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Conceptual Design Requirements for the 200-BP-1 Modified RCRA Subtitle C Barrier

Environmental Excellence
HANFORD

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Bechtel Hanford, Inc.
Richland, Washington

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CONTENTS

1.0 INTRODUCTION 1

2.0 SITE BACKGROUND 1

3.0 SUMMARY OF SITE RISKS 3

4.0 REMEDIAL ACTION OBJECTIVES 4
4.1 ACCEPTABLE EXPOSURE 4
4.1.1 Potential Applicable or Relevant and Appropriate Requirements 5
4.1.2 Future Exposure Conditions 23
4.2 REMEDIAL ACTION OBJECTIVES 23

5.0 EVALUATION OF REMEDIATION ALTERNATIVES 24
5.1 SUMMARY OF ALTERNATIVES 24
5.1.1 Alternative A: No Action 25
5.1.2 Alternative B: Institutional Control 25
5.1.3 Alternative C: Biointrusion Barrier 25
5.1.4 Alternative D: Modified RCRA Barrier 25
5.1.5 Alternative E: Hanford Barrier 25
5.1.6 Alternative F: Excavation and Soil Washing 25
5.1.7 Alternative G: Excavation and Soil Washing with Vitrification 26
5.1.8 Alternative H: Excavation and Fixation 26
5.1.9 Alternative I: Landfill Disposal 26
5.1.10 Alternative J: In Situ Fixation 26
5.2 EVALUATION OF ALTERNATIVES 26

6.0 MODIFIED RCRA BARRIER 27
6.1 DESIGN 28
6.1.1 Layers 1 and 2: Topsoil Layer and Cover Soil Layer . . . 28
6.1.2 Layers 3 and 4: Filter Sand and Filter Gravel 35
6.1.3 Layer 5: Drainage Gravel 35
6.1.4 Layer 6: Asphalt Biointrusion Layer 35
6.1.5 Layer 7: Asphalt Base Course Layer 36
6.1.6 Layer 8: Grading Fill 36
6.2 SITE-SPECIFIC REQUIREMENTS 37
6.3 COSTS 39
6.3.1 Engineering 39
6.3.2 Construction 43

7.0 REFERENCES 46

APPENDIX:

A HELP MODEL SIMULATIONS RESULTS A-1
B EROSION ANALYSIS B-1

CONTENTS (cont.)

FIGURES:

1. 200-BP-1 Operable Unit 2
2. RCRA Subtitle C Cover Cross Section 31
3. Moisture Drawback After Installation of the Modified RCRA Barrier . . 38

TABLES:

1. Identification of Federal ARARs at the 200-BP-1 Operable Unit 6

2. Identification of State ARARs at the 200-BP-1 Operable Unit 15

3. Preliminary Contaminant-Specific ARARs for the 200-BP-1 Operable Unit Contaminants of Concern 20

4. Summary of RCRA Subtitle C Cover Layers 29

5. Summary of RCRA C Cover Design Criteria 32

6. RCRA Subtitle C Cover Conformance with Design Criteria 33

7. RCRA Subtitle C Cover Barrier Cost Estimate Comparison 40

1.0 INTRODUCTION

This document details the conceptual design requirements (CDR) for construction of a modified *Resource Conservation and Recovery Act* (RCRA) Subtitle C barrier at the 200-BP-1 Operable Unit (cribs 216-B-43 through 216-B-50). A comprehensive comparative analysis of 10 alternatives against 7 U.S. Environmental Protection Agency (EPA) criteria was conducted for treating contaminated soil at this site. The evaluation concluded that the preferred alternative was the modified RCRA barrier. The EPA, Washington State Department of Ecology (Ecology), and U.S. Department of Energy (DOE) agree that this alternative would provide the best alternative for permanent remediation of the 200-BP-1 Operable Unit (DOE-RL 1993b). Detailed information can be found in the final remedial investigation/feasibility study (RI/FS) reports for the 200-BP-1 Operable Unit (DOE-RL 1992, 1993a).

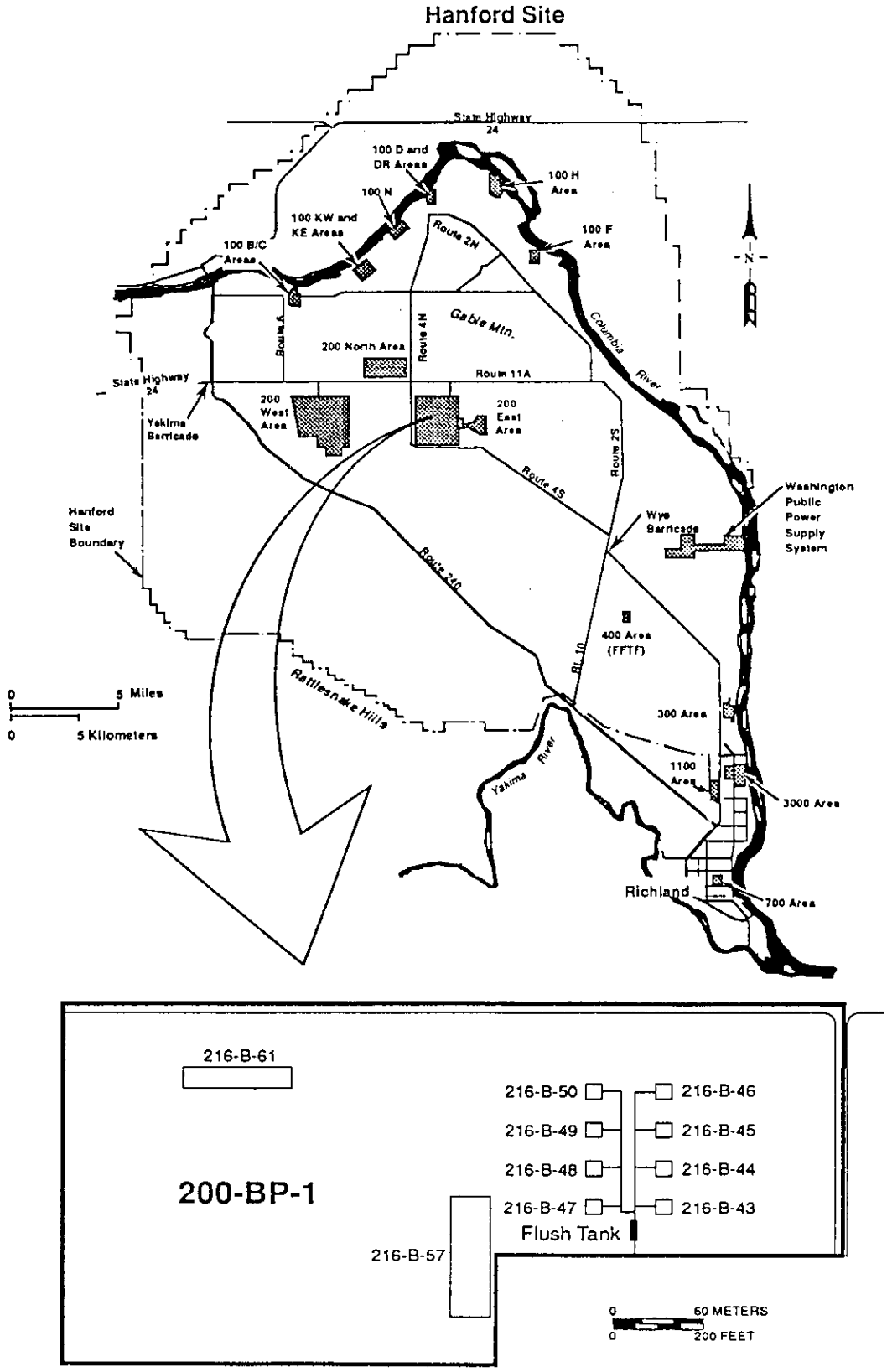
2.0 SITE BACKGROUND

The 200 Areas of the Hanford Site were placed on the National Priority List in November 1989 under the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). The 200 Areas are divided into eight waste area groups largely corresponding to major processing plants (e.g., B Plant). Each waste area group is further subdivided into one or more operable units based on waste disposal information, location, facility type, and other site characteristics. The 200-BP-1 Operable Unit is one specific site within the 200 East Area (Figure 1).

The 200-BP-1 is a source operable unit with contaminated soils associated primarily with 10 inactive cribs. These cribs were used for disposal of low-level radioactive liquid waste from U Plant uranium recovery operations and waste storage tank condensate from the adjacent 241-BY Tank Farm. The cribs used for disposal of U Plant waste were in operation from 1955-1956, and the cribs used for disposal of tank condensate were in operation from 1965-1975. One crib (216-B-61) was constructed, but there is no evidence that the crib was ever used or received waste. This historical information was verified through sampling. In addition to the cribs, four unplanned releases of radioactive materials have occurred within the operable unit. Contaminated surface soils associated with the unplanned releases have been consolidated over the cribs and covered with clean soil to reduce contaminant migration and exposure.

A prototype barrier is currently under construction at the 216-B-57 crib within the 200-BP-1 Operable Unit. Completion of this barrier is scheduled for July 1994. Once constructed, the barrier will be tested and monitored for a minimum of 3 years to determine performance. In addition, it is anticipated that the barrier will result as a final remediation for the 216-B-57 crib.

Figure 1. 200-BP-1 Operable Unit.



3.0 SUMMARY OF SITE RISKS

During the RI/FS, an analysis was conducted to estimate the health or environmental problems that could result if contaminated soils at the 200-BP-1 Operable Unit were not cleaned up. This analysis is commonly referred to as a baseline risk assessment. For carcinogens, the risk is presented as the possible (upper-bound) risk of contracting some form of cancer given a lifetime exposure to a chemical or radionuclides. State and federal guidelines for acceptable upper-bound cancer risk normally range from a chance of 10^{-4} (1 in 10,000) to 10^{-6} (1 in 1,000,000) of developing cancer due to exposure to a carcinogen.

The risk associated with the 200-BP-1 Operable Unit while maintaining current institutional controls is less than 10^{-6}. However, discharge of wastes to the cribs has resulted in additional risk associated with the subsurface soil contamination, if exposed to the surface. Contaminated soils at the site can be categorized by the types of contaminants, their distribution in the soil column, and the risk posed by the various potential exposure pathways. Below the clean soil cover (2 to 15 ft), the near-surface soils contain low levels of contamination with ^{137}Cs, ^{226}Ra, ^{90}Sr, ^{222}Th, and total uranium. The volume of contaminated soils in the near surface is estimated at 62,000 yd^3. The lifetime incremental cancer risk associated with these soils if exposed to the surface is 9×10^{-5}.

The majority of the high-activity contaminated soils are located between 5 to 15 m (15 to 50 ft) below ground surface. The volume of high-activity contaminated soils is estimated at 191,000 yd^3. The most significant contaminants in this zone include ^{90}Sr, ^{137}Cs, ^{238}Pu, $^{239+240}Pu$, and total uranium. Most of the radioactivity is attributable to ^{90}Sr and ^{137}Cs. These radionuclides have relatively short half-lives (29-30 years, respectively) and are highly immobile in the soils. These soils, if exposed at the ground surface through human or biotic intrusion, pose an unacceptable risk ($>10^{-2}$ lifetime incremental cancer risk). However, due to the relatively short half-lives and immobility of ^{90}Sr and ^{137}Cs, they do not pose a risk to groundwater. The plutonium isotopes are highly immobile; however, $^{239+240}Pu$ are extremely long lived (half-life >10,000 years). Uranium is relatively mobile and extremely long-lived (half-life in excess of 100 million years) and poses the most significant future risk for groundwater contamination. Vadose modeling indicates that, if no action were taken to remediate the contaminated soils, uranium will reach the groundwater at concentrations that exceed the proposed drinking water standard (30 pCi/L) in about 700 years.

Contaminants of concern present in soils below 15 m (50 ft) include nitrate, ^{60}Co, ^{99}Tc, and total uranium. Volume of contaminated soils in this region is estimated at 250,000 yd^3. Soils below 50 ft pose a potential risk associated with the groundwater pathway only. Nitrate, ^{60}Co, and ^{99}Tc are highly mobile and reached groundwater very soon after being discharged to the cribs. The peak groundwater concentrations associated with these contaminants are located more than a mile downgradient of the 200-BP-1 Operable Unit. Concentrations currently entering groundwater for the soil at 200-BP-1 are declining, and only nitrate is in excess of drinking water standards (45 mg/L). Concentrations of ^{60}Co and ^{99}Tc entering groundwater from the contaminated soils are below both current and proposed drinking water

standards; however, they exceed Washington State Model Toxics Control Act Cleanup Regulations Method B standards. Contamination of groundwater beneath the 200-BP-1 Operable Unit is being addressed in the 200-BP-5 groundwater operable unit.

4.0 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are developed in the FS. They provide the foundation for identification and screening of remedial technologies. Remedial action objectives are operable unit-specific goals for protecting human health and the environment. For the 200-BP-1 soils operable unit, RAOs are based on the findings of the Phase I RI and on the statutory requirements of CERCLA, the National Contingency Plan (NCP), and the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989). The development of RAOs is founded on the baseline risk assessment and chemical-specific applicable or relevant and appropriate requirements (ARARs), and are specific for the contaminants of concern and exposure pathways identified for the site. Using this information, allowable exposures for each contaminant (or group of contaminants) and for each pathway are defined in Section 4.1. RAOs are then formulated in Section 4.2, specifying the goals for protecting human health and the environment based on allowable exposures.

4.1 ACCEPTABLE EXPOSURE

As specified in the NCP in 40 CFR 300.430(e)(2)(i), remediation goals for the 200-BP-1 Operable Unit are based on establishing acceptable exposure levels that are protective of human health and the environment by considering chemical-specific and location-specific ARARs and risk-based exposure concentrations.

The NCP states that acceptable exposure levels will be based on ARARs, where they are available and are sufficiently protective. For known or suspected carcinogens where ARARs are not available, acceptable exposure levels are concentration levels that represent an excess upper-bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}. The 10^{-6} risk level is to be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective, because of multiple contaminants or multiple pathways of exposure. The NCP specifies that in cases involving multiple contaminants or pathways, where attainment of chemical-specific ARARs will result in cumulative cancer risk in excess of 10^{-4}, the cleanup level should be established using risk-based criteria.

Potential chemical-specific, location-specific, and action-specific ARARs are discussed in Section 4.1.1.

4.1.1 Potential Applicable or Relevant and Appropriate Requirements

This section consists of a review of potential federal and state ARARs that may be pertinent to the remedial actions that are considered in the FS. Identification and refinement of ARARs is an ongoing process that occurs throughout all phases of the RI/FS. The review of ARARs included herein is an update of the preliminary ARAR identification that was presented in the Phase I RI. The ARAR development process is based on CERCLA guidance (EPA 1988a, 1988b).

Section 121(d) of CERCLA, as amended, establishes cleanup standards for remedial actions. This section requires in part that any applicable or relevant and appropriate standard, requirement, criteria, or limitation under any federal environmental law, or any more stringent state requirement promulgated pursuant to a state environmental statute, be met for any hazardous substance, pollutant, or contaminant remaining onsite.

A requirement for Superfund compliance at a hazardous substance cleanup site may be either "applicable" or "relevant and appropriate," but not both. Identification of ARARs must be done on a site-specific basis and involves a two-part analysis: first, a determination is made whether a given requirement is applicable; then, if it is not applicable, a determination is made whether it is nevertheless both relevant <u>and</u> appropriate. The EPA guidance also includes To-Be-Considered (TBC) materials which are advisories and non-promulgated guidance issued by federal or state governments that are non-statutory requirements evaluated along with ARARs as part of the risk assessment used to establish protective cleanup limits.

The different types of requirements that CERCLA actions may have to comply with are identified as chemical-specific, location-specific, and action-specific ARARS. The following definitions are excerpts from EPA guidance in *CERCLA Compliance with Other Laws Manual: Interim Final* (EPA 1988a). However, some requirements may not fall neatly into the classification system.

> <u>Chemical-specific requirements</u> are usually health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These numbers establish the acceptable amount or concentration of a chemical that can be found in, or discharged to, the ambient environment.
>
> <u>Location-specific requirements</u> are restrictions placed on the concentration of hazardous substances or the conduct of activities because they occur in special or sensitive locations or environments.
>
> <u>Action-specific requirements</u> are those that place either technology-based or activity-based requirements on remedial actions at CERCLA sites.

Federal and state regulations along with other guidance were evaluated as potential ARARs and TBC materials. The laws and regulations evaluated as potential ARARs for the 200-BP-1 Operable Unit are summarized in Tables 1, 2, and 3.

Table 1. Identification of Federal ARARs at the 200-BP-1 Operable Unit. (sheet 1 of 9)

Requirements	Applicable, Relevant & Appropriate, or To Be Considered	Comment
Chemical Specific		
Safe Drinking Water Act of 1974 Title 42 USC 300, et seq.		
National Primary Drinking Water Standards 40 CFR 141	Relevant & Appropriate[a]	The NCP requires that maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) established under the Safe Drinking Water Act be attained by remedial actions for groundwater and surface waters that are current or future sources of drinking water where the MCLG or MCL are relevant and appropriate to the situation. (See footnote a.) Groundwater currently is not used for drinking; however, it could be used in the future if the site is released from institutional controls. In addition, there is potential for discharge of contaminated groundwater to the Columbia River, which is used for drinking water. Remedial alternatives need to prevent migration of contaminants from soils to groundwater at concentrations that cause groundwater to exceed MCLs and MCLGs. MCLs and MCLGs for public drinking water are presented in Table 3-3 for radioactive contaminants of concern. Nitrate is the only nonradioactive contaminant of concern reported in the 200-BP-1 RI (DOE-RL 1993). The MCL and MCLG are both set at 45 mg/mL.
National Secondary Drinking Water Standards 40 CFR 143	Not ARAR[a]	Federal secondary standards are not enforceable standards and are not typically applicable or relevant and appropriate requirements. (See footnote a.) There are not established secondary MCLs for operable unit contaminant of concern.
Atomic Energy Act of 1954, as amended Title 42 USC 2011 et seq.		
Environmental Radiation Protection Standards for Nuclear Power Operations 40 CFR 190	Not ARAR	The regulation specifies the levels below which normal operations of the uranium fuel cycle are determined to be environmentally acceptable. These standards are not applicable and not relevant and appropriate since the standard excludes operations at disposal sites and definition of the uranium fuel cycle focuses on those processes that result in generation of electrical power. The standard set dose equivalents from the facility that are not to exceed 25 mrem/yr to whole body, 74 mrem/yr to thyroid, or 25 mrem/yr to any other organ. Release limits at .5 mCi for ^{239}Pu and other alpha-emitting transuranics with half-lives greater than 1 year.

[a]WAC 173-340-720(2)(a)(ii) specifies that MCLs, MCLGs, and SMCLs are applicable requirements for groundwater cleanup, where groundwater has a current or potential future use as a drinking water.

Table 1. Identification of Federal ARARs at the 200-BP-1 Operable Unit. (sheet 2 of 9)

Requirements	Applicable, Relevant & Appropriate, or To Be Considered	Comment
Chemical Specific (cont.)		
Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level Waste and Transuranic Radioactive Waste 40 CFR Part 191	Potentially Relevant & Appropriate	Standards under this regulation are applicable because they contain environmental protection requirements for management and disposal of spent nuclear fuel, high-level waste, and transuranic wastes at facilities operated by the DOE. The standard addresses all disposal methods. These requirements are not potentially applicable because the contaminated soils do not meet the definition of waste subject to regulation. However, long-term performance standards established by the regulation may be potentially relevant and appropriate because the long-lived radionuclides of uranium could impact groundwater in the future. Subpart A applies to facilities regulated by the U.S. Nuclear Regulatory Commission and sets maximum allowable effective dose equivalent for any member of the public at 25 mrem/yr to whole body, 75 mrem/yr to thyroid, or 25 mrem/yr to any other organ. Facilities not regulated by the NRC shall provide reasonable assurance that the combined annual dose to the public resulting from discharges shall not exceed 25 mrem/yr to whole body or 75 mrem/yr to any critical organ. Alternative standards may be established that prevent any member of the public from receiving a continuous exposure of more than 100 mrem/yr and an infrequent exposure of 500 mrem/yr from all sources. Environmental standards set in Subpart B address protection of individual members of the public and groundwater at disposal facilities. Disposal systems are to be designed to provide protection for up to 1,000 years following disposal and undisturbed performance should limit individual members of the public to less than 25 mrem/yr to the whole body or 75 mrem/yr to any critical organ. Radium-226/228 are not to exceed 5 pCi/L, alpha emitters are not to exceed 15 pCi/L, including $^{226/228}Ra$, excluding radon and combined concentrations of beta or gamma emitters shall not produce an annual dose equivalent to whole body or any internal organ greater than 4 mrem/yr if an individual consumed 2 l/day from the groundwater source. If average annual concentrations in groundwater exceed standards prior to construction of the disposal facility, the disposal system may not increase the existing conditions by more than the limits set in Subpart B. The proposed rule published February 10, 1993 (58 FR 7924) would require that disposal methods control radiation exposure for at least 10,000 years. The proposed rule also would limit radiation exposure of an individual to no more than 15 mrem/yr.
Nuclear Regulatory Standards for Protection Against Radiation 10 CFR 20	Relevant & Appropriate	The regulation establishes standards for protection of the public against radiation arising from the use of regulated materials and as such are relevant and appropriate. Radioactive material from sources not licensed by the NRC are not subject to these regulations; therefore, this standard is not applicable because the operable unit is not NRC licensed. Remedial alternatives need to limit external and internal exposure from releases to levels that do not exceed 100 mrem/yr, or 2 mrem/h from external exposure in unrestricted areas. Specific concentration limits of contaminants of concern in liquid effluent allowed in unrestricted areas are listed in Table 3-3. These limits are based on annual effective dose equivalent from internal exposure for adults of 50 mrem.

Table 1. Identification of Federal ARARs at the 200-BP-1 Operable Unit. (sheet 3 of 9)

Requirements	Applicable, Relevant & Appropriate, or To Be Considered	Comment
Chemical Specific (cont.)		
Clean Water Act of 1977 33 USC 1251	Applicable	Standards adopted under this act apply to surface water that is not currently impacted from the operable unit. Applicability or relevance and appropriateness to groundwater and surface water will be evaluated as part of the groundwater aggregate area management study.
Clean Air Act of 1977, as amended 42 USC 7401 et seq.		
National Ambient Air Quality Standards 40 CFR 50	Applicable	Requirements of these regulations are applicable to airborne release of radionuclides and criteria pollutants specified under the statue. Specific release limits for particulates are set at 50 $\mu g/m^3$ annually or 150 $\mu g/m^3$ per 24-h period. Standards for airborne lead measured as elemental lead are set at 1.5 $\mu g/m^3$, maximum arithmetic mean averaged over a calendar quarter.
National Emission Standard for Hazardous Air Pollutants (NESHAP), Subpart H - National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities 40 CFR 61	Applicable	These requirements are applicable to the site and remedial alternatives since the potential to release air emissions to unrestricted areas exist. Subpart H sets emission limits from the entire facility to ambient air not exceed an amount that would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr. The definition of facility includes all buildings, structures, and operations on one contiguous site.
Resource Conservation and Recovery Act 42 USC 6901 et seq.		
Ground Water Protection Standards 40 CFR 264	Not ARAR	Requirements of this section are not applicable or relevant and appropriate since wastes present in soils at the site do not designate as hazardous waste and the 200-BP-1 cribs are not regulated units under RCRA.
Land Disposal Restrictions 40 CFR 268	Not ARAR	Land disposal restrictions are not ARAR to chemicals present at the site since RCRA treatment standards do not concern wastes that are already in place. Land disposal restrictions will be further evaluated as potential action-specific ARARs.
Uranium Mill Tailings Radiation Control Act of 1978 42 USC 2022		
Health and Environment Protection Standards for Uranium and Thorium Mill Tailings 40 CFR 192	Relevant & Appropriate	Requirements of this act are relevant and appropriate since ^{226}Ra is present in soils at the site. The standards is not applicable because the operable unit is not a milling site for uranium or thorium. Subpart B sets concentration limits for ^{226}Ra in soils for land cleanup of 5 pCi/g averaged over the upper 15 cm and 15 pCi/g averaged over any 15-cm-thick layer more than 15 cm from the surface. The level of gamma radiation is any occupiable building is not to exceed 20 microroentgens/h above background. Groundwater protection requirements for concentrations of ^{226}Ra, ^{228}Ra, and gross alpha particle activity are set at EPA-established levels for drinking water.

Table 1. Identification of Federal ARARs at the 200-BP-1 Operable Unit. (sheet 4 of 9)

Requirements	Applicable, Relevant & Appropriate, or To Be Considered	Comment
Chemical Specific (cont.)		
DOE Order 5400.5 - Radiation Protection of the Public and the Environment	To Be Considered	This DOE Order sets radiation standards for protection of the public in the vicinity of DOE facilities. The order sets a limit for the annual effective dose equivalent of 100 mrem, but allows temporary limits of 500 mrem if avoidance of higher exposures is impractical. The standards set annual dose limits for any organ at 5 mrem. An annual dose equivalent from drinking water supplies operated by DOE is set ar 4 mrem and states that liquid effluent from DOE activities will not cause public drinking water systems to exceed EPA MCLs. The order establishes guidelines for residual concentration of radium and thorium in soils, airborne radon decay products, and external gamma exposure as provided in 40 CFR 192. The order also establishes design lifetime control and stabilization features as given in 40 CFR 192, including control and access feature to be effective to reasonable extent for 1,000 years, and in any case no less than 200 years. Specific concentration limits in water for contaminants of concern are listed in Table 3-3.
Toxic Substance Control Act 15 USC 2601 et seq. Regulation of PCBs 40 CFR 761	Not ARAR	TSCA requirements are not ARAR because PCBs detected at the site are below the regulated concentration of 50 ppm. Handling, storage, and disposal requirements may require consideration if the 50 ppm levels are exceeded.
National Historic Preservation Act of 1966 USC 470 et seq.	Not ARAR	Requirements established under this act are not applicable or relevant and appropriate to the operable unit because no facilities located on the operable unit are currently listed on or proposed for inclusion on the National Register of Historic Places.
Archeological and Historic Preservation Act 16 USC 469a-1	Not ARAR	This act requires that actions conducted at the site must not cause the loss of any archeological and historic data. This act varies from the National Historic Preservation Act in that it mandates only preservation of the data and not the actual facility. No archeological or historic sites have currently been identified within the operable unit and therefore for these requirements are not applicable or relevant and appropriate.
Endangered Species Act of 1973 16 USC 1531 et seq.	Not ARAR	Requirements to protect species threatened by extinction and habitats critical to their survival must be considered by remedial alternatives performed on the site. Endangered species and critical habitats have been evaluated at the Hanford Site, and none have been identified in the operable unit; therefore, requirements of this act are not applicable or relevant and appropriate.
Wild and Scenic Rivers Act 16 USC 1271 et seq.	Not ARAR	Requirements of this act are not applicable or relevant and appropriate because the Columbia River is not included in the national system of wild and scenic rivers. The Columbia River has been proposed for inclusion in the system, and remedial alternatives for the site should consider migration of contaminants from soils to groundwater and potential impact to the Columbia River.

