E-03
   46    46  7.56E-03
   47    47  7.09E-03
```

48	48	6.64E-03
49	49	6.22E-03
50	50	5.82E-03
51	51	5.45E-03
52	52	5.10E-03
53	53	4.77E-03
54	54	4.46E-03
55	55	4.16E-03
56	56	3.89E-03
57	57	3.63E-03
58	58	3.38E-03
59	59	3.15E-03
60	60	2.93E-03
61	61	2.73E-03
62	62	2.53E-03
63	63	2.34E-03
64	64	2.17E-03
65	65	2.00E-03
66	66	1.84E-03
67	67	1.69E-03
68	68	1.54E-03
69	69	1.40E-03
70	70	1.27E-03
71	71	1.14E-03
72	72	1.01E-03
73	73	8.95E-04
74	74	7.79E-04
75	75	6.65E-04
76	76	5.55E-04
77	77	4.46E-04
78	78	3.40E-04
79	79	2.35E-04
80	80	1.31E-04

Time: 100.000 - DIMP - 400 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.62641E-06	0.76392E-02	0.80932E-07
2	0.23448E-06	0.28595E-02	0.30295E-07
3	0.69072E-07	0.84234E-03	0.89240E-08
4	0.17430E-07	0.21256E-03	0.22520E-08
5	0.44517E-08	0.54289E-04	0.57516E-09
6	0.16736E-08	0.20410E-04	0.21623E-09
7	0.11151E-08	0.13599E-04	0.14407E-09
8	0.97331E-09	0.11870E-04	0.12575E-09
9	0.90270E-09	0.11009E-04	0.11663E-09
10	0.84604E-09	0.10318E-04	0.10931E-09
11	0.79413E-09	0.96845E-05	0.10260E-09
12	0.74523E-09	0.90882E-05	0.96283E-10
13	0.69936E-09	0.85288E-05	0.90357E-10
14	0.65613E-09	0.80016E-05	0.84772E-10
15	0.61609E-09	0.75133E-05	0.79599E-10
16	0.57826E-09	0.70520E-05	0.74711E-10
17	0.54261E-09	0.66172E-05	0.70105E-10
18	0.50914E-09	0.62090E-05	0.65780E-10
19	0.47777E-09	0.58265E-05	0.61728E-10
20	0.44846E-09	0.54690E-05	0.57940E-10
21	0.42075E-09	0.51311E-05	0.54361E-10
22	0.39485E-09	0.48153E-05	0.51015E-10
23	0.37080E-09	0.45220E-05	0.47907E-10
24	0.34783E-09	0.42418E-05	0.44939E-10
25	0.32638E-09	0.39803E-05	0.42169E-10
26	0.30625E-09	0.37348E-05	0.39568E-10
27	0.28768E-09	0.35083E-05	0.37168E-10
28	0.26998E-09	0.32924E-05	0.34881E-10
29	0.25328E-09	0.30887E-05	0.32723E-10
30	0.23761E-09	0.28977E-05	0.30699E-10
31	0.22296E-09	0.27191E-05	0.28807E-10
32	0.20931E-09	0.25525E-05	0.27042E-10
33	0.19624E-09	0.23932E-05	0.25354E-10
34	0.18436E-09	0.22482E-05	0.23819E-10
35	0.17311E-09	0.21111E-05	0.22365E-10
36	0.16227E-09	0.19789E-05	0.20965E-10
37	0.15216E-09	0.18556E-05	0.19659E-10
38	0.14286E-09	0.17422E-05	0.18458E-10
39	0.13401E-09	0.16343E-05	0.17314E-10
40	0.12547E-09	0.15301E-05	0.16211E-10
41	0.11794E-09	0.14383E-05	0.15238E-10
42	0.11053E-09	0.13480E-05	0.14281E-10
43	0.10362E-09	0.12636E-05	0.13387E-10
44	0.97163E-10	0.11849E-05	0.12553E-10
45	0.91055E-10	0.11104E-05	0.11764E-10
46	0.85325E-10	0.10406E-05	0.11024E-10
47	0.79979E-10	0.97535E-06	0.10333E-10
48	0.74934E-10	0.91383E-06	0.96814E-11
49	0.70194E-10	0.85603E-06	0.90690E-11
50	0.65720E-10	0.80146E-06	0.84910E-11
51	0.61529E-10	0.75035E-06	0.79495E-11
52	0.57584E-10	0.70224E-06	0.74398E-11
53	0.53867E-10	0.65691E-06	0.69596E-11

54	0.50368E-10	0.61425E-06	0.65076E-11
55	0.47044E-10	0.57370E-06	0.60780E-11
56	0.43948E-10	0.53595E-06	0.56780E-11
57	0.41021E-10	0.50025E-06	0.52999E-11
58	0.38238E-10	0.46631E-06	0.49403E-11
59	0.35625E-10	0.43445E-06	0.46028E-11
60	0.33153E-10	0.40430E-06	0.42833E-11
61	0.30841E-10	0.37611E-06	0.39846E-11
62	0.28622E-10	0.34905E-06	0.36979E-11
63	0.26506E-10	0.32324E-06	0.34246E-11
64	0.24533E-10	0.29919E-06	0.31697E-11
65	0.22639E-10	0.27608E-06	0.29249E-11
66	0.20834E-10	0.25408E-06	0.26918E-11
67	0.19124E-10	0.23322E-06	0.24708E-11
68	0.17468E-10	0.21303E-06	0.22569E-11
69	0.15889E-10	0.19377E-06	0.20529E-11
70	0.14393E-10	0.17553E-06	0.18596E-11
71	0.12942E-10	0.15783E-06	0.16721E-11
72	0.11521E-10	0.14050E-06	0.14885E-11
73	0.10180E-10	0.12415E-06	0.13153E-11
74	0.88750E-11	0.10823E-06	0.11466E-11
75	0.75978E-11	0.92656E-07	0.98163E-12
76	0.63540E-11	0.77487E-07	0.82093E-12
77	0.51324E-11	0.62590E-07	0.66310E-12
78	0.39346E-11	0.47983E-07	0.50835E-12
79	0.27524E-11	0.33566E-07	0.35561E-12
80	0.15813E-11	0.19284E-07	0.20430E-12

RMA 93-03 DIMP, 500 years

```
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .561        -1.   1.44E-06
   80y      100.0
    1     1  1.23E+02
    2     2  4.61E+01
    3     3  1.36E+01
    4     4  3.42E+00
    5     5  8.75E-01
    6     6  3.29E-01
    7     7  2.19E-01
    8     8  1.91E-01
    9     9  1.77E-01
   10    10  1.66E-01
   11    11  1.56E-01
   12    12  1.46E-01
   13    13  1.37E-01
   14    14  1.29E-01
   15    15  1.21E-01
   16    16  1.14E-01
   17    17  1.07E-01
   18    18  1.00E-01
   19    19  9.39E-02
   20    20  8.81E-02
   21    21  8.27E-02
   22    22  7.76E-02
   23    23  7.29E-02
   24    24  6.83E-02
   25    25  6.41E-02
   26    26  6.02E-02
   27    27  5.65E-02
   28    28  5.30E-02
   29    29  4.98E-02
   30    30  4.67E-02
   31    31  4.38E-02
   32    32  4.11E-02
   33    33  3.86E-02
   34    34  3.62E-02
   35    35  3.40E-02
   36    36  3.19E-02
   37    37  2.99E-02
   38    38  2.81E-02
   39    39  2.63E-02
   40    40  2.47E-02
   41    41  2.32E-02
   42    42  2.17E-02
   43    43  2.04E-02
   44    44  1.91E-02
   45    45  1.79E-02
   46    46  1.68E-02
   47    47  1.57E-02
```

48	48	1.47E-02
49	49	1.38E-02
50	50	1.29E-02
51	51	1.21E-02
52	52	1.13E-02
53	53	1.06E-02
54	54	9.90E-03
55	55	9.24E-03
56	56	8.64E-03
57	57	8.06E-03
58	58	7.51E-03
59	59	7.00E-03
60	60	6.51E-03
61	61	6.06E-03
62	62	5.62E-03
63	63	5.21E-03
64	64	4.82E-03
65	65	4.45E-03
66	66	4.09E-03
67	67	3.76E-03
68	68	3.43E-03
69	69	3.12E-03
70	70	2.83E-03
71	71	2.54E-03
72	72	2.26E-03
73	73	2.00E-03
74	74	1.74E-03
75	75	1.49E-03
76	76	1.25E-03
77	77	1.01E-03
78	78	7.73E-04
79	79	5.41E-04
80	80	3.11E-04

Time: 100.000 - DIMP - 500 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.79802E-06	0.97319E-02	0.10310E-06
2	0.36176E-06	0.44117E-02	0.46739E-07
3	0.13075E-06	0.15945E-02	0 16893E-07
4	0.40011E-07	0.48794E-03	0.51694E-08
5	0.11553E-07	0.14089E-03	0.14926E-08
6	0.40356E-08	0.49215E-04	0 52140E-09
7	0.22543E-08	0.27491E-04	0.29125E-09
8	0.18118E-08	0.22095E-04	0 23408E-09
9	0.16461E-08	0.20075E-04	0.21268E-09
10	0.15369E-08	0.18743E-04	0 19857E-09
11	0.14424E-08	0.17591E-04	0.18636E-09
12	0.13526E-08	0.16495E-04	0 17476E-09
13	0.12692E-08	0.15477E-04	0.16397E-09
14	0.11928E-08	0.14546E-04	0 15411E-09
15	0.11198E-08	0.13657E-04	0.14468E-09
16	0.10528E-08	0.12839E-04	0 13602E-09
17	0.98874E-09	0.12058E-04	0.12774E-09
18	0.92664E-09	0.11301E-04	0.11972E-09
19	0.86952E-09	0.10604E-04	0.11234E-09
20	0.81606E-09	0.99520E-05	0.10544E-09
21	0.76604E-09	0.93419E-05	0.98972E-10
22	0.71901E-09	0.87684E-05	0.92895E-10
23	0.67514E-09	0.82334E-05	0.87228E-10
24	0.63337E-09	0.77240E-05	0.81831E-10
25	0.59438E-09	0.72486E-05	0.76794E-10
26	0.55804E-09	0.68054E-05	0.72098E-10
27	0.52384E-09	0.63883E-05	0.67680E-10
28	0.49160E-09	0.59952E-05	0 63515E-10
29	0.46161E-09	0.56294E-05	0 59640E-10
30	0.43320E-09	0.52829E-05	0.55969E-10
31	0.40646E-09	0.49568E-05	0.52514E-10
32	0.38143E-09	0.46516E-05	0.49280E-10
33	0.35808E-09	0.43669E-05	0.46264E-10
34	0.33601E-09	0.40977E-05	0 43412E-10
35	0.31543E-09	0.38467E-05	0 40753E-10
36	0.29602E-09	0.36101E-05	0 38246E-10
37	0.27767E-09	0.33862E-05	0.35875E-10
38	0.26068E-09	0.31790E-05	0 33679E-10
39	0.24440E-09	0.29805E-05	0.31577E-10
40	0.22933E-09	0.27968E-05	0.29630E-10
41	0.21528E-09	0.26253E-05	0 27814E-10
42	0.20175E-09	0.24604E-05	0.26066E-10
43	0.18934E-09	0.23091E-05	0.24463E-10
44	0.17751E-09	0.21647E-05	0.22934E-10
45	0.16639E-09	0.20291E-05	0 21497E-10
46	0.15605E-09	0.19031E-05	0.20162E-10
47	0.14613E-09	0.17820E-05	0.18879E-10
48	0.13685E-09	0.16689E-05	0.17681E-10
49	0.12830E-09	0.15646E-05	0 16576E-10
50	0.12011E-09	0.14648E-05	0 15519E-10
51	0.11253E-09	0.13723E-05	0 14539E-10
52	0.10526E-09	0.12837E-05	0 13600E-10
53	0.98568E-10	0.12020E-05	0.12735E-10

54	0.92166E-10	0.11240E-05	0.11908E-10
55	0.86095E-10	0.10499E-05	0.11123E-10
56	0.80445E-10	0.98104E-06	0.10393E-10
57	0.75088E-10	0.91571E-06	0.97014E-11
58	0.70011E-10	0.85379E-06	0.90454E-11
59	0.65244E-10	0.79566E-06	0.84295E-11
60	0.60719E-10	0.74048E-06	0.78449E-11
61	0.56481E-10	0.68879E-06	0.72972E-11
62	0.52430E-10	0.63939E-06	0.67739E-11
63	0.48601E-10	0.59270E-06	0.62793E-11
64	0.44970E-10	0.54842E-06	0.58102E-11
65	0.41522E-10	0.50636E-06	0.53646E-11
66	0.38211E-10	0.46598E-06	0.49368E-11
67	0.35093E-10	0.42797E-06	0.45340E-11
68	0.32075E-10	0.39116E-06	0.41441E-11
69	0.29193E-10	0.35601E-06	0.37717E-11
70	0.26460E-10	0.32268E-06	0.34186E-11
71	0.23800E-10	0.29024E-06	0.30750E-11
72	0.21223E-10	0.25882E-06	0.27420E-11
73	0.18769E-10	0.22889E-06	0.24249E-11
74	0.16373E-10	0.19967E-06	0.21153E-11
75	0.14046E-10	0.17129E-06	0.18147E-11
76	0.11792E-10	0.14380E-06	0.15235E-11
77	0.95713E-11	0.11672E-06	0.12366E-11
78	0.73805E-11	0.90006E-07	0.95355E-12
79	0.52240E-11	0.63708E-07	0.67494E-12
80	0.30897E-11	0.37679E-07	0.39919E-12