Table 1. Identification of Federal ARARs at the 200-BP-1 Operable Unit. (sheet 5 of 9)

Requirements	Applicable, Relevant & Appropriate, or To Be Considered	Comment
Action Specific		
Resource Conservation and Recovery Act, as amended 42 USC 6901		
Identification and Listing of Wastes 40 CFR 261	Potentially Applicable	These requirements are applicable for all waste generated by remedial actions and disposed off-site. Waste must be identified and evaluated to determine if it is designated hazardous waste. The regulations are not applicable for remedial actions that do not generate waste (i.e., barrier alternatives).
Generator Standards 40 CFR 262	Potentially Applicable	Regulatory requirements for facilities that generate hazardous waste are applicable if hazardous waste is generated and transported offsite for disposal.
Standards for Owners and Operators of TSD Facilities 40 CFR 264	Potentially Applicable or Relevant & Appropriate	Regulatory requirements for owners and operators of hazardous waste storage, treatment, or disposal facilities are applicable if hazardous wastes are generated during remedial activities and stored longer than 90 days or disposed onsite. Specific storage, treatment, and disposal requirements may be potentially relevant and appropriate because they address similar circumstances. For example, minimum technical requirements for RCRA landfill covers may be relevant and appropriate for containment activities.
Release from solid waste management units (40 CFR 264.90-264.120)	Applicable	Applicable if a new landfill unit is created to store or dispose of RCRA hazardous waste as part of a remedial action. Establishes a program for groundwater detection and compliance monitoring.
Closure and postclosure (40 CFR 264.110-264.120)	Applicable or Relevant & Appropriate	Describes performance standards for controls to minimize or eliminate the escape of hazardous waste constituents from landfills to the ground and surface waters. Applicable if hazardous waste from remedial actions is disposed of in landfills. Closure performance standards of Part 264.111 are relevant and appropriate if waste is left in place and contained with a surface barrier.
Landfill closure and postclosure (40 CFR 264.310)	Potentially Relevant & Appropriate	Portions of the closure and postclosure requirements for RCRA landfills may be relevant and appropriate if operable unit is remediated with a surface barrier.
Land Disposal Restrictions 40 CFR 268	Potentially Applicable	These requirements are applicable if restricted waste is generated during remediation and disposal offsite.
Treatment standards (40 CFR 268.40)	Applicable	Hazardous wastes that are not treated to BDAT or do not meet the extract or constituent concentration limit are prohibited from land disposal. Applicable to any hazardous waste resulting from remedial actions.
Prohibition on storage (40 CFR 268.50)	Applicable	Wastes are also prohibited from storage longer than 1 year unless storage is necessary to facilitate proper recovery, treatment, or disposal. Land ban wastes, generated from the remedial actions, stored for longer than 1 year must be placed in tanks and containers that meet the requirements, unless wastes have been treated, treatment has been waived, a treatment variance has been set for the waste, an equivalent treatment method petition has been approved, or the waste has been delisted.

Table 1. Identification of Federal ARARs at the 200-BP-1 Operable Unit. (sheet 6 of 9)

Requirements	Applicable, Relevant & Appropriate, or To Be Considered	Comment
Action Specific (cont.)		
Clean Water Act of 1977, 33 USC 1251, as amended		
EPA National Pollutant Discharge Elimination System (NPDES) Permit regulations (40 CFR 122)	Applicable	Both onsite and offsite discharge of wastewater from a treatment system at a CERCLA site discharged to surface waters is required to meet the substantive requirements under NPDES. Requirements include discharge limitations, monitoring requirements, and best management practices. Substantive requirements for onsite discharges from a CERCLA site must be identified and complied with even though an NPDES Permit will not be obtained. Offsite discharges from a CERCLA site directly to receiving waters must comply with applicable federal, state, and local requirements. For offsite discharge, a NPDES application must be made 180 days before discharges actually begin.
Criteria and Standards for the National Pollutant Discharge Elimination System (40 CFR 125)	Applicable	Under Part 301(b) of the Clean Water Act, all direct discharges to waters of the U.S. shall meet technology-based requirements. Best available technology economically achievable will be used for toxic and non-conventional pollutants. Best management practices are required for any discharge containing pollutants listed as toxic or hazardous. Best management practices shall be incorporated into the NPDES Permit and may reflect requirements for Spill Prevention Control and Counter (SPCC) measure plans under Section 311 of the Act and 40 CFR 151.
Safe Drinking Water Act, as amended 42 USC 300f		
Underground Injection Control Regulations 40 CFR 144	Applicable	These requirements are applicable to remedial actions that entail injection of wastes or treated groundwater.
Occupational Safety and Health Act of 1970 (OSHA) 20 USC 333, as amended		
OSHA Standards 29 CFR 1910	Applicable	Health and safety requirements are applicable to all remedial activities conducted at the site, including Section 1910.120, "Hazardous Waste Operations and Emergency Response."
OSHA Safety and Health Regulations for Construction 29 CFR 1926	Applicable	The safety and health standards under this OSHA regulation are applicable to remedial actions at 200-BP-1 that involve construction activities. Subparts of the standard address all activities associated with construction, including safety, training, operation of mechanized equipment, materials handling, and excavation.

Table 1. Identification of Federal ARARs at the 200-BP-1 Operable Unit. (sheet 7 of 9)

Requirements	Applicable, Relevant & Appropriate, or To Be Considered	Comment
Action Specific (cont.)		
Radiation Protection for Occupational Workers, DOE Order 5480.11 10 CFR 835	To Be Considered	DOE Order 5480.11 implements radiation protection standards and program requirements for worker protection at DOE and DOE contractor operations. These standards were developed to be consistent with EPA standards and are based on recommendations by organizations recognized as authorities in the area of radiation protection. DOE policy is to maintain radiation exposures as low as reasonably achievable (ALARA) and as low as effective dose equivalent to a worker from both internal and external sources received in any hear is 5 rem. The limiting value to specific organs and tissues is 15 rem to the lens of the eye or 50 rem to any other organ or extremity of the body. Additional limiting values ar established for unborn (.5 rem/yr), and children and minors (.1 rem/yr). Radiation protection standards for the public entering controlled areas are set at .1 rem/yr from the committed effected dose equivalent from any external radiation. In addition, exposure shall not cause a dose equivalent to any tissue to exceed 5 rem/yr.
Radioactive Waste Management DOE Order 5820.2A	To Be Considered	Policies and guidelines established for the management of radioactive waste and contaminated facilities should be considered during selection of remedial alternatives. These standards are TBC under CERCLA because they are not federally promulgated regulations. However, compliance with DOE Orders is required at the Hanford Site. These guidelines set performance objectives to limit the annual effective dose equivalent beyond the facility boundary to 25 mrem. Disposal methods selected must be sufficient to limit the annual effective dose equivalent to 100 mrem for continuous exposure or 500 mrem for acute exposure when institutional controls are removed.
Chapter III, Management of Low-Level Waste		
Waste treatment [paragraph 3(f)(1)(2)(3)]	To Be Considered	This section states that waste treatment techniques such as incineration, shredding, and compaction shall be implemented to meet performance requirements. These requirements should be considered during selection of remedial alternatives.
Disposal [paragraph 3(i)]	To Be Considered	Proposed remedial actions related to disposal of low-level waste should be selected and designed considering the criterion in this section. The section includes engineered modifications, disposal site selection, disposal facility and site design, and disposal facility operations.
Chapter VI, Waste Management Plan Outline		
Radioactive and mixed waste management [paragraph 3(c)]	To Be Considered	This section is to be considered during selection of remedial alternatives because the section includes system and facility descriptions, current and future plans, and implementation requirements.
Hazardous waste management [paragraph 3(d)]	To Be Considered	This section includes system and facility descriptions that should be considered during selection of remedial alternatives.

Table 1. Identification of Federal ARARs at the 200-BP-1 Operable Unit. (sheet 8 of 9)

Requirements	Applicable, Relevant & Appropriate, or To Be Considered	Comment
Action Specific (cont.)		
Atomic Energy Act of 1954, as amended Title 42 USC 2011 et seq.		
Nuclear Regulatory Standards for Protection Against Radiation 10 CFR 20	Relevant & Appropriate	The regulation establishes standards for protection of the public against radiation arising from the use of regulated materials and as such are relevant and appropriate. Radioactive material from sources not licensed by the NRC are not subject to these regulations; therefore, this standard is not applicable because the operable unit is not NRC licensed. Remedial alternatives need to limit external and internal exposures from releases to levels that do not exceed 100 mrem/yr, or 2 mrem/h from external exposure in unrestricted areas. Specific concentration limits for contaminants are addressed. These limits are under chemical-specific ARARs.
Licensing Requirements for Land Disposal of Radioactive Waste 10 CFR 61	Relevant & Appropriate	Requirements that disposal systems must be designed to limit the annual dose equivalent beyond the facility boundary below 25 mrem to the whole body, 75 mrem to the thyroid, or 25 mrem to any other organ are relevant and appropriate to remedial actions at the site. The regulation is not applicable because it does not apply to disposal of high-level waste. Requirements to define protection to inadvertent intruders at any time after institutional controls have been removed may also be relevant and appropriate to actions implemented at the site.
Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes 40 CFR Part 191	Potentially Applicable	Containment requirements established by this standard are potentially applicable to remedial actions that involve generation and disposal of waste meeting the definition of 40 CFR 191.02(ii). The standard states that radionuclide release to the environment for a period of 10,000 years after disposal shall not exceed a 1 in 10 likelihood of 10 times the specified level listed in Appendix A, Table 1, or the regulations, or less than 1 in 100 chance of exceeding 10 times the limit specified in Table 1. Requirements for protection of groundwater and for individual members of the public are also relevant and appropriate and are discussed as chemical-specific ARARs. Proposed standards for disposal of spent nuclear fuel, high-level, and transuranic waste were published February 10, 1993 (58 FR 7924). The proposed standards would require that disposal methods control radiation exposure for at least 10,000 years and proposes to limit radiation exposure of an individual to no more than 15 mrem/yr.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings 40 CFR 192	Relevant & Appropriate	Standards for cleanup set under this program are relevant and appropriate to remedial actions conducted at the site, including groundwater protection requirements for ^{226}Ra, ^{228}Ra, and gross alpha particle activity which are set at EPA-established levels for drinking water. The standard is not applicable because the operable unit is not a uranium or thorium milling site.
National Emission Standard for Hazardous Air Pollutants (NESHAP), Subpart H - National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities 40 CFR 61	Applicable	These requirements are applicable to the site and remedial alternatives because the potential to release air emissions to unrestricted areas exists. Subpart H sets emission limits to ambient air from the entire facility not to exceed an amount that would cause any member of the public to receive an effective dose equivalent of 100 mrem/yr. The definition of facility includes all buildings, structures, and operations on one contiguous site. Radionuclide emission from stacks shall be monitored and effective dose equivalent values to members of the public calculated.

Table 1. Identification of Federal ARARs at the 200-BP-1 Operable Unit. (sheet 9 of 9)

Requirements	Applicable, Relevant & Appropriate, or To Be Considered	Comment
Action Specific (cont.)		
Hazardous Materials Transportation Act (49 USC 1801, et seq.)		
Hazardous Materials Regulation (49 CFR 171)	Applicable	No person may offer or accept hazardous material for transportation in commerce unless the material is properly classed, described, packaged, marked, labeled, and in condition for shipment. Applicable to hazardous waste material generated during treatment of groundwater and that would be sent offsite for disposal. Items could include ion exchange resins, reverse osmosis brine, filters, and sludge from processing equipment.
Hazardous Materials Tables, Hazardous Materials Communications Requirements and Emergency Response Information Requirements (49 CFR 172)	Applicable	The class of each hazardous material is identified in tables with requirements pertaining to its packaging, labeling, and transportation. Small quantities of radioactive materials are not subject to any other requirements of the chapter if the activity level is not exceeding that specified in §§173.421, 173.422, or 173.424, as appropriate, for a package containing a radioactive material. Packages used for shipping the hazardous materials shall be designed and constructed, and its contents so limited, that under conditions normally incident to transportation, there is no significant release of hazardous materials to the environment. These requirements are only relevant and appropriate if the hazardous waste generated by the remedial actions is transported off the Hanford Site.

Table 2. Identification of State ARARs at the 200-BP-1 Operable Unit. (sheet 1 of 5)

REQUIREMENTS	Applicable, Relevant & Appropriate, To be Considered	COMMENT
CHEMICAL SPECIFIC		
Water Pollution Control/ Water Resource Act of 1971 Ch. 90.48 RCW/ Ch.90.54 RCW		
Surface Water Quality Standards WAC 173-201	Potentially Applicable	Groundwater below the operable unit is considered to be in communication with surface waters and also discharges to the Columbia River. However, contaminants from the operable unit do not currently discharge to the Columbia River. Potential future impacts will be evaluated in the groundwater aggregate management study. Due to these considerations, requirements of this standard are potentially applicable to the site. Remedial actions must consider migration of contaminants from soils to groundwater and their potential discharge to surface waters.
Hazardous Waste Clean Up/ Model Toxics Control Act Ch. 70.105D RCW		
Model Toxics Control Act WAC 173-340	Applicable	Requirements under this standard are applicable to the operable unit. Specific clean up goals and methods established in the standard require implementation of the strictest federal or state cleanup criteria. For groundwater remediation, MCLGs and secondary drinking water standards are identified as cleanup criteria. MTCA also establishes requirements for cleanup levels for soils based on protection of groundwater are set at 100 times the most stringent federal or state standard or calculated using standard methods incorporated in the regulation unless it can be demonstrated this is not appropriate for the site. Vadose zone fate and transport modeling has been used to determine soil cleanup levels that are protective for groundwater at 200-BP-1.. MTCA surface and groundwater clean-up levels for contaminant of concern are listed in Table 3-3. MTCA method B and C groundwater cleanup standards for nitrate are at 26 mg/l and 44 mg/l, respectively. MTCA soil clean-up standards for radioactive contaminants of concern are also listed in Table 3-3. Method B and C cleanup levels for soils are set at 1.28E05 mg/kg and 5.12E-05 mg/kg, respectively.
Dangerous Waste Regulations Ch. 70.105 RCW		
Dangerous Waste Regulations WAC 173-303	Not ARAR	Requirements found in the dangerous waste regulations are not applicable or relevant and appropriate to the site since contaminants present do not designate as dangerous waste.

Table 2. Identification of State ARARs at the 200-BP-1 Operable Unit. (sheet 2 of 5)

REQUIREMENTS	Applicable, Relevant & Appropriate, To be Considered	COMMENT
Solid Waste Management, Recovery and Recycling Act Ch. 70.95 RCW		The standard is applicable for alternatives requiring management of solid waste. Sets the minimum standards for the handling of all solid waste, including operation, monitoring and closure requirements. The standard sets groundwater maximum contaminant levels (MCLs) at the same levels as the drinking water standards under 40 CFR 141.
Minimum Functional Standards for Solid Waste Handling WAC 173-304	Applicable	
State Radiation Standards Ch. 70.98 RCW		
Radiation Protection Standards WAC 246	Relevant & Appropriate	State radiation standards developed pursuant to the Atomic Energy Act of 1954, as amended, are relevant and appropriate to remedial actions conducted at the site. These standards are not applicable since sections of the regulation address specific facility types and activities not associated with the operable unit. Remedial alternatives must not allow maximum annual radiation dose to individuals in restricted areas above 1.25 mrem to the whole body, the head and trunk, active blood forming organs, gonads or lens of the eye; a maximum annual dose of 18.75 mrems to the hands and forearms or feet and ankles; a maximum annual dose of 7.5 mrems to the skin of the whole body. Approval may be granted for alternate dose levels of 3 mrem/yr to the whole body, or a total accumulated dose not to exceed 5 times the individuals age minus 18. Section 246-221-050 requirements set a maximum allowable exposure that minors may receive in restricted areas at a 2mrem/yr permissible level of radiation from external sources in unrestricted areas, or if the individual were continuously present would not result in excess of 100 mrem/ seven consecutive days. Anyone may apply to the agency for approval of an alternate dose as long as the annual dose to an individual does not exceed .5 rem/yr. Section 246-221-070 establishes concentration limits in effluent released to unrestricted areas. Table 3-3 presents the limits for operable unit radionuclides of concern. Section 246-252, Radiation Protection at Uranium and thorium milling operations, contains specific concentration limits for protection of groundwater; gross alpha excluding radon and uranium not to exceed 15 pCi/l, and combined radium-226 and radium-228 not to exceed 5 pCi/l.
LOCATION SPECIFIC		
Department of Game SEPA Procedures WAC 232-12	Not ARAR	Requirements which define actions the Department of Game must take to protect endangered, threatened or sensitive wildlife and habitat. These requirements are not ARAR since no threatened, endangered or sensitive wildlife or habitat has been identified at the operable unit.

Table 2. Identification of State ARARs at the 200-BP-1 Operable Unit. (sheet 3 of 5)

REQUIREMENTS	Applicable, Relevant & Appropriate, To be Considered	COMMENT
ACTION SPECIFIC		
Hazardous Waste Management Act Ch. 70.105D RCW		
Model Toxic Control Act WAC 173-340	Potentially Applicable	MTCA is potentially applicable to the operable unit. The standard establishes cleanup requirements that include acceptable contaminant levels or risks and ensures that cleanup meets specified requirements.
Groundwater cleanup standards (WAC 173-340-720)	Potentially Applicable	Groundwater cleanup levels shall be based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use as a source of drinking water.
Soil Cleanup Standards (WAC 173-340-740)	Potentially Applicable	Soil cleanup levels and procedures established under this section are applicable to remedial actions at 200-BP-1. Soil cleanup concentrations are based on a maximum expected from a residential use scenerio. Alternate cleanup levels may be established if appropriate use restrictions are placed on the property, it can be shown that the site is not a residential area or the site does not have the potential to serve as such in the future. Soil cleanup levels for industrial/commercial sites are established under WAC 173-340-745 and alternate levels for other non-residential scenerios may be set on a case by case basis.
Cleanup Standards for Industrial Sites (WAC 173-340-745)	Potentially Applicable	
Compliance Monitoring Requirements (WAC 173-340-410)	Potentially Applicable	Compliance monitoring shall be conducted according to an approved plan during and after cleanup actions. The plan will include procedures for sampling and analysis and statistical parameters will be used to determine compliance with groundwater cleanup levels. Applicable to site cleanup actions.
Solid Waste Management, Recovery and Recycling Act Ch. 70.95 RCW		
Minimum Functional Standards for Solid Waste Handling WAC 173-304	Applicable	Requirements of this section are applicable for alternatives requiring management of solid waste. The regulations sets the minimum standards for the handling of all solid waste, including operation, monitoring and closure requirements. Groundwater maximum contaminant levels (MCLs) are set at the same levels as under 40 CFR 141.
Water Pollution Control/ Water Resource Act of 1971 Ch. 90.48 RCW/ Ch.90.54 RCW		

Table 2. Identification of State ARARs at the 200-BP-1 Operable Unit. (sheet 4 of 5)

REQUIREMENTS	Applicable, Relevant & Appropriate, To be Considered	COMMENT
Minimum Standards for Construction and Maintenance of Water Wells WAC 173-160	Applicable	Requirements are applicable to construction of wells used for monitoring or remediation at the operable unit.
Water Quality Standards for Groundwater WAC 173-200	Relevant & Appropriate	Requirements of this standard are relevant and appropriate to remedial actions at the site since contaminants may migrate from soils to groundwater and the standard establishes specific groundwater quality criteria. The standard explicitly notes that groundwater remediation cleanup levels are to be determined using the standards presented in 173-390-720. Remedial actions must utilize treatment methods necessary to protect future beneficial uses of groundwater.
State Waste Discharge Program WAC 173-216	Applicable	Requirements of this program are applicable to remediation actions that include discharges to ground. The chapter implements a permit system applicable to industrial and commercial operations to the ground, surface waters or sewerage systems. Specific discharges prohibited under the program are identified. Applications for a permit will not be required for remedial actions, however, the intent of the regulation to maintain the highest possible standards using all known available and reasonable methods to prevent and control the discharge of wastes, must be met.
Underground Injection Control Program WAC 173-218	Applicable	Applicable to remedial alternatives that involve underground injection of treated water or wastes. The regulation sets procedures and practices designed to meet Safe Drinking Water Act requirements under 40 CFR 124, 141, 144, and 146. On-site remedial actions need only meet the substantive requirements of the standard.
National Pollution Discharge Elimination System Permit Program WAC 173-220	Applicable	Establishes a state permit program pursuant to the National NPDES system created under the Federal Water Pollution Control Act and is applicable to alternatives that include discharges to the Columbia River.
Washington Clean Air Act Ch. 70.94 RCW and Ch. 43.21A RCW		
General Regulations for Air Pollution WAC 173-400	Applicable	Standards established for the control of air pollution from air contaminant sources are applicable requirements for remedial actions proposed for the site. The regulations require that all sources meet emission standards for visible emissions, particulate, fugitive, odors, hazardous air pollutants and SO_2. Performance standards for new sources of air pollution set in Section 173-400-115 are also applicable requirements.
Washington Clean Air Act (Ch. 70.94 RCW and Ch. 43.21A RCW)		Best available control technologies (BACT) consistent with the requirement in RCW 70.94, shall be applied to releases of hazardous substances to the air resulting form cleanup actions at the site.
General Regulations for Air Pollution (WAC 173-400)		

Table 2. Identification of State ARARs at the 200-BP-1 Operable Unit. (sheet 5 of 5)

REQUIREMENTS	Applicable, Relevant & Appropriate, To be Considered	COMMENT
General standards for maximum emissions (WAC 173-400-040)	Applicable	The standards discussed in this section are applicable to remedial actions performed at the site that include releases of air pollutants. This section requires that all emission units use reasonably available control technology which may be determined for some source categories to be more stringent than the emission limitations listed in this chapter.
Minimum emission standards for general process emissions units (WAC 173-400-060)	Applicable	The requirements of this section are applicable to the exhaust gas generated by the remedial actions of the site.
Emission standards for sources emitting hazardous air pollutants (WAC 173-400-075)	Applicable	Requirements of this standard are applicable to remedial actions performed at the site that could result in the emission of hazardous air pollutants. The regulation requires that source testing monitoring and analytical methods for the emission of Vinyl/Chloride (a constituent of the groundwater of the 300-FF-5 Operable Unit).
Standards of performance for new sources (WAC 173-400-115)	Applicable	This section adopts and incorporates Title 40 CFR Part 60 (except sections 60.5 and 60.6) into the standards of performance for incinerators. The standards are applicable since incineration is included as part of the remedial actions performed at the site.
Ambient Air Quality Standards and Emission Limits for Radionuclides WAC 173-480	Applicable	Requirements of this standard are applicable to remedial actions performed at the site. The standard defines the maximum allowable level for radionuclides in the ambient air which shall not cause a maximum accumulated dose equivalent of 25 mrems/yr to the whole body, or 75 mrems/yr to any critical organ. The standard requires all sources of emissions to meet levels set in 246-220, including determination of compliance using methods established by the Department of Social and Health Services.
Washington Industrial Safety and Health Act (Ch. 49.17 RCW)		
Worker safety and health (WAC 173-340-810)	Applicable	Regulations under the Washington Industrial Safety and Health Act shall be applicable to all remedial actions
General safety and health standards (WAC 296-24)	Relevant and Appropriate	Regulation covers worker safety requirements for all work places. Appropriate to protect human health during remedial actions on-site, covers personnel protective equipment, general safety procedures, and materials handling and storage.

Table 3. Preliminary Contaminant-Specific ARARs for the 200-BP-1 Operable Unit Contaminants of Concern. (sheet 1 of 3)

Contaminant	Drinking Water 40 CFR 141[a]	Washington State Model Toxics Control Act Cleanup Regulation Modified for Radionuclides[b]				NRC Standards 10 CFR 20[c,d]		Atomic Energy Act, Protection of the Public and Environment, DOE Order 5400.5[e]	
	MCL (pCi/L) Current/ proposed	Method B		Method C		Water (pCi/L)	Air (pCi/m^3)	Water (pCi/L)	Air (pCi/m^3)
		Groundwater (pCi/L)	Soil (pCi/g)	Groundwater (pCi/L)	Soil (pCi/g)				
^{90}Sr	8[f]/42[g]	1.3	64	13	2,528	300/40000	30/200	40	2[h]
^{137}Cs	200[f]/119[g]	1.62	82	16	3,250	20000/40000	2,000/500	120	16[h]
^{60}Co	100[f]/218[g]	3.1	153	31	6,067	50000/30000	1,000/100	200	16[h]
^{238}Pu	15/7.1[g]	.21	10.5	2.1	414	5000/30000	.07/1	1.6	.0012[i]
^{239}Pu	15/65[g]	.2	10	2.0	396	5000/30000	.06/1	1.2	.0008[i]
$^{239+240}$Pu	15/65[g]	.2	10	2.0	396	5000/30000	.06/1	1.2	.0008[i]
Total U	-/30[g]	1.6[i]	82	16[i]	3,250	40000/40000	3/5	24	.08[i]
^{226}Ra	5/20[g]	.38	19	3.8	758	30/3000	3/2	4	.004[i]
^{228}Th	15[f]/153[g]	.84	42	8.4	1,655	7000/10000	.3/.2	16	.002[i]
^{99}Tc	900[f]/3,790[g]	35	1,769	350	70,000	300,000/ 200,000	70,000/ 2,000	4,000	80[i]
Gross alpha	15[f]/15[g]	--	--	--	--	--	--	--	--
Gross beta	4 mrem/yr	--	--	--	--	--	--	--	--

Table 3. Preliminary Contaminant-Specific ARARs for the 200-BP-1 Operable Unit Contaminants of Concern. (sheet 2 of 3)

Contaminant	Drinking Water 40 CFR 141[a]	Washington State Model Toxics Control Act Cleanup Regulation Modified for Radionuclides[b]				NRC Standards 10 CFR 20[c,d]		Atomic Energy Act, Protection of the Public and Environment, DOE Order 5400.5[e]	
	MCL (pCi/L) Current/ proposed	Method B		Method C		Water (pCi/L)	Air (pCi/m^3)	Water (pCi/L)	Air (pCi/m^3)
		Ground-water (pCi/L)	Soil (pCi/g)	Ground-water (pCi/L)	Soil (pCi/g)				
Nitrate as NO_3	45 mg/L	45 mg/L	1.2810^5 μg/kg	45 mg/L	$5.12x10^5$ μg/kg	--	--	--	--
Nitrate as N	10 mg/L	10 mg/L	$2.89x10^4$ μg/kg	10 mg/L	$1.16x10^5$ μg/kg	--	--	--	--

[a]State Drinking Water Standards, WAC 246-290, are as stringent as current federal MCLs, unless otherwise noted.

[b]Radionuclide cleanup levels are based on equations and guidelines provided in MTCA Cleanup Regulations (WAC 173-340-720 and 173-340-740), modified for radionuclides as per EPA guidance (EPA 1989a)(see Section 3.1.1.1.2). These cleanup levels do not account for an external exposure pathway. These values are provided for comparison purposes only, and will be superseded when radionuclide cleanup levels are promulgated.

[c]Appendix B, Table II, Column 2, Concentration Limits for Radionuclides in Liquid Effluent Released to Unrestricted Areas (soluble/insoluble).

[d]Water Quality Standards for the State of Washington (WAC 173-201A) concentrations for all classes of radionuclides are determined by one-one hundredth of the value listed in WAC 246-221, Appendix A, Table II, Column 2, which is an equivalent to 10 CFR 20, Appendix B, Table II, Column 2.

[e]Reported as 4% of the Derived Concentration Guide for Ingested Water, which allows comparison with DOE drinking water criterion of 4 mrem/yr.

[f]Current MCL.

[g]Proposed MCL as reported in the Advanced Notice of Proposed Rule published in 56 FR 33050, July 18, 1991. Appendix B of the proposed regulations lists activity for beta and photon emitters equivalent to a 4 mrem/yr dose. The notice also published a proposed MCLG of 0 for the radionuclide.

[h]ICRP Lung Retention Class W.

[i]ICRP Lung Retention Class Y.

[j]Total uranium calculated as ^{235}U.

"--" = criteria not listed.

Table 3. Preliminary Contaminant-Specific ARARs for the 200-BP-1 Operable Unit Contaminants of Concern. (sheet 3 of 3)

Dose-Related Standards for Radionuclides
Environmental Standards for the Uranium Fuel Cycle 40 CFR 190 The annual dose equivalent is not to exceed 25 mrem/yr to whole body 75 mrem/yr to thyroid 25 mrem/yr to any other organ
Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes 40 CFR 191 Subpart A - Facilities regulated by the commission are not to exceed standards set by 40 CFR 190. Facilities not regulated by the Commission shall provide reasonable assurance that the combined annual dose to the public resulting from discharges shall not exceed 25 mrem/yr to whole body 75 mrem/yr to any critical organ Alternative standards may be established that prevent any member of the public from receiving continuous exposure of more than 100 mrem/yr and an infrequent exposure of 500 mrem/yr from all sources. Subpart B - Environmental Standards for Disposal sets groundwater protection levels at $^{226/228}$Ra at 5 pCi/L Alpha emitters at 15 pCi/L, including $^{226/228}$Ra, excluding radon Combined concentrations of beta or gamma emitters shall not produce an annual dose equivalent to whole body or any internal organ greater than 4 mrem/yr if an individual consumed 2 l/day from the groundwater source.
National Emission Standards for Hazardous Air Pollutants 40 CFR 61 Subpart I - National Emission Standards for Radionuclide Emissions from Facilities Licensed by the Nuclear Regulatory Agency and Federal Facilities not Covered by Subpart H Emission of radionuclides, including iodine, to the ambient air from a facility regulated under this subpart shall not exceed those amounts that cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr.

4.1.2 Future Exposure Conditions

Future land use on the operable unit through the year 2117 will be limited to industrial land use only. No residential, recreational, or agricultural uses will be permitted within this timeframe. Land use beyond the year 2118 is assumed to remain the same, based on the current policy of using the 200 Areas as permanently controlled waste storage and disposal facilities and on the recommendations from the Hanford Site Future Uses Working Group (HFSUWG 1992).

4.2 REMEDIAL ACTION OBJECTIVES

Remedial objectives establish site remediation goals by taking specific contaminants, contaminated environmental media, and potential contaminant exposure pathways into account [40 CFR 300.430(e)(2)(i)]. Remedial action objectives focus on the development, screening, and analysis of remedial alternatives to ensure that they are protective of human health and the environment.

The 200-BP-1 Operable Unit is a source operable unit, with contaminants contained in the soil matrix or adsorbed to soil particles. Under current conditions, the risk to human health and the environment from the source operable unit is below 1×10^{-6} for all pathways combined. Unacceptable risk above this level, requiring remedial actions, occurs under future industrial scenarios for land use at the operable unit.

Groundwater beneath the 200-BP-1 Operable Unit is included in a separate groundwater operable unit, the 200 East Groundwater Aggregate Area. An assessment of environmental risk that is posed by the groundwater pathway and consideration of remedial objectives aimed at addressing groundwater contamination will be included in the 200 East Groundwater Aggregate Area Study.

Based on the results of the fate and transport analysis and the baseline risk assessment completed in the Phase I RI and FS reports, recommended RAOs include the following:

- Limit human receptor exposure to near-surface and subsurface infiltration gravels/soils to maintain receptor risk in the range of 10^{-4} to 10^{-6}
- Limit biotic exposures to near-surface and subsurface infiltration gravels/soils
- Limit future impacts to groundwater by taking measures that minimize infiltration and downward migration of contaminated vadose zone pore water, such that ARARs are not exceeded or risk-based concentrations in groundwater remain below the range of 10^{-4} to 10^{-6}
- Take into account impacts of the proximity of the 241-BY Tank Farm on remedial objectives.

5.0 EVALUATION OF REMEDIATION ALTERNATIVES

A comprehensive evaluation of 10 alternatives against 7 EPA criteria was conducted for treating contaminated soil in the FS report. These 10 alternatives and criteria include the following:

Remediation Alternatives

1. Alternative A: No Action
2. Alternative B: Institutional Controls
3. Alternative C: Biointrusion
4. Alternative D: RCRA Barrier
5. Alternative E: Hanford Barrier
6. Alternative F: Excavation and Soil Washing
7. Alternative G: Excavation and Soil Washing with Vitrification
8. Alternative H: Excavation and Fixation
9. Alternative I: Landfill Disposal
10. Alternative J: In Situ Fixation.

EPA Criteria

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Performance
4. Reduction of Toxicity, Mobility, or Volume
5. Short-Term Effectiveness
6. Implementability
7. Cost.

Two additional criteria that will be conducted during the final public review period include the following:

1. State Acceptance
2. Community Acceptance.

5.1 SUMMARY OF ALTERNATIVES

The alternatives analyzed for the 200-BP-1 Operable Unit are presented below. These numbers correspond with the numbers in the RI/FS reports.

Except for the "no action" alternative, all of the alternatives now being considered for the site would include a number of common components. All of the alternatives would require some form of institutional control to provide long-term effectiveness. All barrier designs and in situ fixation would leave waste in place. Excavation alternatives assume a maximum excavation depth of 50 ft. Excavation below 50 ft would compromise the integrity of the adjacent 241-BY Tank Farm. All waste removed from the site would be placed in a permanent landfill on the Hanford Site that is presently in the conceptual design stage. A RCRA barrier would be required to prevent groundwater contamination for all excavation alternatives due to soil contamination below 50 ft.

5.1.1 Alternative A: No Action

The NCP requires that a "no action" alternative be included in remediation alternatives to provide a baseline for comparison to other alternatives. Under this alternative, no further action would be taken to prevent exposure to the soil contamination. The total cost of this alternative is $1,140,000.

5.1.2 Alternative B: Institutional Control

This alternative assumes that the current administrative and maintenance of the existing clean soil cover remain in effect. Institutional controls consist of fencing, warning marker and signs, site use restrictions, and groundwater use restrictions. These controls are consistent with current plans for dedication of the 200 East Area as a permanent waste management and disposal area. The total cost of this alternative is $1,240,000.

5.1.3 Alternative C: Biointrusion Barrier

Contaminated soils would be left in place and covered with a 3-ft biointrusion barrier. The multilayered barrier would be designed to prevent contact with contaminated soils and to prevent plant or burrowing animals from bringing contaminated soils to the surface. The total cost of this alternative is $3,470,000.

5.1.4 Alternative D: Modified RCRA Barrier

Contaminated soils would be left in place and covered with a 5-ft RCRA barrier. The barrier would be designed to meet ARARs of RCRA landfill closure in 40 CFR 264.310. The total cost of this alternative is $5,650,000.

5.1.5 Alternative E: Hanford Barrier

Contaminated soils would be left in place and covered with a 15-ft Hanford barrier. The barrier is designed to minimize water infiltration, prevent biological intrusion, and resist erosion for a design life 1,000 years. The total cost of this alternative is $8,470,0000.

5.1.6 Alternative F: Excavation and Soil Washing

The purpose of this alternative is to minimize the volume of soil requiring disposal. Soil washing is used to physically or chemically separate the size of the soil particles. Higher contaminated soils are generally found in the fine soil particles and would be disposed of in an approved landfill. The total cost of this alternative is $182,000,000.

5.1.7 Alternative G: Excavation and Soil Washing with Vitrification

This alternative is essentially the same as alternative F with the addition of vitrifying the highly contaminated soils once separated. The vitrification process would immobilize the contaminants in a glass matrix. The total cost of this alternative is $268,000,000.

5.1.8 Alternative H: Excavation and Fixation

Contaminated soils would be removed, mixed into a grout matrix, and returned to the excavation. The grout matrix would reduce the mobility of the contaminants. The total cost of this alternative is $81,000,000.

5.1.9 Alternative I: Landfill Disposal

Contaminated soils would be removed and disposed of in an approved landfill on the Hanford Site. The total cost of this alternative is $82,000,000.

5.1.10 Alternative J: In Situ Fixation

This alternative would involve treating most of the highly contaminated soils in place with fixation. Deep soil mixing would be accomplished by drilling with large augers to mix the soil in place while grout or other fixation agents are injected. The total cost of this alternative is $53,000,000.

5.2 EVALUATION OF ALTERNATIVES

A comprehensive analysis was conducted to evaluate the ability of the alternatives to meet the seven criteria listed above. The comparative analysis was conducted by first determining relative scores for each of the alternatives against the individual criteria. The relative scores were then normalized on a 0 to 10 preference scale, with 10 being the most preferred. The criteria were then weighted in terms of importance. Finally, composite scores were calculated by multiplying the criteria weight by the alternative score and summing for all criteria.

The results of the comparative analysis indicate that the low-permeability barriers (with institutional controls and component that prevent biointrusion) score the highest. The modified RCRA barrier scored highest, just slightly higher than the Hanford barrier. Following the two barriers, the next highest scoring alternative is institutional controls. The remaining alternatives all score significantly lower. The sensitivity analysis indicates the RCRA barrier scores highest across a wide range of criteria weights.

6.0 MODIFIED RCRA BARRIER

RCRA Subtitle C Cover designs are widely used at hazardous waste sites and vary somewhat in their construction. The majority of RCRA Subtitle C Covers depend on the use of synthetic liners for hydrologic barriers. The use of synthetic liners in this cover design was determined not to meet the durability requirement necessary to achieve the long-term resilience design criteria.

Other cover designs used at RCRA sites that do not use synthetic liners must be approved by EPA as being functionally equivalent to those that do. This process of approving equivalence is dependent on site-specific conditions such as underlying geologic conditions and the local microclimate.

Three RCRA Subtitle C Covers have been designed for site-specific applications at the Hanford Site. These cover designs, termed the PUREX Cover, the 183-H Cover, and the Hanford Nonradiological Dangerous Waste Landfill (NRDWL) Cover, are similar in design and the use of construction materials. The NRDWL cover design provides for the thickest soil vegetative layer and is thought to most closely meet the design criteria. Therefore, the RCRA Subtitle C cover design has been based on the cover design used for the NRDWL. This NRDWL cover design was modified to incorporate design changes making it suitable for use at low-level waste sites.

The NRDWL cover, as submitted in the permit application (DOE-RL 1990), consisted of the following six layers listed from the surface downward:

- 75-cm (30-in.) soil top layer
- 15-cm (6-in.) sand drainage layer
- Geotextile filter cloth
- Geonet drainage layer
- High-density polyethylene liner
- 60-cm (24-in.) soil liner.

The RCRA Subtitle C Cover alternative incorporated three design changes to the NRDWL design. The first design change was to increase the thickness of the soil top layer by 25 cm (10 in.) to provide for more long-term soil erosion. Second, to further minimize soil erosion, a gravel admixture was added to the soil top layer. The third design change was to replace the geonet and high-density polyethylene liner with a sand filter system and an asphalt liner to increase its design life. The asphalt layer, in addition to functioning as a liner, will also serve as a biointrusion barrier to prevent plant roots or burrowing animals from contacting underlying waste.

The RCRA Subtitle C Cover was designed for application at waste sites that contain hazardous and/or low-level waste constituents. The RCRA barrier is a multilayered barrier intended to minimize infiltration, prevent biological intrusion, and resist erosion. The design meets minimum technology requirements contained in 40 CFR 264.301 for hazardous wastes, but is a modification of the design recommended in EPA guidance.

6.1 DESIGN

The RCRA Subtitle C Cover is composed of eight layers having a total thickness of 1.7 m (5.66 ft). A detailed description of the functions of each of the cover layers is provided in the following sections. The uppermost layers are described first, followed by descriptions of successively deeper layers. A summary description of each of the cover layers is provided in Table 4, and a cross section is shown in Figure 2. Tables 5 and 6 list the design criteria and how the barrier conforms to these criteria.

6.1.1 Layers 1 and 2: Topsoil Layer and Cover Soil Layer

The topsoil layer is designed to perform several specific functions. First, the topsoil layer is required to support the growth and propagation of vegetation that will prevent wind and water erosion and facilitate evapotranspiration. Pea gravel will be mixed with the topsoil layer to improve its ability to resist wind erosion if areas of the cover become temporarily denuded of vegetation during extended dry periods. The high degree of effectiveness of pea gravel in controlling wind erosion was demonstrated in work conducted by Pacific Northwest Laboratory on Hanford Site soils (Ligotke and Klopfer 1990).

A secondary function of the two soil layers is to intercept, temporarily store, and return the moisture to the atmosphere by evapotranspiration. Based on HELP modeling, essentially 100% of the annual precipitation is evapotranspired (Appendix A). By eliminating deep percolation, reliance on the performance of the lower layers as infiltration barriers can be reduced and the layers can be approached as contingency components of the overall cover design.

The topsoil material will provide a suitable medium for establishing and maintaining the cover vegetation that will facilitate soil moisture removal by evapotranspiration. The compacted topsoil layer will retard moisture migration through the lower part of the cover system, extending the residence time for which soil moisture is available for plant uptake.

Moisture retention and removal by evapotranspiration will be maximized within layer 2 by the creation of a capillary break with the underlying filter sand (layer 3). Conceptually, a capillary break occurs when a layer of fine-textured soil overlies a layer of coarser textured soil (e.g., sand, gravel, or rock) (DOE-RL 1987). The capillary break acts as a one-way check-valve. Surface tension effects within the pore space of the fine-textured soil exert a negative (suction) pressure on the contained soil moisture. For moisture to begin to drain out of the textured soil, the suction pressure must be overcome by development of gravitational pressure (hydraulic head) within the layer. In effect, a portion of the fine-textured soil must become nearly saturated before drainage can occur.

Table 4. Summary of RCRA Subtitle C Cover Layers. (sheet 1 of 2)

Layer no.[a]	Thickness, cm (in.)	Layer description	Specifications	Function
1	50 (20)	McGee Ranch silt with pea gravel mix	McGee Ranch silt mixed with pea gravel 15% by wt. 2.36 to 9.5 mm in diameter conforming to ASTM D448 No. 8 aggregate.	The silt loam was selected for optimal water retention properties and should provide a good rooting medium for cover vegetation. The pea gravel is designed to minimize wind erosion of the silt without significantly affecting its moisture retention capabilities. The thickness of this layer was selected based on HELP modeling.
2	50 (20)	Compacted McGee Ranch silt	McGee Ranch silt compacted to 90% of the optimum dry density as determined by the standard proctor.	The compacted silt is designed to slow the percolation of soil moisture. The extended residence time of moisture in this layer will increase the volume of moisture removed by evaporation and transpiration. The thickness of this layer was selected based on HELP modeling.
3	15 (6)	Filter sand	Naturally occurring or blended sand meeting the following filter requirements (diameters are approximate): D_{15} = 0.45 mm, D_{50} = 1.25 mm, and D_{85} = 1.8 mm.	This layer is designed to prevent piping of soil fines into the underlying layer. The thickness of this layer was selected to allow for reasonable construction tolerances.
4	15 (6)	Filter gravel	Naturally occurring or blended gravel meeting the following filter requirements (diameters are approximate): D_{15} = 1.8 mm, D_{50} = 31 mm, and D_{85} = 36 mm.	This layer will prevent the piping soil fines and sands into the underlying gravel drainage layer.
5	15 (6)	Drainage gravel	Naturally occurring or blended gravel having a saturated hydraulic conductivity greater than 1 cm/s.	This layer provides lateral drainage for removal of any soil moisture that percolates through the overlying layers.

Table 4. Summary of RCRA Subtitle C Cover Layers. (sheet 2 of 2)

Layer no.[a]	Thickness, cm (in.)	Layer description	Specifications	Function
6	15 (6)	Asphalt	Asphaltic concrete with a gilsonite top coat. The permeability of the asphalt will be less than 1×10^{-8} cm/s.	This layer will function as a hydrologic barrier and a biointrusion barrier. The thickness of this layer was determined to allow for reasonable construction tolerances.
7	10 (4)	Asphalt base course	15.87-mm-diameter crushed basalt conforming to WDOT M41-10, 9-03.9(3).	The purpose of this layer is to provide a stable base for placement of the asphalt layer.
8	Variable	Grading fill	WDOT M41-10, 9-03.18 approved backfill.	This layer will provide a level subgrade for construction of the overlying layers.

[a]Cover layers are listed sequentially from top to bottom.

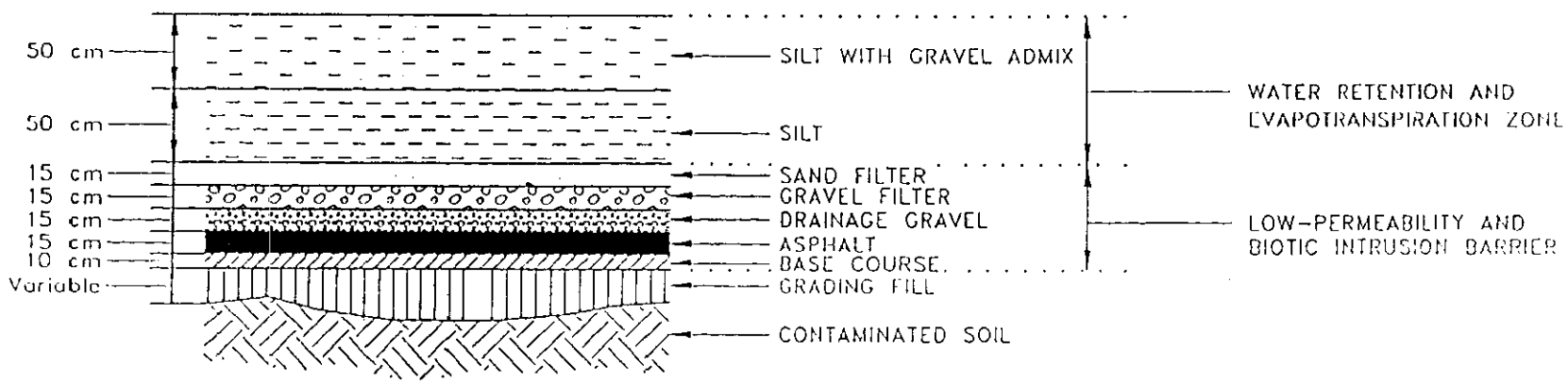


Figure 2. RCRA Subtitle C Cover Cross Section.

Table 5. Summary of RCRA C Cover Design Criteria.

	Criteria
1.	Design cover that does not require maintenance.
2.	Design cover to promote drainage and minimize erosion.
3.	Prevent plant intrusion.
4.	Prevent animal intrusion.
5.	Prevent downward infiltration through the cover.
6.	Design cover with a permeability less than or equal to any natural subsoils present.
7.	Prevent individuals from inadvertently occupying site or contacting waste.
8.	Design multimedia cover that relies on material resilient to natural degradation processes.
9.	Design cover with biointrusion control functional life of 500 years.
10.	Design cover to prevent piping of fines into the lateral drainage layer (i.e., D_{15} Filter/D_{85} Top Soil Layer <4.5 and D_{15} Drainage Layer/D_{85} Filter <4.5).

Table 6. RCRA Subtitle C Cover Conformance with Design Criteria. (sheet 1 of 2)

	Design Criteria	Conformance with Design Criteria
1.	Design cover that does not require maintenance.	Cover layers 1 and 2 have been designed to sustain the growth and propagation of a native vegetation layer that would protect against soil erosion and require no maintenance. In addition, cover layers 3 through 6 will provide biointrusion protection from plants and animals that could potentially damage the cover if left unrepaired.
2.	Design cover to promote drainage and minimize erosion.	Cover layers 1 and 2 have been designed to limit wind and water erosion to an acceptable level by limiting surface slope to 2%, adding a pea gravel admixture, establishing erosion-resisting vegetation, and providing a 36-cm (14-in.) allowance for erosion. Soil erosion calculation shown in Appendix B shows these design features will provide for long-term protection.
3.	Prevent plant intrusion.	Four mechanisms are provided in the cover design to prevent plant intrusion: (1) adequate soil rooting medium is provided in layers 1 and 2 for most vegetation, (2) a capillary break at the interphase of layers 2 and 3 should prevent plants from deep rooting, (3) layers 3 and 4 provide 45 cm (1.5 ft) of granular media that is inconducive to plant growth, and (4) the asphalt layer will prevent plant penetration.
4.	Prevent animal intrusion.	The asphalt layer 6 will prevent burrowing animals from contacting underlying waste material.
5.	Prevent downward infiltration through the cover.	Percolation through the cover will be essentially prevented by plant transpiration from layers 1 and 2 by lateral drainage from layer 6. HELP modeling has confirmed that no downward percolation of water through the cover will occur (Appendix A).
6.	Design cover with a permeability less than or equal to any natural subsoils present (assumed to be McGee Ranch Silt).	This cover design includes an asphalt hydrologic/biointrusion layer that is expected to have a permeability lower than any naturally occurring subsoil. Compliance with this criteria cannot be fully evaluated without site-specific soil information.

Table 6. RCRA Subtitle C Cover Conformance with Design Criteria. (sheet 2 of 2)

	Design Criteria	Conformance with Design Criteria
7.	Prevent individuals from inadvertently occupying site or contacting waste.	Following the removal of active institutional controls, markers will be placed at the barrier site to warn individuals about the dangers of occupying the site. In addition, the site will be recorded on the county land deeds. Casual explorers will be prevented from contacting the wastes by use of the biointrusion layer 6.
8.	Design multimedia cover that relies on material resilient to natural degradation processes.	This cover has been designed with a 100-cm (40-in.) soil cover layer designed to prevent wind and water erosion. The cover uses a gravel admixture to minimize wind erosion, includes an allowance for long-term soil loss, and has limited surface slopes to 2% to minimize water erosion. In addition, the cover uses only naturally occurring geologic materials that have good resistance to weathering.
9.	Design cover with biointrusion control functional life in excess of 500 years.	The asphalt biointrusion layer 6 of this cover is located 145 cm (5.9 ft) below grade. At this depth, the asphalt is protected from freeze/thaw activity and is a low oxidizing environment. To further protect the asphalt, it will be coated with Gilsinite, a tar-like substance that has natural analogues that have existed for thousands of years. The combination of these design features should provide for a functional design life of this layer in excess of 500 years.
10.	Design cover to prevent piping of fines into the lateral drainage layer (i.e., D_{15} Filter/D_{85} Top Soil Layer < 4.5 and D_{15} Drainage Layer/D_{85} Filter < 4.5).	The lateral drainage layer 4 was designed with two overlying soil filters to prevent the piping of fines, which could potentially cause clogging. Those filter layers were designed in accordance with the design criteria.

The effectiveness of a capillary break is contingent on selecting a fine-textured topsoil to store and return water to the atmosphere by evapotranspiration such that it will remain unsaturated in its lower portion at all times. The topsoil must have sufficiently fine texture to exhibit high water retention characteristics (i.e., high field capacity and porosity values), yet must be sufficiently coarse textured that plants can readily access and extract the moisture from storage. Silt loams and fine sandy loams are most suitable for this application. The proposed material for construction of layers 1 and 2 is a sandy-silt to silt-loam soil. This material can be obtained from the McGee Ranch area, located northwest of the Yakima Barricade on the Hanford Site. The McGee Ranch soil has been characterized by preliminary test boring and sampling (Ligotke and Klopfer 1990; DOE-RL 1990). Performance of McGee Ranch silt as a component of long-term covers currently is being evaluated at the Field Lysimeter Test Facility on the Hanford Site.

The proposed cover design includes a 2% surface slope to promote surface runoff from the topsoil layer without causing excessive soil erosion.

6.1.2 Layers 3 and 4: Filter Sand and Filter Gravel

These layers, besides acting as capillary breaks, are designed to prevent the piping of soil fines into the underlying lateral drainage (layer 5). The accumulation of fines in the lateral drainage layer could, given sufficient quantity, clog the drainage layer and prevent it from functioning properly. The filter layer was designed using criteria summarized in the text *Seepage, Drainage, and Flow Nets* (Cedergren 1967). Use of these filter design criteria will provide a conservative design given the filter criteria were developed for dams that experience hydraulic heads several orders of magnitude higher than those expected for the RCRA Subtitle C Cover.

6.1.3 Layer 5: Drainage Gravel

This layer will provide a drainage layer should water penetrate through layer 2 and its underlying capillary layer. The lateral drainage layer will be sloped on a 2% grade to move water to the edge of the cover where it will be discharged to the soil. The drainage layer is designed to have sufficient permeability to avoid the formation of greater than 30 cm (1 ft) of hydraulic head on the underlying asphalt liner.

6.1.4 Layer 6: Asphalt Biointrusion Layer

The purpose of this layer is to isolate the covered wastes from contact with plant roots and/or burrowing animals and to act as a secondary hydraulic barrier. Plant and animal intrusion represents a variety of risks. Root holes could potentially provide a direct pathway for surface water to move downward and if the roots penetrate the waste layer, they could transport contaminants to the surface. Animal intrusion into the waste layer could provide a direct path for the movement of contamination to the soil surface.

The RCRA Subtitle C Cover will use three design components to prevent deep plant rooting: (1) the combined 1-m (3.3-ft) thickness of layers 1 and 2 will allow adequate rooting depth for most indigenous plant species on the Hanford Site; (2) the capillary break effect between layer 2 and layer 3 will result in the long-term maintenance of relatively dry soil conditions below the capillary barrier, which are not conducive to plant growth; and (3) the asphalt layer will provide a cover that cannot be penetrated by plants unless cracked or otherwise damaged.

Prevention of animal and insect intrusion will be ensured by use of the following design features: (1) the compacted soil (layer 2) will deter intrusion because of the difficulty of excavation; (2) the dry, cohesionless soil (layers 3 and 4) may be unstable for burrowing; (3) results of a literature survey show that the majority of animals do not burrow deeper than 2 m (6.56 ft) (Landeen 1990); and (4) the asphalt is of sufficient strength to prevent penetration of even large burrowing mammals such as badgers.

The asphalt layer will be constructed of a durable mixture with double the tar content of normal highway asphalt and added sand as a binder material. Tests have shown that a hydraulic conductivity as low as 10^{-8} cm/s should be expected in this material (Dunning 1990). The life span of the asphalt is estimated to be in excess of 5,000 years based on natural analogues of similar material. This long life span is based on the asphalt remaining covered and therefore protected from ultraviolet radiation and freeze/thaw activity. To provide additional protection to the asphalt, it will be coated with 6.4 mm (250 mil) of a derivative of gilsonite, a naturally occurring tar sand material. This material has gained wide acceptance within the uranium mill tailings remedial action program because of its excellent puncture resistance, retained flexibility, and ease of constructibility. Tests on asphalt modified with a similar top coating have shown it to have a permeability as low as 10^{-11} cm/s (Romine 1992).

6.1.5 Layer 7: Asphalt Base Course Layer

This layer will be used to provide a stable base for constructing the overlying asphalt layer. The base course will be of a standard mix design used by the Washington State Department of Transportation.

6.1.6 Layer 8: Grading Fill

Grading fill will be used to establish a smooth base for the construction of the overlying soil layers. The sub-base will be constructed with a 2% grade to establish the required slope for the lateral drainage (layer 5) and to promote runoff from layer 1. Construction of a level sub-base will also facilitate the construction process by allowing for more accurate placement of the soil lifts.

6.2 SITE-SPECIFIC REQUIREMENTS

The modified RCRA barrier will consist of one barrier that will cover the 216-B-43 through 216-B-50 cribs within the 200-BP-1 Operable Unit. The fully functional portion of the barrier will extend 60 ft from the outer edge of each crib. This overlap will prevent water from remobilizing waste beneath the cribs. Justification for this overlap was based on previous field and vadose modeling (DOE-RL 1993b). Additional vadose modeling was completed to determine the drawback of moisture after installation of the barrier (Figure 3).

The following are site-specific requirements that will be evaluated during the definitive design.

1. Side slopes will be minimized. Construction material will be from pit run gravel and/or basalt rip-rap.

2. Asphalt layer will extend to the toe of the side slopes. No water collection system will be required.

3. Design will take into account adjacent facilities such as the BY Tank Farm and the Prototype Surface Barrier.

4. Neutron access tubes will be required to monitor the lower silt layer and beneath the asphalt layer.

5. Surface structures (wells, power poles, posts, etc.) will be removed prior to barrier construction. All groundwater monitoring wells within the barrier foot print, with the possible exception of 299-E33-38 and 299-E33-40, will be abandoned. If the integrity of the barrier will be compromised by leaving these two wells in place, they will also be abandoned.