```
RMA 93-03 DIMP, 600 years
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .600        -1.   2.72E-06
   80y      100.0
    1    1  1.57E+02
    2    2  7.11E+01
    3    3  2.57E+01
    4    4  7.86E+00
    5    5  2.27E+00
    6    6  7.93E-01
    7    7  4.43E-01
    8    8  3.56E-01
    9    9  3.23E-01
   10   10  3.02E-01
   11   11  2.83E-01
   12   12  2.66E-01
   13   13  2.49E-01
   14   14  2.34E-01
   15   15  2.20E-01
   16   16  2.07E-01
   17   17  1.94E-01
   18   18  1.82E-01
   19   19  1.71E-01
   20   20  1.60E-01
   21   21  1.51E-01
   22   22  1.41E-01
   23   23  1.33E-01
   24   24  1.24E-01
   25   25  1.17E-01
   26   26  1.10E-01
   27   27  1.03E-01
   28   28  9.66E-02
   29   29  9.07E-02
   30   30  8.51E-02
   31   31  7.99E-02
   32   32  7.50E-02
   33   33  7.04E-02
   34   34  6.60E-02
   35   35  6.20E-02
   36   36  5.82E-02
   37   37  5.46E-02
   38   38  5.12E-02
   39   39  4.80E-02
   40   40  4.51E-02
   41   41  4.23E-02
   42   42  3.96E-02
   43   43  3.72E-02
   44   44  3.49E-02
   45   45  3.27E-02
   46   46  3.07E-02
   47   47  2.87E-02
```

48	48	2.69E-02
49	49	2.52E-02
50	50	2.36E-02
51	51	2.21E-02
52	52	2.07E-02
53	53	1.94E-02
54	54	1.81E-02
55	55	1.69E-02
56	56	1.58E-02
57	57	1.48E-02
58	58	1.38E-02
59	59	1.28E-02
60	60	1.19E-02
61	61	1.11E-02
62	62	1.03E-02
63	63	9.55E-03
64	64	8.84E-03
65	65	8.16E-03
66	66	7.51E-03
67	67	6.90E-03
68	68	6.30E-03
69	69	5.74E-03
70	70	5.20E-03
71	71	4.68E-03
72	72	4.17E-03
73	73	3.69E-03
74	74	3.22E-03
75	75	2.76E-03
76	76	2.32E-03
77	77	1.88E-03
78	78	1.45E-03
79	79	1.03E-03
80	80	6.07E-04

Time: 100.000 - DIMP - 600 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.94697E-06	0.11548E-01	0.12235E-06
2	0.49612E-06	0.60503E-02	0.64099E-07
3	0.21045E-06	0.25665E-02	0.27190E-07
4	0.75590E-07	0.92183E-03	0.97661E-08
5	0.24754E-07	0.30188E-03	0.31983E-08
6	0.87053E-08	0.10616E-03	0.11247E-08
7	0.42550E-08	0.51890E-04	0.54974E-09
8	0.30684E-08	0.37420E-04	0.39644E-09
9	0.26834E-08	0.32724E-04	0.34669E-09
10	0.24833E-08	0.30284E-04	0.32084E-09
11	0.23245E-08	0.28348E-04	0.30033E-09
12	0.21826E-08	0.26617E-04	0.28199E-09
13	0.20468E-08	0.24961E-04	0.26445E-09
14	0.19219E-08	0.23437E-04	0.24830E-09
15	0.18058E-08	0.22022E-04	0.23331E-09
16	0.16975E-08	0.20702E-04	0.21932E-09
17	0.15932E-08	0.19429E-04	0.20584E-09
18	0.14951E-08	0.18233E-04	0.19317E-09
19	0.14041E-08	0.17123E-04	0.18141E-09
20	0.13165E-08	0.16054E-04	0.17008E-09
21	0.12383E-08	0.15101E-04	0.15999E-09
22	0.11607E-08	0.14155E-04	0.14996E-09
23	0.10913E-08	0.13309E-04	0.14100E-09
24	0.10221E-08	0.12464E-04	0.13205E-09
25	0.96087E-09	0.11718E-04	0.12414E-09
26	0.90326E-09	0.11015E-04	0.11670E-09
27	0.84733E-09	0.10333E-04	0.10947E-09
28	0.79491E-09	0.96940E-05	0.10270E-09
29	0.74619E-09	0.90999E-05	0.96408E-10
30	0.70037E-09	0.85412E-05	0.90488E-10
31	0.65751E-09	0.80184E-05	0.84950E-10
32	0.61726E-09	0.75275E-05	0.79749E-10
33	0.57944E-09	0.70664E-05	0.74864E-10
34	0.54363E-09	0.66297E-05	0.70237E-10
35	0.51039E-09	0.62243E-05	0.65943E-10
36	0.47915E-09	0.58433E-05	0.61906E-10
37	0.44966E-09	0.54837E-05	0.58096E-10
38	0.42185E-09	0.51446E-05	0.54503E-10
39	0.39568E-09	0.48254E-05	0.51122E-10
40	0.37147E-09	0.45301E-05	0.47993E-10
41	0.34856E-09	0.42507E-05	0.45034E-10
42	0.32671E-09	0.39843E-05	0.42211E-10
43	0.30659E-09	0.37389E-05	0.39612E-10
44	0.28766E-09	0.35081E-05	0.37166E-10
45	0.26970E-09	0.32891E-05	0.34846E-10
46	0.25302E-09	0.30856E-05	0.32690E-10
47	0.23696E-09	0.28898E-05	0.30615E-10
48	0.22203E-09	0.27077E-05	0.28686E-10
49	0.20804E-09	0.25370E-05	0.26878E-10
50	0.19487E-09	0.23764E-05	0.25177E-10
51	0.18250E-09	0.22256E-05	0.23578E-10
52	0.17090E-09	0.20841E-05	0.22080E-10
53	0.16006E-09	0.19519E-05	0.20680E-10

54	0.14959E-09	0.18243E-05	0.19328E-10
55	0.13974E-09	0.17042E-05	0.18054E-10
56	0.13058E-09	0.15924E-05	0.16871E-10
57	0.12211E-09	0.14892E-05	0.15777E-10
58	0.11397E-09	0.13898E-05	0.14724E-10
59	0.10601E-09	0.12928E-05	0.13696E-10
60	0.98581E-10	0.12022E-05	0.12737E-10
61	0.91781E-10	0.11193E-05	0.11858E-10
62	0.85251E-10	0.10396E-05	0.11014E-10
63	0.79052E-10	0.96405E-06	0.10214E-10
64	0.73178E-10	0.89241E-06	0.94545E-11
65	0.67578E-10	0.82412E-06	0.87311E-11
66	0.62232E-10	0.75893E-06	0.80403E-11
67	0.57166E-10	0.69715E-06	0.73858E-11
68	0.52274E-10	0.63749E-06	0.67538E-11
69	0.47626E-10	0.58081E-06	0.61533E-11
70	0.43171E-10	0.52647E-06	0.55776E-11
71	0.38883E-10	0.47419E-06	0.50237E-11
72	0.34717E-10	0.42338E-06	0.44855E-11
73	0.30728E-10	0.37473E-06	0.39701E-11
74	0.26858E-10	0.32753E-06	0.34700E-11
75	0.23080E-10	0.28146E-06	0.29819E-11
76	0.19423E-10	0.23687E-06	0.25095E-11
77	0.15820E-10	0.19292E-06	0.20439E-11
78	0.12279E-10	0.14974E-06	0.15864E-11
79	0.88034E-11	0.10736E-06	0.11374E-11
80	0.53421E-11	0.65148E-07	0.69020E-12

```
RMA 93-03 DIMP, 700 years
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .630        -1.   4.55E-06
   80y      100.0
    1     1  1.86E+02
    2     2  9.75E+01
    3     3  4.14E+01
    4     4  1.49E+01
    5     5  4.86E+00
    6     6  1.71E+00
    7     7  8.36E-01
    8     8  6.03E-01
    9     9  5.27E-01
   10    10  4.88E-01
   11    11  4.57E-01
   12    12  4.29E-01
   13    13  4.02E-01
   14    14  3.78E-01
   15    15  3.55E-01
   16    16  3.34E-01
   17    17  3.13E-01
   18    18  2.94E-01
   19    19  2.76E-01
   20    20  2.59E-01
   21    21  2 43E-01
   22    22  2.28E-01
   23    23  2.14E-01
   24    24  2.01E-01
   25    25  1.89E-01
   26    26  1.77E-01
   27    27  1.66E-01
   28    28  1.56E-01
   29    29  1.47E-01
   30    30  1.38E-01
   31    31  1.29E-01
   32    32  1.21E-01
   33    33  1.14E-01
   34    34  1 07E-01
   35    35  1.00E-01
   36    36  9.42E-02
   37    37  8.84E-02
   38    38  8.29E-02
   39    39  7.78E-02
   40    40  7.30E-02
   41    41  6.85E-02
   42    42  6.42E-02
   43    43  6.02E-02
   44    44  5.65E-02
   45    45  5.30E-02
   46    46  4.97E-02
   47    47  4.66E-02
```

48	48	4.36E-02
49	49	4.09E-02
50	50	3.83E-02
51	51	3.59E-02
52	52	3.36E-02
53	53	3.15E-02
54	54	2.94E-02
55	55	2.75E-02
56	56	2.57E-02
57	57	2.40E-02
58	58	2.24E-02
59	59	2.08E-02
60	60	1.94E-02
61	61	1.80E-02
62	62	1.68E-02
63	63	1.55E-02
64	64	1.44E-02
65	65	1.33E-02
66	66	1.22E-02
67	67	1.12E-02
68	68	1.03E-02
69	69	9.36E-03
70	70	8.48E-03
71	71	7.64E-03
72	72	6.82E-03
73	73	6.04E-03
74	74	5.28E-03
75	75	4.54E-03
76	76	3.82E-03
77	77	3.11E-03
78	78	2.41E-03
79	79	1.73E-03
80	80	1.05E-03

Time: 100.000 - DIMP - 700 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.10721E-05	0.13074E-01	0.13851E-06
2	0.62909E-06	0.76719E-02	0.81278E-07
3	0.30398E-06	0.37071E-02	0.39274E-07
4	0.12497E-06	0.15241E-02	0.16146E-07
5	0.45983E-07	0.56077E-03	0.59410E-08
6	0.16950E-07	0.20671E-03	0.21900E-08
7	0.76761E-08	0.93611E-04	0.99174E-09
8	0.49414E-08	0.60261E-04	0.63842E-09
9	0.40820E-08	0.49781E-04	0.52740E-09
10	0.37115E-08	0.45262E-04	0.47952E-09
11	0.34613E-08	0.42210E-04	0.44719E-09
12	0.32463E-08	0.39589E-04	0.41942E-09
13	0.30450E-08	0.37134E-04	0.39341E-09
14	0.28605E-08	0.34884E-04	0.36957E-09
15	0.26869E-08	0.32767E-04	0.34715E-09
16	0.25258E-08	0.30803E-04	0.32633E-09
17	0.23705E-08	0.28908E-04	0.30626E-09
18	0.22258E-08	0.27144E-04	0.28757E-09
19	0.20900E-08	0.25488E-04	0.27003E-09
20	0.19620E-08	0.23927E-04	0.25349E-09
21	0.18416E-08	0.22459E-04	0.23793E-09
22	0.17285E-08	0.21079E-04	0.22332E-09
23	0.16226E-08	0.19788E-04	0.20964E-09
24	0.15238E-08	0.18583E-04	0.19688E-09
25	0.14320E-08	0.17463E-04	0.18501E-09
26	0.13433E-08	0.16382E-04	0.17356E-09
27	0.12602E-08	0.15369E-04	0.16282E-09
28	0.11836E-08	0.14434E-04	0.15292E-09
29	0.11134E-08	0.13579E-04	0.14386E-09
30	0.10461E-08	0.12757E-04	0.13515E-09
31	0.98022E-09	0.11954E-04	0.12664E-09
32	0.91931E-09	0.11211E-04	0.11877E-09
33	0.86439E-09	0.10541E-04	0.11168E-09
34	0.81190E-09	0.99013E-05	0.10490E-09
35	0.76065E-09	0.92763E-05	0.98276E-10
36	0.71479E-09	0.87170E-05	0.92351E-10
37	0.67123E-09	0.81857E-05	0.86722E-10
38	0.62983E-09	0.76809E-05	0.81374E-10
39	0.59108E-09	0.72083E-05	0.76367E-10
40	0.55469E-09	0.67646E-05	0.71666E-10
41	0.52054E-09	0.63481E-05	0.67254E-10
42	0.48819E-09	0.59536E-05	0.63074E-10
43	0.45786E-09	0.55837E-05	0 59155E-10
44	0.42960E-09	0.52390E-05	0.55504E-10
45	0.40303E-09	0.49150E-05	0.52071E-10
46	0.37799E-09	0.46097E-05	0.48837E-10
47	0.35445E-09	0.43225E-05	0.45795E-10
48	0.33199E-09	0.40487E-05	0.42893E-10
49	0.31122E-09	0.37954E-05	0.40209E-10
50	0.29158E-09	0.35558E-05	0 37672E-10
51	0.27321E-09	0.33319E-05	0.35299E-10
52	0.25582E-09	0.31198E-05	0 33052E-10
53	0.23964E-09	0.29224E-05	0.30961E-10

54	0.22402E-09	0.27319E-05	0.28943E-10
55	0.20946E-09	0.25544E-05	0.27062E-10
56	0.19577E-09	0.23874E-05	0.25293E-10
57	0.18284E-09	0.22298E-05	0.23623E-10
58	0.17065E-09	0.20811E-05	0.22048E-10
59	0.15882E-09	0.19368E-05	0.20520E-10
60	0.14795E-09	0.18042E-05	0.19114E-10
61	0.13749E-09	0.16767E-05	0.17764E-10
62	0.12798E-09	0.15608E-05	0.16535E-10
63	0.11850E-09	0.14452E-05	0.15311E-10
64	0.10983E-09	0.13394E-05	0.14190E-10
65	0.10152E-09	0.12380E-05	0.13116E-10
66	0.93366E-10	0.11386E-05	0.12063E-10
67	0.85704E-10	0.10452E-05	0.11073E-10
68	0.78634E-10	0.95895E-06	0.10159E-10
69	0.71649E-10	0.87377E-06	0.92570E-11
70	0.64950E-10	0.79207E-06	0.83915E-11
71	0.58543E-10	0.71394E-06	0.75638E-11
72	0.52340E-10	0.63830E-06	0.67623E-11
73	0.46381E-10	0.56562E-06	0.59924E-11
74	0.40604E-10	0.49517E-06	0.52460E-11
75	0.34981E-10	0.42660E-06	0.45195E-11
76	0.29502E-10	0.35978E-06	0.38117E-11
77	0.24123E-10	0.29418E-06	0.31167E-11
78	0.18825E-10	0.22957E-06	0.24322E-11
79	0.13636E-10	0.16629E-06	0.17617E-11
80	0.84867E-11	0.10350E-06	0.10965E-11

```
RMA 93-03 DIMP, 800 years
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .655        -1.   7.00E-06
   80y      100.0
    1     1  2.11E+02
    2     2  1.24E+02
    3     3  5.97E+01
    4     4  2.46E+01
    5     5  9.04E+00
    6     6  3.33E+00
    7     7  1.51E+00
    8     8  9.71E-01
    9     9  8.02E-01
   10    10  7.29E-01
   11    11  6.80E-01
   12    12  6.38E-01
   13    13  5.98E-01
   14    14  5.62E-01
   15    15  5.28E-01
   16    16  4.96E-01
   17    17  4.66E-01
   18    18  4.37E-01
   19    19  4.11E-01
   20    20  3.86E-01
   21    21  3.62E-01
   22    22  3.40E-01
   23    23  3.19E-01
   24    24  2.99E-01
   25    25  2.81E-01
   26    26  2.64E-01
   27    27  2.48E-01
   28    28  2.33E-01
   29    29  2.19E-01
   30    30  2.06E-01
   31    31  1.93E-01
   32    32  1.81E-01
   33    33  1.70E-01
   34    34  1.60E-01
   35    35  1.49E-01
   36    36  1.40E-01
   37    37  1.32E-01
   38    38  1.24E-01
   39    39  1.16E-01
   40    40  1.09E-01
   41    41  1.02E-01
   42    42  9.59E-02
   43    43  9.00E-02
   44    44  8.44E-02
   45    45  7.92E-02
   46    46  7.43E-02
   47    47  6.96E-02
```

48	48	6.52E-02
49	49	6.12E-02
50	50	5.73E-02
51	51	5.37E-02
52	52	5.03E-02
53	53	4.71E-02
54	54	4.40E-02
55	55	4.12E-02
56	56	3.85E-02
57	57	3.59E-02
58	58	3.35E-02
59	59	3.12E-02
60	60	2.91E-02
61	61	2.70E-02
62	62	2.51E-02
63	63	2.33E-02
64	64	2.16E-02
65	65	1.99E-02
66	66	1.83E-02
67	67	1.68E-02
68	68	1.55E-02
69	69	1.41E-02
70	70	1.28E-02
71	71	1.15E-02
72	72	1.03E-02
73	73	9.11E-03
74	74	7.98E-03
75	75	6.87E-03
76	76	5.80E-03
77	77	4.74E-03
78	78	3.70E-03
79	79	2.68E-03
80	80	1.67E-03

Time: 100.000 - DIMP - 800 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.11794E-05	0.14383E-01	0.15238E-06
2	0.75741E-06	0.92367E-02	0.97857E-07
3	0.40640E-06	0.49560E-02	0 52506E-07
4	0.18703E-06	0.22808E-02	0.24164E-07
5	0.76553E-07	0.93358E-03	0.98906E-08
6	0.30128E-07	0.36741E-03	0.38925E-08
7	0.13283E-07	0.16199E-03	0.17162E-08
8	0.77532E-08	0.94552E-04	0.10017E-08
9	0.59593E-08	0.72675E-04	0.76994E-09
10	0.52639E-08	0.64194E-04	0.68010E-09
11	0.48686E-08	0.59373E-04	0.62902E-09
12	0.45581E-08	0.55587E-04	0.58890E-09
13	0.42747E-08	0.52131E-04	0.55229E-09
14	0.40149E-08	0.48962E-04	0.51872E-09
15	0.37720E-08	0.46000E-04	0.48734E-09
16	0.35436E-08	0.43214E-04	0.45783E-09
17	0.33292E-08	0.40600E-04	0.43013E-09
18	0.31248E-08	0.38108E-04	0.40372E-09
19	0.29365E-08	0.35811E-04	0.37939E-09
20	0.27587E-08	0.33642E-04	0.35642E-09
21	0.25893E-08	0.31577E-04	0.33454E-09
22	0.24315E-08	0.29653E-04	0.31415E-09
23	0.22826E-08	0.27836E-04	0.29491E-09
24	0.21414E-08	0.26114E-04	0.27666E-09
25	0.20112E-08	0.24527E-04	0.25985E-09
26	0.18895E-08	0.23043E-04	0.24412E-09
27	0.17750E-08	0.21647E-04	0.22933E-09
28	0.16676E-08	0.20336E-04	0.21545E-09
29	0.15670E-08	0.19110E-04	0.20245E-09
30	0.14732E-08	0.17965E-04	0.19033E-09
31	0.13823E-08	0.16857E-04	0.17859E-09
32	0.12968E-08	0.15815E-04	0.16755E-09
33	0.12177E-08	0.14849E-04	0.15732E-09
34	0.11448E-08	0.13961E-04	0.14791E-09
35	0.10709E-08	0.13060E-04	0.13836E-09
36	0.10046E-08	0.12251E-04	0.12980E-09
37	0.94523E-09	0.11527E-04	0.12212E-09
38	0.88839E-09	0.10834E-04	0.11478E-09
39	0.83275E-09	0.10155E-04	0.10759E-09
40	0.78172E-09	0.95332E-05	0.10100E-09
41	0.73272E-09	0.89356E-05	0.94667E-10
42	0.68802E-09	0.83905E-05	0.88891E-10
43	0.64586E-09	0.78764E-05	0.83445E-10
44	0.60592E-09	0.73893E-05	0.78285E-10
45	0.56852E-09	0.69332E-05	0.73453E-10
46	0.53338E-09	0.65046E-05	0.68912E-10
47	0.49998E-09	0.60973E-05	0.64597E-10
48	0.46854E-09	0.57138E-05	0.60534E-10
49	0.43947E-09	0.53593E-05	0.56779E-10
50	0.41177E-09	0.50216E-05	0.53201E-10
51	0.38583E-09	0.47052E-05	0.49849E-10
52	0.36142E-09	0.44076E-05	0.46696E-10
53	0.33844E-09	0.41273E-05	0.43726E-10

54	0.31647E-09	0.38594E-05	0.40888E-10
55	0.29611E-09	0.36111E-05	0.38258E-10
56	0.27682E-09	0.33758E-05	0.35765E-10
57	0.25837E-09	0.31509E-05	0.33381E-10
58	0.24108E-09	0.29401E-05	0.31148E-10
59	0.22468E-09	0.27400E-05	0.29029E-10
60	0.20942E-09	0.25539E-05	0.27057E-10
61	0.19464E-09	0.23737E-05	0.25148E-10
62	0.18085E-09	0.22055E-05	0.23366E-10
63	0.16787E-09	0.20471E-05	0.21688E-10
64	0.15558E-09	0.18974E-05	0.20101E-10
65	0.14361E-09	0.17514E-05	0.18555E-10
66	0.13219E-09	0.16121E-05	0.17079E-10
67	0.12140E-09	0.14804E-05	0.15684E-10
68	0.11160E-09	0.13610E-05	0.14419E-10
69	0.10182E-09	0.12417E-05	0.13155E-10
70	0.92432E-10	0.11272E-05	0.11942E-10
71	0.83251E-10	0.10153E-05	0.10756E-10
72	0.74545E-10	0.90908E-06	0.96311E-11
73	0.66073E-10	0.80577E-06	0.85366E-11
74	0.57923E-10	0.70638E-06	0.74836E-11
75	0.49981E-10	0.60952E-06	0.64575E-11
76	0.42273E-10	0.51553E-06	0.54617E-11
77	0.34698E-10	0.42314E-06	0.44829E-11
78	0.27250E-10	0.33232E-06	0.35207E-11
79	0.19929E-10	0.24304E-06	0.25748E-11
80	0.12690E-10	0.15476E-06	0.16396E-11

```
RMA 93-03 DIMP, 900 years
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057        1.6       0.40        .25       .005
      .675        -1.   1.02E-06
   80y      100.0
    1     1  2.32E+02
    2     2  1.49E+02
    3     3  7.99E+01
    4     4  3.68E+01
    5     5  1.50E+01
    6     6  5.92E+00
    7     7  2.61E+00
    8     8  1.52E+00
    9     9  1.17E+00
   10    10  1.03E+00
   11    11  9.57E-01
   12    12  8.96E-01
   13    13  8.40E-01
   14    14  7.89E-01
   15    15  7.41E-01
   16    16  6.96E-01
   17    17  6.54E-01
   18    18  6.14E-01
   19    19  5.77E-01
   20    20  5.42E-01
   21    21  5.09E-01
   22    22  4.78E-01
   23    23  4.49E-01
   24    24  4.21E-01
   25    25  3.95E-01
   26    26  3.71E-01
   27    27  3.49E-01
   28    28  3.28E-01
   29    29  3.08E-01
   30    30  2.89E-01
   31    31  2.72E-01
   32    32  2.55E-01
   33    33  2.39E-01
   34    34  2.25E-01
   35    35  2.10E-01
   36    36  1.97E-01
   37    37  1.86E-01
   38    38  1.75E-01
   39    39  1.64E-01
   40    40  1.54E-01
   41    41  1.44E-01
   42    42  1.35E-01
   43    43  1.27E-01
   44    44  1.19E-01
   45    45  1.12E-01
   46    46  1.05E-01
   47    47  9.82E-02
```

48	48	9.21E-02
49	49	8.64E-02
50	50	8.09E-02
51	51	7.58E-02
52	52	7.10E-02
53	53	6.65E-02
54	54	6.22E-02
55	55	5.82E-02
56	56	5.44E-02
57	57	5.08E-02
58	58	4.74E-02
59	59	4.41E-02
60	60	4.12E-02
61	61	3.82E-02
62	62	3.55E-02
63	63	3.30E-02
64	64	3.06E-02
65	65	2.82E-02
66	66	2.60E-02
67	67	2.39E-02
68	68	2.19E-02
69	69	2.00E-02
70	70	1.82E-02
71	71	1.64E-02
72	72	1.46E-02
73	73	1.30E-02
74	74	1.14E-02
75	75	9.82E-03
76	76	8.31E-03
77	77	6.82E-03
78	78	5.35E-03
79	79	3.92E-03
80	80	2.49E-03

Time: 100.000 - DIMP - 900 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.12690E-05	0.15476E-01	0.16396E-06
2	0.87522E-06	0.10673E-01	0.11308E-06
3	0.51330E-06	0.62598E-02	0.66318E-07
4	0.26007E-06	0.31716E-02	0.33601E-07
5	0.11681E-06	0.14246E-02	0.15092E-07
6	0.49381E-07	0.60221E-03	0.63800E-08
7	0.21936E-07	0.26752E-03	0.28342E-08
8	0.11935E-07	0.14554E-03	0.15419E-08
9	0.84900E-08	0.10354E-03	0.10969E-08
10	0.71928E-08	0.87717E-04	0.92930E-09
11	0.65712E-08	0.80136E-04	0.84899E-09
12	0.61316E-08	0.74776E-04	0.79220E-09
13	0.57473E-08	0.70088E-04	0.74254E-09
14	0.53963E-08	0.65809E-04	0.69720E-09
15	0.50686E-08	0.61812E-04	0.65486E-09
16	0.47613E-08	0.58064E-04	0.61516E-09
17	0.44737E-08	0.54557E-04	0.57800E-09
18	0.42018E-08	0.51241E-04	0.54287E-09
19	0.39479E-08	0.48145E-04	0.51007E-09
20	0.37090E-08	0.45232E-04	0.47920E-09
21	0.34840E-08	0.42488E-04	0.45013E-09
22	0.32724E-08	0.39907E-04	0.42279E-09
23	0.30740E-08	0.37488E-04	0.39716E-09
24	0.28850E-08	0.35183E-04	0.37274E-09
25	0.27076E-08	0.33020E-04	0.34983E-09
26	0.25428E-08	0.31010E-04	0.32853E-09
27	0.23905E-08	0.29152E-04	0.30885E-09
28	0.22468E-08	0.27400E-04	0.29029E-09
29	0.21106E-08	0.25739E-04	0.27269E-09
30	0.19814E-08	0.24164E-04	0.25600E-09
31	0.18629E-08	0.22719E-04	0.24069E-09
32	0.17487E-08	0.21326E-04	0.22593E-09
33	0.16403E-08	0.20003E-04	0.21192E-09
34	0.15420E-08	0.18804E-04	0.19922E-09
35	0.14440E-08	0.17609E-04	0.18656E-09
36	0.13540E-08	0.16512E-04	0.17493E-09
37	0.12748E-08	0.15546E-04	0 16470E-09
38	0.11995E-08	0.14628E-04	0.15497E-09
39	0.11257E-08	0.13728E-04	0.14544E-09
40	0.10568E-08	0.12888E-04	0.13654E-09
41	0.99009E-09	0.12074E-04	0.12792E-09
42	0.92819E-09	0.11319E-04	0.11992E-09
43	0.87202E-09	0.10634E-04	0.11266E-09
44	0.81805E-09	0.99762E-05	0 10569E-09
45	0.76874E-09	0.93749E-05	0 99321E-10
46	0.72136E-09	0.87971E-05	0.93200E-10
47	0.67561E-09	0.82392E-05	0.87288E-10
48	0.63334E-09	0.77236E-05	0.81827E-10
49	0.59400E-09	0.72438E-05	0 76744E-10
50	0.55656E-09	0.67873E-05	0.71907E-10
51	0.52146E-09	0.63593E-05	0 67372E-10
52	0.48847E-09	0.59570E-05	0.63111E-10
53	0.45749E-09	0.55792E-05	0 59107E-10

54	0.42810E-09	0.52207E-05	0.55310E-10
55	0.40052E-09	0.48844E-05	0.51747E-10
56	0.37445E-09	0.45665E-05	0.48379E-10
57	0.34978E-09	0.42656E-05	0.45191E-10
58	0.32645E-09	0.39811E-05	0.42178E-10
59	0.30409E-09	0.37084E-05	0.39288E-10
60	0.28364E-09	0.34591E-05	0.36646E-10
61	0.26359E-09	0.32145E-05	0.34056E-10
62	0.24486E-09	0.29861E-05	0.31636E-10
63	0.22744E-09	0.27736E-05	0.29385E-10
64	0.21089E-09	0.25718E-05	0.27246E-10
65	0.19470E-09	0.23744E-05	0.25155E-10
66	0.17946E-09	0.21885E-05	0.23186E-10
67	0.16499E-09	0.20121E-05	0.21317E-10
68	0.15120E-09	0.18440E-05	0.19536E-10
69	0.13807E-09	0.16838E-05	0.17838E-10
70	0.12557E-09	0.15313E-05	0.16223E-10
71	0.11332E-09	0.13820E-05	0.14641E-10
72	0.10121E-09	0.12342E-05	0.13076E-10
73	0.89923E-10	0.10966E-05	0.11618E-10
74	0.78954E-10	0.96286E-06	0.10201E-10
75	0.68169E-10	0.83133E-06	0.88074E-11
76	0.57731E-10	0.70404E-06	0.74588E-11
77	0.47503E-10	0.57930E-06	0.61373E-11
78	0.37426E-10	0.45641E-06	0.48354E-11
79	0.27555E-10	0.33604E-06	0.35601E-11
80	0.17755E-10	0.21653E-06	0.22940E-11