6. Subsurface vaults on the south side of the cribs will be stabilized prior to barrier construction.

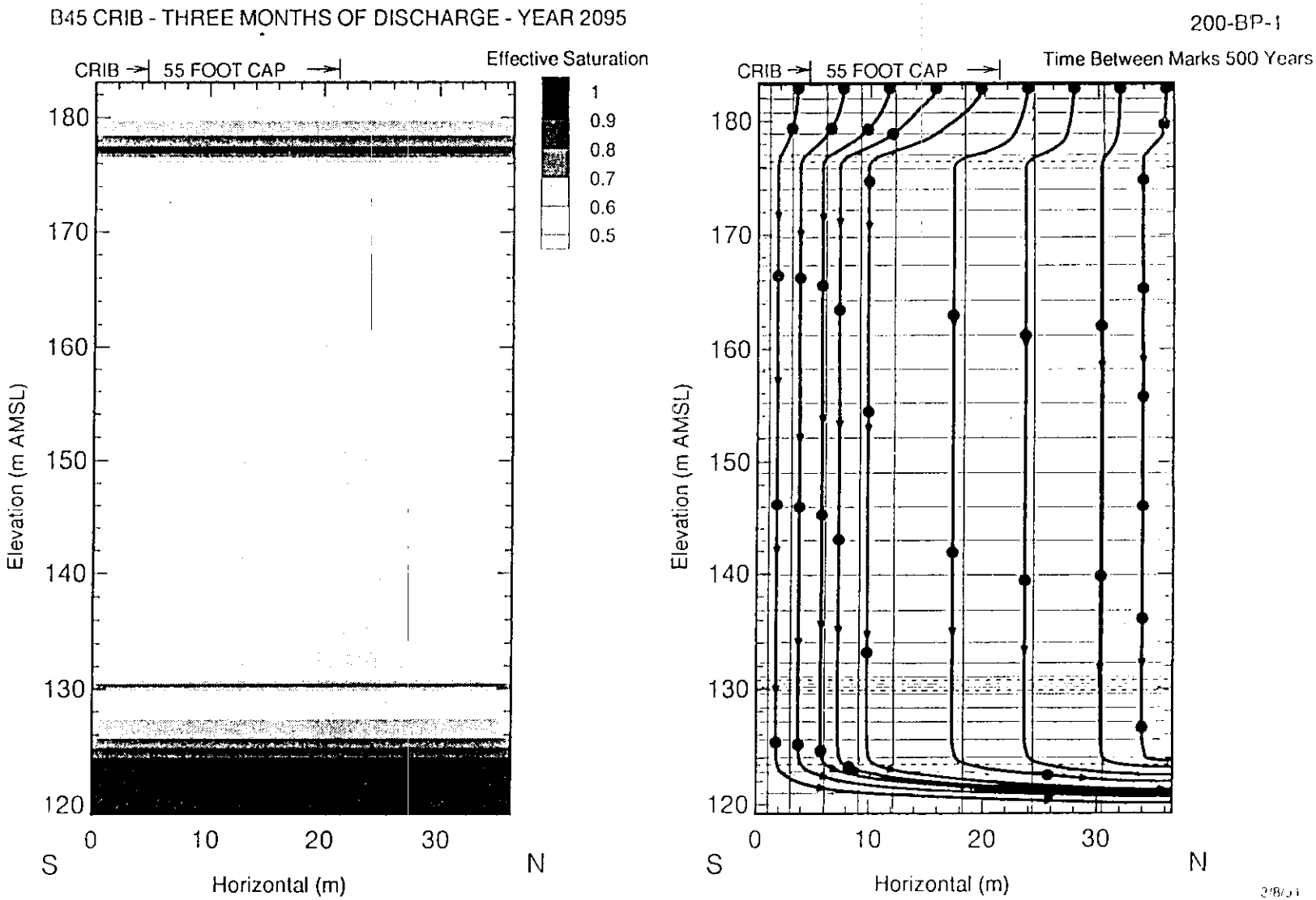


Figure 3. Moisture Drawback After Installation of the Modified RCRA Barrier.

6.3 COSTS

The modified RCRA barrier rough order of magnitude cost estimate is based on many assumptions, which are listed in this section. These assumptions may or may not be applicable to the final definitive design. The engineering design contractor will develop site-specific construction specifications for the barrier. This cost estimate is broken down into the following categories and summarized in Table 7.

Engineering

Definitive Design
Construction Management, Engineering, and Inspection
Sealed Double-Ring Infiltrometer Test on Asphalt Layer

Construction

Site Grading, Compaction, and Placement of Grading Fill
Placement of Base Course for Asphalt
Placement of Asphalt
Placement of Gravel Drainage Layer
Placement of Side-Slope Fill and Fill to Support Graded Filter Layers
Placement of Gravel and Sand Filter Layers
Placement of Compacted Silt
Placement of Silt/Pea Gravel Admix
Placement of Crushed Basalt Surfacing Material on Perimeter Berm

6.3.1 Engineering

Definitive Design. Definitive design will be performed by a consulting civil engineering subcontractor. Definitive design activities will include preparation of plan and section drawings, specifications, and quality control plans for construction; materials testing to support preparation of specifications; stability and performance analysis calculations; and preparation of procurement documents. Costs for this task (including OH&P) are estimated as 5% of construction costs.

Construction Management, Engineering, and Inspection. Construction management activities will be supported by Westinghouse Hanford Company Projects. This task covers bid evaluations, control and review of vendor submittals, engineering support during construction (including survey support), design change control, inspection planning, constructibility reviews, and production of as-built drawings. This task includes costs for quality control overview, sampling, and testing exclusive of the sealed double-ring infiltrometer test (see following task). Costs for this task (including OH&P) are estimated as 10% of construction costs.

Table 7. RCRA Subtitle C Barrier Cost Estimate Comparison. (sheet 1 of 3)

COST ITEMS	Estimated	Indirect	Subtotal	15% Cont.	Total
Definitive Design (Technical Services)					
Subtotal	121,000	0	121,000	18,150	139,150
Engineering/Inspection (Technical Services)					
Subtotal	242,000	0	242,000	36,300	278,300
SRDI Test on Asphalt Layer (Technical Services)					
Subtotal	50,500	0	50,500	7,575	58,075
Totals	413,500	0	413,500	62,025	475,525
Site Grading, Compaction & Fill					
- Load, haul & dump soil from pit 30, 8 mile round trip using 5 dump trucks @ 12 CY each, and one 4 CY loader.	308,821				
- 56,600 CY plus 20% swell = 67,900 CY to haul. Ten man crew will average 816 CY per day for 85 days (17 week job).	0				
- Spread soil and level with dozer/grader.	67,922				
- Compact site with vibratory roller, 415 ft X 530 ft area 6" lifts, 2 passes.	17,584				
Subtotal	394,327	70,206	464,533	69,680	534,213
Placement of Base Course					
- Base course material, 5/8" minus, delivered to site	46,805				
- Spread gravel and level with dozer/gracer, 4" deep.	2,696				
- Compact with vibratory roller, 2 passes.	1,041				
- Sales Tax at 7.8%	3,174				
- OH&P (on markups only)	476				
Subtotal	54,192	7,587	61,779	9,267	71,046
Placement of Asphalt					
- 6" inch polymer-modified asphalt. (Per Don @ A & B Asphalt)	377,300				
- Spray applied gilsonite top coat. (Per KEH estimate ER 3412 (W-263), dated 2-10-93). *NOTE: High cost may be temporary* due to current monopoly on product.	970,200				
Subtotal	1,347,500	188,650	1,536,150	230,423	1,766,573
Placement of Gravel Drainage Layer					
- Load trucks with screened run-of-pit gravel.	30,648				
- Haul and dump gravel at site, assume 8 miles round trip.	12,628				
- Spread and level gravel with dozer/grader, 6 in layer.	4,114				
- Compact gravel with vibratory roller, 2 passes.	1,075				
- Sales Tax @ 7.8%	2,078				
- OH&P (on markups only)	311				
Subtotal	50,854	7,120	57,974	8,696	66,670

Table 7. RCRA Subtitle C Barrier Cost Estimate Comparison. (sheet 2 of 3)

COST ITEMS	Estimated	Indirect	Subtotal	15% Cont.	Total
Placement of Crushed Basalt					
- Load, haul and spread 12 inch layer of 12" minus crushed basalt around perimeter berm. Existing quarry is 17 miles from site.	50,744				
- Sales Tax @ 7.3%	1,248				
- OH&P (on markups only)	187				
Subtotal	52,179	7,305	59,484	8,923	68,407
Placement of Side-Slope Fill					
- Load, haul & dump pit run sand and gravel mix from pit 30.	20,007				
- Spread material along west, north and east sides of the coverd area at 3 to 1 slope with dozer/grader.	8,810				
- Compact berm with vibratory roller, 6" lifts, 2 passes.	2,277				
Placement of Fill to Support Graded Filter Layer					
- Load, haul & dump pit run sand and gravel mix from pit 30.	4,548				
- Spread material along perimeter of the covered area at 2 to 1 slope with dozer/grader.	2,001				
- Compact berm with vibratory roller, 6" lifts, 2 passes.	518				
Subtotal	38,161	5,343	43,504	6,526	50,030
Gravel and Sand Filter Layers					
- Load trucks with screened run-of-pit gravel.	30,648				
- Haul and dump gravel at site, assume 8 mile round trip.	12,628				
- Spread and level gravel with dozer/grader, 6 in layer.	4,114				
- Compact gravel with vibratory roller, 2 passes.	1,075				
- Load trucks with screened sand.	47,857				
- Haul and dump sand at site, assume 8 mile round trip.	12,628				
- Spread and level sand with dozer/grader, 6 in layer.	4,114				
- Compact sand with vibratory roller, 2 passes.	1,075				
- Sales Tax @ 7.8%	5,324				
- OH&P (on markups only)	798				
Subtotal	120,261	16,837	137,098	20,565	157,663
Placement of Compacted Silt					
- Load, haul and dump McGee Ranch silt, 36 mile round trip	98,477				
- Spread and Static Compact to 20" depth in 3 lifts, using dozer/grader, roller and water truck	69,411				
Subtotal	167,888	23,504	191,392	28,709	220,101

Table 7. RCRA Subtitle C Barrier Cost Estimate Comparison. (sheet 3 of 3)

COST ITEMS	Estimated	Indirect	Subtotal	15% Cont.	Total
Placement of Silt/Pea Gravel Admix					
- Load, haul, and dump McGee Ranch silt at pit 30, 26 miles round trip.	86,025				
- Mix above silt with 1980 CY of local sourced pea gravel, load haul 4 miles, and dump.	88,673				
- Spread mix and level to depth of 20 in.	13,146				
- Sales Tax @ 7.8%	2,051				
- OH&P (on markups only)	205				
Subtotal	190,100	26,614	216,714	32,507	249,221
Base for Perimeter Access Road	N/A for the RCRA Subtitle C Barrier.				
- Base course material, 1-1/2" minus, delivered to site.	0				
- Spread gravel and level with dozer/grader, 6" deep.	0				
- Compact with virtratory roller, 2 passes.	0				
- Sales Tax @ 7.8%	0				
- OH&P (on markups only)	0				
Subtotal	0	0	0	0	0
Application of Pea Gravel	N/A for RCRA Subtitle C Barrier				
- Load trucks with screended pea gravel	0				
- Haul and dump, or broadcast pea gravel in 1 inch layer, assume 8 mile round trip.	0				
- Hand dress top layer	0				
Subtotal	0	0	0	0	0
Totals	2,363,283	353,166	2,768,628	415,294	3,183,922
Project Totals	2,776,783	353,166	3,182,128	477,319	3,659,447

Sealed Double-Ring Infiltrometer Test on Asphalt Layer. Costs are included in the estimate for performing two sealed double-ring infiltrometer tests on the asphalt layer, after construction of the layer and before construction of any superimposed layers, to obtain a direct measurement of the hydraulic conductivity of the layer as built. The tests will be performed by a consulting geotechnical engineering subcontractor. The task will include equipment, labor, per diem and travel expenses related to construction, installation, and monitoring, followed by disassembly of the testing apparatus. Equipment costs are limited to expendable portions of the apparatus. Costs for this task (including OH&P) are estimated at $50,500 (per proposal).

6.3.2 Construction

Site Grading, Compaction, and Placement of Grading Fill. The work will be performed by a qualified subcontractor. The site surface measures approximately 415 ft (E-W) by 530 ft (N-S). The area is devoid of vegetation (no clearing and grubbing will be necessary). The existing site surface is slightly irregular and slopes at approximately 1.5% to the north. A planar surface is desirable prior to placement of the barrier layers, to facilitate survey control and quality control of material placement and layer thicknesses. Consistent with ALARA principles, balanced cuts and fills will not be used to create a uniform site surface. Surface grading will be done exclusively with fill. It is estimated that approximately 56,600 bank yd^3 of grading fill will be needed (corresponding to 67,900 loose yd^3, assuming 20% swell). The material will be sourced from pit 30, situated between 200 West and 200 East Areas, opposite the 609-A Fire Station. Moisture conditioning (i.e., addition and control) will be performed at pit 30 before transportation to the construction site. The one-way haul will be approximately 4 mi. Grading fill and existing site soils will be densified by making several passes over the site with a vibratory compactor to create a suitable sub-base for cover construction.

Placement of Base Course for Asphalt Layer. The work will be performed by a qualified subcontractor. The base course material will be >80% minus 5/8-in. material conforming to WDOT M41-10, 9-03.9(3). The material will be sourced from a local commercial supplier. Cover construction will require hauling and placing approximately 4,400 T of material (corresponding to approximately 2,700 yd^3). These quantities were determined based on placing 4 in. of material over an area of (530)(415) ft^2; and a dry unit weight of 120 lb/ft^3. A track dozer will spread and grade the material. A vibratory compactor will be required to densify the base course material as it is placed. The base course layer will slope at a uniform 1.5% down to the north.

Placement of Asphalt. The asphalt layer will be placed by a qualified subcontractor (possibly a different subcontractor from the one performing other construction activities). The asphalt will be a polymer-modified asphalt (i.e., asphaltic concrete) with a spray-applied gilsonite top coat. The asphalt layer will be 6 in. thick (nominally) and will be placed over an area of (530)(415) ft^2 = 220,000 ft^2 = 24,500 yd^2. The asphalt layer will slope at a uniform 1.5% down to the north.

Placement of Gravel Drainage Layer. The work will be performed by a qualified subcontractor. The specification for the gravel drainage material is a saturated hydraulic conductivity value of 1 cm/sec. Material will be sourced from the pit 30 site between 200 West and 200 East Areas. Run-of-pit material will be screened to specification at the pit. The one-way haul will be approximately 4 mi. Construction of the gravel filter layer will require hauling and placing approximately 6,500 T of material (corresponding to approximately 4,100 yd^3). These quantities were determined based on placing 6 in. of material over an area of (530)(415)ft^2; a material density of 0.70 ft^3 solids/ft^3 volume and a specific gravity of 2.70, corresponding to 117.9 lb/ft^3. A motor grader will be used to spread and grade the material. A vibratory compactor also will support construction of this layer.

Placement of Side-Slope Fill and Fill to Support Graded Filter Layers. The work will be performed by a qualified subcontractor. The perimeter side slope will be built up by placing and compacting fill along the west, north, and east sides of the covered area. The perimeter fill will be placed with a 3H:1V slope and will be approximately 4 ft + 8 in. thick. Mixed sand and gravel (pit run material from pit 30) will be used as the fill material. Approximately 4,400 yd^3 of fill will be required for side-slope construction. Additional fill (of the same type and source) will be placed to facilitate termination of the graded filter layers around the perimeter of the covered area. The graded filter layers will be angled up to intersect the surface at a slope of 2H:1V. The additional fill requirement beneath the filter layers is 1,000 yd^3. A track dozer will be used to spread and grade the material. A vibratory compactor will support construction of this layer.

Placement of Gravel and Sand Filter Layers. The work will be performed by a qualified subcontractor. Two 6-in. filter layers will be placed above the lateral drainage layer to prevent entry and accumulation of fines in the lateral drainage layer. The gravel filter material will be sourced from pit 30. Run-of-pit material will be screened to specification at the pit. Construction of the gravel filter layer will require hauling and placing approximately 6,500 T of material (corresponding to approximately 4,100 yd^3). These quantities were determined based on placing 6 in. of material over an area of (530)(415)ft^2; a material density of 0.70 ft^3 solids/ft^3 volume and a specific gravity of 2.70, corresponding to 117.9 lb/ft^3. A motor grader will spread and grade the material over the majority of the work area. A vibratory compactor will be required to support construction of this layer.

The sand filter layer material also will be sourced from pit 30. This material will be another size fraction product of the size separation plant providing the gravel filter material. As above, construction of the sand filter layer will require hauling and placing approximately 6,400 T of material (corresponding to approximately 4,100 yd^3). These quantities were determined based on placing 6 in. of material over an area of (530)(415)ft^2; a material density of 0.70 ft^3 solids/CF volume and a specific gravity of 2.65, corresponding to 115.8 lb/ft^3. A motor grader will spread and grade the material. As above, a vibratory compactor will support placement of this layer. When completed, the surface of the sand filter layer will slope down at 1.5% over the central part of the cover area, and will slope up at 2:1 around the perimeter.

Placement of Compacted Silt. The silt soil will be sourced from the McGee Ranch site, which represents a 17-mi one-way haul. Construction will require hauling, placing, and compacting approximately (22,900-1,400) = 21,500 T of material (corresponding to 13,600-800 = 12,800 yd^3). These quantities were determined based on placing and compacting material to a depth of 20 in. over an area of (530)(415)ft^2 less the volume occupied by fill and filter layers in the perimeter area sloped at 2:1; and the following dry unit weights -- bank unit weight of 86.5 lb/ft^3, loose unit weight loaded on haul trucks of 72.1 lb/ft^3 (assumes 20% swell), and compacted unit weight of 125 lb/ft^3. The layer will be constructed in three lifts, using a motor grader or a small dozer to spread material and a static compactor (such as a sheep's foot roller) to densify the material. Moisture conditioning will be performed at the borrow site to the maximum practical extent. However, a water tanker truck and a farm tractor with disk will be required to support construction of this layer.

Placement of Silt/Pea Gravel Admix. The silt soil will be sourced from the McGee Ranch site as above. However, the material will first be transported to an admix plant (assumed to be sited at pit 30). Pea gravel will be mechanically mixed with the silt to produce a product that is 85% silt and 15% pea gravel by weight. Construction will require hauling and placing approximately (22,900-700) = 22,200 T of material (corresponding to 13,600-450 = 13,150 yd^3). These quantities were determined based on placing and compacting material to a depth of 20 in. over an area of (530)(415)ft^2 less the volume occupied by fill and filter layers in the perimeter area sloped at 2:1; and the following dry unit weights--bank unit weight of 86.5 lb/ft^3, loose unit weight loaded on haul trucks of 72.1 lb/ft^3 (assumes 20% swell), and compacted unit weight of 125 lb/ft^3. A motor grader or a small dozer will be used to spread the material. Moisture conditioning will be performed at the borrow site. Minimal compaction of this material is needed (i.e., wheel loads of placement equipment will be sufficient; no additional compaction equipment will be required).

Placement of Crushed Basalt Surfacing Material on Perimeter Berm. The work will be performed by a qualified subcontractor. The crushed basalt will be minus 12-in. material sourced from the existing quarry immediately east of State Highway 24 on the nose of Umtanum Ridge, overlooking Vernita Bridge. The one-way haul will be approximately 17 mi. Construction will require hauling and placing approximately 3,400 T of material (corresponding to approximately 2,000 yd^3). These quantities were determined based on placing 12 in. of material around a perimeter of 2(530+2(27))(415) = 1,998 ft^2 over a width of 27 LF; a material density of 0.75 CF solids/CF volume and a specific gravity of 2.70, corresponding to 126.4 lb/ft^3. A track dozer will be used to spread and grade the material. Compacting equipment will not be required. When completed, the perimeter berm will slope down at 3H:1V to meet the surrounding grade surface.

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APPENDIX A

HELP MODEL SIMULATIONS RESULTS

APPENDIX A

HELP MODEL SIMULATIONS RESULTS

Presented in Appendix A are the input data and results of model simulations of hydraulic performance of the RCRA Subtitle C Cover. Each layer in the designs utilized were characterized in terms of thickness, state of compaction, porosity, field capacity, wilting point, and saturated hydraulic conductivity. The results of each simulation are presented in conjunction with the input data.

HELP MODEL SIMULATIONS -- DISCUSSION OF RESULTS

1. General Information. The HELP Model (Version 2.0) is a quasi-two-dimensional numerical model that is used to simulate the hydraulic performance of engineered liner and cover systems. The model was developed by USACE (Waterways Experiment Station - Vicksburg) under contract to EPA (Schroeder et al., 1985; Schroeder et al., 1988; Peyton and Schroeder, 1988). The model computes runoff, lateral drainage and infiltration through a multi-layer soil liner and/or cover system for a user-specified location, using actual or stochastically generated daily rainfall data and stochastically generated temperature and solar radiation parameters for that location.

To model the candidate cover systems, each layer in the design is characterized in terms of thickness, degree of compaction, porosity, field capacity, wilting point, and saturated hydraulic conductivity. The HELP Model contains a look-up table with default characteristics for various representative soil textural types. Climate input information for HELP model applications at the Hanford Site is documented in WHC-SD-EN-CSWD-028 (Skelly 1990). The Hanford data set includes 10 years of daily precipitation values (for the period Jan. 1, 1979 to Dec. 31, 1988). The data set also includes site-specific stochastic parameters for temperature and solar radiation, beginning and end dates for the growing season, and a maximum leaf area index parameter.

For these simulations, the cover area was defined as 1 acre (43,560 square ft) so that runoff, drainage and infiltration values in the output file are directly assessable on a "per acre" basis. The runoff curve number of 87.21 was assigned by the program. A conservative value of 36-in. was assumed for the simulations as the limiting depth of evapotranspiration.

Each model was rerun until quasi-steady state moisture conditions were identified. This was accomplished by redefining the final moisture content values for individual layers from one run as the initial values for the next run until the initial and final values became invariant. This procedure eliminates the effects of overstating soil moisture conditions at the beginning of a simulation.

2. Model Results for the RCRA Subtitle C Design. The RCRA Subtitle C Barrier was modeled as follows:

Layer 1 -- upper silt layer with pea gravel admixture: 20-in. thick. Material properties for McGee Ranch silt for this simulation are the same as specified for layer 1 of the Hanford Barrier. A "poor" grass cover was specified.

Layer 2 -- lower (compacted) silt layer: 20-in. thick. The values cited here are the same as values used for compacted McGee Ranch silt in other recent HELP model simulations (e.g., NRDWL and SWL). The following adjustments were made to reflect compaction of layer 2:

Porosity: reduced by 25%

Field capacity: reduced by 25% of the difference between the uncompacted field capacity and wilting point values
Saturated hydraulic conductivity: 1.6 x 10^{-6} cm/sec (based on actual laboratory data from compacted samples)

These modifications to properties are consistent with the algorithm within the HELP Model that modifies default soil properties to account for the effects of compaction (Schroeder et al., 1988).

Layer 3 -- sand filter layer: The layer was modeled as consisting of 6-in. of HELP default textural type 3 soil (fine sand). Layer 3 was modeled as a compacted soil layer.

Layer 4 -- gravel filter layer: The layer was modeled as 6-in. of HELP default textural type 1 soil (sand and gravel). This layer also was modeled as a compacted soil layer.

Layer 5 -- Lateral Drainage Layer: The lateral drainage layer was modeled as a 6-in. layer of uncompacted HELP default type 1 soil (sand and gravel), sloping at 2 percent. Specifications call for this material to be a screened product, substantially free of fines, with a relatively high saturated hydraulic conductivity (>1 cm/sec).

Layer 6 -- Asphalt Layer: The asphalt was modeled as a 6-in. barrier soil layer with a saturated hydraulic conductivity of 1 x 10^{-8} cm/sec and arbitrarily assigned low porosity (0.022), field capacity (0.021) and wilting point (0.020) values. In practice, asphalt porosity should be well below two percent. However, the HELP model will not accept lower values. Because the layer is identified as a barrier soil layer, the HELP model operates on the assumption that the layer is saturated at all times and computes flow according to the Darcy equation (i.e., unsaturated hydraulic properties for layer 6 do not enter into the analysis).

The results of the simulation for the RCRA Subtitle C design indicate that evapotranspiration would remove essentially all (i.e., 99.99%) of average annual precipitation receipts. Predicted runoff is negligible. The HELP model predicts no lateral drainage from layer 5 and no infiltration through layer 6. The simulation indicates that the RCRA Subtitle C cover would perform as designed.

HELP MODEL SIMULATIONS -- RCRA SUBTITLE C

1. **General Information.** The HELP Model (Version 2.0) is a quasi-two-dimensional numerical model that is used to simulate the hydraulic performance of engineered liner and cover systems. The model was developed by USACE (Waterways Experiment Station - Vicksburg) under contract to EPA (Schroeder et al., 1985; Schroeder et al., 1988; Peyton and Schroeder, 1988). The model computes infiltration through a multi-layer soil liner and/or cover system for a user-specified location, using actual or stochastically generated daily rainfall data and stochastically generated temperature and solar radiation parameters.

2. **Input Date.** To model the candidate cover system, each layer in the design was characterized in terms of its thickness, state of compaction, porosity, field capacity, wilting point, and saturated hydraulic conductivity. The HELP Model contains a lookup table with default characteristics for various representative textural types of soils. In the case of the RCRA Subtitle C Barrier, the six cover layers were modeled as follows:

Layer 1 -- McGee Ranch Silt/Pea Gravel Admixture: Specific material properties for McGee Ranch silt; 20-in. thick. The values cited here are the same as those used in other recent HELP model simulations (e.g., NRDWL and SWL), but porosity, field capacity and wilting point values were all reduced by 7.9% to reflect the reduced void volume attributable to the pea gravel admixture. (The void volume reduction factor was calculated based on a mixture consisting of 15 wt. percent pea gravel [125 pounds per cubic ft dry unit weight and 25 percent porosity] and 85 wt. percent silt [85 pounds per cubic ft dry unit weight and 51.4 percent porosity]).

Layer 2 -- Compacted McGee Ranch Silt: Specific materials data for McGee Ranch silt, as above; 20-in. thick. The values cited here are the same as values used for compacted McGee Ranch silt in other recent HELP model simulations (e.g., NRDWL and SWL). However, the following adjustments were made to reflect compaction of layer 2.

<u>Porosity</u>: reduced by 25%

<u>Field capacity</u>: reduced by 25% of the difference between the uncompacted field capacity and wilting point values

<u>Saturated hydraulic conductivity</u>: reduced by a factor of 20.

These modifications to properties are consistent with the algorithm inside the HELP Model that modifies default soil properties to account for the effects of compaction (Schroeder et al., 1988).

Layer 3 -- Sand Filter Layer: The layer was modeled as consisting of 6-in. of HELP default textural type 3 soil (fine sand). Layer 3 was modeled as a compacted soil layer.

Layer 4 -- Gravel Filter Layer: The layer was modeled as 6-in. of HELP default textural type 1 soil (sand and gravel). This layer also was modeled as a compacted soil layer.

Layer 5 -- Lateral Drainage Layer: The lateral drainage layer was modeled as a 6-in. layer of uncompacted HELP default type 1 soil (sand and gravel), sloping at 1.5 percent. Specifications call for this material to be a screened product that is substantially free of fines with a relatively high saturated hydraulic conductivity (>1 cm/sec). In practice, this material probably will have to be a clean, uniform gravel with significantly lower field capacity and wilting point values than default type 1 soil. However, the HELP default soils data base does not include such a material type.

Layer 6 -- Asphalt Layer: The asphalt was modeled as a barrier soil layer with a saturated hydraulic conductivity of 1×10^{-8} cm/sec and arbitrarily assigned low porosity (0.022), field capacity (0.021) and wilting point (0.020) values. In practice, asphalt porosity should be well below two percent. However, the HELP model will not accept lower values. Because the layer is identified as a barrier soil layer, the HELP model operates on the assumption that the layer is saturated at all times and computes flow according to the Darcy equation (i.e., unsaturated hydraulic properties for layer 6 do not enter into the analysis).

The runoff curve number of 87.21 was assigned by the program. The cover area was input as 1 acre (43,560 square ft) so that all runoff, drainage and infiltration values in the output file will be interpretable on a "per acre" basis.