```
RMA 93-03 DIMP, 1000 years
  1
       0.1       100.        50.       100.
      60.0    .000082     22000.       0.52
Polygon I
        1.       0.25     .00057       1.6       0.40        .25       .005
      .693        -1.   1.40E-06
   80y      100.0
    1     1  2.49E+02
    2     2  1.72E+02
    3     3  1.01E+02
    4     4  5.11E+01
    5     5  2.30E+01
    6     6  9.70E+00
    7     7  4.31E+00
    8     8  2.35E+00
    9     9  1.67E+00
   10    10  1.41E+00
   11    11  1.29E+00
   12    12  1.20E+00
   13    13  1.13E+00
   14    14  1.06E+00
   15    15  9.96E-01
   16    16  9.36E-01
   17    17  8.79E-01
   18    18  8.26E-01
   19    19  7.76E-01
   20    20  7.29E-01
   21    21  6.85E-01
   22    22  6.43E-01
   23    23  6.04E-01
   24    24  5.67E-01
   25    25  5.32E-01
   26    26  5.00E-01
   27    27  4.70E-01
   28    28  4.41E-01
   29    29  4.15E-01
   30    30  3.89E-01
   31    31  3 66E-01
   32    32  3.44E-01
   33    33  3.22E-01
   34    34  3.03E-01
   35    35  2.84E-01
   36    36  2.66E-01
   37    37  2.50E-01
   38    38  2.36E-01
   39    39  2.21E-01
   40    40  2.08E-01
   41    41  1.95E-01
   42    42  1.82E-01
   43    43  1.71E-01
   44    44  1.61E-01
   45    45  1.51E-01
   46    46  1.42E-01
   47    47  1.33E-01
```

48	48	1.24E-01
49	49	1.17E-01
50	50	1.09E-01
51	51	1.02E-01
52	52	9.60E-02
53	53	8.99E-02
54	54	8.41E-02
55	55	7.87E-02
56	56	7.36E-02
57	57	6.87E-02
58	58	6.41E-02
59	59	5.98E-02
60	60	5.57E-02
61	61	5.18E-02
62	62	4.81E-02
63	63	4.47E-02
64	64	4.14E-02
65	65	3.83E-02
66	66	3.53E-02
67	67	3.24E-02
68	68	2.97E-02
69	69	2.71E-02
70	70	2.47E-02
71	71	2.23E-02
72	72	1.99E-02
73	73	1.77E-02
74	74	1.55E-02
75	75	1.34E-02
76	76	1.13E-02
77	77	9.33E-03
78	78	7.35E-03
79	79	5.41E-03
80	80	3.49E-03

Time: 100.000 - DTMP - 1000 Years

Cell	Cgas(g/cu.ft)	Cliq(g/cu.ft)	Csol(g/g)
1	0.13428E-05	0.16375E-01	0.17349E-06
2	0.98094E-06	0.11963E-01	0.12674E-06
3	0.62048E-06	0.75669E-02	0.80166E-07
4	0.34140E-06	0.41634E-02	0.44109E-07
5	0.16707E-06	0.20374E-02	0.21585E-07
6	0.75720E-07	0.92341E-03	0.97830E-08
7	0.34559E-07	0.42145E-03	0.44649E-08
8	0.18091E-07	0.22062E-03	0.23374E-08
9	0.11964E-07	0.14591E-03	0.15458E-08
10	0.96313E-08	0.11745E-03	0.12444E-08
11	0.86047E-08	0.10494E-03	0.11117E-08
12	0.79602E-08	0.97076E-04	0.10285E-08
13	0.74652E-08	0.91039E-04	0.96450E-09
14	0.70083E-08	0.85467E-04	0.90547E-09
15	0.65839E-08	0.80291E-04	0.85063E-09
16	0.61871E-08	0.75452E-04	0.79937E-09
17	0.58124E-08	0.70883E-04	0.75096E-09
18	0.54616E-08	0.66605E-04	0.70564E-09
19	0.51318E-08	0.62583E-04	0.66303E-09
20	0.48217E-08	0.58801E-04	0.62296E-09
21	0.45308E-08	0.55254E-04	0.58537E-09
22	0.42552E-08	0.51893E-04	0.54977E-09
23	0.39972E-08	0.48746E-04	0.51643E-09
24	0.37538E-08	0.45779E-04	0.48499E-09
25	0.35240E-08	0.42975E-04	0.45530E-09
26	0.33109E-08	0.40377E-04	0.42777E-09
27	0.31119E-08	0.37950E-04	0.40205E-09
28	0.29221E-08	0.35635E-04	0.37753E-09
29	0.27474E-08	0.33505E-04	0.35496E-09
30	0.25788E-08	0.31449E-04	0.33318E-09
31	0.24240E-08	0.29561E-04	0.31318E-09
32	0.22785E-08	0.27786E-04	0.29438E-09
33	0.21366E-08	0.26056E-04	0.27605E-09
34	0.20079E-08	0.24486E-04	0.25942E-09
35	0.18844E-08	0.22980E-04	0.24346E-09
36	0.17667E-08	0.21545E-04	0.22826E-09
37	0.16591E-08	0.20233E-04	0.21436E-09
38	0.15628E-08	0.19058E-04	0.20191E-09
39	0.14669E-08	0.17888E-04	0.18952E-09
40	0.13788E-08	0.16814E-04	0.17814E-09
41	0.12941E-08	0.15781E-04	0.16719E-09
42	0.12108E-08	0.14766E-04	0.15644E-09
43	0.11360E-08	0.13854E-04	0.14678E-09
44	0.10682E-08	0.13027E-04	0.13801E-09
45	0.10028E-08	0.12229E-04	0.12956E-09
46	0.94219E-09	0.11490E-04	0.12173E-09
47	0.88356E-09	0.10775E-04	0.11416E-09
48	0.82589E-09	0.10072E-04	0.10670E-09
49	0.77630E-09	0.94671E-05	0.10030E-09
50	0.72602E-09	0.88539E-05	0.93801E-10
51	0.67926E-09	0.82837E-05	0.87760E-10
52	0.63777E-09	0.77777E-05	0.82400E-10
53	0.59779E-09	0.72901E-05	0.77234E-10

54	0.55951E-09	0.68234E-05	0.72289E-10
55	0.52355E-09	0.63847E-05	0.67642E-10
56	0.48965E-09	0.59714E-05	0.63263E-10
57	0.45735E-09	0.55774E-05	0.59089E-10
58	0.42683E-09	0.52053E-05	0.55147E-10
59	0.39818E-09	0.48559E-05	0.51445E-10
60	0.37102E-09	0.45246E-05	0.47935E-10
61	0.34520E-09	0.42098E-05	0.44600E-10
62	0.32070E-09	0.39110E-05	0.41434E-10
63	0.29784E-09	0.36322E-05	0.38481E-10
64	0.27600E-09	0.33659E-05	0.35659E-10
65	0.25531E-09	0.31135E-05	0.32985E-10
66	0.23546E-09	0.28714E-05	0.30421E-10
67	0.21633E-09	0.26382E-05	0.27950E-10
68	0.19827E-09	0.24179E-05	0.25616E-10
69	0.18099E-09	0.22072E-05	0.23383E-10
70	0.16475E-09	0.20092E-05	0.21286E-10
71	0.14891E-09	0.18160E-05	0.19239E-10
72	0.13323E-09	0.16248E-05	0.17214E-10
73	0.11841E-09	0.14440E-05	0.15298E-10
74	0.10391E-09	0.12672E-05	0.13426E-10
75	0.89908E-10	0.10964E-05	0.11616E-10
76	0.76094E-10	0.92798E-06	0.98313E-11
77	0.62837E-10	0.76630E-06	0.81185E-11
78	0.49743E-10	0.60662E-06	0.64267E-11
79	0.36845E-10	0.44932E-06	0.47603E-11
80	0.24091E-10	0.29380E-06	0.31126E-11

WIND EROSION CALCULATION SUPPORTING INFORMATION

Exhibit 502.61(a)

Wind Erodibility Groups
and Soil Erodibility Index

Predominant Soil Texture Class of Surface Layer	Wind Erodibility Group (WEG)	Soil Erodibility Index (I) (T/Ac/Yr)1/
Very fine sand, fine sand, sand, or coarse sand.	1	310 2/ 250 220 180 160
Loamy very fine sand, loamy fine sand, loamy sand, loamy coarse sand, or sapric organic soil materials.	2	134
Very fine sandy loam, fine sandy loam, sandy loam, or coarse sandy loam.	3	86
Clay, silty clay, noncalcareous clay loam, or silty clay loam with more than 35 percent clay.	4	86
Calcareous loam and silt loam, or calcareous clay loam and silty clay loam.	4L	86
Noncalcareous loam and silt loam with less than 20 percent clay, or sandy clay loam, sandy clay, and hemic organic soil materials.	5	56
Noncalcareous loam and silt loam with more than 20 percent clay, or non-calcareous clay loam with less than 35 percent clay.	6	48
Silt, noncalcareous silty clay loam with less than 35 percent clay, and fibric organic soil material.	7	38
Soils not susceptible to wind erosion due to coarse surface fragments or wetness.	8	—

1/ The soil erodibility index is based on the relationship of dry soil aggregates greater than .84 mm to potential soil erosion. See exhibit 502.61(b).
2/ The "I" factors for WEG 1 vary from 160 for coarse sands to 310 for very fine sands. Use an I of 220 as an average figure. For coarse sand with gravel, use a low figure. For no gravel and very fine sand, use a higher figure.

Table A-2. VALUES OF K, L AND V FOR COMMON FIELD CROPS

Crop	K	L,ft.	V,lb/acre	o
Alfalfa	1.0	1000	3000	×
Barley	0.6	2000	1100	×
Beans	0.5	1000	250	
Corn	0.6	2000	500	
Cotton	0.5	2000	250	
Grain Hays	0.8	2000	1250	×
Oats	0.8	2000	1250	×
Peanuts	0.6	1000	250	
Potatoes	0.8	1000	400	
Rice	0.8	1000	1000	
Rye	0.6	2000	1250	×
Safflower	1.0	2000	1500	×
Sorghum	0.5	2000	900	
Soybeans	0.6	2000	250	
Sugar Beets	0.6	1000	100	
Vegetables	0.6	500	100	
Wheat	0.6	2000	1350	×

SOURCE: "DEVELOPMENT OF EMISSION FACTORS FOR FUGITIVE DUST SOURCES" EPA-450/3-74-037 JUNE, 1974

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

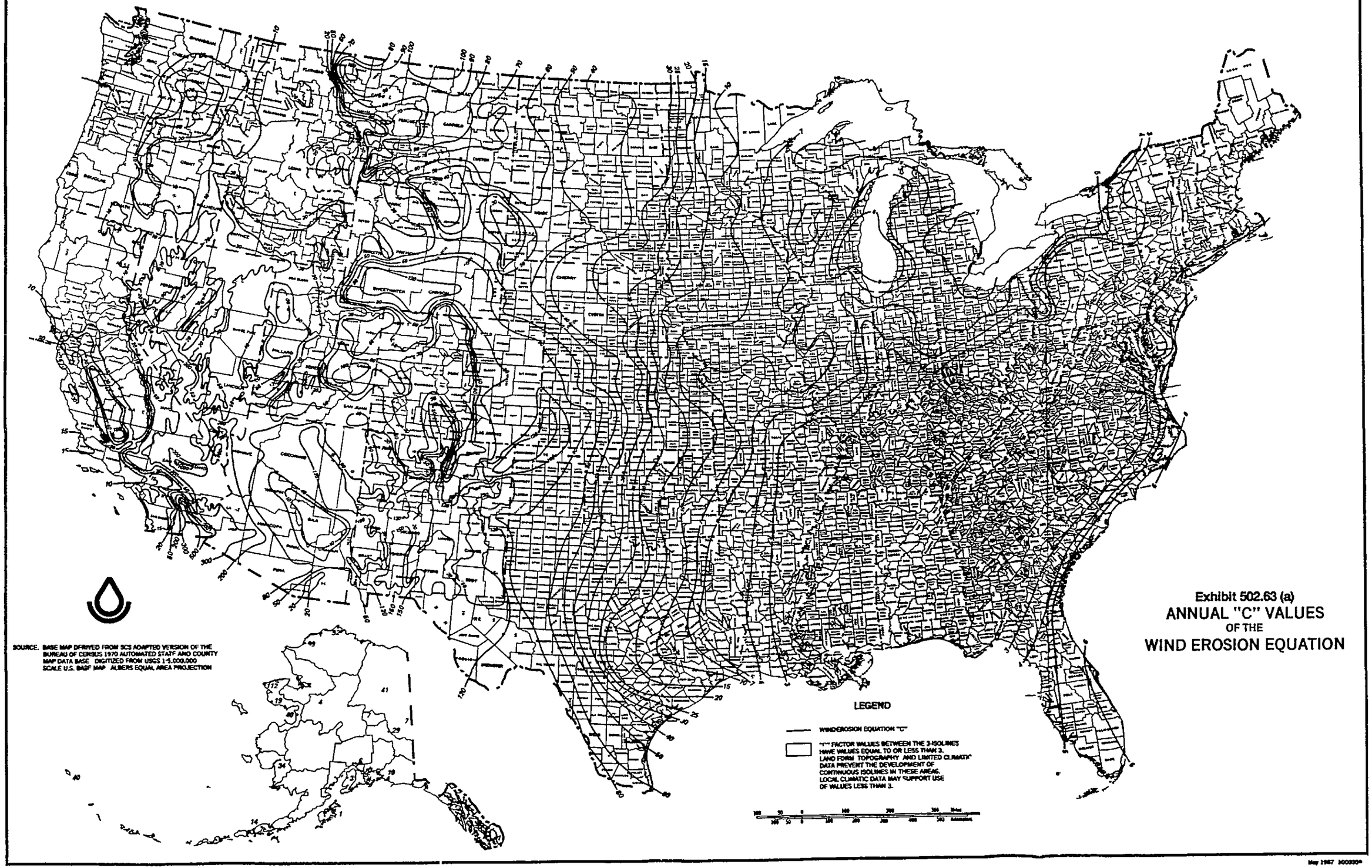

Exhibit 502.63 (a)

ANNUAL "C" VALUES

OF THE

WIND EROSION EQUATION

May 1987

GULLY EROSION CALCULATIONS AND RUSLE RESULTS

Harding Lawson Associates
Engineering and
Environmental Services

SHEET 1 OF 4
JOB NO 21907-702010
DATE 1-10-96
COMPUTED BY SES
CHECKED BY ECA

PROJECT RMA 9303 CAMU D.D.
SUBJECT GULLY EROSION - COVER SIDE SLOPES

OBJECTIVE: TO DETERMINE THE REQUIRED PARTICLE DIAMETER (D_{50}) TO RESIST GULLY EROSION ON THE SIDE SLOPES OF THE FINAL COVER.

ASSUMPTIONS. 1) 200' LONG TO P SLOPE
2) 100' LONG SIDE SLOPE

REFERENCES: 1. PRECIPITATION-FREQUENCY ATLAS OF THE WESTERN U.S, VOL. III - COLORADO. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) ATLAS 2.

2. FINAL STAFF TECHNICAL POSITION DESIGN OF EROSION PROTECTION COVERS FOR STABILIZATION OF URANIUM MILL TAILINGS SITES, AUG. 1990. U.S. NUCLEAR REGULATORY COMMISSION

3. METHODOLOGIES FOR EVALUATING LONG-TERM STABILIZATION DESIGNS OF URANIUM MILL TAILINGS IMPOUNDMENTS JUNE 1986, U.S. NUCLEAR REGULATORY COMMISSION.

DETERMINE RAINFALL INTENSITY:

FROM NOAA ATLAS NO. 2 (Ref. 1)

$X_{24} \Rightarrow$ 100 yr, 24 hr. = 5 in

$X_6 \Rightarrow$ 100 yr., 6 hr = 3.6 in.

$X_1 \Rightarrow$ 100 yr., 1 hr. $\Rightarrow y_{100} = 1.897 + 0.439\left[X_6\left(\frac{X_6}{X_{24}}\right)\right] - 0.008Z$

WHERE Z - ELEVATION IN HUNDREDS OF FEET
ASSUME FORMA Z = 52.80

$$X_1 = 1.897 + 0.439\left[3.6\left(\frac{3.6}{5}\right)\right] - 0.008(52.80) = 2.6''$$

USE % 1 hr FROM NRC/CR-4620 (REF. 3) THEN CONVERT TO INTENSITY:

$$i = P_t\left(\frac{60}{t}\right)$$

time (t) (minutes)	% of 1 Hr PRECIP.	PRECIP (P_t) For t (in.)	INTENSITY (TIME (t)) (in/hr.)
2.5	27.5	0.72	17.28
5	45	1.17	14.04
10	62	1.61	9.66
15	74	1.92	7.68
20	82	2.13	6.40
30	89	2.31	4.62
45	95	2.47	3.29
60	100	2.6	2.60

for time t_c = 2.5 min i = 17.28 in/hr.

DETERMINE THE DRAINAGE AREA FOR AN ASSUMED SIDE SLOPE SITUATION (IN ACRES) FOR A UNIT WIDTH OF 1'.

$$A_{TOPSLOPE} = \frac{200'(1')}{43560\ ft^2/ac.} = 0.00459\ Ac.$$

$$A_{SIDESLOPE} = \frac{100'(1')}{43560\ ft^2/ac} = 0.00230\ Ac.$$

CALCULATE THE TIME OF CONSENTRATION USING THE KIRPICH METHOD: (REF. 2)

$$t_c = \left[\frac{11.9L^3}{H}\right]^{0.385}$$

L in miles
H in feet

$$t_{c_{TOP}} = \left[\frac{11.9\ (0.038)^3}{10'}\right]^{0.385}$$

$L = 200/5280 = 0.038\ mi$
$H = 0.05 \times 200 = 10'$

$= 0.0245\ hr. = 1.47\ min.$

$$t_{c_{SIDE}} = \left[\frac{11.9\ (0.0189)^3}{20}\right]^{0.385}$$

$L = \frac{100}{5280} = 0.0189\ mi$
$H = 100(.2) = 20'$

$= 0.00837\ hr = 0.50\ min$

TOTAL $T_c = 1.47 + 0.50 = 1.97\ min$

$\boxed{\text{USE 2.5 minutes minimum}}$

Harding Lawson Associates
Engineering and
Environmental Services

SHEET 4 OF 4
JOB NO 21907-708010
DATE 1-10-96
COMPUTED BY SES
CHECKED BY EGA

PROJECT RMA9503 CAMU D.D.
SUBJECT GULLY EROSION - COVER SIDE SLOPES

DETERMINE PEAK FLOW RATE USING THE RATIONAL FORMULA:

$$Q = CiA$$

ASSUME A RUNOFF COEFFICIENT (C) OF 0.8