Site-specific climate input information for HELP model applications at the Hanford Site is documented in WHC-SD-EN-CSWD-028 (Skelly 1990). The Hanford data set includes 10 years of daily precipitation values (from January 1, 1979 to December 31, 1988). The data set also includes site-specific stochastic parameters for temperature and solar radiation, beginning and end dates for the growing season, and a maximum leaf area index parameter. A "poor" grass cover was specified for the simulations.

3. Modeling procedure. The input file was assembled as indicated above. For each simulation, the model was rerun a number of times until a quasi-steady state moisture condition was attained, wherein the initial and final moisture contents of all individual cover layers become invariant. This was accomplished by redefining the initial moisture contents of the cover layers for the next run with the final values reported from the previous run.

4. Discussion of results. If the evaporative zone depth is specified such that it does not correspond to the interface between two cover layers, there will be discontinuity in the numerical analysis of water movement at the depth in the soil column. An evaporative zone depth of 36-in. has been assumed in most previous Hanford Site applications of the HELP model. In the RCRA

Subtitle C application, fine-textured soils (i.e., layer 1 and layer 2) have a combined thickness of 40-in. (100 cm). If an evaporative zone depth of 36-in. is specified, the model will assume that no upward moisture removal can occur from the bottom 4-in. of layer 2. This is an infeasible result, insofar as layer 2 is a continuum region from the standpoint of matric potentials. An evaporative zone depth of 36-in. is known to be conservative based on data from ongoing lysimeters studies at Hanford. However, a specific value for the thickness of fine-textured soil column that would be subject to direct evaporation of moisture at the Hanford Site is not well established.

To bracket the uncertainties concerning the evaporative zone depth and hydraulic performance of layer 2, separate simulations were carried out for evaporative depths of 36, 40 and 42-in. The following results were obtained. Evapotranspiration efficiency in the three simulations improves slightly as the evaporative depth is extended from 36 to 44-in. Lateral drainage from layer 5 and percolation from layer 6 undergo significant reductions (from 0.19% and 0.67% for a 36-in. evaporative zone to 0.00 and 0.00 when the evaporative zone is 44-in.). Predicted infiltration through layer 6 (the low-permeability asphalt layer) is overstated by the model because of the assumptions that (1) layer 6 is continually saturated and (2) flow is as computed by Darcy's law. Runoff is insignificant (the 10-year precipitation data set includes a single runoff event).

The HELP model underestimates the evapotranspiration component of the water balance for arid sites generally. The model lacks the capability to evaluate the effects of wind on soil moisture. Wind effects can be pronounced, particularly under conditions where the wind blows for an extended period or conditions when the air temperature is high and/or humidity is low. The model also does not adequately account for moisture retention in fine-textured soils at capillary barrier interfaces. Hanford lysimeter studies constructed to evaluate capillary barriers have consistently shown that evapotranspiration exceeds model performance predictions.

The simulations predict that all or virtually all precipitation will be returned to the air by evapotranspiration. For the reasons discussed above, the HELP model results are believed to be conservative estimates of cover performance. In practice, moisture conditions within the lower portion of the cover system probably will be considerably drier and leakage through layer 6 (the asphalt layer) should be negligible.

HELP MODEL SIMULATION
RCRA SUBTITLE C
EQUIVALENT BARRIER DESIGN - 1,000-YR/24-HR STORM

LAYER 1 -- POOR GRASS

VERTICAL PERCOLATION LAYER

THICKNESS	=	20.00 INCHES
POROSITY	=	0.4734 VOL/VOL
FIELD CAPACITY	=	0.2381 VOL/VOL
WILTING POINT	=	0.0629 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0946 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000989999971 CM/SEC

LAYER 2

VERTICAL PERCOLATION LAYER

THICKNESS	=	20.00 INCHES
POROSITY	=	0.4570 VOL/VOL
FIELD CAPACITY	=	0.0831 VOL/VOL
WILTING POINT	=	0.0326 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0351 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000001600000 CM/SEC

LAYER 3

VERTICAL PERCOLATION LAYER

THICKNESS	=	6.00 INCHES
POROSITY	=	0.3509 VOL/VOL
FIELD CAPACITY	=	0.0705 VOL/VOL
WILTING POINT	=	0.0326 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0563 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000154999987 CM/SEC

LAYER 4

VERTICAL PERCOLATION LAYER

THICKNESS	=	6.00 INCHES
POROSITY	=	0.3178 VOL/VOL
FIELD CAPACITY	=	0.0391 VOL/VOL
WILTING POINT	=	0.0200 VOL/VOL

```
INITIAL SOIL WATER CONTENT                  =          0.0293 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY            =          0.000500000024 CM/SEC


                                   LAYER  5
                                   --------

                             LATERAL DRAINAGE LAYER

THICKNESS                                   =          6.00 INCHES
POROSITY                                    =          0.4170 VOL/VOL
FIELD CAPACITY                              =          0.0454 VOL/VOL
WILTING POINT                               =          0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT                  =          0.0454 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY            =          1.000000000000 CM/SEC
SLOPE                                       =          2.00 PERCENT
DRAINAGE LENGTH                             =          295.0 FEET


                                   LAYER  6
                                   --------

                              BARRIER SOIL LINER

THICKNESS                                   =          6.00 INCHES
POROSITY                                    =          0.0220 VOL/VOL
FIELD CAPACITY                              =          0.0210 VOL/VOL
WILTING POINT                               =          0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT                  =          0.0210 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY            =          0.000000010000 CM/SEC


                             GENERAL SIMULATION DATA
                             -----------------------

SCS RUNOFF CURVE NUMBER                     =          87.21
TOTAL AREA OF COVER                         =          43560. SQ FT
EVAPORATIVE ZONE DEPTH                      =          36.00 INCHES
UPPER LIMIT VEG. STORAGE                    =          16.7800 INCHES
INITIAL VEG. STORAGE                        =          2.4536 INCHES
INITIAL SNOW WATER CONTENT                  =          0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL
 AND WASTE LAYERS                           =          3.5060 INCHES

                       SOIL WATER CONTENT INITIALIZED BY USER.
```

CLIMATOLOGICAL DATA

USER SPECIFIED RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR HANF WASH

MAXIMUM LEAF AREA INDEX	=	1.60
START OF GROWING SEASON (JULIAN DATE)	=	113
END OF GROWING SEASON (JULIAN DATE)	=	288

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
29.30	36.30	45.10	53.10	61.50	69.30
76.40	74.30	65.20	53.00	39.80	32.70

VARIABLE 1: HEAD ON TOP OF LAYER 6
VARIABLE 2: PERCOLATION THROUGH LAYER 6
VARIABLE 3: LATERAL DRAINAGE FROM LAYER 5
VARIABLE 4: UNUSED VARIABLE
VARIABLE 5: UNUSED VARIABLE
VARIABLE 6: UNUSED VARIABLE

DAILY OUTPUT FOR YEAR 1983

DAY	RAIN IN.	RUNOFF IN.	ET IN.	VAR. 1 IN.	VAR. 2 IN.	VAR. 3 IN.	VAR. 4 IN.	VAR. 5 IN.	VAR. 6 IN.	SOIL WATER IN/IN
1	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0677
2	0.17	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0705
3	0.08	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.0725
4	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0728
5	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0724
6	0.50	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0822
7	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0850
8	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0843
9	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0835
10	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0833
11	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0831
12	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0827
13	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0824
14	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0823
15	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0823
16	0.05	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0823
17	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0823
18	0.11	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0846
19	0.12	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0871
20	0.00	0.000	0.048	0.0	0.0000	0.000	0.000	0.000	0.000	0.0868
21	0.00	0.000	0.049	0.0	0.0000	0.000	0.000	0.000	0.000	0.0854
22	0.00	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0844
23	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0839
24	0.13	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0862
25	0.02	0.000	0.052	0.0	0.0000	0.000	0.000	0.000	0.000	0.0863
26	0.20	0.000	0.047	0.0	0.0000	0.000	0.000	0.000	0.000	0.0893
27	0.06	0.000	0.059	0.0	0.0000	0.000	0.000	0.000	0.000	0.0904
28	0.00	0.000	0.057	0.0	0.0000	0.000	0.000	0.000	0.000	0.0892
29	0.00	0.000	0.047	0.0	0.0000	0.000	0.000	0.000	0.000	0.0878
30	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0872
31	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0866
32	0.00	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.0856
33	0.00	0.000	0.040	0.0	0.0000	0.000	0.000	0.000	0.000	0.0845
34	0.00	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.0833
35	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0824
36	0.00	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.0815
37	0.16	0.000	0.056	0.0	0.0000	0.000	0.000	0.000	0.000	0.0834

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	38	0.00	0.000	0.078	0.0	0.0000	0.000	0.000	0.000	0.000	0.0825
2	39	0.00	0.000	0.057	0.0	0.0000	0.000	0.000	0.000	0.000	0.0807
3	40	0.14	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.0824
4	41	0.09	0.000	0.071	0.0	0.0000	0.000	0.000	0.000	0.000	0.0835
5	42	0.01	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
6	43	0.01	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0823
7	44	0.02	0.000	0.074	0.0	0.0000	0.000	0.000	0.000	0.000	0.0810
8	45	0.07	0.000	0.089	0.0	0.0000	0.000	0.000	0.000	0.000	0.0802
9	46	0.11	0.000	0.081	0.0	0.0000	0.000	0.000	0.000	0.000	0.0807
10	47	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0805
11	48	0.07	0.000	0.065	0.0	0.0000	0.000	0.000	0.000	0.000	0.0805
12	49	0.34	0.000	0.072	0.0	0.0000	0.000	0.000	0.000	0.000	0.0861
13	50	0.00	0.000	0.071	0.0	0.0000	0.000	0.000	0.000	0.000	0.0865
14	51	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0856
15	52	0.07	0.000	0.051	0.0	0.0000	0.000	0.000	0.000	0.000	0.0858
16	53	0.00	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.0851
17	54	0.01	0.000	0.056	0.0	0.0000	0.000	0.000	0.000	0.000	0.0838
18	55	0.01	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
19	56	0.22	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0870
20	57	0.00	0.000	0.057	0.0	0.0000	0.000	0.000	0.000	0.000	0.0872
21	58	0.03	0.000	0.086	0.0	0.0000	0.000	0.000	0.000	0.000	0.0856
22	59	0.00	0.000	0.064	0.0	0.0000	0.000	0.000	0.000	0.000	0.0839
23	60	0.00	0.000	0.074	0.0	0.0000	0.000	0.000	0.000	0.000	0.0819
24	61	0.00	0.000	0.064	0.0	0.0000	0.000	0.000	0.000	0.000	0.0801
	62	0.00	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0788
26	63	0.01	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0782
27	64	0.02	0.000	0.118	0.0	0.0000	0.000	0.000	0.000	0.000	0.0761
28	65	0.02	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0753
29	66	0.00	0.000	0.059	0.0	0.0000	0.000	0.000	0.000	0.000	0.0741
30	67	0.10	0.000	0.141	0.0	0.0000	0.000	0.000	0.000	0.000	0.0728
31	68	0.26	0.000	0.097	0.0	0.0000	0.000	0.000	0.000	0.000	0.0759
32	69	0.02	0.000	0.101	0.0	0.0000	0.000	0.000	0.000	0.000	0.0754
33	70	0.00	0.000	0.076	0.0	0.0000	0.000	0.000	0.000	0.000	0.0732
34	71	0.02	0.000	0.064	0.0	0.0000	0.000	0.000	0.000	0.000	0.0718
35	72	0.35	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.0781
36	73	0.00	0.000	0.107	0.0	0.0000	0.000	0.000	0.000	0.000	0.0780
37	74	0.00	0.000	0.105	0.0	0.0000	0.000	0.000	0.000	0.000	0.0751
38	75	0.00	0.000	0.100	0.0	0.0000	0.000	0.000	0.000	0.000	0.0723
39	76	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0710
40	77	0.00	0.000	0.069	0.0	0.0000	0.000	0.000	0.000	0.000	0.0693
41	78	0.00	0.000	0.144	0.0	0.0000	0.000	0.000	0.000	0.000	0.0659
42	79	0.00	0.000	0.106	0.0	0.0000	0.000	0.000	0.000	0.000	0.0626
43	80	0.00	0.000	0.061	0.0	0.0000	0.000	0.000	0.000	0.000	0.0606
44	81	0.00	0.000	0.139	0.0	0.0000	0.000	0.000	0.000	0.000	0.0573
45	82	0.00	0.000	0.139	0.0	0.0000	0.000	0.000	0.000	0.000	0.0535
46	83	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
47	84	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
48	85	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
49	86	0.05	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.0527
	87	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0526
51	88	0.15	0.000	0.045	0.0	0.0000	0.000	0.000	0.000	0.000	0.0547
52	89	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0547

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	90	0.00	0.000	0.033	0.0	0.0000	0.000	0.000	0.000	0.000	0.0538
2	91	0.18	0.000	0.038	0.0	0.0000	0.000	0.000	0.000	0.000	0.0565
3	92	0.09	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.0586
4	93	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.0584
5	94	0.00	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.0576
6	95	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0569
7	96	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0562
8	97	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0555
9	98	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
10	99	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0542
11	100	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0536
12	101	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0530
13	102	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0526
14	103	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
15	104	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
16	105	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
17	106	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
18	107	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
19	108	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
20	109	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
21	110	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
22	111	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
23	112	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
24	113	0.13	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0547
	114	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
26	115	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0546
27	116	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0542
28	117	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0537
29	118	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0533
30	119	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0528
31	120	0.02	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0526
32	121	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
33	122	0.00	0.000	0.001	0.0	0.0000	0.000	0.000	0.000	0.000	0.0524
34	123	0.00	0.000	0.001	0.0	0.0000	0.000	0.000	0.000	0.000	0.0524
35	124	0.00	0.000	0.001	0.0	0.0000	0.000	0.000	0.000	0.000	0.0524
36	125	0.03	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
37	126	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0524
38	127	0.39	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0599
39	128	0.10	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0641
40	129	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0643
41	130	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0638
42	131	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0634
43	132	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0629
44	133	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0624
45	134	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0619
46	135	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0614
47	136	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0609
48	137	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0604
49	138	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0599
	139	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0593
51	140	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0588
52	141	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0582

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	142	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0576
2	143	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0570
3	144	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0563
4	145	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0557
5	146	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
6	147	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0544
7	148	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0537
8	149	0.00	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.0530
9	150	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0521
10	151	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0514
11	152	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0508
12	153	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0502
13	154	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0496
14	155	0.00	0.000	0.002	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
15	156	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
16	157	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
17	158	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
18	159	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
19	160	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
20	161	0.08	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0507
21	162	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0508
22	163	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0505
23	164	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0501
24	165	0.04	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0504
	166	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0502
26	167	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0499
27	168	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0495
28	169	0.07	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0504
29	170	0.01	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0506
30	171	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0503
31	172	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0499
32	173	0.02	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0498
33	174	0.01	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0496
34	175	0.00	0.000	0.002	0.0	0.0000	0.000	0.000	0.000	0.000	0.0495
35	176	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
36	177	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
37	178	0.37	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0567
38	179	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0585
39	180	0.08	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0592
40	181	0.00	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.0589
41	182	0.03	0.000	0.040	0.0	0.0000	0.000	0.000	0.000	0.000	0.0585
42	183	0.00	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.0578
43	184	0.00	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.0570
44	185	0.00	0.000	0.030	0.0	0.0000	0.000	0.000	0.000	0.000	0.0562
45	186	0.00	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.0554
46	187	0.00	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.0545
47	188	0.00	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.0536
48	189	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0529
49	190	0.00	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.0520
	191	0.00	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0511
51	192	0.00	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.0501
52	193	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0495

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	194	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
2	195	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
3	196	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
4	197	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
5	198	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
6	199	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
7	200	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
8	201	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
9	202	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
10	203	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
11	204	0.02	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
12	205	0.01	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
13	206	0.23	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.0537
14	207	0.00	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.0543
15	208	0.02	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.0536
16	209	0.00	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0528
17	210	0.00	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.0518
18	211	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0511
19	212	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0506
20	213	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0502
21	214	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0497
22	215	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0495
23	216	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
24	217	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
	218	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
26	219	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
27	220	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
28	221	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
29	222	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
30	223	0.01	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
31	224	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
32	225	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
33	226	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
34	227	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
35	228	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
36	229	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
37	230	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
38	231	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
39	232	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
40	233	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
41	234	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
42	235	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
43	236	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
44	237	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
45	238	0.02	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
46	239	0.02	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
47	240	0.03	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0496
48	241	0.04	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0500
49	242	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0498
	243	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0495
51	244	0.24	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0540
52	245	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0550

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	246	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0544
2	247	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.0537
3	248	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0530
4	249	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0523
5	250	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0518
6	251	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0513
7	252	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0508
8	253	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0502
9	254	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0498
10	255	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0495
11	256	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
12	257	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
13	258	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
14	259	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
15	260	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
16	261	0.22	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0535
17	262	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0546
18	263	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0542
19	264	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0538
20	265	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0534
21	266	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0531
22	267	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0528
23	268	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0524
24	269	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0521
	270	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0518
26	271	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0515
27	272	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0512
28	273	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0509
29	274	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0507
30	275	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0504
31	276	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0502
32	277	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0500
33	278	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0498
34	279	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0495
35	280	0.00	0.000	0.002	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
36	281	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
37	282	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
38	283	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
39	284	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
40	285	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
41	286	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
42	287	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
43	288	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
44	289	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
45	290	0.08	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0507
46	291	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0510
47	292	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0508
48	293	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0506
49	294	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0505
	295	0.20	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0542
51	296	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0553
52	297	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	298	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0550
2	299	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0548
3	300	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0546
4	301	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0544
5	302	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0542
6	303	0.23	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0586
7	304	0.01	0.000	0.055	0.0	0.0000	0.000	0.000	0.000	0.000	0.0591
8	305	0.15	0.000	0.074	0.0	0.0000	0.000	0.000	0.000	0.000	0.0604
9	306	0.05	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0616
10	307	0.04	0.000	0.059	0.0	0.0000	0.000	0.000	0.000	0.000	0.0614
11	308	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0609
12	309	0.04	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0612
13	310	0.01	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0610
14	311	0.00	0.000	0.087	0.0	0.0000	0.000	0.000	0.000	0.000	0.0591
15	312	0.00	0.000	0.084	0.0	0.0000	0.000	0.000	0.000	0.000	0.0567
16	313	0.07	0.000	0.052	0.0	0.0000	0.000	0.000	0.000	0.000	0.0565
17	314	0.66	0.000	0.085	0.0	0.0000	0.000	0.000	0.000	0.000	0.0686
18	315	0.00	0.000	0.058	0.0	0.0000	0.000	0.000	0.000	0.000	0.0714
19	316	0.01	0.000	0.078	0.0	0.0000	0.000	0.000	0.000	0.000	0.0696
20	317	0.02	0.000	0.084	0.0	0.0000	0.000	0.000	0.000	0.000	0.0678
21	318	0.08	0.000	0.072	0.0	0.0000	0.000	0.000	0.000	0.000	0.0675
22	319	0.01	0.000	0.062	0.0	0.0000	0.000	0.000	0.000	0.000	0.0665
23	320	0.08	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0674
24	321	0.09	0.000	0.038	0.0	0.0000	0.000	0.000	0.000	0.000	0.0689
	322	0.00	0.000	0.044	0.0	0.0000	0.000	0.000	0.000	0.000	0.0684
26	323	0.08	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0694
27	324	0.00	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.0690
28	325	0.05	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0691
29	326	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0691
30	327	0.42	0.000	0.045	0.0	0.0000	0.000	0.000	0.000	0.000	0.0768
31	328	0.20	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0834
32	329	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0844
33	330	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0840
34	331	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0834
35	332	0.06	0.000	0.033	0.0	0.0000	0.000	0.000	0.000	0.000	0.0838
36	333	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0837
37	334	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0833
38	335	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0829
39	336	0.03	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0833
40	337	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0832
41	338	0.05	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0833
42	339	0.32	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0898
43	340	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0915
44	341	0.32	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0976
45	342	0.00	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.0988
46	343	0.41	0.000	0.046	0.0	0.0000	0.000	0.000	0.000	0.000	0.1061
47	344	0.06	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.1091
48	345	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1088
49	346	0.03	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1086
	347	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.1086
51	348	0.01	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.1086
52	349	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.1085

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	350	0.01	0.000	0.033	0.0	0.0000	0.000	0.000	0.000	0.000	0.1079
2	351	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.1076
3	352	0.02	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.1077
4	353	0.04	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1081
5	354	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1082
6	355	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1082
7	356	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1078
8	357	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.1074
9	358	0.06	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1084
10	359	0.12	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1110
11	360	0.00	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.1109
12	361	0.09	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.1117
13	362	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.1118
14	363	0.55	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1230
15	364	2.68	0.790	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1658
16	365	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.1787

MONTHLY TOTALS FOR YEAR 1983

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION(INCHES)	1.44 0.31	1.36 0.12	1.00 0.46	0.42 0.52	0.52 2.12	0.68 4.80
RUNOFF(INCHES)	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.790
EVAPOTRANSPIRATION (INCHES)	0.784 0.605	1.465 0.158	2.077 0.410	0.454 0.232	0.568 1.244	0.413 0.574
LATERAL DRAINAGE FROM LAYER 5 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
AVG. DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
STD. DEV. OF DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
PERCOLATION FROM LAYER 6 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

ANNUAL TOTALS FOR YEAR 1983

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	13.75	49913.	100.00
RUN OFF	0.790	2868.	5.75
EVAPOTRANSPIRATION	8.984	32612.	65.34
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	3.976	14433.	28.92
SOIL WATER AT START OF YEAR	3.5	112727.	
SOIL WATER AT END OF YEAR	7.48	27159.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

VARIABLE 1: HEAD ON TOP OF LAYER6
VARIABLE 2: PERCOLATION THROUGH LAYER6
VARIABLE 3: LATERAL DRAINAGE FROM LAYER5
VARIABLE 4: UNUSED VARIABLE
VARIABLE 5: UNUSED VARIABLE
VARIABLE 6: UNUSED VARIABLE

DAILY OUTPUT FOR YEAR 1984

DAY	RAIN IN.	RUNOFF IN.	ET IN.	VAR. 1 IN.	VAR. 2 IN.	VAR. 3 IN.	VAR. 4 IN.	VAR. 5 IN.	VAR. 6 IN.	SOIL WATER IN/IN
1	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.1784
2	0.02	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.1784
3	0.04	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1788
4	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.1788
5	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.1784
6	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.1780
7	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.1777
8	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.1774
9	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1774
10	0.02	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1774
11	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1774
12	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1774
13	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1774
14	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1774
15	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1774
16	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1774
17	0.00	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.1768
18	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1760
19	0.00	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.1751
20	0.00	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.1742
21	0.15	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.1763
22	0.00	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.1764
23	0.00	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.1755
24	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1753
25	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1753
26	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1753
27	0.00	0.000	0.044	0.0	0.0000	0.000	0.000	0.000	0.000	0.1744
28	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1735
29	0.00	0.000	0.045	0.0	0.0000	0.000	0.000	0.000	0.000	0.1724
30	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1721
31	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.1718
32	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.1715
33	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1712
34	0.00	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.1704
35	0.00	0.000	0.056	0.0	0.0000	0.000	0.000	0.000	0.000	0.1690
36	0.01	0.000	0.044	0.0	0.0000	0.000	0.000	0.000	0.000	0.1679
37	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.1674
38	0.00	0.000	0.059	0.0	0.0000	0.000	0.000	0.000	0.000	0.1661
39	0.06	0.000	0.076	0.0	0.0000	0.000	0.000	0.000	0.000	0.1653

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	40	0.04	0.000	0.072	0.0	0.0000	0.000	0.000	0.000	0.000	0.1646
2	41	0.00	0.000	0.038	0.0	0.0000	0.000	0.000	0.000	0.000	0.1635
3	42	0.01	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1630
4	43	0.03	0.000	0.052	0.0	0.0000	0.000	0.000	0.000	0.000	0.1625
5	44	0.18	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1655
6	45	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1663
7	46	0.13	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1684
8	47	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.1686
9	48	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1678
10	49	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.1673
11	50	0.02	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1672
12	51	0.18	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1704
13	52	0.02	0.000	0.083	0.0	0.0000	0.000	0.000	0.000	0.000	0.1702
14	53	0.00	0.000	0.072	0.0	0.0000	0.000	0.000	0.000	0.000	0.1683
15	54	0.08	0.000	0.095	0.0	0.0000	0.000	0.000	0.000	0.000	0.1675
16	55	0.08	0.000	0.069	0.0	0.0000	0.000	0.000	0.000	0.000	0.1676
17	56	0.06	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1684
18	57	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.1679
19	58	0.00	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.1669
20	59	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1663
21	60	0.04	0.000	0.098	0.0	0.0000	0.000	0.000	0.000	0.000	0.1649
22	61	0.03	0.000	0.071	0.0	0.0000	0.000	0.000	0.000	0.000	0.1637
23	62	0.00	0.000	0.044	0.0	0.0000	0.000	0.000	0.000	0.000	0.1625
24	63	0.00	0.000	0.067	0.0	0.0000	0.000	0.000	0.000	0.000	0.1608
	64	0.00	0.000	0.062	0.0	0.0000	0.000	0.000	0.000	0.000	0.1590
26	65	0.00	0.000	0.040	0.0	0.0000	0.000	0.000	0.000	0.000	0.1578
27	66	0.00	0.000	0.124	0.0	0.0000	0.000	0.000	0.000	0.000	0.1549
28	67	0.00	0.000	0.083	0.0	0.0000	0.000	0.000	0.000	0.000	0.1523
29	68	0.00	0.000	0.075	0.0	0.0000	0.000	0.000	0.000	0.000	0.1502
30	69	0.00	0.000	0.050	0.0	0.0000	0.000	0.000	0.000	0.000	0.1486
31	70	0.01	0.000	0.075	0.0	0.0000	0.000	0.000	0.000	0.000	0.1469
32	71	0.00	0.000	0.060	0.0	0.0000	0.000	0.000	0.000	0.000	0.1452
33	72	0.00	0.000	0.070	0.0	0.0000	0.000	0.000	0.000	0.000	0.1433
34	73	0.14	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.1450
35	74	0.00	0.000	0.051	0.0	0.0000	0.000	0.000	0.000	0.000	0.1447
36	75	0.03	0.000	0.054	0.0	0.0000	0.000	0.000	0.000	0.000	0.1438
37	76	0.03	0.000	0.049	0.0	0.0000	0.000	0.000	0.000	0.000	0.1433
38	77	0.00	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.1423
39	78	0.02	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.1416
40	79	0.11	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.1429
41	80	0.43	0.000	0.040	0.0	0.0000	0.000	0.000	0.000	0.000	0.1515
42	81	0.10	0.000	0.149	0.0	0.0000	0.000	0.000	0.000	0.000	0.1532
43	82	0.00	0.000	0.088	0.0	0.0000	0.000	0.000	0.000	0.000	0.1510
44	83	0.00	0.000	0.070	0.0	0.0000	0.000	0.000	0.000	0.000	0.1489
45	84	0.00	0.000	0.120	0.0	0.0000	0.000	0.000	0.000	0.000	0.1460
46	85	0.03	0.000	0.165	0.0	0.0000	0.000	0.000	0.000	0.000	0.1423
47	86	0.01	0.000	0.085	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
48	87	0.00	0.000	0.060	0.0	0.0000	0.000	0.000	0.000	0.000	0.1381
49	88	0.07	0.000	0.059	0.0	0.0000	0.000	0.000	0.000	0.000	0.1379
	89	0.00	0.000	0.045	0.0	0.0000	0.000	0.000	0.000	0.000	0.1370
51	90	0.00	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.1358
52	91	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1351