$$Q_{TOPSLOPE} = 0.8(17.28)(0.0046) = 0.0636 \text{ cfs}$$

$$Q_{SIDESLOPE} = 0.8(17.28)(0.0023) = 0.0318 \text{ cfs}$$

$$0.0954 \text{ cfs}$$

FROM THE GRAPH SHOWN IN ATTACHMENT A

FOR A $C = 0.10$ $D_{50} = 0.8$ in for a 20% slope.

DETERMINE TOTAL THICKNESS OF ARMOR LAYER.

$$t_r = 1.5 D_s \quad \text{WHERE } D_s = D_{50}$$

$$= 1.5(0.8) = 1.2 \text{ inches thick.}$$

USE MIN. OF 3 inches due to difficulty of placement & QA/QC.

$$\boxed{d_{50} = 0.8 \text{ in} \quad @ \ 3 \text{ in thick}}$$

NOTE:
IT SHOULD BE EVALUATED DURING DESIGN WHETHER A SOIL/GRAVEL ADMIX WITH A D_{50} OF 0.8 in WOULD BE SUITABLE (ie could it support THE SELECTED VEGETATION SPECIES.

REF. "DEVELOPMENT OF RIPRAP DESIGN CRITERIA BY RIPRAP TESTING IN FLUMES PHASE II" NUREG/CR-4651 (Sept 1988) U.S. NUCLEAR REGULATORY COMMISSION

ATTACHMENT A

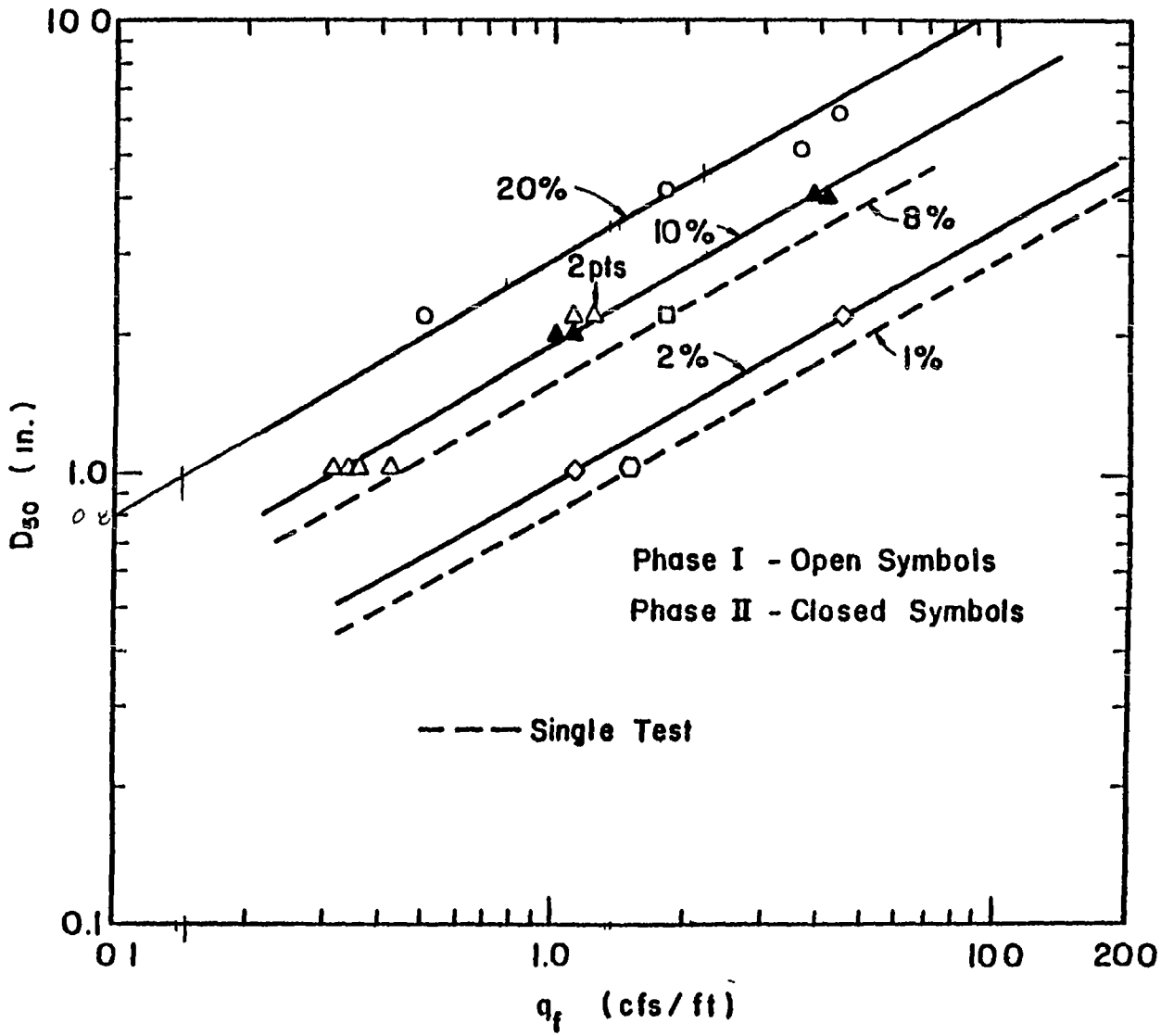

Figure 4.1. Comparison of unit discharge and median stone size relationship at failure for Phase II tests with Phase I tests at 10% slope.

Harding Lawson Associates
Engineering and Environmental Services

SHEET 1 OF 8
JOB NO. 21907-708010
DATE 12-19-95
COMPUTED BY SES
CHECKED BY RAJ

PROJECT RMA 9303 CAMU D.D.
SUBJECT GULLY EROSION - COVER TOP SLOPES

OBJECTIVE: TO DETERMINE THE EROSION RESISTANCE OF THE VEGETATED TOPSLOPES OF THE ENGINEERED COVER AGAINST THE EROSIVE VELOCITIES OF STORMWATER RUNOFF RESULTING FROM A PROBABLE MAXIMUM PRECIPITATION (PMP) STORM EVENT FOR A FULLY VEGETATED COVER AND A 100-YEAR STORM EVENT FOR AN UNVEGETATED COVER

ASSUMPTIONS:

1) DESIGN LIFE OF 1,000 YEARS. USE THE PMP STORM, WHICH IS GENERALLY CONSIDERED TO BE IN THE 100,000 YEAR RECURRANCE RANGE, TO DEMONSTRATE THAT THE COVER WILL BE STABLE FOR 1,000 YEARS (REF. 1)

2) ASSUME THE SOIL PROPERTIES OF INSITU TOPSOILS WHICH ARE PRIMARILY SANDY LOAMS. SEE ATACHMENT 2 FOR THE SCS INFORMATION ON THESE SOILS.

3) ASSUME A 40% GRAVEL ADMIXTURE TO THE EXISTING SOILS TO ENHANCE THE EROSION RESISTANCE OVER THE 1000-YEAR DURATION. USE 1/2" MINUS FOR THE ADMIX

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SHEET 2 OF 8
JOB NO 21907-708010
DATE 12-19-95
COMPUTED BY SES
CHECKED BY KAT

PROJECT RMA 93-03 CAMU DD
SUBJECT GULLY EROSION - COVER TOP SLOPES

REFERENCES:

1) U.S. Nuclear Regulatory Commission, August 1990. Final Staff Technical Position Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites.

2) U.S. Department of Agriculture, Soil Conservation Service. Soil Survey of Adams County, Colorado. (October 1974)

3) U.S. Department of Energy, December 1989. Technical Approach Document, Revision 2.

CALCULATIONS:

USE THE ANALYTICAL/EMPIRICAL METHOD (REF 3) OR TRACTIVE FORCE METHOD TO COMPARE THE TRACTIVE FORCE PRODUCED BY THE FLOW TO THE ALLOWABLE TRACTIVE FORCES THE SOIL CAN WITHSTAND.

NOTE: THIS ANALYSIS IS FOR SLOPES NO GREATER THAN FIVE PERCENT.

1) DETERMINE THE ALLOWABLE TRACTIVE SHEAR STRESS OF THE TOPSOIL ONLY BY THE TEMPLE METHOD (REF. 1 & 3), NOTE: FOR NONCOHESIVE GRANULAR SOILS ONLY

$$\tau_{ALLOWABLE} = 0.4 d_{75}$$

☐ ASSUME $d_{75} = 0.02185$ inches (ATTACHMENT A)

$$\tau_{ALL.} = 0.00874 \text{ PSF}$$

2) CALCULATE THE ACTUAL TRACTIVE SHEAR STRESS THAT THE TOPSOIL MUST WITHSTAND FOR THE GIVEN PRECIPITATION EVENTS

DETERMINE THE UNIT DISCHARGE RATE q FOR BOTH THE 100-YEAR AND PMP EVENTS.

$$q = F_{cu} \times I \times L \qquad \text{(REF. 1)}$$

$$F_{cu} = 3 \times C_r \qquad \text{(REF. 1)}$$

☐ ASSUME $C_r = 0.3$ (REF 3, pg. 103)

☐ ASSUME $L_{max} = 200$ FEET

☐ ASSUME: $I_{100\text{-yr.}} = 2.7 \frac{in}{hr}$ (ATTACHMENT D)

$I_{PMP} = 10.7 \frac{in}{hr.}$ (ATTACHMENT D)

$$\therefore q_{r_{100\text{-yr}}} = (3 \times 0.3) \times \frac{2.7 \frac{in}{hr}}{43{,}200 \frac{in/hr}{ft/sec}} \times 200 \text{ Feet} = 0.01125$$

$$q_{r_{PMP}} = (3 \times 0.3) \times \frac{10.7}{43{,}200} \times 200 = 0.04458$$

☐ ASSUME MANNING'S ROUGHNESS COEFFICIENT FOR A DISTURBED UNVEGETATED SLOPE

$\therefore n = 0.022$ (ATTACHMENT E)

DETERMINE DEPTH OF SHEET FLOW FOR 100-YR EVENT:

BY MANNING'S EQUATION:

$$V = \frac{1.486}{n} \times D^{2/3} \times S^{1/2} \quad \text{(REF. 3)}$$

FROM CONTINUITY:

$$V = q_r / D \quad \text{(REF. 3)}$$

$$\therefore \frac{q_{r_{100}}}{D} = \frac{1.486}{n} \times D^{2/3} \times S^{1/2}$$ ⇒ SOLVE FOR D (USE FACTORED $q \times F_a$)

$$D = \left[q_{r_{100}} F_a \left(\frac{n}{1.486}\right)\left(\frac{1}{S^{1/2}}\right) \right]^{3/5}$$

☐ ASSUME MAX SLOPE = 5% ∴ S = 0.05

$$D = \left[(0.01125)(0.9)\left(\frac{0.022}{1.486}\right)\left(\frac{1}{\sqrt{0.05}}\right)\right]^{3/5} = 0.0125 \text{ FEET}$$

CALCULATE ACTUAL TRACTIVE SHEAR STRESS BY DUBOY'S FORMULA (REF. 3)

$\tau_{ACT} = \gamma' D S$ ☐ ASSUME $\gamma' = 62.4$ PCF

$= (62.4 \text{ PCF})(0.0125')(0.05 \frac{\text{FEET}}{\text{FOOT}}) = 0.0389$ PSF

$\boxed{\tau_{ACTUAL} > \tau_{ALLOWABLE}}$

0.0389 PSF > 0.00874 PSF

THEREFORE, AN UNVEGETATED SLOPE UNDER THE GIVEN CONDITIONS WOULD NOT RESIST EROSIVE FORCES.

3) DETERMINE THE ACTUAL TRACTIVE SHEAR STRESS FOR A VEGETATED SLOPE:

☐ ASSUME : $C_I = 5.60$, $C_F = 0.75$ } (Ref 3, pg 105)

DETERMINE NEW MANNING'S COEFFICIENTS FOR VEGETATED SLOPES

CALCULATE THE FLOW RESISTANCE COEFFICIENT (n_r) FOR VEGETAL CONDITIONS WITHIN THE FLOW FIELD:

$$n_r = e^{\left[0.01329\, C_I [\ln(RV)]^2 - 0.09543\, C_I \ln(RV) + 0.2971\, C_I - 4.16\right]}$$

(REF. 3) ☐ ASSUME $RV = q_{r_{pmp}}$ (REF. 3)

$$n_r = e^{0.01329(5.6)[\ln(0.0446)]^2 - 0.09543(5.6)\ln(0.0446) + 0.2971(5.6) - 4.16}$$

$$n_r = e^{-0.114} = 0.89$$

CALCULATE NEW ROUGHNESS COEFFICIENT (n_s) FOR SOIL GRAIN ROUGHNESS AT SOIL/WATER BOUNDARY:

$$n_s = \frac{d_{=5}^{1/6}}{39} = 0.01356$$

CALCULATE n'_v FOR THE COMBINED INFLUENCE OF VEGETATION AND SOIL ROUGHNESS

$$n'_v = \left[n_r^2 - (0.0156)^2 + n_s^2\right]^{1/2}$$

$$= \left[(0.89)^2 - (0.0156)^2 + (0.01356)^2\right]^{1/2} = 0.89$$

COMPUTE THE FLOW DEPTH DOWN THE VEGETATED SLOPE USING THE MANNING'S COEFFICIENT OF RESISTANCE ON A VEGETATED SLOPE AND THE UNIT DISCHARGE FROM THE PMP EVENT.

$$D = \left[q_{pmp} F_a \left(\frac{n}{1.486}\right)\left(\frac{1}{S^{1/2}}\right)\right]^{3/5} = \left[0.0446(.9)\left(\frac{0.89}{1.486}\right)\left(\frac{1}{\sqrt{0.05}}\right)\right]^{3/5}$$

$$D = 0.2623 \text{ FEET}$$

CALCULATE THE COEFFICIENT OF VEGETAL RESISTANCE (K_V)

$$K_V = (1 - C_F)\left(\frac{n_s}{n_v'}\right)^2 = (1-0.75)\left(\frac{0.01356}{0.89}\right)^2$$

$$K_V = 0.000058$$

DETERMINE THE ACTUAL SHEAR STRESS FOR THE GIVEN FLOW DEPTH FOR THE PMP EVENT

$$\tau_{ACT} = \gamma D S = (62.4\ pcf)(0.2623')(0.05\ \tfrac{ft}{ft})$$

$$\tau_{ACT} = 0.818\ PSF$$

CALCULATE THE EFFECTIVE ACTUAL TRACTIVE SHEAR STRESS, τ_e, APPLIED TO THE VEGETATED SLOPE AT THE SOIL/WATER BOUNDARY:

$$\tau_e = \tau_{ACT} \times K_V = 0.818\ PSF \times 0.000058$$

$$\boxed{\tau_e = 0.0000474\ PSF \ll \tau_{ALLOWABLE}}$$

∴ EXISTING SOILS WILL BE ADEQUATE FOR COVER TOP SLOPES UNDER VEGETATED CONDITIONS, BUT MUST BE ENHANCED FOR UNVEGETATED CONDITIONS.

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SHEET 8 OF 8
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4) DETERMINE THE REQUIRED d_{75} OF AN ENHANCED SOIL MIX TO ACHIEVE τ_{actual} FOR UNVEGETATED SITUATIONS.

$\tau_{actual} = 0.0389$ PSF

$\tau = 0.4 d_{75}$

$d_{75} = \frac{0.0389}{0.4} = 0.09725$ inches SAY #8 SIEVE

d_{75} FOR A 30% GRAVEL ADMIXTURE IS APPROXIMATELY 0.315", AND THEREFORE WOULD SUFFICE

ATTACHMENT A

TABLE 6.—*Estimated properti*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two or more kinds of soil The sc for referring to the other series that appear in the first col

Soil series and map symbols	Depth from surface	Classification		
		USDA texture	Unified	AASH(
	Inches			
*Adena. AaB, AaC, AcC, AcD	0–11	Loam, clay loam, silty clay loam	ML or CL	A–4 or A-
For properties of Colby soils in AcC and AcD, refer to Colby series.	11–60	Silty clay loam, silt loam	ML or CL	A–4 or A-
Arvada AdB	0–4	Loam, sandy loam	SM or ML	A–4 or A-
	4–28	Clay, sandy clay	CL or CH	A–7
	28–60	Sandy loam	SM	A–2 or A-
*Ascalon ArB, ArC, AsB, AsC, AsD, At, AvC	0–21	Loamy sand, sandy loam, and sandy clay loam	SM or SC	A–2 or A-
For properties of Platner soils in At and Vona soils in AvC, refer to their respective series	21–60	Sandy loam	SM	A–2 or A-
*Blakeland BoD, Bt	0–60	Loamy sand and sand	SP–SM or SM	A–2 or A-
For properties of Truckton soils in Bt, refer to Truckton series.				
Colby CbE	0–60	Loam and fine sandy loam	ML	A–4
Dacono DaA, DaB	0–9	Loam	ML	A–4
	9–17	Clay	CH	A–7
	17–26	Sandy clay loam	SC	A–4
	26–60	Very coarse loamy sand, sand, and gravel.	SP or SM, SP–SM, or GP–GM	A–1
Deertrail	0–9	Very fine sandy loam and loam	ML	A–4
Mapped only in a complex with Weld soils.	9–21	Clay	CH	A–7
	21–60	Silty clay loam and loam	CL or ML	A–4 or A-
Gravelly land-Shale outcrop complex Gr				
Properties too variable to be estimated.				
Gullied land Gu				
Properties too variable to be estimated				
Heldt HlB, HlD	0–32	Clay	CH	A–7
	32–60	Silty clay loam, sandy clay loam.	CL	A–6
Loamy alluvial land				
Lu	0–60	Loam, silt loam, and clay loam	ML or CL	A–4 or A
Lv	0–20	Stratified loam	ML	A–4
	20–60	Sand and gravel	SP or GP	A–1
Lw	0–36	Loam, clay, and stratified loam	ML or CL	A–4 or A
	36	Gravel	GP	A–1
Nunn.				
NlA, NlB	0–9	Loam and clay loam	ML	A–4 or A
	9–23	Clay	CH	A–7
	23–60	Loam and silt loam	CL or ML	A–4
NuA, NuB	0–9	Clay loam	CL	A–6
	9–23	Clay	CH	A–7
	23–60	Loam and silt loam	CL or ML	A–6 or A
Platner PlB, PlC	0–9	Loam	ML	A–4
	9–18	Clay	CH	A–7
	18–60	Clay loam, loam, and sandy loam	SM, ML, or CL	A–6 or A
Renohill ReB, ReD	0–9	Loam and clay loam	ML or CL	A–6
	9–28	Clay and clay loam	CH	A–7
	28	Shale and sandstone		

ATTACHMENT A
CONTINUED

soils significant to engineering

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructio
The sign > means more than, and the sign < means less than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential
No 4 (4 7 mm)	No 10 (2 0 mm)	No 40 (0 42 mm)	No 200 (0 074 mm)					
				Inches per hour	*Inches per inch of soil*	*pH*	*Mmhos /cm. at 25° C*	
100	100	85–95	70–85	0 06–0 20	0. 19–0 21	6 6–7 8	0–4	Moderate
100	100	90–100	70–90	0 63–2 0	0 19–0 21	7 9–9 0	0–4	Low to moderate