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	92	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
2	93	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
3	94	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
4	95	0.13	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.1368
5	96	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1369
6	97	0.00	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.1361
7	98	0.22	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
8	99	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.1406
9	100	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1399
10	101	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1393
11	102	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1386
12	103	0.01	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1381
13	104	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1375
14	105	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1369
15	106	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1364
16	107	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1358
17	108	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1353
18	109	0.12	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.1371
19	110	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.1373
20	111	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1368
21	112	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1363
22	113	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1358
23	114	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1353
24	115	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.1350
	116	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
	117	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
27	118	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
28	119	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
29	120	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
30	121	0.12	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1369
31	122	0.19	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1410
32	123	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1418
33	124	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1414
34	125	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1410
35	126	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1405
36	127	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1401
37	128	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.1396
38	129	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1392
39	130	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1387
40	131	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1383
41	132	0.04	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1385
42	133	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1383
43	134	0.05	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1388
44	135	0.07	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1400
45	136	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.1400
46	137	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1395
47	138	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.1391
48	139	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1386
49	140	0.03	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1386
	141	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.1382
	142	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1377
52	143	0.12	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1396

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	144	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
2	145	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1393
3	146	0.05	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.1396
4	147	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1393
5	148	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1388
6	149	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1382
7	150	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1376
8	151	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1370
9	152	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.1363
10	153	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.1356
11	154	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
12	155	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.1341
13	156	0.25	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.1382
14	157	0.00	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.1389
15	158	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.1380
16	159	0.07	0.000	0.046	0.0	0.0000	0.000	0.000	0.000	0.000	0.1382
17	160	0.00	0.000	0.048	0.0	0.0000	0.000	0.000	0.000	0.000	0.1374
18	161	0.00	0.000	0.047	0.0	0.0000	0.000	0.000	0.000	0.000	0.1361
19	162	0.00	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.1349
20	163	0.00	0.000	0.052	0.0	0.0000	0.000	0.000	0.000	0.000	0.1335
21	164	0.01	0.000	0.049	0.0	0.0000	0.000	0.000	0.000	0.000	0.1323
22	165	0.00	0.000	0.030	0.0	0.0000	0.000	0.000	0.000	0.000	0.1314
23	166	0.00	0.000	0.061	0.0	0.0000	0.000	0.000	0.000	0.000	0.1300
24	167	0.00	0.000	0.057	0.0	0.0000	0.000	0.000	0.000	0.000	0.1284
	168	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.1274
[illegible]	169	0.00	0.000	0.058	0.0	0.0000	0.000	0.000	0.000	0.000	0.1259
27	170	0.00	0.000	0.067	0.0	0.0000	0.000	0.000	0.000	0.000	0.1241
28	171	0.00	0.000	0.064	0.0	0.0000	0.000	0.000	0.000	0.000	0.1224
29	172	0.24	0.000	0.060	0.0	0.0000	0.000	0.000	0.000	0.000	0.1257
30	173	0.03	0.000	0.089	0.0	0.0000	0.000	0.000	0.000	0.000	0.1257
31	174	0.00	0.000	0.087	0.0	0.0000	0.000	0.000	0.000	0.000	0.1235
32	175	0.00	0.000	0.078	0.0	0.0000	0.000	0.000	0.000	0.000	0.1212
33	176	0.00	0.000	0.054	0.0	0.0000	0.000	0.000	0.000	0.000	0.1196
34	177	0.00	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.1184
35	178	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.1174
36	179	0.00	0.000	0.098	0.0	0.0000	0.000	0.000	0.000	0.000	0.1151
37	180	0.23	0.000	0.138	0.0	0.0000	0.000	0.000	0.000	0.000	0.1163
38	181	0.16	0.000	0.275	0.0	0.0000	0.000	0.000	0.000	0.000	0.1146
39	182	0.00	0.000	0.107	0.0	0.0000	0.000	0.000	0.000	0.000	0.1116
40	183	0.00	0.000	0.152	0.0	0.0000	0.000	0.000	0.000	0.000	0.1076
41	184	0.00	0.000	0.149	0.0	0.0000	0.000	0.000	0.000	0.000	0.1035
42	185	0.00	0.000	0.153	0.0	0.0000	0.000	0.000	0.000	0.000	0.0993
43	186	0.00	0.000	0.172	0.0	0.0000	0.000	0.000	0.000	0.000	0.0946
44	187	0.00	0.000	0.160	0.0	0.0000	0.000	0.000	0.000	0.000	0.0901
45	188	0.00	0.000	0.084	0.0	0.0000	0.000	0.000	0.000	0.000	0.0872
46	189	0.00	0.000	0.123	0.0	0.0000	0.000	0.000	0.000	0.000	0.0841
47	190	0.00	0.000	0.142	0.0	0.0000	0.000	0.000	0.000	0.000	0.0803
48	191	0.00	0.000	0.147	0.0	0.0000	0.000	0.000	0.000	0.000	0.0762
49	192	0.00	0.000	0.191	0.0	0.0000	0.000	0.000	0.000	0.000	0.0712
	193	0.00	0.000	0.134	0.0	0.0000	0.000	0.000	0.000	0.000	0.0671
	194	0.00	0.000	0.153	0.0	0.0000	0.000	0.000	0.000	0.000	0.0630
52	195	0.00	0.000	0.128	0.0	0.0000	0.000	0.000	0.000	0.000	0.0593

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	196	0.00	0.000	0.142	0.0	0.0000	0.000	0.000	0.000	0.000	0.0554
2	197	0.00	0.000	0.145	0.0	0.0000	0.000	0.000	0.000	0.000	0.0514
3	198	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0497
4	199	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
5	200	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
6	201	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
7	202	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
8	203	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
9	204	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
10	205	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
11	206	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
12	207	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
13	208	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
14	209	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
15	210	0.06	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0498
16	211	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0496
17	212	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
18	213	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
19	214	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
20	215	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
21	216	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
22	217	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
23	218	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
24	219	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
	220	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
[illegible]	221	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
27	222	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
28	223	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
29	224	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
30	225	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
31	226	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
32	227	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
33	228	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
34	229	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
35	230	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
36	231	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
37	232	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
38	233	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
39	234	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
40	235	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
41	236	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
42	237	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
43	238	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
44	239	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
45	240	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
46	241	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
47	242	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
48	243	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
49	244	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
	245	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
	246	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
52	247	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	248	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
2	249	0.03	0.000	0.030	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
3	250	0.01	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
4	251	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
5	252	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
6	253	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
7	254	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
8	255	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
9	256	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
10	257	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
11	258	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
12	259	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
13	260	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
14	261	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
15	262	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
16	263	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0494
17	264	0.11	0.000	0.030	0.0	0.0000	0.000	0.000	0.000	0.000	0.0511
18	265	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0515
19	266	0.20	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
20	267	0.07	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.0568
21	268	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0568
22	269	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0564
23	270	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
24	271	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0558
	272	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0555
	273	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
27	274	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0550
28	275	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0547
29	276	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0545
30	277	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0543
31	278	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0540
32	279	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0538
33	280	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0535
34	281	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0533
35	282	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0531
36	283	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0529
37	284	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0527
38	285	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
39	286	0.03	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0525
40	287	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0524
41	288	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0522
42	289	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0520
43	290	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0519
44	291	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0517
45	292	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0515
46	293	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0513
47	294	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0511
48	295	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0509
49	296	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0508
	297	0.02	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0508
	298	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0506
52	299	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0505

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	300	0.02	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0504
2	301	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0503
3	302	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0501
4	303	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0500
5	304	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0498
6	305	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0496
7	306	0.03	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0499
8	307	0.25	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0547
9	308	0.01	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0562
10	309	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0560
11	310	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0559
12	311	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0557
13	312	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0555
14	313	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0553
15	314	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
16	315	0.12	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0572
17	316	0.14	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0603
18	317	0.06	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0619
19	318	0.05	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0627
20	319	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0628
21	320	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0626
22	321	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0625
23	322	0.10	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0640
24	323	0.05	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0652
	324	0.01	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0653
	325	0.26	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0702
27	326	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0716
28	327	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0712
29	328	0.20	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0748
30	329	0.03	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0758
31	330	0.00	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0751
32	331	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0741
33	332	0.49	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0838
34	333	0.01	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.0864
35	334	0.02	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0863
36	335	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0860
37	336	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0856
38	337	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0853
39	338	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0850
40	339	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0847
41	340	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0842
42	341	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0839
43	342	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0832
44	343	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
45	344	0.14	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
46	345	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
47	346	0.05	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
48	347	0.05	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
49	348	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
	349	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
	350	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0830
52	351	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0852

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	352	0.18	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0893
2	353	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0904
3	354	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0900
4	355	0.02	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0902
5	356	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0901
6	357	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0894
7	358	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0888
8	359	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0885
9	360	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
10	361	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
11	362	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
12	363	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
13	364	0.13	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0909
14	365	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0916
15	366	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0913
16											

MONTHLY TOTALS FOR YEAR 1984

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.23	0.94	1.01	0.60	0.55	0.99
	0.06	0.00	0.42	0.07	1.83	0.57
RUNOFF (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.476	1.201	2.076	0.505	0.601	1.901
(INCHES)	2.270	0.000	0.222	0.263	0.523	0.376
LATERAL DRAINAGE FROM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AVG. DAILY HEAD ON	0.00	0.00	0.00	0.00	0.00	0.00
LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV. OF DAILY HEAD	0.00	0.00	0.00	0.00	0.00	0.00
ON LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
PERCOLATION FROM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 6 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ANNUAL TOTALS FOR YEAR 1984

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	7.27	26390.	100.00
RUNOFF	0.000	0.	0.00
EVAPOTRANSPIRATION	10.414	37801.	143.24
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	-3.144	-11412.	-43.24
SOIL WATER AT START OF YEAR	7.48	27159.	
SOIL WATER AT END OF YEAR	4.34	15748.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1983 THROUGH 1984

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.83	1.15	1.00	0.51	0.53	0.84
	0.19	0.06	0.44	0.29	1.97	2.69
STD. DEVIATIONS	0.86	0.30	0.01	0.13	0.02	0.22
	0.18	0.08	0.03	0.32	0.21	2.99
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.395
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.559
EVAPOTRANSPIRATION						
TOTALS	0.630	1.333	2.077	0.479	0.585	1.157
	1.438	0.079	0.316	0.248	0.883	0.475
STD. DEVIATIONS	0.218	0.186	0.001	0.036	0.023	1.052
	1.177	0.111	0.132	0.021	0.510	0.140
LATERAL DRAINAGE FROM LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION FROM LAYER 6						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD.DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1983 THROUGH 1984

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	10.51	(4.582)	38151.	100.00
RUN OFF	0.395	(0.559)	1434.	3.76
EVAPOTRANSPIRATION	9.699	(1.011)	35207.9	2.28
LATERAL DRAINAGE FROM LAYER 5	0.0000	(0.0000)	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	(0.0000)	0.	0.00
CHANGE IN WATER STORAGE	0.416	(5.034)	1511.	3.96

PEAK DAILY VALUES FOR YEARS 1983 THROUGH 1984

	(INCHES)	(CU. FT.)
PRECIPITATION	2.68	9728.4
RUNOFF	0.790	2868.0
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.0
PERCOLATION FROM LAYER 6	0.0000	0.0
HEAD ON LAYER 6	0.0	
SNOW WATER	0.19	697.0

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.1788
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0494

FINAL WATER STORAGE AT END OF YEAR 1984

LAYER	(INCHES)	(VOL/VOL)
1	2.72	0.1362
2	0.70	0.0352
3	0.34	0.0563
4	0.18	0.0293
5	0.27	0.0454
6	0.13	0.0210
SNOW WATER	0.00	

HELP MODEL SIMULATION
RCRA SUBTITLE C
EQUIVALENT BARRIER DESIGN - STEADY-STATE PERFORMANCE

LAYER 1 -- POOR GRASS

VERTICAL PERCOLATION LAYER

THICKNESS	=	20.00 INCHES
POROSITY	=	0.4734 VOL/VOL
FIELD CAPACITY	=	0.2381 VOL/VOL
WILTING POINT	=	0.0629 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0946 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000989999971 CM/SEC

LAYER 2

VERTICAL PERCOLATION LAYER

THICKNESS	=	20.00 INCHES
POROSITY	=	0.4570 VOL/VOL
FIELD CAPACITY	=	0.0831 VOL/VOL
WILTING POINT	=	0.0326 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0351 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000001600000 CM/SEC

LAYER 3

VERTICAL PERCOLATION LAYER

THICKNESS	=	6.00 INCHES
POROSITY	=	0.3509 VOL/VOL
FIELD CAPACITY	=	0.0705 VOL/VOL
WILTING POINT	=	0.0326 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0563 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000154999987 CM/SEC

LAYER 4

VERTICAL PERCOLATION LAYER

THICKNESS	=	6.00 INCHES
POROSITY	=	0.3178 VOL/VOL
FIELD CAPACITY	=	0.0391 VOL/VOL
WILTING POINT	=	0.0200 VOL/VOL

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INITIAL SOIL WATER CONTENT                  =          0.0293 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY            =          0.000500000024 CM/SEC


                                   LAYER 5
                                   -------

                            LATERAL DRAINAGE LAYER

THICKNESS                                   =          6.00 INCHES
POROSITY                                    =          0.4170 VOL/VOL
FIELD CAPACITY                              =          0.0454 VOL/VOL
WILTING POINT                               =          0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT                  =          0.0454 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY            =          1.000000000000 CM/SEC
SLOPE                                       =          2.00 PERCENT
DRAINAGE LENGTH                             =          295.0 FEET


                                   LAYER 6
                                   -------

                              BARRIER SOIL LINER
THICKNESS                                   =          6.00 INCHES
POROSITY                                    =          0.0220 VOL/VOL
FIELD CAPACITY                              =          0.0210 VOL/VOL
WILTING POINT                               =          0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT                  =          0.0210 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY            =          0.000000010000 CM/SEC


                            GENERAL SIMULATION DATA
                            -----------------------

SCS RUNOFF CURVE NUMBER                     =          87.21
TOTAL AREA OF COVER                         =          43560. SQ FT
EVAPORATIVE ZONE DEPTH                      =          36.00 INCHES
UPPER LIMIT VEG. STORAGE                    =          16.7800 INCHES
INITIAL VEG. STORAGE                        =          2.4536 INCHES
INITIAL SNOW WATER CONTENT                  =          0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL
 AND WASTE LAYERS                           =          3.5060 INCHES

                     SOIL WATER CONTENT INITIALIZED BY USER.
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CLIMATOLOGICAL DATA

USER SPECIFIED RAINFALL WITH SYNTHETIC DAILY TEMPERATURES
AND SOLAR RADIATION FOR HANFORD WASHINGTON

MAXIMUM LEAF AREA INDEX	=	1.60
START OF GROWING SEASON (JULIAN DATE)	=	113
END OF GROWING SEASON (JULIAN DATE)	=	288

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
29.30	36.30	45.10	53.10	61.50	69.30
76.40	74.30	65.20	53.00	39.80	32.70

MONTHLY TOTALS FOR YEAR 1979

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.54	0.17	0.54	0.52	0.10	0.00
	0.09	0.38	0.20	0.67	1.36	0.99
RUNOFF (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.776	0.504	0.204	0.442	0.581	0.038
(INCHES)	0.090	0.274	0.306	0.143	0.380	0.526
LATERAL DRAINAGE FROM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AVG. DAILY HEAD ON	0.00	0.00	0.00	0.00	0.00	0.00
LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV. OF DAILY HEAD	0.00	0.00	0.00	0.00	0.00	0.00
ON LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
PERCOLATION FROM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 6 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ANNUAL TOTALS FOR YEAR 1979

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	5.56	20183.	100.00
RUNOFF	0.000	0.	0.00
EVAPOTRANSPIRATION	4.263	15476.	76.68
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	1.297	4707.	23.32
SOIL WATER AT START OF YEAR	3.51	12727.	
SOIL WATER AT END OF YEAR	4.80	17433.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 1980

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	1.32 0.00	1.30 0.02	0.30 0.85	0.86 0.33	1.41 0.44	0.96 1.89
RUNOFF (INCHES)	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.001 0.000	0.000 0.000
EVAPOTRANSPIRATION (INCHES)	0.486 0.340	1.175 0.020	1.902 0.382	0.557 0.371	1.655 0.286	2.005 0.317
LATERAL DRAINAGE FROM LAYER 5 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
AVG. DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
STD. DEV. OF DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
PERCOLATION FROM LAYER 6 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

ANNUAL TOTALS FOR YEAR 1980

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	9.68	35138.	100.00
RUNOFF	0.001	4.	0.01
EVAPOTRANSPIRATION	9.495	34468.	98.09
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	0.184	667.	1.90
SOIL WATER AT START OF YEAR	4.80	17433.	
SOIL WATER AT END OF YEAR	4.99	18100.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 1981

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.56	0.60	0.70	0.02	0.99	0.43
	0.19	0.03	0.60	0.39	1.08	1.45
RUNOFF (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION (INCHES)	0.674	1.453	1.021	0.391	0.347	1.525
	0.234	0.030	0.110	0.351	0.520	0.547
LATERAL DRAINAGE FROM LAYER 5 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AVG. DAILY HEAD ON LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV. OF DAILY HEAD ON LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
PERCOLATION FROM LAYER 6 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ANNUAL TOTALS FOR YEAR 1981

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	7.042	5555.	100.00
RUN OFF	0.000	0.	0.00
EVAPOTRANSPIRATION	7.203	26147.	102.32
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	-0.163	-592.	-2.32
SOIL WATER AT START OF YEAR	4.99	18100.	
SOIL WATER AT END OF YEAR	4.82	17508.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 1982

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.33 0.22	0.57 0.20	0.30 0.55	0.75 1.33	0.28 0.91	0.75 1.79
RUNOFF (INCHES)	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.008	0.000 0.000	0.000 0.000
EVAPOTRANSPIRATION (INCHES)	0.667 0.688	1.122 0.198	0.924 0.299	0.584 0.396	0.697 0.998	0.510 0.551
LATERAL DRAINAGE FROM LAYER 5 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
AVG. DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
STD. DEV. OF DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
PERCOLATION FROM LAYER 6 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

ANNUAL TOTALS FOR YEAR 1982

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	7.98	28967.	100.00
RUN OFF	0.008	28.	0.09
EVAPOTRANSPIRATION	7.634	27712.	95.66
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	0.338	1228.	4.24
SOIL WATER AT START OF YEAR	4.82	17508.	
SOIL WATER AT END OF YEAR	5.16	18736.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 1983

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	1.44	1.36	1.00	0.42	0.52	0.68
	0.31	0.12	0.46	0.52	2.12	2.12
RUNOFF (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.581	0.972	2.128	0.881	0.684	1.865
(INCHES)	0.949	0.121	0.459	0.166	0.557	0.422
LATERAL DRAINAGE FROM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AVG. DAILY HEAD ON	0.00	0.00	0.00	0.00	0.00	0.00
LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV. OF DAILY HEAD	0.00	0.00	0.00	0.00	0.00	0.00
ON LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
PERCOLATION FROM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 6 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ANNUAL TOTALS FOR YEAR 1983

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	11.07	40184.	100.00
RUN OFF	0.000	0.	0.00
EVAPOTRANSPIRATION	9.784	35517.	88.39
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	1.286	4667.	11.61
SOIL WATER AT START OF YEAR	5.16	18736.	
SOIL WATER AT END OF YEAR	6.45	23403.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 1984

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.23	0.94	1.01	0.60	0.55	0.99
	0.06	0.00	0.42	0.07	1.83	0.57
RUNOFF (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION (INCHES)	0.413	1.206	2.109	0.540	0.787	2.022
	0.918	0.000	0.254	0.236	0.464	0.522
LATERAL DRAINAGE FROM LAYER 5 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AVG. DAILY HEAD ON LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV. OF DAILY HEAD ON LAYER 6 (INCHES)	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
PERCOLATION FROM LAYER 6 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ANNUAL TOTALS FOR YEAR 1984

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	7.27	26390.	100.00
RUN OFF	0.000	0.	0.00
EVAPOTRANSPIRATION	9.471	34381.	130.28
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	-2.201	-7991.	-30.28
SOIL WATER AT START OF YEAR	6.45	23403.	
SOIL WATER AT END OF YEAR	4.25	15412.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 1985

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.34 0.12	0.82 0.01	0.36 0.63	0.01 0.46	0.12 1.24	0.15 0.84
RUNOFF (INCHES)	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
EVAPOTRANSPIRATION (INCHES)	0.587 0.044	1.059 0.086	1.219 0.428	0.010 0.307	0.140 0.277	0.200 0.215
LATERAL DRAINAGE FROM LAYER 5 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
AVG. DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
STD. DEV. OF DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
PERCOLATION FROM LAYER 6 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

ANNUAL TOTALS FOR YEAR 1985

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	5.10	18513.	100.00
RUN OFF	0.000	0.	0.00
EVAPOTRANSPIRATION	4.570	16590.	89.61
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	0.530	1923.	10.39
SOIL WATER AT START OF YEAR	4.25	15412.	
SOIL WATER AT END OF YEAR	4.78	17335.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 1986

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	1.76 0.21	1.37 0.02	0.76 0.96	0.00 0.29	0.30 0.65	0.00 0.77
RUNOFF (INCHES)	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
EVAPOTRANSPIRATION (INCHES)	0.515 1.713	1.235 0.020	1.871 0.432	0.347 0.272	0.354 0.231	0.308 0.270
LATERAL DRAINAGE FROM LAYER 5 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
AVG. DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
STD. DEV. OF DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
PERCOLATION FROM LAYER 6 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

ANNUAL TOTALS FOR YEAR 1986

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	7.09	25737.	100.00
RUN OFF	0.000	0.	0.00
EVAPOTRANSPIRATION	7.569	27474.	106.75
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	-0.479	-1738.	-6.75
SOIL WATER AT START OF YEAR	4.78	17335.	
SOIL WATER AT END OF YEAR	4.30	15597.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 1987

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.80 0.50	0.19 0.07	1.05 0.01	0.14 0.00	0.17 0.40	0.11 1.63
RUNOFF (INCHES)	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
EVAPOTRANSPIRATION (INCHES)	0.260 0.500	0.926 0.070	0.756 0.010	0.412 0.000	0.593 0.223	0.977 0.346
LATERAL DRAINAGE FROM LAYER 5 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
AVG. DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
STD. DEV. OF DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
PERCOLATION FROM LAYER 6 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

ANNUAL TOTALS FOR YEAR 1987

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	5.07	18404.	100.00
RUN OFF	0.000	0.	0.00
EVAPOTRANSPIRATION	5.074	18420.	100.09
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	-0.005	-17.	-0.09
SOIL WATER AT START OF YEAR	4.30	15597.	
SOIL WATER AT END OF YEAR	4.29	15581.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.48 0.13	0.00 0.00	0.39 0.39	1.12 0.01	0.33 0.82	0.11 0.40
RUNOFF (INCHES)	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
EVAPOTRANSPIRATION (INCHES)	0.698 0.130	0.652 0.000	0.570 0.189	0.582 0.197	0.605 0.285	0.785 0.275
LATERAL DRAINAGE FROM LAYER 5 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
AVG. DAILY HEADON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
STD. DEV. OF DAILY HEAD ON LAYER 6 (INCHES)	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
PERCOLATION FROM LAYER 6 (INCHES)	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

ANNUAL TOTALS FOR YEAR 1988

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	4.18	15173.	100.00
RUN OFF	0.000	0.	0.00
EVAPOTRANSPIRATION	4.967	18030.	118.83
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.	0.00
PERCOLATION FROM LAYER 6	0.0001	0.	0.00
CHANGE IN WATER STORAGE	-0.787	-2857.	-18.83
SOIL WATER AT START OF YEAR	4.29	15581.	
SOIL WATER AT END OF YEAR	3.51	12723.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1979 THROUGH 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.78	0.73	0.64	0.44	0.48	0.42
	0.18	0.09	0.51	0.41	1.09	1.24
STD. DEVIATIONS	0.54	0.51	0.30	0.40	0.42	0.40
	0.14	0.12	0.28	0.39	0.57	0.60
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.001	0.000	0.000
STD.DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.002	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.566	1.030	1.270	0.475	0.644	1.024
	0.561	0.082	0.287	0.244	0.422	0.399
STD. DEVIATIONS	0.153	0.282	0.689	0.222	0.406	0.775
	0.522	0.092	0.149	0.122	0.235	0.130
LATERAL DRAINAGE FROM LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION FROM LAYER 6						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD.DEVIATIONS) FOR YEARS 1979 THROUGH 1988

	(INCHES)	(CU.FT.)	PERCENT
PRECIPITATION	7.00 (2.164)	25425.	100.00
RUN OFF	0.001 (0.002)	3.	0.01
EVAPOTRANSPIRATION	7.003 (2.162)	25422.	99.99
LATERAL DRAINAGE FROM LAYER 5	0.0000 (0.0000)	0.	0.00
PERCOLATION FROM LAYER 6	0.0001 (0.0000)	0.	0.00
CHANGE IN WATER STORAGE	0.000 (1.027)	0.	0.00

PEAK DAILY VALUES FOR YEARS 1979 THROUGH 1988

	(INCHES)	(CU.FT.)
PRECIPITATION	0.93	3375.9
RUN OFF	0.008	27.5
LATERAL DRAINAGE FROM LAYER 5	0.0000	0.0
PERCOLATION FROM LAYER 6	0.0000	0.0
HEAD ON LAYER 6	0.0	
SNOW WATER	0.76	2743.4

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.1531
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0492

FINAL WATER STORAGE AT END OF YEAR 1988

LAYER	(INCHES)	(VOL/VOL)
1	1.89	0.0946
2	0.70	0.0351
3	0.34	0.0563
4	0.18	0.0293
5	0.27	0.0454
6	0.13	0.0210
SNOW WATER	0.00	

HELP MODEL SIMULATION
RCRA SUBTITLE D DESIGN
EQUIVALENT BARRIER DESIGN - 1,000-YR/24-HR STORM

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	8.00 INCHES
POROSITY	=	0.4724 VOL/VOL
FIELD CAPACITY	=	0.2381 VOL/VOL
WILTING POINT	=	0.0629 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1349 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000989999971 CM/SEC

LAYER 2

VERTICAL PERCOLATION LAYER

THICKNESS	=	16.00 INCHES
POROSITY	=	0.5140 VOL/VOL
FIELD CAPACITY	=	0.2585 VOL/VOL
WILTING POINT	=	0.0681 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0738 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000989999971 CM/SEC

LAYER 3

VERTICAL PERCOLATION LAYER

THICKNESS	=	12.00 INCHES
POROSITY	=	0.4570 VOL/VOL
FIELD CAPACITY	=	0.0831 VOL/VOL
WILTING POINT	=	0.0326 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0326 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000001600000 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	87.21
TOTAL AREA OF COVER	=	43560. SQ FT
EVAPORATIVE ZONE DEPTH	=	36.00 INCHES
UPPER LIMIT VEG. STORAGE	=	17.4872 INCHES
INITIAL VEG. STORAGE	=	2.6512 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES

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INITIAL TOTAL WATER STORAGE IN
 SOIL AND WASTE LAYERS              =     2.6512 INCHES


                    SOIL WATER CONTENT INITIALIZED BY USER.
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CLIMATOLOGICAL DATA

USER SPECIFIED RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR HANFORD WASHINGTON

MAXIMUM LEAF AREA INDEX	=	1.60
START OF GROWING SEASON (JULIAN DATE)	=	113
END OF GROWING SEASON (JULIAN DATE)	=	288

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
29.30	36.30	45.10	53.10	61.50	69.30
76.40	74.30	65.20	53.00	39.80	32.70

VARIABLE 1: UNUSED VARIABLE
VARIABLE 2: PERCOLATION THROUGH LAYER 3
VARIABLE 3: UNUSED VARIABLE
VARIABLE 4: UNUSED VARIABLE
VARIABLE 5: UNUSED VARIABLE
VARIABLE 6: UNUSED VARIABLE