100	100	60–90	30–60	0 63–6. 3	0 11–0 18	7 9–8. 4	0–8	Low
100	100	90–100	80–90	<0 06	0 04–0 06	7 9–10 0	8–15	High
100	95–100	60–70	30–40	2 0–6. 3	0 04–0 06	7 9–9 0	4–15	Low
100	95–100	60–80	30–50	0 63–2 0	0 13–0 15	6 6–7 8	0–4	Low to moderate
100	95–100	60–70	30–40	2 0–6 3	0 11–0 13	7 9–9 0	0–4	Low
100	100	50–75	5–15	6 3–20 0	0 06–0 08	6 1–7 3	0–2	Low
100	100	80–95	50–80	0 63–2. 0	0 16–0 18	7 9–8. 4	0–4	Low to moderate
90–100	85–100	80–90	60–70	0 63–2 0	0 16–0 18	6 6–7 3	0–1	Low
90–100	85–100	80–100	70–80	0 06–0 20	0 14–0 16	7 4–7. 8	0–1	High
90–100	85–100	80–90	35–50	0 63–2 0	0 14–0 16	7 9–8 4	0–2	Moderate
50–65	25–35	15–25	0–15	>20. 0	0 03–0 05	7 9–8. 4	0–2	Low
100	100	85–95	60–70	0 63–2 0	0 15–0 17	6 6–7 8	0–4	Low.
100	100	85–95	70–80	0 06–0. 20	0. 04–0 06	7 9–10 0	0–8	High.
100	100	90–100	75–85	0 63–2 0	0 04–0 06	7 9–10 0	4–8	Low to moderate
100	100	95–100	80–95	0. 06–0 20	0. 14–0 16	7 9–8. 4	0–2	High
100	100	90–100	70–90	0 20–0 63	0 16–0 18	7 9–8 4	0–2	Moderate
100	100	85–100	60–80	0 20–2 0	0 16–0 20	----------	4–8	Low to moderate.
100	95–100	85–95	50–80	0 63–2. 0	0 16–0 18	----------	0–8	Low.
30–40	25–35	15–25	0–5	>20. 0	0 03–0 05	----------	0–2	Low.
100	100	85–95	50–80	0 20–2 0	0 16–0 20	----------	0–8	Low to moderate.
30–40	25–35	15–25	0–5	>20 0	0 03–0 05	----------	0–2	Low.
100	90–100	80–90	60–80	0 63–2. 0	0 16–0 18	6. 6–7 3	0–2	Moderate
100	100	90–100	75–85	0 2–0 63	0 14–0 16	7 4–7 8	0–2	High.
100	90–100	80–90	60–80	0 63–0 20	0 18–0 20	7 9–8 4	0–4	Moderate
100	90–100	80–90	60–80	0 20–0 63	0 19–0 21	6 6–7 3	0–2	Moderate
100	90–100	80–90	75–85	0 06–0 20	0 14–0 16	7 4–7 8	0–2	High.
100	90–100	80–90	50–70	0 20–2 0	0 18–0 20	7 9–8. 4	0–4	Moderate
100	100	85–95	60–70	0 63–2. 0	0 16–0 18	6 6–7 3	0–2	Moderate
100	100	90–100	75–85	0 06–0 20	0 14–0 16	6 6–7 3	0–4	High.
100	90–100	75–85	40–75	0 63–2. 0	0 16–0 18	7 9–8. 0	0–4	Low to moderate
100	100	85–95	70–80	0 2–0 63	0 18–0. 20	7 4–8. 4	0–2	Moderate
100	100	90–100	70–95	0 06–0 20	0. 15–0. 17	7 9–9 0	0–2	High

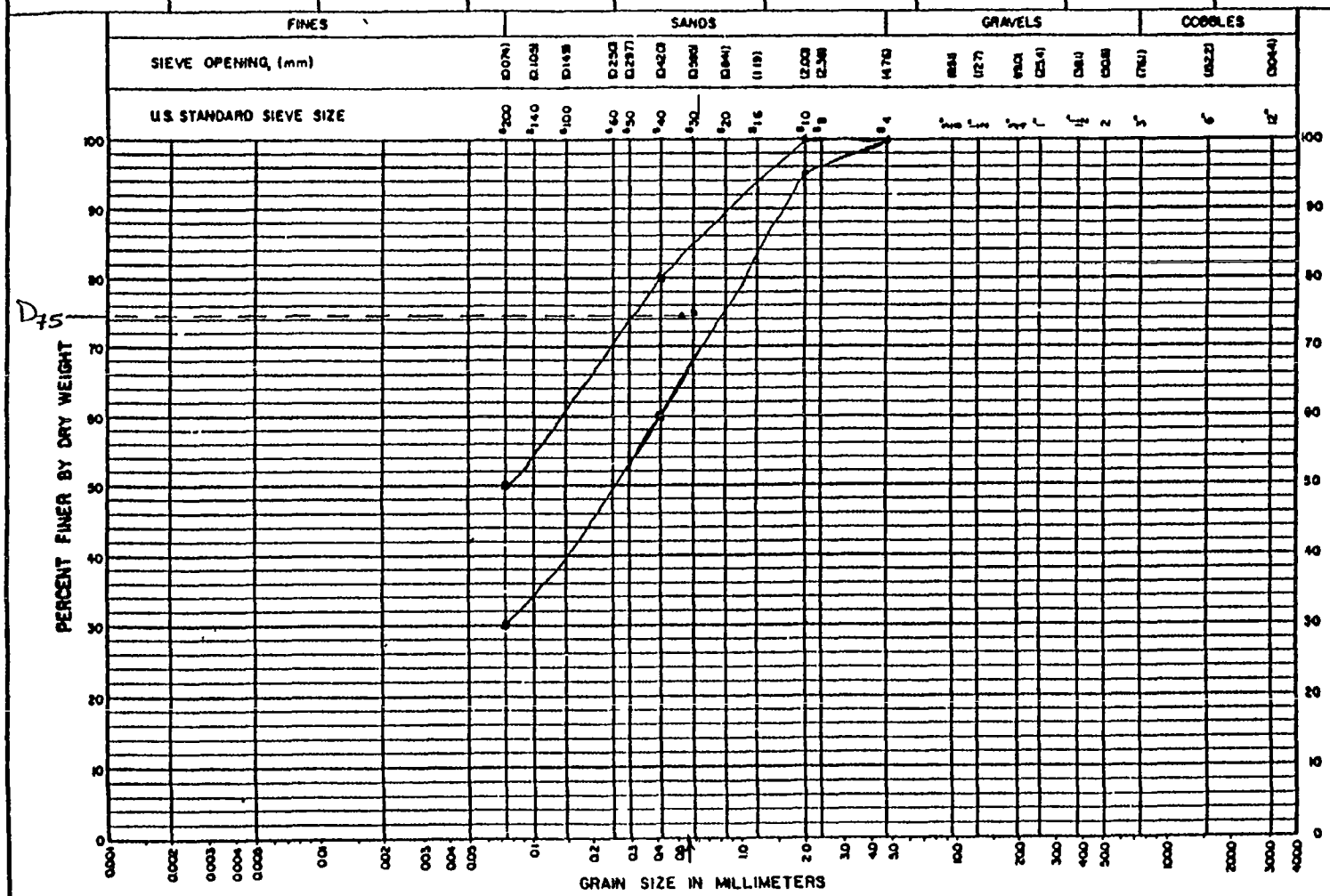
SCS-ENG-353 (REV. 3-70)
FILE CODE ENG-22

SOIL CLASSIFICATION

PROJECT and STATE	RMA 9303 21907-708010 SOILS NATIVE TO THE PROJECT SITE
FIELD SAMPLE NO.	ROCKY MOUNTAIN ARSENAL
DEPTH	
GEOLOGIC ORIGIN	
SAMPLE LOCATION	
TYPE OF SAMPLE	
TESTED AT	
APPROVED BY	SES
DATE	11-28-95
LABORATORY NO.	
SYMBOL	SM or SC
DESCRIPTION	ASCALON SERIES - LEADATION PER SCS

GRAIN SIZE DISTRIBUTION

D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	D_{MAX}	C_u	C_c



SPECIFIC GRAVITY (G_s)		ATTERBERG LIMITS						SOLUBLE SALTS	SHRINKAGE LIMIT	UNDISTURBED CONDITION	
		NATURAL MOISTURE		AIR DRY		OVEN DRY				MOISTURE	DRY UNIT WEIGHT
(-) #4	(+) #4	LL	PI	LL	PI	LL	PI	%	%	%	g/cc pcf

REMARKS

SANDY LOAMS & LOAMY SANDS

ATTACHMENT B

SCS-ENG-353 (REV. 3-70)
FILE CODE ENG-22

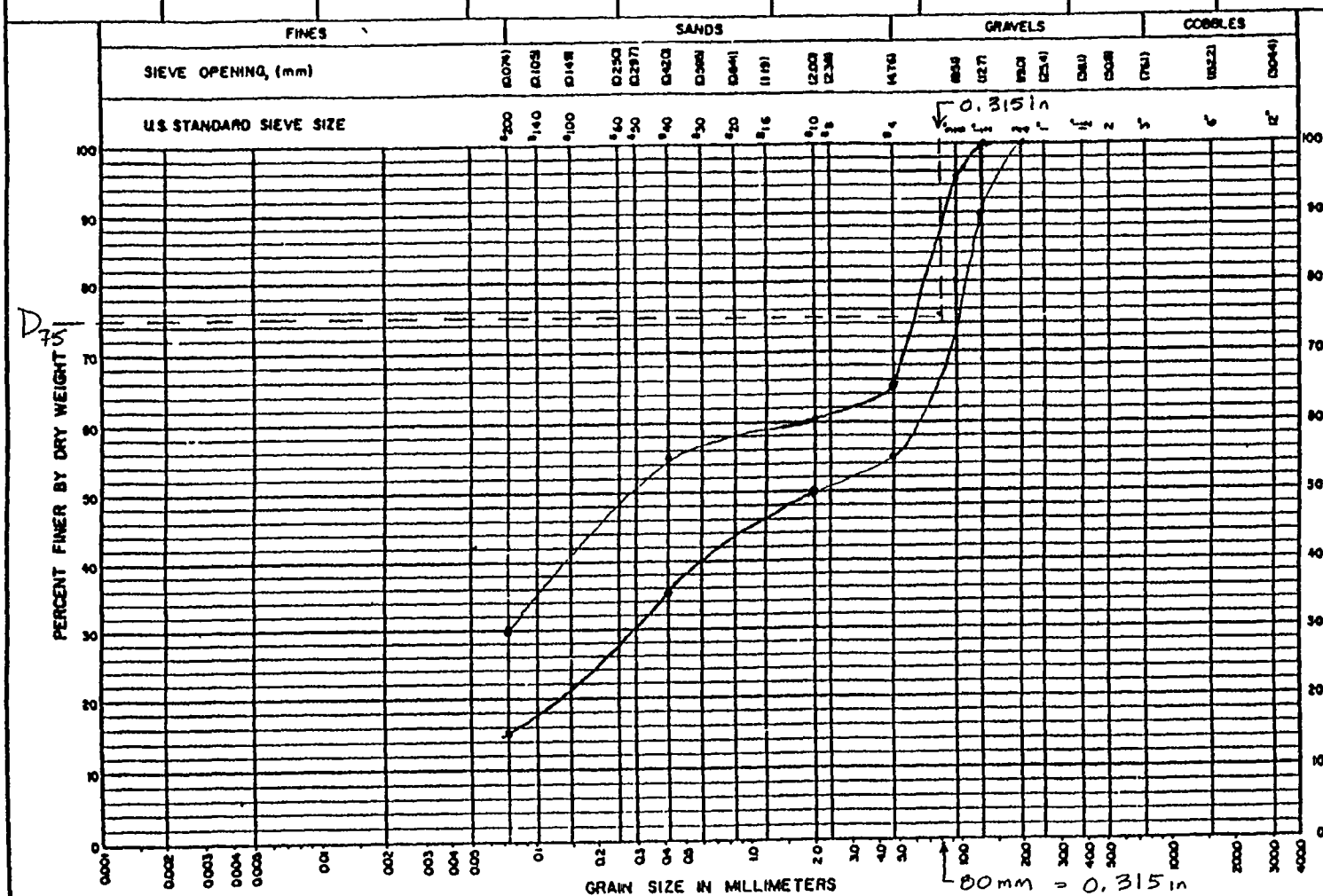
ATTACHMENT 6

SOIL CLASSIFICATION

PROJECT and STATE	RMA 9303
	21907-708010
	NATIVE SOILS W/ 30% GRAVEL ADMIX
LABORATORY NO.	
SAMPLE LOCATION	
FIELD SAMPLE NO.	
DEPTH	
GEOLOGIC ORIGIN	
TYPE OF SAMPLE	
TESTED AT	
APPROVED BY	SES
DATE	11-28-95
SYMBOL	
DESCRIPTION	

GRAIN SIZE DISTRIBUTION

D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	D_{MAX}	C_u	C_c



SPECIFIC GRAVITY (G_s)		ATTERBERG LIMITS						SOLUBLE SALTS	SHRINKAGE LIMIT	UNDISTURBED CONDITION	
		NATURAL MOISTURE		AIR DRY		OVEN DRY				MOISTURE	DRY UNIT WEIGHT
(-) #4	(+) #4	LL	PI	LL	PI	LL	PI	%	%	%	g/cc pcf

REMARKS

GRAVELLY SANDY LOAMS OR GRAVELLY LOAMY SANDS

ATTACHMENT D

Table 1
Precipitation Values for the RFP → ROCKY FLATS PLANT
(in inches) (DENVER AREA)

DURATION	RECURRENCE INTERVAL (Probability of Occurrence) 2-yr (50%)	5-yr (20%)	10-yr (10%)	25-yr (4%)	50-yr (2%)	100-yr (1%)	500 yr (0.2%)	PMP(L)	PMP(G)	REFERENCE APPENDIX TABLE
5-min	0.3	0.4	0.5	0.6	0.7	0.8	–	–	–	
10-min	0.5	0.6	0.8	1.0	1.1	1.2	–	–	–	
15-min	0.6	0.8	1.0	1.2	1.4	1.5	–	–	–	
30-min	0.8	1.2	1.4	1.7	1.9	2.1	–	–	–	
1-hr	1.0	1.5	1.8	2.1	2.4	2.7	3.3	10.7	13	B-4
2-hr	1.2	1.6	2.0	2.4	2.8	3.0	3.8	–	15	
6-hr	1.6	2.0	2.5	3.0	3.4	3.8	4.8	14.5	24	B-1
24-hr	2.2	2.8	3.2	4.0	4.4	5.2	6.5	–	35	B-2
72-hr	2.9	3.3	3.8	5.0	5.5	6.3	8.1	–	43	B-3

PMP(L) = Local Storm PMP

PMP(G) = General Storm PMP

STANDARD HANDBOOK FOR CIVIL ENGINEERS 2nd EDITION

ATTACHMENT F

Table 21-11. Values of the Roughness Coefficient n for Use in the Manning Equation

	Min	Avg	Max
A Open-channel flow in closed conduits			
1 Corrugated-metal storm drain	0 021	0 024	0 030
2 Cement-mortar surface	0 011	0 013	0 015
3 Concrete (unfinished)			
a Steel form	0 012	0 013	0 014
b Smooth wood form	0 012	0 014	0 016
c Rough wood form	0 015	0 017	0 020
B Lined channels			
1 Metal			
a Smooth steel (unpainted)	0 011	0 012	0 014
b Corrugated	0 021	0 025	0 030
2 Wood			
a Planed, untreated	0 010	0 012	0 014
3 Concrete			
a Float finish	0 013	0 015	0 016
b Gunite, good section	0 016	0 019	0 023
c Gunite, wavy section	0 018	0 022	0 025
4 Masonry			
a Cemented rubble	0 017	0 025	0 030
b Dry rubble	0 023	0 032	0 035
5 Asphalt			
a Smooth	0 013	0 013	
b Rough	0 016	0 016	
C Unlined channels			
1 Excavated earth straight and uniform			
a Clean, after weathering	0 018	0 022	0 025
b With short grass, few weeds	0 022	0 027	0 033
c Dense weeds, high as flow depth	0 050	0 080	0 120
d Dense brush, high stage	0 080	0 100	0 140
2 Dredged earth			
a No vegetation	0 025	0 028	0 033
b Light brush on banks	0 035	0 050	0 060
3 Rock cuts			
a Smooth and uniform	0 025	0 035	0 040
b Jagged and irregular	0 035	0 040	0 050

Shallow flow in an unlined channel will result in an increase in the effective n value if the channel bottom is covered with large boulders or ridges of silt, since these projections would then have a larger influence on the flow than for deep flow A deeper-than-normal flow will also result in an increase in the effective n value if there is a dense growth of brush along the banks within the path of flow When channel banks are overtopped during a flood, the effective n value increases as the flow spills into heavy growth bordering the channel The roughness of a lined channel experiences change with age, because of both deterioration of the surface and accumulation of foreign matter, therefore, the average n values given in Table 21-11 are recommended only for well-maintained channels (See also Art 21-9 and Table 21-4)

21-26. Water-Surface Profiles for Gradually Varied Flow. Examples of various surface curves possible with gradually varied flow are shown in Fig 21-46 These surface profiles represent backwater curves that form under the conditions illustrated in examples (*a*) through (*r*)

These curves are divided into five groups according to the slope of the channel in which they appear (Art 21-23) Each group is labeled with a letter descriptive of the slope M for mild (subcritical), S for steep (supercritical), C for critical, H for horizontal, and A for adverse The two dashed lines that appear in the left-hand figure for each of these classes are the *normal-depth line* N D L and the *critical-depth line* C D L The N D L and C D.L are identical for a channel of critical slope, and the N D L is replaced by a horizontal line, at an arbitrary elevation, for the channels of horizontal or adverse slope

There are three types of surface-profile curves possible in channels of mild or steep slope, and for channels of critical, horizontal, and adverse slope

Harding Lawson Associates
Engineering and Environmental Services

SHEET 1 OF 9
JOB NO 21907-708010
DATE 2-22-96
PROJECT RMA 9303 - LANDFILL COVERS
COMPUTED BY SES
SUBJECT SHEET & RILL EROSION OF COVERS (RUSLE ANALYSIS)
CHECKED BY ECH

OBJECTIVE:

DETERMINE HOW MUCH SOIL LOSS WILL OCCUR TO THE PROPOSED ENGINEERED COVERS DUE TO SHEET AND RILL EROSION CAUSED BY OVERLAND RUNOFF OVER THE 1,000 YEAR DESIGN LIFE.

ASSUMPTIONS:

1) USE RUSLE MODEL VERSION 1.04 (MOST CURRENT AVAILABLE), DEVELOPED BY THE SOIL AND WATER CONSERVATION SOCIETY TO REVISE THE USLE EQUATION ORIGINALLY DEVELOPED BY THE SCS.

2) IT SHOULD BE NOTED THAT NO ACTUAL LAB OR FIELD TESTS WERE PERFORMED FOR THIS ANALYSIS. GENERAL SOILS TYPICAL TO THE LANDFILL AREA WHERE USED FOR BASIC PROPERTY INFORMATION. IT IS ASSUMED THAT SOILS EXCAVATED DURING CONSTRUCTION OF THE LANDFILLS WILL BE STOCKPILED AND REUSED FOR THE ENGINEERED COVER CONSTRUCTION.

3) ASSUME GENERAL ASCALON SERIES SOILS (SCS) ATTACHMENT A WHICH ARE SANDY LOAMS, LOAMY SANDS AND SANDY CLAY LOAMS, SM OR SC.

4) ASSUME RMA IS A SEMI-ARID CLIMATE. THE VEGETATIVE COVER (CANOPY) IS ASSUMED TO BE APPROXIMATELY 30 PERCENT, BASED ON SIMILAR VEGETATION INDEGINOUS TO THE AREA (CONSERVATIVE)

5) AS NOTED WITHIN CALCULATIONS & MODEL.

RUSLE COMPUTER ANALYSIS
(SWCS1.04)

SUMMARY TABLE

File Exit Help Screen

< RUSLE SWCS1.04 >

Conservation Planning Alternatives - Soil Loss Computation Worksheet

filename	R	x	K	x	LS	x	C	x	P	=	A (TONS/AC)
TRIAL-SO	40		0.29		6.09		0.135		1.00	=	9.5
TRIAL-VG	40		0.29		6.09		0.052		1.00	=	3.6
TRIAL-GA	40		0.18		6.09		0.045		1.00	=	2
TRIAL-GV	40		0.18		6.09		0.025		1.00	=	1.1
	0		0		0		0		0	=	0
	0		0		0		0		0	=	0
	0		0		0		0		0	=	0
	0		0		0		0		0	=	0
	0		0		0		0		0	=	0
	0		0		0		0		0	=	0

TRIAL-SO ASSUMES SOIL ONLY CONDITIONS, NO GRAVEL ADMIX AND NO ABOVE GROUND VEGETATION OR ROOTMASS (VEGETATION NEVER PLANTED) ← THIS IS NOT LIKELY, AS NATURAL VEGETATION WILL EVENTUALLY SEED & ESTABLISH.

TRIAL-VG ASSUMES SOIL W/O GRAVEL ADMIX, WITH NORMAL VEGETATION AND ROOTMASS.

TRIAL-GA ASSUMES SOIL W/ GRAVEL ADMIX WITH ROOT MASS, BUT NO ABOVE GRADE VEGETATION (IN CASE OF FIRE, DROUGHT, etc.)

TRIAL-GV ASSUMES SOIL W/GRAVEL ADMIX WITH ABOVE GRADE VEGETATION & ROOT MASS

THESE FOUR SCENARIOS REPRESENT A RANGE OF POSSIBLE CONDITIONS. CONSIDERING THE 1,000 YEAR DESIGN LIFE OF THIS COVER THE POSSIBILITY THAT VEGETATION MAY BE DESTROYED AT SOME TIME SHOULD BE CONSIDERED ONCE VEGETATION IS ESTABLISHED (@ CONSTRUCTION). HOWEVER, ROOT MASS WILL BE PRESENT EVEN IF VEG. IS DESTROYED.

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PROJECT RMA 9303
COMPUTED BY SCS
SUBJECT RUSLE ANALYSIS
CHECKED BY ECA

RAINFALL FACTOR (R) - FOR ALL 4 SCENARIOS

```
File          Exit          Help          Screen
Rainfall Factor SWCS1.04

                city code: 6001    DENVER              CO
        Initial R value: 40
          field slope %: 14.8
     adjust for ponding?: 1      1. yes
                                 2. no

Should the program adjust the R factor for the
effect of ponded water absorbing rainfall impact?
  Answer yes UNLESS the surface is very rough or
has been formed into moderate to high ridges.

F3 When Questions Answered
```

SLOPE LENGTH FACTOR (LS) - FOR ALL 4 SCENARIOS

```
File          Exit          Help          Screen
LS Factor SWCS1.04

  number of segments: 2          segment lengths are measured: 2
         segments are: 1
         use LS table: 3

                              1          2
 Gradient (%) of Segment      5          20
 Length of Segment (ft)       200        140
 Segment LS                   1.017      13.344
    overall LS = 6.09; equiv. slope = 14.9 %; horiz. length = 340 ft

Esc exits
```

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Engineering and Environmental Services

SHEET 4 OF 9
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COMPUTED BY SES
CHECKED BY ECR

PROJECT RMA 9303
SUBJECT KUSLE ANALYSIS

SOIL ONLY
NO GRAVEL ADMIX

K-FACTOR → FOR FIRST TWO SCENARIOS W/SOIL & NO GRAVEL ADMIX

File Exit Help Screen

< Seasonally Variable K Factor SWCS1.04 >

city code: 6001_ DENVER CO estimated K: 0.24

% rock cover: 0 # yrs to consolidate: 7 hyd. group: 2

soil series: ascalon surface texture: sl

DATE	EI	K	DATE	EI	K
1/1-1/15	0.0	0.188	7/1-7/15	14.5	0.297
1/16-1/31	0.1	0.216	7/16-7/31	16.0	0.246
2/1-2/15	0.0	0.249	8/1-8/15	15.1	0.202
2/16-2/28	0.1	0.285	8/16-8/31	7.7	0.167
3/1-3/15	0.1	0.32	9/1-9/15	4.8	0.137
3/16-3/31	0.3	0.367	9/16-9/30	1.8	0.113
4/1-4/15	1.1	0.423	10/1-10/15	1.0	0.094
4/16-4/30	3.2	0.485	10/16-10/31	0.4	0.094
5/1-5/15	5.0	0.64	11/1-11/15	0.2	0.109
5/16-5/31	9.6	0.53	11/16-11/30	0.0	0.125
6/1-6/15	7.7	0.434	12/1-12/15	0.1	0.142
6/16-6/30	11.1	0.359	12/16-12/31	0.1	0.163

NOTE: upward adjustment of K reached the limit of 1.2 * Knom -----

EI DIST.: 84 FREEZE-FREE DAYS: 160 AVERAGE ANNUAL K: 0.288

R VALUE: 40 Kmin = 0.087 on 10/14 Kmax = 0.648 on 5/7

< Esc exits >

SOIL WITH
30% GRAVEL ADMIX

K-FACTOR → FOR LAST TWO SCENARIOS W/GRAVEL ADMIX

File Exit Help Screen

< Seasonally Variable K Factor SWCS1.04 >

city code: 6001_ DENVER CO estimated K: 0.15

% rock cover: 30 # yrs to consolidate: 7 hyd. group: 2

soil series: ascalon surface texture: sl

DATE	EI	K	DATE	EI	K
1/1-1/15	0.0	0.118	7/1-7/15	14.5	0.186
1/16-1/31	0.1	0.135	7/16-7/31	16.0	0.154
2/1-2/15	0.0	0.156	8/1-8/15	15.1	0.126
2/16-2/28	0.1	0.178	8/16-8/31	7.7	0.104
3/1-3/15	0.1	0.2	9/1-9/15	4.8	0.085
3/16-3/31	0.3	0.229	9/16-9/30	1.8	0.071
4/1-4/15	1.1	0.265	10/1-10/15	1.0	0.059
4/16-4/30	3.2	0.303	10/16-10/31	0.4	0.059
5/1-5/15	5.0	0.4	11/1-11/15	0.2	0.068
5/16-5/31	9.6	0.331	11/16-11/30	0.0	0.078
6/1-6/15	7.7	0.271	12/1-12/15	0.1	0.089
6/16-6/30	11.1	0.224	12/16-12/31	0.1	0.102

NOTE: upward adjustment of K reached the limit of 1.2 * Knom -----

EI DIST.: 84 FREEZE-FREE DAYS: 160 AVERAGE ANNUAL K: 0.18

R VALUE: 40 Kmin = 0.054 on 10/14 Kmax = 0.405 on 5/7

< Esc exits >

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PROJECT RMA 9303
SUBJECT RUSLE ANALYSIS

C-FACTOR
TRIAL - SO - SOIL ONLY W/NO VEG. OR ROOTMASS

```
        File            Exit            Help            Screen
Õáááááááááááááááááááááááá< Time-invariant C SWCS1.04 >ááááááááááááááááááááááááááá¢
°       where get vegetation information?: 3                                          °
°                                                                                     °
°                                                     Õááááááááááááááááááááááááá¢    °
°                                                     ° CA ann. grassland   .3 °    °
°   effective root mass (lb/ac) in top 4": 0          ° tallgrass prairie   .3 °    °
°                           % canopy cover: 0          ° clipped & bare      .6 °    °
°                  average fall height (ft): 0          ° pinyon/jun. inter.  .6 °    °
° roughness value for the field condition: 1          ° cleared             .7 °    °
°   has there been mechanical disturbance: 1          ° natural shrub       .8 °    °
°                                                     ° shortgrass desert   .8 °    °
°                                                     ° cleared & pitted   1.0 °    °
° total % ground cover (rock and residue): 20         ° mixed grass prar.  1.0 °    °
°     % surface covered by rock fragments: 0          ° pitted             1.1 °    °
°      % vegetative residue surface cover: 20         ° sagebrush          1.1 °    °
°    surface cover function; B-value code: 1          ° root plow          1.3 °    °
°                                                     âáááááááááááááááááááááááááì    °
°                                                                                     °
°                                        C=0.132                                      °
° enter avg. annual values!                                                           °
   âááááááááááááááááááááááá< F3 When Questions Answered >áááááááááááááááááááááááááì
```

C-FACTOR
TRIAL - VG - SOIL W/VEGETATION & ROOT MASS

```
        File            Exit            Help            Screen
Õáááááááááááááááááááááááá< Time-invariant C SWCS1.04 >ááááááááááááááááááááááááááá¢
°       where get vegetation information?: 3                                          °
°                                                                                     °
°                                                     Õááááááááááááááááááááááááá¢    °
°                                                     ° CA ann. grassland   .3 °    °
°   effective root mass (lb/ac) in top 4": 950        ° tallgrass prairie   .3 °    °
°                           % canopy cover: 30         ° clipped & bare      .6 °    °
°                  average fall height (ft): 1          ° pinyon/jun. inter.  .6 °    °
° roughness value for the field condition: 0.3        ° cleared             .7 °    °
°   has there been mechanical disturbance: 1          ° natural shrub       .8 °    °
°                                                     ° shortgrass desert   .8 °    °
°                                                     ° cleared & pitted   1.0 °    °
° total % ground cover (rock and residue): 30         ° mixed grass prar.  1.0 °    °
°     % surface covered by rock fragments: 0          ° pitted             1.1 °    °
°      % vegetative residue surface cover: 30         ° sagebrush          1.1 °    °
°    surface cover function; B-value code: 1          ° root plow          1.3 °    °
°                                                     âáááááááááááááááááááááááááì    °
°                                                                                     °
                                         C=0.052                                      °
  enter avg. annual values!                                                           °
âááááááááááááááááááááááááá< F3 When Questions Answered >áááááááááááááááááááááááááì
```

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C-FACTOR
TRIAL - GA SOIL W/GRAVEL ADMIX, ROOTMASS w/NO. VEG.