DAILY OUTPUT FOR YEAR 1983

DAY	RAIN IN.	RUNOFF IN.	ET IN.	VAR. 1 IN.	VAR. 2 IN.	VAR. 3 IN.	VAR. 4 IN.	VAR. 5 IN.	VAR. 6 IN.	SOIL WATER IN/IN
1	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0732
2	0.17	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0760
3	0.08	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.0780
4	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0783
5	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0779
6	0.50	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0877
7	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0904
8	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0898
9	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0890
10	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0888
11	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0886
12	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0882
13	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0879
14	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0878
15	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0878
16	0.05	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0878
17	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0878
18	0.11	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0901
19	0.12	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0926
20	0.00	0.000	0.047	0.0	0.0000	0.000	0.000	0.000	0.000	0.0923
21	0.00	0.000	0.048	0.0	0.0000	0.000	0.000	0.000	0.000	0.0909
22	0.00	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.0899
23	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0894
24	0.13	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0917
25	0.02	0.000	0.052	0.0	0.0000	0.000	0.000	0.000	0.000	0.0918
26	0.20	0.000	0.047	0.0	0.0000	0.000	0.000	0.000	0.000	0.0948
27	0.06	0.000	0.059	0.0	0.0000	0.000	0.000	0.000	0.000	0.0959
28	0.00	0.000	0.056	0.0	0.0000	0.000	0.000	0.000	0.000	0.0947
29	0.00	0.000	0.047	0.0	0.0000	0.000	0.000	0.000	0.000	0.0933
30	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0927
31	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0921
32	0.00	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.0912
33	0.00	0.000	0.040	0.0	0.0000	0.000	0.000	0.000	0.000	0.0901
34	0.00	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.0889
35	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0880
36	0.00	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.0870
37	0.16	0.000	0.056	0.0	0.0000	0.000	0.000	0.000	0.000	0.0889
38	0.00	0.000	0.077	0.0	0.0000	0.000	0.000	0.000	0.000	0.0880

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	39	0.00	0.000	0.057	0.0	0.0000	0.000	0.000	0.000	0.000	0.0863
2	40	0.14	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.0880
3	41	0.09	0.000	0.071	0.0	0.0000	0.000	0.000	0.000	0.000	0.0890
4	42	0.01	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0885
5	43	0.01	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0879
6	44	0.02	0.000	0.074	0.0	0.0000	0.000	0.000	0.000	0.000	0.0866
7	45	0.07	0.000	0.089	0.0	0.0000	0.000	0.000	0.000	0.000	0.0858
8	46	0.11	0.000	0.081	0.0	0.0000	0.000	0.000	0.000	0.000	0.0863
9	47	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0861
10	48	0.07	0.000	0.065	0.0	0.0000	0.000	0.000	0.000	0.000	0.0861
11	49	0.34	0.000	0.072	0.0	0.0000	0.000	0.000	0.000	0.000	0.0917
12	50	0.00	0.000	0.070	0.0	0.0000	0.000	0.000	0.000	0.000	0.0921
13	51	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0912
14	52	0.07	0.000	0.051	0.0	0.0000	0.000	0.000	0.000	0.000	0.0914
15	53	0.00	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.0907
16	54	0.01	0.000	0.056	0.0	0.0000	0.000	0.000	0.000	0.000	0.0894
17	55	0.01	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0886
18	56	0.22	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0926
19	57	0.00	0.000	0.057	0.0	0.0000	0.000	0.000	0.000	0.000	0.0928
20	58	0.03	0.000	0.086	0.0	0.0000	0.000	0.000	0.000	0.000	0.0913
21	59	0.00	0.000	0.063	0.0	0.0000	0.000	0.000	0.000	0.000	0.0896
22	60	0.00	0.000	0.073	0.0	0.0000	0.000	0.000	0.000	0.000	0.0876
23	61	0.00	0.000	0.063	0.0	0.0000	0.000	0.000	0.000	0.000	0.0858
24	62	0.00	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0845
[illegible]	63	0.01	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0839
26	64	0.02	0.000	0.118	0.0	0.0000	0.000	0.000	0.000	0.000	0.0818
27	65	0.02	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0811
28	66	0.00	0.000	0.058	0.0	0.0000	0.000	0.000	0.000	0.000	0.0798
29	67	0.10	0.000	0.141	0.0	0.0000	0.000	0.000	0.000	0.000	0.0786
30	68	0.25	0.000	0.097	0.0	0.0000	0.000	0.000	0.000	0.000	0.0817
31	69	0.02	0.000	0.101	0.0	0.0000	0.000	0.000	0.000	0.000	0.0811
32	70	0.00	0.000	0.076	0.0	0.0000	0.000	0.000	0.000	0.000	0.0790
33	71	0.02	0.000	0.064	0.0	0.0000	0.000	0.000	0.000	0.000	0.0775
34	72	0.35	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.0838
35	73	0.00	0.000	0.106	0.0	0.0000	0.000	0.000	0.000	0.000	0.0838
36	74	0.00	0.000	0.104	0.0	0.0000	0.000	0.000	0.000	0.000	0.0809
37	75	0.00	0.000	0.099	0.0	0.0000	0.000	0.000	0.000	0.000	0.0781
38	76	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0769
39	77	0.00	0.000	0.068	0.0	0.0000	0.000	0.000	0.000	0.000	0.0752
40	78	0.00	0.000	0.142	0.0	0.0000	0.000	0.000	0.000	0.000	0.0718
41	79	0.00	0.000	0.105	0.0	0.0000	0.000	0.000	0.000	0.000	0.0686
42	80	0.00	0.000	0.060	0.0	0.0000	0.000	0.000	0.000	0.000	0.0666
43	81	0.00	0.000	0.138	0.0	0.0000	0.000	0.000	0.000	0.000	0.0634
44	82	0.00	0.000	0.159	0.0	0.0000	0.000	0.000	0.000	0.000	0.0591
45	83	0.00	0.000	0.066	0.0	0.0000	0.000	0.000	0.000	0.000	0.0566
46	84	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
47	85	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
48	86	0.05	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.0563
49	87	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0562
[illegible]	88	0.15	0.000	0.047	0.0	0.0000	0.000	0.000	0.000	0.000	0.0583
[illegible]	89	0.00	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.0583
52	90	0.00	0.000	0.033	0.0	0.0000	0.000	0.000	0.000	0.000	0.0573

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	91	0.18	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0600
2	92	0.09	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.0620
3	93	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0618
4	94	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.0610
5	95	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0603
6	96	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0595
7	97	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0588
8	98	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0582
9	99	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0575
10	100	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0569
11	101	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0563
12	102	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
13	103	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
14	104	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
15	105	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
16	106	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
17	107	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
18	108	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
19	109	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
20	110	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
21	111	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
22	112	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
23	113	0.13	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0583
24	114	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0587
	115	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0582
[illegible]	116	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0577
27	117	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0573
28	118	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0568
29	119	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0563
30	120	0.02	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
31	121	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
32	122	0.00	0.000	0.001	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
33	123	0.00	0.000	0.001	0.0	0.0000	0.000	0.000	0.000	0.000	0.0560
34	124	0.00	0.000	0.001	0.0	0.0000	0.000	0.000	0.000	0.000	0.0560
35	125	0.03	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
36	126	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0560
37	127	0.39	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0635
38	128	0.10	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0676
39	129	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0678
40	130	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0673
41	131	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0669
42	132	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0664
43	133	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0659
44	134	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0655
45	135	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0650
46	136	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0645
47	137	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0640
48	138	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0635
49	139	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0629
[illegible]	140	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0624
[illegible]	141	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0619
52	142	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0613

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	143	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0608
2	144	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0603
3	145	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0599
4	146	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0594
5	147	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0590
6	148	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0585
7	149	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0580
8	150	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0575
9	151	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0570
10	152	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0564
11	153	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0559
12	154	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0553
13	155	0.00	0.000	0.003	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
14	156	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
15	157	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
16	158	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
17	159	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
18	160	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
19	161	0.08	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0563
20	162	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0564
21	163	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
22	164	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0557
23	165	0.04	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0560
24	166	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0558
	167	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0555
[illegible]	168	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
27	169	0.07	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
28	170	0.01	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0562
29	171	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0559
30	172	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0555
31	173	0.02	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0554
32	174	0.01	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
33	175	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
34	176	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
35	177	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
36	178	0.37	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0623
37	179	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0642
38	180	0.08	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0649
39	181	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.0646
40	182	0.03	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.0643
41	183	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.0636
42	184	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0629
43	185	0.00	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.0622
44	186	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0615
45	187	0.00	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.0607
46	188	0.00	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.0598
47	189	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0592
48	190	0.00	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.0584
49	191	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0576
[illegible]	192	0.00	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.0567
	193	0.00	0.000	0.038	0.0	0.0000	0.000	0.000	0.000	0.000	0.0556
52	194	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	195	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
2	196	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
3	197	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
4	198	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
5	199	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
6	200	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
7	201	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
8	202	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
9	203	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
10	204	0.02	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
11	205	0.01	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
12	206	0.23	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0593
13	207	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0600
14	208	0.02	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.0594
15	209	0.00	0.000	0.030	0.0	0.0000	0.000	0.000	0.000	0.000	0.0586
16	210	0.00	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.0576
17	211	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.0568
18	212	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0563
19	213	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0559
20	214	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0555
21	215	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
22	216	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
23	217	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
24	218	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
	219	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
26	220	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
27	221	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
28	222	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
29	223	0.01	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
30	224	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
31	225	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
32	226	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
33	227	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
34	228	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
35	229	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
36	230	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
37	231	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
38	232	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
39	233	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
40	234	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
41	235	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
42	236	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
43	237	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
44	238	0.02	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
45	239	0.02	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
46	240	0.03	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
47	241	0.04	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0556
48	242	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0554
49	243	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
	244	0.24	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0596
51	245	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0606
52	246	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0601

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	247	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0594
2	248	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0587
3	249	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0581
4	250	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.0575
5	251	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0571
6	252	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0566
7	253	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
8	254	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0556
9	255	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
10	256	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
11	257	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
12	258	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
13	259	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
14	260	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
15	261	0.22	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0592
16	262	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0602
17	263	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0599
18	264	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0595
19	265	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0591
20	266	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0588
21	267	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0584
22	268	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0581
23	269	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0578
24	270	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0574
	271	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0571
[illegible]	272	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0569
27	273	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0566
28	274	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0564
29	275	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561
30	276	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0559
31	277	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0557
32	278	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0554
33	279	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
34	280	0.00	0.000	0.002	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
35	281	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
36	282	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
37	283	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
38	284	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
39	285	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
40	286	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
41	287	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
42	288	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
43	289	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
44	290	0.08	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0563
45	291	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0566
46	292	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0564
47	293	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0562
48	294	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0560
49	295	0.20	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0597
[illegible]	296	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0608
[illegible]	297	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0606
52	298	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0605

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	299	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0603
2	300	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0601
3	301	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0599
4	302	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0597
5	303	0.23	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0640
6	304	0.01	0.000	0.055	0.0	0.0000	0.000	0.000	0.000	0.000	0.0645
7	305	0.15	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0669
8	306	0.05	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0685
9	307	0.04	0.000	0.059	0.0	0.0000	0.000	0.000	0.000	0.000	0.0683
10	308	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0678
11	309	0.04	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.0681
12	310	0.01	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.0679
13	311	0.00	0.000	0.085	0.0	0.0000	0.000	0.000	0.000	0.000	0.0660
14	312	0.00	0.000	0.082	0.0	0.0000	0.000	0.000	0.000	0.000	0.0637
15	313	0.07	0.000	0.052	0.0	0.0000	0.000	0.000	0.000	0.000	0.0635
16	314	0.66	0.000	0.085	0.0	0.0000	0.000	0.000	0.000	0.000	0.0756
17	315	0.00	0.000	0.057	0.0	0.0000	0.000	0.000	0.000	0.000	0.0784
18	316	0.01	0.000	0.077	0.0	0.0000	0.000	0.000	0.000	0.000	0.0766
19	317	0.02	0.000	0.084	0.0	0.0000	0.000	0.000	0.000	0.000	0.0748
20	318	0.08	0.000	0.072	0.0	0.0000	0.000	0.000	0.000	0.000	0.0746
21	319	0.01	0.000	0.062	0.0	0.0000	0.000	0.000	0.000	0.000	0.0735
22	320	0.08	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0745
23	321	0.09	0.000	0.038	0.0	0.0000	0.000	0.000	0.000	0.000	0.0760
24	322	0.00	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.0755
	323	0.08	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0765
26	324	0.00	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.0761
27	325	0.05	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0762
28	326	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0762
29	327	0.42	0.000	0.045	0.0	0.0000	0.000	0.000	0.000	0.000	0.0839
30	328	0.20	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0905
31	329	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0915
32	330	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0911
33	331	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0905
34	332	0.06	0.000	0.033	0.0	0.0000	0.000	0.000	0.000	0.000	0.0909
35	333	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0909
36	334	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0904
37	335	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0901
38	336	0.03	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0904
39	337	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0904
40	338	0.05	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0905
41	339	0.32	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0970
42	340	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0987
43	341	0.32	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1048
44	342	0.00	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.1060
45	343	0.41	0.000	0.046	0.0	0.0000	0.000	0.000	0.000	0.000	0.1133
46	344	0.06	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.1163
47	345	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1160
48	346	0.03	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1158
49	347	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.1158
[illegible]	348	0.01	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.1158
[illegible]	349	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.1157
52	350	0.01	0.000	0.033	0.0	0.0000	0.000	0.000	0.000	0.000	0.1152

DAILY OUTPUT FOR YEAR 1983 (CON'T)

1	351	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.1148
2	352	0.02	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.1150
3	353	0.04	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1154
4	354	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1155
5	355	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1155
6	356	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1150
7	357	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.1147
8	358	0.06	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1156
9	359	0.12	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1182
10	360	0.00	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.1181
11	361	0.09	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.1190
12	362	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.1191
13	363	0.55	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1302
14	364	2.68	0.790	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1731
15	365	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.1859
16											

MONTHLY TOTALS FOR YEAR 1983

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	1.44	1.36	1.00	0.42	0.52	0.68
	0.31	0.12	0.46	0.52	2.12	4.80
RUNOFF (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.790
EVAPOTRANSPIRATION (INCHES)	0.782	1.460	2.154	0.456	0.493	0.406
	0.608	0.158	0.409	0.242	1.181	0.569
PERCOLATION FROM LAYER 3 (INCHES)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ANNUAL TOTALS FOR YEAR 1983

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	13.75	49913.	100.00
RUNOFF	0.790	2868.	5.75
EVAPOTRANSPIRATION	8.920	32378.	64.87
PERCOLATION FROM LAYER 3	0.0000	0.	0.00
CHANGE IN WATER STORAGE	4.040	14666.	29.38
SOIL WATER AT START OF YEAR	2.65	9624.	
SOIL WATER AT END OF YEAR	6.69	24290.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

VARIABLE 1: UNUSED VARIABLE
VARIABLE 2: PERCOLATION THROUGH LAYER 3
VARIABLE 3: UNUSED VARIABLE
VARIABLE 4: UNUSED VARIABLE
VARIABLE 5: UNUSED VARIABLE
VARIABLE 6: UNUSED VARIABLE

DAILY OUTPUT FOR YEAR 1984

DAY	RAIN IN.	RUNOFF IN.	ET IN.	VAR. 1 IN.	VAR. 2 IN.	VAR. 3 IN.	VAR. 4 IN.	VAR. 5 IN.	VAR. 6 IN.	SOIL WATER IN/IN
1	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.1857
2	0.02	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.1856
3	0.04	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1861
4	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.1860
5	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1857
6	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.1853
7	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.1850
8	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.1847
9	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1847
10	0.02	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1847
11	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1847
12	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1847
13	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1847
14	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1847
15	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1847
16	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1847
17	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.1841
18	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1834
19	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.1824
20	0.00	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.1815
21	0.15	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.1836
22	0.00	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.1838
23	0.00	0.000	0.031	0.0	0.0000	0.000	0.000	0.000	0.000	0.1829
24	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1827
25	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1827
26	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1827
27	0.00	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.1818
28	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1810
29	0.00	0.000	0.044	0.0	0.0000	0.000	0.000	0.000	0.000	0.1799
30	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1795
31	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.1793
32	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.1790
33	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.1787
34	0.00	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.1779
35	0.00	0.000	0.055	0.0	0.0000	0.000	0.000	0.000	0.000	0.1765
36	0.01	0.000	0.044	0.0	0.0000	0.000	0.000	0.000	0.000	0.1754
37	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1749
38	0.00	0.000	0.058	0.0	0.0000	0.000	0.000	0.000	0.000	0.1736

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	39	0.06	0.000	0.076	0.0	0.0000	0.000	0.000	0.000	0.000	0.1729
2	40	0.04	0.000	0.072	0.0	0.0000	0.000	0.000	0.000	0.000	0.1721
3	41	0.00	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.1711
4	42	0.01	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1706
5	43	0.03	0.000	0.052	0.0	0.0000	0.000	0.000	0.000	0.000	0.1700
6	44	0.18	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1731
7	45	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.1739
8	46	0.13	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1760
9	47	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.1762
10	48	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1754
11	49	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.1750
12	50	0.02	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1748
13	51	0.18	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1780
14	52	0.02	0.000	0.083	0.0	0.0000	0.000	0.000	0.000	0.000	0.1778
15	53	0.00	0.000	0.071	0.0	0.0000	0.000	0.000	0.000	0.000	0.1759
16	54	0.08	0.000	0.095	0.0	0.0000	0.000	0.000	0.000	0.000	0.1751
17	55	0.08	0.000	0.069	0.0	0.0000	0.000	0.000	0.000	0.000	0.1752
18	56	0.06	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1760
19	57	0.00	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.1755
20	58	0.00	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.1745
21	59	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.1739
22	60	0.04	0.000	0.098	0.0	0.0000	0.000	0.000	0.000	0.000	0.1726
23	61	0.03	0.000	0.071	0.0	0.0000	0.000	0.000	0.000	0.000	0.1713
24	62	0.00	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.1702
	63	0.00	0.000	0.066	0.0	0.0000	0.000	0.000	0.000	0.000	0.1685
26	64	0.00	0.000	0.061	0.0	0.0000	0.000	0.000	0.000	0.000	0.1668
27	65	0.00	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.1655
28	66	0.00	0.000	0.122	0.0	0.0000	0.000	0.000	0.000	0.000	0.1627
29	67	0.00	0.000	0.082	0.0	0.0000	0.000	0.000	0.000	0.000	0.1601
30	68	0.00	0.000	0.074	0.0	0.0000	0.000	0.000	0.000	0.000	0.1580
31	69	0.00	0.000	0.050	0.0	0.0000	0.000	0.000	0.000	0.000	0.1565
32	70	0.01	0.000	0.075	0.0	0.0000	0.000	0.000	0.000	0.000	0.1548
33	71	0.00	0.000	0.059	0.0	0.0000	0.000	0.000	0.000	0.000	0.1531
34	72	0.00	0.000	0.069	0.0	0.0000	0.000	0.000	0.000	0.000	0.1512
35	73	0.14	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.1529
36	74	0.00	0.000	0.081	0.0	0.0000	0.000	0.000	0.000	0.000	0.1520
37	75	0.03	0.000	0.072	0.0	0.0000	0.000	0.000	0.000	0.000	0.1505
38	76	0.03	0.000	0.062	0.0	0.0000	0.000	0.000	0.000	0.000	0.1496
39	77	0.00	0.000	0.046	0.0	0.0000	0.000	0.000	0.000	0.000	0.1484
40	78	0.02	0.000	0.050	0.0	0.0000	0.000	0.000	0.000	0.000	0.1474
41	79	0.11	0.000	0.048	0.0	0.0000	0.000	0.000	0.000	0.000	0.1485
42	80	0.43	0.000	0.046	0.0	0.0000	0.000	0.000	0.000	0.000	0.1569
43	81	0.10	0.000	0.148	0.0	0.0000	0.000	0.000	0.000	0.000	0.1586
44	82	0.00	0.000	0.087	0.0	0.0000	0.000	0.000	0.000	0.000	0.1565
45	83	0.00	0.000	0.069	0.0	0.0000	0.000	0.000	0.000	0.000	0.1544
46	84	0.00	0.000	0.118	0.0	0.0000	0.000	0.000	0.000	0.000	0.1515
47	85	0.03	0.000	0.164	0.0	0.0000	0.000	0.000	0.000	0.000	0.1478
48	86	0.01	0.000	0.087	0.0	0.0000	0.000	0.000	0.000	0.000	0.1453
49	87	0.00	0.000	0.062	0.0	0.0000	0.000	0.000	0.000	0.000	0.1435
	88	0.07	0.000	0.062	0.0	0.0000	0.000	0.000	0.000	0.000	0.1432
51	89	0.00	0.000	0.046	0.0	0.0000	0.000	0.000	0.000	0.000	0.1423
52	90	0.00	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.1411

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	91	0.00	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.1401
2	92	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
3	93	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
4	94	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
5	95	0.13	0.000	0.039	0.0	0.0000	0.000	0.000	0.000	0.000	0.1417
6	96	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.1418
7	97	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1410
8	98	0.22	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.1446
9	99	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1454
10	100	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.1447
11	101	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1440
12	102	0.00	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.1434
13	103	0.01	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.1428
14	104	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1422
15	105	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1416
16	106	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1410
17	107	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1405
18	108	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.1400
19	109	0.12	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1417
20	110	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.1420
21	111	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.1414
22	112	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.1409
23	113	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1404
24	114	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.1399
	115	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
26	116	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
27	117	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
28	118	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
29	119	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
30	120	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.1398
31	121	0.12	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.1418
32	122	0.19	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1459
33	123	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1467
34	124	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1462
35	125	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1458
36	126	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1453
37	127	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1449
38	128	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.1444
39	129	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1440
40	130	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1435
41	131	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1431
42	132	0.04	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1433
43	133	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.1431
44	134	0.05	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.1435
45	135	0.07	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1446
46	136	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.1447
47	137	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.1442
48	138	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.1437
49	139	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1432
	140	0.03	0.000	0.027	0.0	0.0000	0.000	0.000	0.000	0.000	0.1432
	141	0.00	0.000	0.019	0.0	0.0000	0.000	0.000	0.000	0.000	0.1428
52	142	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.1423

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	143	0.12	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1442
2	144	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1444
3	145	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1439
4	146	0.05	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1442
5	147	0.00	0.000	0.020	0.0	0.0000	0.000	0.000	0.000	0.000	0.1439
6	148	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1433
7	149	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1427
8	150	0.00	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.1421
9	151	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.1415
10	152	0.00	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.1409
11	153	0.00	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.1402
12	154	0.00	0.000	0.026	0.0	0.0000	0.000	0.000	0.000	0.000	0.1394
13	155	0.00	0.000	0.028	0.0	0.0000	0.000	0.000	0.000	0.000	0.1387
14	156	0.25	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.1428
15	157	0.00	0.000	0.036	0.0	0.0000	0.000	0.000	0.000	0.000	0.1435
16	158	0.00	0.000	0.034	0.0	0.0000	0.000	0.000	0.000	0.000	0.1425
17	159	0.07	0.000	0.046	0.0	0.0000	0.000	0.000	0.000	0.000	0.1428
18	160	0.00	0.000	0.047	0.0	0.0000	0.000	0.000	0.000	0.000	0.1420
19	161	0.00	0.000	0.046	0.0	0.0000	0.000	0.000	0.000	0.000	0.1407
20	162	0.00	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.1395
21	163	0.00	0.000	0.051	0.0	0.0000	0.000	0.000	0.000	0.000	0.1382
22	164	0.01	0.000	0.048	0.0	0.0000	0.000	0.000	0.000	0.000	0.1370
23	165	0.00	0.000	0.030	0.0	0.0000	0.000	0.000	0.000	0.000	0.1361
24	166	0.00	0.000	0.060	0.0	0.0000	0.000	0.000	0.000	0.000	0.1347
	167	0.00	0.000	0.056	0.0	0.0000	0.000	0.000	0.000	0.000	0.1331
[illegible]	168	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.1321
27	169	0.00	0.000	0.057	0.0	0.0000	0.000	0.000	0.000	0.000	0.1307
28	170	0.00	0.000	0.066	0.0	0.0000	0.000	0.000	0.000	0.000	0.1290
29	171	0.00	0.000	0.057	0.0	0.0000	0.000	0.000	0.000	0.000	0.1273
30	172	0.24	0.000	0.059	0.0	0.0000	0.000	0.000	0.000	0.000	0.1307
31	173	0.03	0.000	0.087	0.0	0.0000	0.000	0.000	0.000	0.000	0.1307
32	174	0.00	0.000	0.085	0.0	0.0000	0.000	0.000	0.000	0.000	0.1286
33	175	0.00	0.000	0.076	0.0	0.0000	0.000	0.000	0.000	0.000	0.1264
34	176	0.00	0.000	0.053	0.0	0.0000	0.000	0.000	0.000	0.000	0.1247
35	177	0.00	0.000	0.038	0.0	0.0000	0.000	0.000	0.000	0.000	0.1236
36	178	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.1226
37	179	0.00	0.000	0.096	0.0	0.0000	0.000	0.000	0.000	0.000	0.1204
38	180	0.23	0.000	0.136	0.0	0.0000	0.000	0.000	0.000	0.000	0.1216
39	181	0.16	0.000	0.112	0.0	0.0000	0.000	0.000	0.000	0.000	0.1233
40	182	0.00	0.000	0.283	0.0	0.0000	0.000	0.000	0.000	0.000	0.1177
41	183	0.00	0.000	0.149	0.0	0.0000	0.000	0.000	0.000	0.000	0.1127
42	184	0.00	0.000	0.146	0.0	0.0000	0.000	0.000	0.000	0.000	0.1086
43	185	0.00	0.000	0.141	0.0	0.0000	0.000	0.000	0.000	0.000	0.1046
44	186	0.00	0.000	0.160	0.0	0.0000	0.000	0.000	0.000	0.000	0.1003
45	187	0.00	0.000	0.158	0.0	0.0000	0.000	0.000	0.000	0.000	0.0959
46	188	0.00	0.000	0.083	0.0	0.0000	0.000	0.000	0.000	0.000	0.0931
47	189	0.00	0.000	0.122	0.0	0.0000	0.000	0.000	0.000	0.000	0.0900
48	190	0.00	0.000	0.141	0.0	0.0000	0.000	0.000	0.000	0.000	0.0862
49	191	0.00	0.000	0.145	0.0	0.0000	0.000	0.000	0.000	0.000	0.0822
50	192	0.00	0.000	0.189	0.0	0.0000	0.000	0.000	0.000	0.000	0.0773
	193	0.00	0.000	0.132	0.0	0.0000	0.000	0.000	0.000	0.000	0.0732
52	194	0.00	0.000	0.152	0.0	0.0000	0.000	0.000	0.000	0.000	0.0691

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	195	0.00	0.000	0.127	0.0	0.0000	0.000	0.000	0.000	0.000	0.0654
2	196	0.00	0.000	0.141	0.0	0.0000	0.000	0.000	0.000	0.000	0.0616
3	197	0.00	0.000	0.144	0.0	0.0000	0.000	0.000	0.000	0.000	0.0576
4	198	0.00	0.000	0.061	0.0	0.0000	0.000	0.000	0.000	0.000	0.0553
5	199	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
6	200	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
7	201	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
8	202	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
9	203	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
10	204	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
11	205	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
12	206	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
13	207	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
14	208	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
15	209	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0549
16	210	0.06	0.000	0.042	0.0	0.0000	0.000	0.000	0.000	0.000	0.0553
17	211	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
18	212	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
19	213	0.00	0.000	0.000	0.0	0&0000	0.000	0.000	0.000	0.000	0.0551
20	214	0.00	0&000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
21	215	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
22	216	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
23	217	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
24	218	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
[illegible]	219	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
[illegible]	220	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
27	221	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
28	222	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
29	223	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
30	224	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
31	225	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
32	226	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
33	227	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
34	228	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
35	229	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
36	230	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
37	231	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
38	232	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
39	233	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
40	234	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
41	235	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
42	236	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
43	237	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
44	238	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
45	239	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
46	240	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
47	241	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
48	242	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
49	243	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
50	244	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
[illegible]	245	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
52	246	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	247	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
2	248	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
3	249	0.03	0.000	0.030	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
4	250	0.01	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
5	251	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
6	252	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
7	253	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
8	254	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
9	255	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
10	256	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
11	257	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
12	258	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
13	259	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
14	260	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
15	261	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
16	262	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
17	263	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
18	264	0.11	0.000	0.030	0.0	0.0000	0.000	0.000	0.000	0.000	0.0568
19	265	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0571
20	266	0.20	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0606
21	267	0.07	0.000	0.037	0.0	0.0000	0.000	0.000	0.000	0.000	0.0624
22	268	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0624
23	269	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0621
24	270	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0617
	271	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0614
	272	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0611
27	273	0.00	0.000	0.011	0.0	0.0000	0.000	0.000	0.000	0.000	0.0608
28	274	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0606
29	275	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0603
30	276	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0601
31	277	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0598
32	278	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0596
33	279	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0593
34	280	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0591
35	281	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0589
36	282	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0587
37	283	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0584
38	284	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0582
39	285	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0580
40	286	0.03	0.000	0.024	0.0	0.0000	0.000	0.000	0.000	0.000	0.0581
41	287	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0580
42	288	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0578
43	289	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0576
44	290	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0574
45	291	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0572
46	292	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0570
47	293	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0568
48	294	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0566
49	295	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0564
50	296	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0563
	297	0.02	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0562
52	298	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0561