```
     File          Exit        Help        Screen
Õáááááááááááááááááááááááá< Time-invariant C SWCS1.04 >áááááááááááááááááááááááááááá¢
°       where get vegetation information?: 3                                     °
°                                                                                °
°                                                  Õáááááááááááááááááááááááá¢    °
°                                                  ° CA ann. grassland  .3 °     °
°   effective root mass (lb/ac) in top 4": 950     ° tallgrass prairie  .3 °     °
°                            % canopy cover: 0     ° clipped & bare     .6 °     °
°                 average fall height (ft): 0      ° pinyon/jun. inter. .6 °     °
° roughness value for the field condition: 1       ° cleared            .7 °     °
°   has there been mechanical disturbance: 1       ° natural shrub      .8 °     °
°                                                  ° shortgrass desert  .8 °     °
°                                                  ° cleared & pitted  1.0 °     °
° total % ground cover (rock and residue): 30      ° mixed grass prar. 1.0 °     °
°     % surface covered by rock fragments: 30      ° pitted            1.1 °     °
°      % vegetative residue surface cover: 0       ° sagebrush         1.1 °     °
°    surface cover function; B-value code: 1       ° root plow         1.3 °     °
°                                                  ááááááááááááááááááááááááì     °
°                                                                                °
°                                     C=0045                                     °
° enter avg. annual values!                                                      °
áááááááááááááááááááááááááááá< F3 When Questions Answered >áááááááááááááááááááá   ì
```

C-FACTOR
TRIAL - GV - SOIL W/GRAVEL ADMIX, W/ VEG & ROOTMAS

```
     File          Exit        Help        Screen
Õáááááááááááááááááááááááá< Time-invariant C SWCS1.04 >áááááááááááááááááááááááááááá¢
°       where get vegetation information?: 3                                     °
°                                                                                °
°                                                  Õáááááááááááááááááááááááá¢    °
°                                                  ° CA ann. grassland  .3 °     °
°   effective root mass (lb/ac) in top 4": 950     ° tallgrass prairie  .3 °     °
°                            % canopy cover: 30    ° clipped & bare     .6 °     °
°                 average fall height (ft): 1      ° pinyon/jun. inter. .6 °     °
° roughness value for the field condition: 0.3     ° cleared            .7 °     °
°   has there been mechanical disturbance: 1       ° natural shrub      .8 °     °
°                                                  ° shortgrass desert  .8 °     °
°                                                  ° cleared & pitted  1.0 °     °
° total % ground cover (rock and residue): 51      ° mixed grass prar. 1.0 °     °
°     % surface covered by rock fragments: 30      ° pitted            1.1 °     °
°      % vegetative residue surface cover: 30      ° sagebrush         1.1 °     °
°    surface cover function; B-value code: 1       ° root plow         1.3 °     °
°                                                  ááááááááááááááááááááááááì     °
°                                                                                °
°                                    C=0.025                                     °
° enter avg. annual values!                                                      °
áááááááááááááááááááááááááááá< F3 When Questions Answered >áááááááááááááááááááá   ì
```

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PROJECT RMA 9303

SUBJECT RUSLE ANALYSIS

CROPLAND FACTOR (P) - FOR ALL 4 SCENARIOS

```
        File            Exit            Help            Screen
Õáááááááááááááááááááááá< P Factor - Cropland SWCS1.04 >ááááááááááááááááááááááá¢
°                                                                             °
°                                                                             °
°     contoured    strip   terraced  subsurface              P factor         °
°               cropped              drained                                  °
°   Õáááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááá¢       °
°   °  1____        1        1        1                   =  1        °       °
°   âááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááì       °
°                                                                             °
°                                                                             °
°                                                                             °
°                                                                             °
°                                                                             °
°                                                                             °
°                                                                             °
°                                                                             °
°                                                                             °
°                                                                             °
                                                                              °
  ááááááááááááááá< F4 Calls Routine, Esc Returns to P Main Menu >áááááááááááááááì
```

ASSUME THE CROPLAND FACTOR P IS 1 FOR NON-FARMLAND.
(SEE REF. 1)

CALCULATE DEPTH OF SOIL LOSS

☐ ASSUME SOIL ONLY DENSITY OF 105 lb/ft3

TRIAL - SO

$$\text{Depth}_{1\text{-YR}} = 9.5 \frac{\text{TONS}}{\text{Ac}} \times \frac{1\text{Ac}}{43{,}560\text{ft}^2} \times \frac{2000\text{ lb}}{\text{TON}} \times \frac{1\text{ft}^3}{105\text{ lb}} \times \frac{12\text{in}}{1\text{ft}} = 0.0498\text{in}$$

$$\text{Depth}_{1000\text{yr}} = 0.0498\text{in} \times 1000\text{yr} = \boxed{49.8 \text{ inches}}$$

TRIAL - VG

$$\text{Depth}_{1000\text{yr}} = \frac{3.6 \times 1 \times 2000 \times 1 \times 12 \times 1000}{43560 \times 1 \times 105} = \boxed{18.89 \text{ inches}}$$

☐ ASSUME SOIL/GRAVEL DENSITY OF 135 lb/ft3

TRIAL - GA

$$\text{Depth}_{1000\text{yr}} = \frac{2.0 \times 1 \times 2000 \times 1 \times 12 \times 1000}{43{,}560 \times 1 \times 135} = \boxed{8.16 \text{ inches}}$$

TRIAL - GV

$$\text{Depth}_{1000\text{yr}} = \frac{1.1 \times 1 \times 2000 \times 1 \times 12 \times 1000}{43560 \times 1 \times 135} = \boxed{4.5 \text{ inches}}$$

RUN SCENARIO → "TRIAL - SR" for SOIL w/ROOTMASS BUT NO ABOVE GROUND VEGETATION (COVER WAS VEGETATED BUT BY FIRE, DROUGHT, ETC. VEG. WAS DESTROYED). (NO GRAVEL ADMIX)

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SUBJECT RUSLE ANALYSIS

TRIAL-SR

```
        File              Exit              Help              Screen
Õááááááááááááááááááááááááááááááá< RUSLE SWCS1.04 >áááááááááááááááááááááááááááááááááá¢
°      Conservation Planning Alternatives - Soil Loss Computation Worksheet        °
°                                                                                  °
° filename              R     x     K     x     LS    x     C     x     P      =  A °
°ááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááááá°
° TRIAL-SR             40          0.29        6.093       0.063       1.00    = 4.5 °
°                       0           0           0           0           0      =  0  °
°                       0           0           0           0           0      =  0  °
°                       0           0           0           0           0      =  0  °
        File              Exit              Help              Screen
Õáááááááááááááááááááááááááá< Time-invariant C SWCS1.04 >ááááááááááááááááááááááááááá¢
°      where get vegetation information?: 3                                        °
°                                                                                  °
°                                                     Õááááááááááááááááááááááááá¢  °
°                                                     ° CA ann. grassland   .3 °  °
°   effective root mass (lb/ac) in top 4": 950        ° tallgrass prairie   .3 °  °
°                          % canopy cover: 0          ° clipped & bare      .6 °  °
°                 average fall height (ft): 0         ° pinyon/jun. inter.  .6 °  °
° roughness value for the field condition: 1          ° cleared             .7 °  °
°   has there been mechanical disturbance: 1          ° natural shrub       .8 °  °
-                                                     ° shortgrass desert   .8 °  °
                                                      ° cleared & pitted   1.0 °  °
° total % ground cover (rock and residue): 20         ° mixed grass prar.  1.0 °  °
°     % surface covered by rock fragments: 0          ° pitted             1.1 °  °
°       % vegetative residue surface cover: 20        ° sagebrush          1.1 °  °
°    surface cover function; B-value code: 1          ° root plow          1.3 °  °
°                                                     âáááááááááááááááááááááááááì  °
°                                                                                  °
°                                                                                  °
° enter avg. annual values!                                                        °
âááááááááááááááááááááááááááááá< F3 When Questions Answered >áááááááááááááááááááááááì
```

$$\frac{\text{DEPTH}}{1000\text{ YR}} = \frac{4.5 \times 1 \times 2000 \times 1 \times 12 \times 1000}{43560 \times 1 \times 105} = \boxed{23.61 \text{ inches}}$$

Since it is not anticipated that a consistent vegetative condition would be maintained over the entire 1000-year design life of the cover, it is suggested that the design of the uppermost soil layer be designed to account for an unvegetated condition. The inclusion of the gravel admix into the topsoil layer greatly reduces the total required depth of this layer (23 61 inches vs 8.16 inches) However, a cover of soil with vegetation (no gravel admix) may be suitable for the 1,000 year design life with appropriate final slope lengths and angles These conceptual calculations were based on assumed slope angles and lengths which may change during design. Based on these conceptual calculations, it suggested that the Trial-GA (soil/gravel admix with root mass, but no above grade vegetation) scenario be used, which would yield a minimum topsoil/gravel admix layer thickness of 10 inches (to allow for some remaining functional layer after the 1000 year period).

ATTACHMENT A

TABLE 6.—*Estimated propertie*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two or more kinds of soil. The soil for referring to the other series that appear in the first colu

Soil series and map symbols	Depth from surface	Classification		
		USDA texture	Unified	AASHO
	Inches			
*Adena. AaB, AaC, AcC, AcD	0–11	Loam, clay loam, silty clay loam.	ML or CL	A–4 or A–6
For properties of Colby soils in AcC and AcD, refer to Colby series.	11–60	Silty clay loam, silt loam	ML or CL	A–4 or A–6
Arvada. AdB	0–4	Loam, sandy loam	SM or ML	A–4 or A–2
	4–28	Clay, sandy clay	CL or CH	A–7
	28–60	Sandy loam	SM	A–2 or A–4
*Ascalon ArB, ArC, AsB, AsC, AsD, At, AvC	0–21	Loamy sand, sandy loam, and sandy clay loam.	SM or SC	A–2 or A–4
For properties of Platner soils in At and Vona soils in AvC, refer to their respective series	21–60	Sandy loam	SM	A–2 or A–4
*Blakeland BoD, Bt	0–60	Loamy sand and sand	SP–SM or SM	A–2 or A–3
For properties of Truckton soils in Bt, refer to Truckton series.				
Colby CbE	0–60	Loam and fine sandy loam	ML	A–4
Dacono DaA, DaB	0–9	Loam	ML	A–4
	9–17	Clay	CH	A–7
	17–26	Sandy clay loam	SC	A–4
	26–60	Very coarse loamy sand, sand, and gravel.	SP or SM, SP–SM, or GP–GM	A–1
Deertrail	0–9	Very fine sandy loam and loam	ML	A–4
Mapped only in a complex with Weld soils.	9–21	Clay	CH	A–7
	21–60	Silty clay loam and loam	CL or ML	A–4 or A–6
Gravelly land-Shale outcrop complex Gr				
Properties too variable to be estimated				
Gullied land Gu.				
Properties too variable to be estimated				
Heldt HlB, HlD	0–32	Clay	CH	A–7
	32–60	Silty clay loam, sandy clay loam.	CL	A–6
Loamy alluvial land:				
Lu	0–60	Loam, silt loam, and clay loam	ML or CL	A–4 or A–6
Lv	0–20	Stratified loam	ML	A–4
	20–60	Sand and gravel	SP or GP	A–1
Lw	0–36	Loam, clay, and stratified loam	ML or CL	A–4 or A–6
	36	Gravel	GP	A–1
Nunn:				
NlA, NlB	0–9	Loam and clay loam	ML	A–4 or A–6
	9–23	Clay	CH	A–7
	23–60	Loam and silt loam	CL or ML	A–4
NuA, NuB	0–9	Clay loam	CL	A–6
	9–23	Clay	CH	A–7
	23–60	Loam and silt loam	CL or ML	A–6 or A–4
Platner PlB, PlC	0–9	Loam	ML	A–4
	9–18	Clay	CH	A–7
	18–60	Clay loam, loam, and sandy loam.	SM, ML, or CL	A–6 or A–4
Renohill. ReB, ReD	0–9	Loam and clay loam	ML or CL	A–6
	9–28	Clay and clay loam	CH	A–7
	28	Shale and sandstone.		

ATTACHMENT A. (CONTINUED)

soils significant to engineering

[Such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructio The sign > means more than, and the sign < means less than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential
No 4 (4 7 mm)	No 10 (2 0 mm)	No 40 (0.42 mm.)	No 200 (0 074 mm)					
				Inches per hour	*Inches per inch of soil*	*pH*	*Mmhos./cm. at 25° C*	
100	100	85–95	70–85	0. 06–0 20	0. 19–0. 21	6. 6–7. 8	0–4	Moderate.
100	100	90–100	70–90	0. 63–2. 0	0 19–0. 21	7. 9–9 0	0–4	Low to moderate
100	100	60–90	30–60	0. 63–6. 3	0. 11–0 18	7 9–8. 4	0–8	Low
100	100	90–100	80–90	<0 06	0. 04–0 06	7 9–10 0	8–15	High.
100	95–100	60–70	30–40	2. 0–6. 3	0. 04–0. 06	7 9–9 0	4–15	Low.
100	95–100	60–80	30–50	0 63–2. 0	0. 13–0 15	6. 6–7 8	0–4	Low to moderate
100	95–100	60–70	30–40	2. 0–6. 3	0. 11–0 13	7 9–9 0	0–4	Low
100	100	50–75	5–15	6 3–20 0	0 06–0 08	6. 1–7 3	0–2	Low
100	100	80–95	50–80	0 63–2. 0	0 16–0 18	7. 9–8. 4	0–4	Low to moderate
90–100	85–100	80–90	60–70	0. 63–2. 0	0. 16–0. 18	6. 6–7. 3	0–1	Low
90–100	85–100	80–100	70–80	0. 06–0. 20	0. 14–0 16	7. 4–7 8	0–1	High.
90–100	85–100	80–90	35–50	0. 63–2. 0	0. 14–0. 16	7. 9–8. 4	0–2	Moderate
50–65	25–35	15–25	0–15	>20. 0	0. 03–0 05	7. 9–8. 4	0–2	Low.
100	100	85–95	60–70	0 63–2. 0	0 15–0 17	6. 6–7 8	0–4	Low
100	100	85–95	70–80	0. 06–0 20	0. 04–0 06	7. 9–10. 0	0–8	High
100	100	90–100	75–85	0. 63–2. 0	0. 04–0 06	7. 9–10 0	4–8	Low to moderate.
100	100	95–100	80–95	0 06–0 20	0 14–0 16	7 9–8. 4	0–2	High.
100	100	90–100	70–90	0 20–0 63	0 16–0 18	7 9–8. 4	0–2	Moderate
100	100	85–100	60–80	0. 20–2. 0	0 16–0. 20	----------	4–8	Low to moderate.
100	95–100	85–95	50–80	0. 63–2. 0	0 16–0 18	----------	0–8	Low.
30–40	25–35	15–25	0–5	>20. 0	0 03–0 05	----------	0–2	Low.
100	100	85–95	50–80	0. 20–2. 0	0. 16–0 20	----------	0–8	Low to moderate
30–40	25–35	15–25	0–5	>20. 0	0. 03–0. 05	----------	0–2	Low.
100	90–100	80–90	60–80	0 63–2. 0	0 16–0 18	6. 6–7. 3	0–2	Moderate.
100	100	90–100	75–85	0. 2–0 63	0. 14–0 16	7 4–7 8	0–2	High
100	90–100	80–90	60–80	0 63–0 20	0. 18–0 20	7. 9–8. 4	0–4	Moderate.
100	90–100	80–90	60–80	0. 20–0 63	0 19–0 21	6 6–7 3	0–2	Moderate
100	90–100	80–90	75–85	0. 06–0 20	0 14–0 16	7. 4–7. 8	0–2	High
100	90–100	80–90	50–70	0. 20–2. 0	0. 18–0 20	7. 9–8. 4	0–4	Moderate
100	100	85–95	60–70	0. 63–2. 0	0. 16–0 18	6. 6–7. 3	0–2	Moderate
100	100	90–100	75–85	0 06–0 20	0. 14–0 16	6 6–7 3	0–4	High.
100	90–100	75–85	40–75	0. 63–2. 0	0. 16–0 18	7. 9–8. 0	0–4	Low to moderate
100	100	85–95	70–80	0. 2–0. 63	0. 18–0 20	7 4–8. 4	0–2	Moderate.
100	100	90–100	70–95	0. 06–0. 20	0. 15–0. 17	7. 9–9 0	0–2	High.

ATTACHMENT B
(RUSLE MANUAL)

Table 8.

Typical Root Mass Values for Established Forage Stands.[1]

(Source: USDA Agriculture Handbook 703.)

Common Name	Root mass in top 4 in. (lb ac^{-1})	Yield (tons/acre)
Grasses:		
Bahiagrass	1,900	-
Bermudagrass, Coastal	3,900	-
Bermudagrass, Common	2,400	-
Bluegrass, Kentucky	4,800	-
Bromegrass, Smooth	4,500	2.5
Dallisgrass	2,500	-
Fescue, Tall	7,000	1.5
Orchardgrass	5,900	2.5
Timothy	2,900	2.5
Legumes:		
Alfalfa	3,500	1.75
Clover, Ladino	1,400	-
Clover, Red	2,100	1.25
Clover, Sweet	1,200	-
Clover, White	1,900	-
Lespedeza, Sericea	1,900	-
Trefoil, Birdsfoot	2,400	-

[1]These values are for mature, full pure stands on well drained nonirrigated soils with moderate to high available water-holding capacity. These values hold for the species shown only within their range of adaptation. Except for biennials, most forages do not attain a fully-developed root system until the end of the second growing season. Root mass values listed can be reduced by as much as half on excessively drained or shallow soils and in areas where rainfall during the growing season is less than 18 inches.

ASSUME HALF OF LOWEST VALUE (CONSERVATIVE)

USE $\frac{1,900}{2} = 950 \frac{lb}{ac}$