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	299	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0559
2	300	0.02	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0559
3	301	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0558
4	302	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0556
5	303	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0554
6	304	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0552
7	305	0.00	0.000	0.003	0.0	0.0000	0.000	0.000	0.000	0.000	0.0551
8	306	0.03	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0554
9	307	0.25	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0602
10	308	0.01	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0617
11	309	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0616
12	310	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0614
13	311	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0612
14	312	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0610
15	313	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0608
16	314	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0607
17	315	0.12	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0626
18	316	0.14	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0657
19	317	0.06	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0673
20	318	0.05	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0682
21	319	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0682
22	320	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0680
23	321	0.00	0.000	0.006	0.0	0.0000	0.000	0.000	0.000	0.000	0.0679
24	322	0.10	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0694
[illegible]	323	0.05	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0705
[illegible]	324	0.01	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0706
27	325	0.26	0.000	0.023	0.0	0.0000	0.000	0.000	0.000	0.000	0.0756
28	326	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0770
29	327	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0766
30	328	0.20	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0802
31	329	0.03	0.000	0.041	0.0	0.0000	0.000	0.000	0.000	0.000	0.0812
32	330	0.00	0.000	0.032	0.0	0.0000	0.000	0.000	0.000	0.000	0.0804
33	331	0.00	0.000	0.035	0.0	0.0000	0.000	0.000	0.000	0.000	0.0795
34	332	0.49	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0892
35	333	0.01	0.000	0.043	0.0	0.0000	0.000	0.000	0.000	0.000	0.0918
36	334	0.02	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0917
37	335	0.00	0.000	0.018	0.0	0.0000	0.000	0.000	0.000	0.000	0.0914
38	336	0.00	0.000	0.012	0.0	0.0000	0.000	0.000	0.000	0.000	0.0910
39	337	0.00	0.000	0.013	0.0	0.0000	0.000	0.000	0.000	0.000	0.0906
40	338	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0903
41	339	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0901
42	340	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0896
43	341	0.00	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0892
44	342	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0886
45	343	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
46	344	0.14	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
47	345	0.00	0.000	0.017	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
48	346	0.05	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
49	347	0.05	0.000	0.025	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
[illegible]	348	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
[illegible]	349	0.00	0.000	0.015	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884
52	350	0.00	0.000	0.014	0.0	0.0000	0.000	0.000	0.000	0.000	0.0884

DAILY OUTPUT FOR YEAR 1984 (CON'T)

1	351	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0906
2	352	0.18	0.000	0.022	0.0	0.0000	0.000	0.000	0.000	0.000	0.0946
3	353	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0957
4	354	0.00	0.000	0.016	0.0	0.0000	0.000	0.000	0.000	0.000	0.0954
5	355	0.02	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0955
6	356	0.00	0.000	0.008	0.0	0.0000	0.000	0.000	0.000	0.000	0.0954
7	357	0.00	0.000	0.029	0.0	0.0000	0.000	0.000	0.000	0.000	0.0948
8	358	0.00	0.000	0.021	0.0	0.0000	0.000	0.000	0.000	0.000	0.0942
9	359	0.00	0.000	0.007	0.0	0.0000	0.000	0.000	0.000	0.000	0.0939
10	360	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0938
11	361	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0938
12	362	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0938
13	363	0.00	0.000	0.000	0.0	0.0000	0.000	0.000	0.000	0.000	0.0938
14	364	0.13	0.000	0.010	0.0	0.0000	0.000	0.000	0.000	0.000	0.0963
15	365	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0970
16	366	0.00	0.000	0.009	0.0	0.0000	0.000	0.000	0.000	0.000	0.0967
17											

MONTHLY TOTALS FOR YEAR 1984

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	0.23	0.94	1.01	0.60	0.55	0.99
	0.06	0.00	0.42	0.07	1.83	0.57
RUNOFF (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.468	1.194	2.175	0.506	0.612	1.886
(INCHES)	2.243	0.000	0.225	0.265	0.530	0.375
PERCOLATION FROM	0.0000	0.0000	0.0000	0.0002	0.0006	0.0010
LAYER 3 (INCHES)	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000

ANNUAL TOTALS FOR YEAR 1984

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	7.27	26390.	100.00
RUNOFF	0.000	0.	0.00
EVAPOTRANSPIRATION	10.480	38042.	144.15
PERCOLATION FROM LAYER 3	0.0022	8.	0.03
CHANGE IN WATER STORAGE	-3.212	-11660.	-44.18
SOIL WATER AT START OF YEAR	6.69	24290.	
SOIL WATER AT END OF YEAR	3.48	12630.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1983 THROUGH 1984

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.83	1.15	1.00	0.51	0.53	0.84
	0.19	0.06	0.44	0.29	1.97	2.69
STD. DEVIATIONS	0.86	0.30	0.01	0.13	0.02	0.22
	0.18	0.08	0.03	0.32	0.21	2.99
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.395
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.559
EVAPOTRANSPIRATION						
TOTALS	0.625	1.327	2.165	0.481	0.553	1.146
	1.426	0.079	0.317	0.253	0.856	0.472
STD. DEVIATIONS	0.222	0.188	0.015	0.036	0.084	1.047
	1.156	0.112	0.130	0.016	0.461	0.137
PERCOLATION FROM LAYER 3						
TOTALS	0.0000	0.0000	0.0000	0.0001	0.0003	0.0005
	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0001	0.0004	0.0007
	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1983 THROUGH 1984

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	10.51	(4.582)	38151.	100.00
RUNOFF	0.395	(0.559)	1434.	3.76
EVAPOTRANSPIRATION	9.700	(1.103)	35210.	92.29
PERCOLATION FROM LAYER 3	0.0011	(0.0015)	4.	0.01
CHANGE IN WATER STORAGE	0.414	(5.128)	1503.	3.94

PEAK DAILY VALUES FOR YEARS 1983 THROUGH 1984

	(INCHES)	(CU. FT.)
PRECIPITATION	2.68	9728.4
RUNOFF	0.790	2867.9
PERCOLATION FROM LAYER 3	0.0000	0.1
SNOW WATER	0.19	697.0

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.1861
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0549

FINAL WATER STORAGE AT END OF YEAR 1984

LAYER	(INCHES)	(VOL/VOL)
1	1.35	0.1682
2	1.74	0.1089
3	0.39	0.0326
SNOW WATER	0.00	

APPENDIX B

EROSION ANALYSIS

Appendix C (DOE/RL-90-38, Rev. 0, Appendix 6D) presents an estimate of soil erosion losses from a cover surface constructed of McGee Ranch silt. Erosion from the barrier surface is composed of wind and water erosion. Wind erosion is calculated by a procedure developed by the U.S. Department of Agriculture. Water erosion is estimated using the U.S. Department of Agriculture's universal soil loss equation. Soil erosion losses were calculated to range between 1.8 to 2.4 tons per year depending on the vegetative factor that varies between wet and dry years. An average wind erosion was assumed to be 2.1 tons per acre per year. Wind erosion was estimated to be 0.27 tons per acre for the first year following seeding to 0.07 ton per acre following establishment of vegetation. In total 2.2 tons/acre/year of erosion will occur from the cover surface. This is equivalent to 14 in. erosion over a period of 1,000 years.

WIND AND WATER EROSION CALCULATIONS FOR PROPOSED FINAL COVER

910116.1345

910116.1345

WIND AND WATER EROSION CALCULATIONS FOR PROPOSED FINAL COVER

1.0 WIND EROSION POTENTIAL FOR PROPOSED FINAL COVER

The wind erosion equation was developed by the U.S. Department of Agriculture (USDA), Agricultural Research Service. It has been modified for use in the state of Washington by the U.S. Soil Conservation Service (USDA 1987). The equation is used to evaluate potential wind erosion of soil surfaces in the following manner:

$$E = f(IKCLV)$$

where

- E = The estimated average annual soil loss in tons per acre per year due to wind erosion
- f = An indication that the equation includes functional relationships that are not straight-line mathematical functions
- I = Soil erodibility factor
- K = Ridge roughness factor
- C = Climatic factor
- L = Unsheltered distance
- V = Vegetative factor.

The equation can be considered to be solved by successive modifications to I. The I value is the potential annual wind erosion in tons per acre per year for a given soil on an isolated, level, smooth, unsheltered, wide, and bare field with a noncrusted surface where the climatic factor is 100 percent.

The I value depends on soil texture and the percentage of dry aggregates over 0.84 millimeter in size. McGee Ranch soils normally exhibit a crusted surface condition, for which the indicated I value in Table 6D-1 is 36.7. It is expected that the topsoil layer will form a crusted surface relatively soon after construction in response to rain and snowfall during the winter of the first year. If necessary, formation of a crusted surface may be accelerated by direct application of water. Adjustment for knoll configuration as indicated in Figure 6D-1 (2 percent surface slope) increases the I value to about 42.

The primary application of the ridge roughness factor (K) is to soil surfaces that are exposed to recurring agricultural practices (e.g., plowing, planting, disking, harrowing). Ridges are created on the soil surface at planting time. Assuming a ridge height of 1 inch after seeding, a K factor of 0.6 is obtained from Figure 6D-2. For the Solid Waste

Landfill (SWL) cover, a 1-inch ridge height is assumed to exist during the first year after cover construction. However, soil ridges will not be restored in subsequent years by periodic tillage. Therefore, after the first year, a ridge height value of zero is assumed. For this condition, the indicated K value is 1.

The distribution of climatic factor (C) values across Washington State is indicated in Figure 6D-3. Appropriate C values for the SWL are in the range of 60 to 70.

The vegetative factor (V) is difficult to characterize. During the first year after cover construction, before a mature stand of cover vegetation has been produced, the soil surface will be protected from wind erosion by spreading and crimping 4,000 pounds of straw per acre on or into the soil surface. For subsequent years, the amount of plant production must be estimated. The USDA Soil Conservation Service has performed a number of evaluations of range site conditions for varying soil and precipitation conditions. Average annual rainfall for the Hanford Site is in the 6- to 9-inch range. Using data from similar climate and land use areas, the total annual production of air-dry weight per acre for cover vegetation of mixed wheatgrasses is predicted to range from a minimum of 200 pounds in unfavorable years to 500 pounds in favorable years (USDA 1981), yielding a median value for V of 350 pounds of air-dry material. Based on data for crested wheatgrass in Table 6D-2, the flat small-grain equivalent quantity is roughly 1,100 pounds per acre.

A limiting value for the unsheltered field length (L) for the SWL cover section is 600 feet.

With the given information, I equals 48, K equals 0.6 for the first year and then 1.0 for the life of the cover, C equals 60 to 70, L is less than 600, and V equals 4,000 for the first year and then 1,100 for subsequent years; the value of E in the wind erosion equation is determined by interpolation of Soil Conservation Service wind erosion charts for these values. Wind erosion for the first year is estimated to be essentially zero, attributable primarily to the projected effectiveness of the straw mulch treatment. In subsequent years, wind erosion is predicted to average between 1.8 tons per acre per year (for C equals 60) and 2.4 tons per acre per year (for C equals 70). The straw mulch will continue to assist in reducing wind erosion for 2 to 3 years after its placement, depending on climatic conditions during that time span.

The projected soil losses of 1.8 to 2.4 tons represent average annual estimates and are highly dependent upon the vegetative factor. In years when the vegetation yield is above average, the erosion rate will be significantly reduced. Until the vegetative cover is established, erosion rates may exceed the estimated average range. After vegetation is established, erosion rates should coincide more closely with the predicted

range. Increasing vegetative growth to optimal production (500 pounds air-dry weight per acre) would decrease predicted soil losses to zero.

2.0 WATER EROSION POTENTIAL FOR PROPOSED FINAL COVER

The potential for erosion of the SWL cover surface as a result of precipitation events is evaluated using the USDA's universal soil loss equation (Parametrix 1987, p. 40-1):

$$A = RKLSCP$$

where

A = Average soil loss in tons per acre
R = Rainfall and run-off erosivity factor
K = Soil erodibility factor
LS = Slope-length factor
C = Cover/management factor
P = Erosion control practice factor.

The following topsoil properties and cover design information are used to evaluate A:

- Topsoil type: sandy silt
- Organic matter: less than 0.5 percent
- Estimated percent sand (coarser than 0.1 millimeter): 18 percent
- Estimated percent silt and sand finer than 0.1 millimeter: 77 percent
- Estimated percent clay: 5 percent
- Cover slope: 2 percent
- Slope length: less than 600 feet
- Cover vegetation: (First Year) 4,000 pounds per acre of straw mulch crimped into the soil surface; (subsequent years) 60-80 percent ground cover consisting of mixed wheatgrasses.

The R factor in the universal soil loss equation is a rainfall erosion index value that accounts for site meteorological conditions. In Figure 6D-4, R values are less than 20 for most of eastern Washington, including the Columbia Basin and the Hanford Site. More detailed information provided in Israelson et al. (1980, Figure 5-2) indicates that appropriate R values for the Hanford Site are in the range of 9 to 12 (use R equals 12).

The K factor is used to differentiate the erodibility potential of various soil types under conditions where rainfall, topography, cover, and management are invariant. Using the nomograph in Figure 6D-5, the proposed topsoil (McGee Ranch silt) has a K value of about 0.64.

The universal soil loss equation combines the effects of cover length and steepness into a single topographic factor, LS. From Figure 6D-6, the LS value for the SWL cover (slope of 2 percent, length of less than 600 feet) is about 0.35.

The cover/management factor addresses the effects of vegetation and other agricultural (as opposed to engineering) erosion-control practices. On freshly covered surfaces with no vegetation or erosion-reducing vegetative controls (such as mulch), the C factor usually has a value of about 1. Application of straw mulch is highly effective in reducing the C factor component of the universal soil-loss equation during the initial period before perennial vegetation becomes established, particularly if the mulch is punched or tacked in place (Israelson et al. 1980, p. 11). For the SW1 cover, 2 tons per acre of straw mulch will be spread and crimped into the soil surface. The expected C value for the first year is about 0.10. For subsequent years, C values can be estimated from Table 6D-3. It is envisioned that a 60 to 80 percent grass cover will be attained over the cover area within a 3- to 5-year period after cover construction, corresponding to a range of C values of 0.01 to 0.04 (use C equals 0.025).

The supporting practices factor, P, takes into account some agricultural practices other than vegetation effects (e.g., contouring, terracing, and contour strip cropping) and also includes the beneficial effects of engineering treatments such as compaction, soil blending, and stabilization with additives. For this analysis, no credit is taken for any ongoing support practices that would be performed after the cover is constructed and planted (use P equals 1).

For the first year, A is estimated as:

$$A = (12)(0.64)(0.35)(0.10)(1) = 0.27 \text{ tons per acre per year.}$$

For subsequent years, A is estimated as:

$$A = (12)(0.64)(0.35)(0.025)(1) = 0.07 \text{ tons per acre per year.}$$

Calculated water erosion rates for the cover section are acceptably low. The sum of expected average water and wind erosion rates for the first year following construction also is acceptable (i.e., less than 2 tons per acre per year). The sum of expected average water and wind erosion rates for subsequent years (1.9 to 2.5 tons per acre per year) is somewhat above the U.S. Environmental Protection Agency target value (EPA 1979) due to the magnitude of the wind component. The predicted rates are not viewed as unacceptable and are considered to be manageable. However, they do indicate that provisional control measures should be developed during definitive design for minimizing erosion (particularly wind erosion) during extended periods of adverse weather.

3.0 REFERENCES

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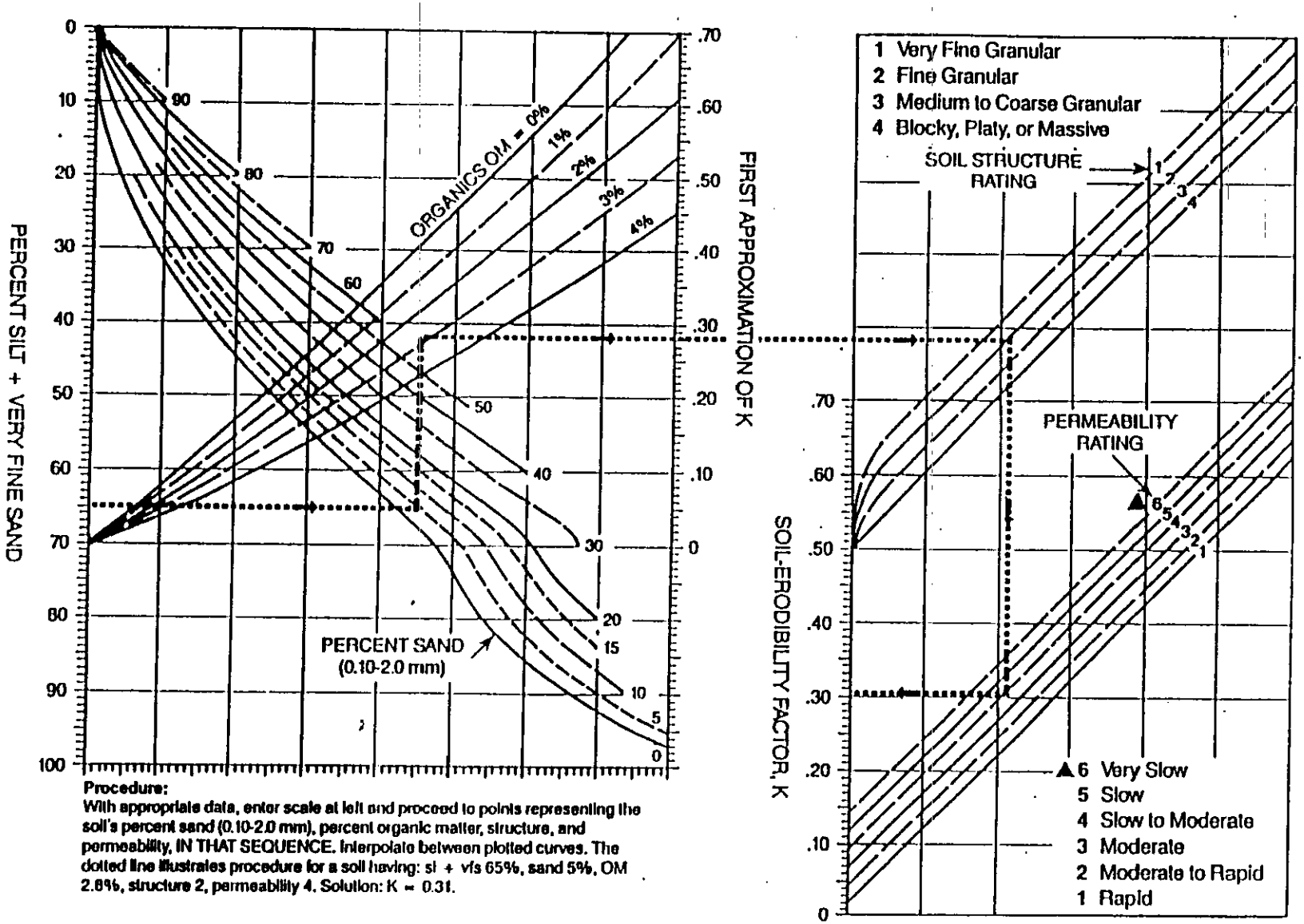

Procedure:
With appropriate data, enter scale at left and proceed to points representing the soil's percent sand (0.10-2.0 mm), percent organic matter, structure, and permeability, IN THAT SEQUENCE. Interpolate between plotted curves. The dotted line illustrates procedure for a soil having: si + vfs 65%, sand 5%, OM 2.6%, structure 2, permeability 4. Solution: K = 0.31.

Adapted From: Lutton, et. al., 1979

Figure 6D-5. Nomograph for Determining Soil Erodibility Factor K for U.S. Mainland (EPA 1979).

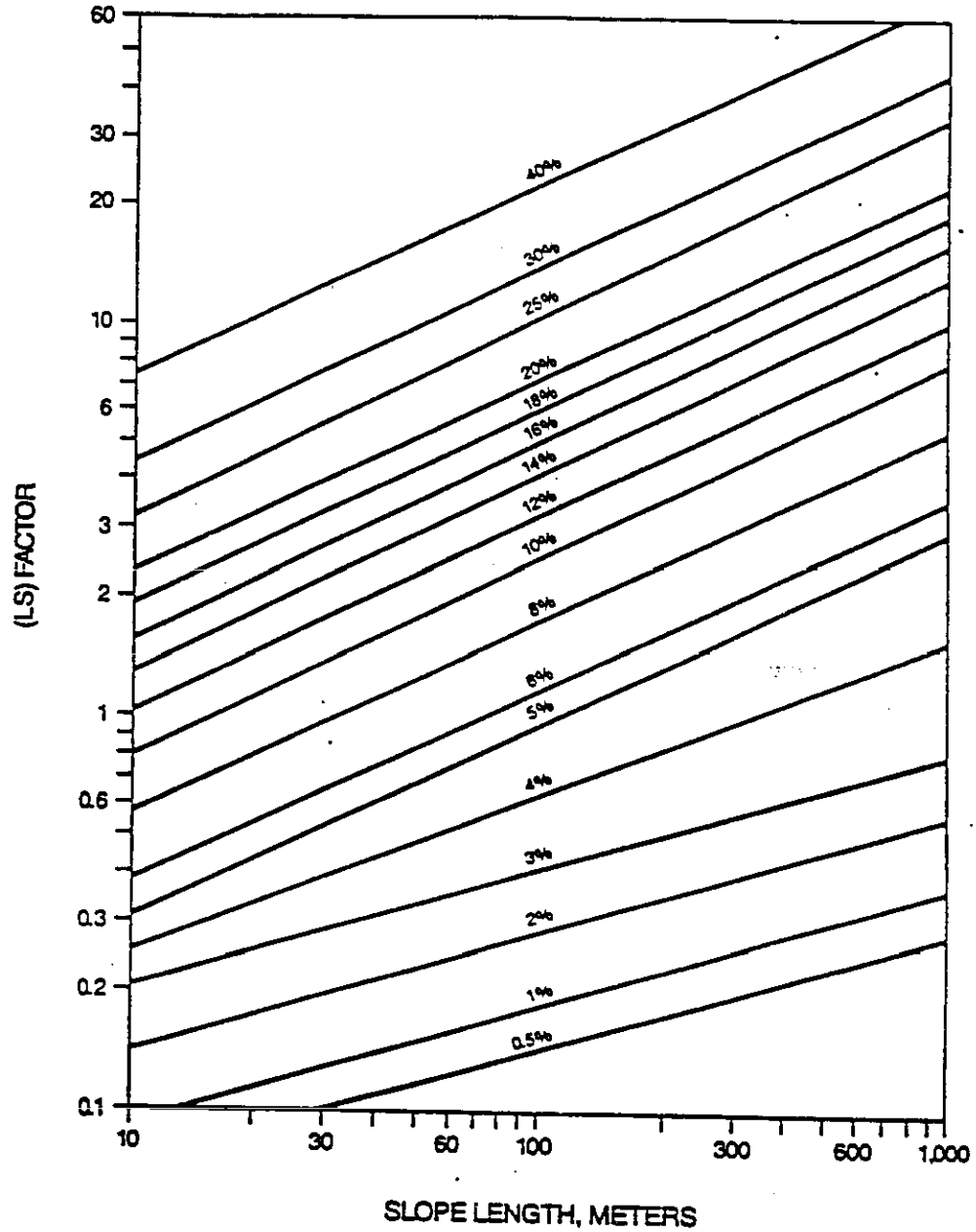

Figure 6D-6. Length-Slope Factor (LS) for Different Slopes (Parametrix 1987).

Table 6D-1. Soil-Wind Erodibility Index I. (Israelsen et al. 1980)

Percent of dry soil not passing a 20 mesh screen	0	1%	2%	3%	4%	5%	6%	7%	8%	9%
(Units)	Noncrusted soil surface (tons/acre)									
0	-	310	250	220	195	180	170	160	150	140
10	134	131	128	125	121	117	113	109	106	102
20	98	95	92	90	88	86	83	81	79	76
30	74	72	71	69	67	65	63	62	60	58
40	56	54	52	51	50	48	47	45	43	41
50	38	36	33	31	29	27	25	24	23	22
60	21	20	19	18	17	16	16	15	14	13
70	12	11	10	8	7	6	4	3	3	2
80	2	-	-	-	-	-	-	-	-	-
	Fully crusted soil surface (tons/acre)									
0	-	51.7	41.7	36.7	32.5	30.0	28.3	26.7	25.0	23.3
10	22.3	21.8	21.3	20.8	20.2	19.5	18.8	18.2	17.7	17.0
20	16.3	15.8	15.3	15.0	14.7	14.3	13.8	13.5	13.2	12.7
30	12.3	12.0	11.8	11.5	11.2	10.8	10.5	10.3	10.0	9.7
40	9.3	9.0	8.7	8.5	8.3	8.0	7.8	7.5	7.2	6.8
50	6.3	6.0	5.5	5.2	4.8	4.5	4.2	4.0	3.8	3.7
60	3.5	3.3	3.2	3.0	2.8	2.7	2.7	2.5	2.3	2.2
70	2.0	1.8	1.7	1.3	1.2	1.0	0.7	0.5	0.5	0.3
80	0.3	-	-	-	-	-	-	-	-	-

Table 6D-2. Guide for Converting Range Vegetation to an Equivalent Quantity of Flat, Small-Grain Residue (USDA 1987).

Grass plants	Pounds per acre of range vegetation										
	50	100	200	300	400	500	600	700	800	900	1,000
Buffalograss[a], burrograss, and inland saltgrass	320	720	1,630	2,630							
Big bluestem[a]	45	110	280	480	705	950	1,215	1,495	1,785	2,090	2,410
Western wheatgrass[a], creeping wildrye, and sideoats grama	155	245	775	1,240	1,740	2,260	2,795	3,345			
Little Bluestem[a]	45	110	285	495	735	995	1,280	1,580	1,900	2,230	2,575
Blue grama[a], threadleaf sedge, and perennial threeawn	110	235	490	760	1,040	1,325	1,610	1,905			
Galleta and tobosa	150	300	800	1,200	1,700	2,600					
Bottlebrush squirrel tail, needleandthread[a], and thurber needlegrass	70	150	300	600	800	1,200					
Alkali sacaton	60	150	400	800	1,400	2,200	2,800	3,600			
Bluebunch wheatgrass	50	120	300	550	850	1,150	1,500	1,900	2,300	2,600	3,000
Idaho fescue	100	200	400	900	1,500	2,300					
Indian ricegrass	100	175	300	600	900	1,400					
Crested wheatgrass	130	300	600	900	1,300	1,800	2,400	3,100	4,000		
Cheatgrass	100	200	300	600	800	1,000	1,200	2,000	2,500	3,000	

NOTE: Other grass species equivalents were estimated by comparing the growth characteristics with the tested species.
[a] Lyles and Allison (1980).

Table 6D-3. Values of C for Idle Land.

	C
Grass cover 95-100%	
As grass	0.003
As weeds	0.01
Ground cover 80%	
As grass	0.01
As weeds	0.04
Ground cover 60%	
As grass	0.04
As weeds	0.09
No ground cover	1.00

Source: Parametrix 1987.

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