RETURN ORIGINAL TO PDR, HQ.

## PLATEAU RESOURCES LIMITED

SHOOTARING CANYON URANIUM PROCESSING FACILITY SOURCE MATERIAL LICENSE SUA-1371 DOCKET NO. 40-8698

RENEWAL APPLICATION

November 1993

WIET 11/29/93 94-0097



Corporate Offices: 877 North 8th West, Riverton, WY 82501

Shootaring Operations: Box 2111, Ticaboo, Lake Powell, UT 84533 Tel: (307) 856-9271 Fax: (307) 857-3050

Tel: (801) 788-2120 Fax: (801) 788-2118

November 29, 1993

Mr. R.E. Hall, Director United States Nuclear Regulatory Commission Uranium Recovery Field Office 730 Simms Street, Suite 100 Golden, CO 80401

RE: Amendment and Renewal of Source Material License SUA-1371 Docket No. 40-8698, Ticaboo, Lake Powell, Utah

Dear Mr. Hall:

Plateau Resources Limited (Plateau) request an amendment and Renewal of Source Material License SUA-1371 (Expiration Date: December 31, 1993). Enclosed as Attachment I is the Application for Amendment to and Renewal of the License.

The Shootaring Canyon Uranium Processing Facility has been maintained on an interim standby status since 1986. In making this application, it is the intent of Plateau to continue to maintain the facility on an interim standby basis.

In making this application, Plateau is bound by SUA-1371 Amendment No. 12 dated 8-11-93, a copy of which is included as Attachment VII, and any other amendments as listed in Attachment II. The Environmental Report completed by Woodward-Clyde Consultants dated May 1978 still applies for the current activities on the site.

Amendment No. 12 is very clear and specific as to Plateau requirements should we consider the resumption of operations in the future, Plateau recognizes the need to provide additional information with respect to reclamation and decommissioning of the Facility.

The Plateau reporting requirements are detailed in Amendment No. 12. Plateau personnel have kept your office fully informed from 1986 through the present day. These requirements will continue to be fulfilled by Plateau.

There has been no change in status on the Facility since 1986 with the exception of the requirements of Amendments 1 through 9, 11 & 12 (10 not issued). There has been no change

Mr. R. E. Hall, Director Uranium Recovery Field Office

RE: Renewal of Source Material License SUA-1371 Docket No. 40-8698 Ticaboo, Lake Powell, Utah

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in principle site personnel or Noel Savignac, PhD, the Radiation Safety Officer since 1986. Principle Site Personnel and Noel Savignac, RSO Resumes are included in Attachment VI. We respectfully request that this Application be considered as complete and adequate to support the amendment request and renewal of the License.

The underlying basis for this Application is the Source Material License Renewal Application SUA-1371, Docket No. 40-8698 submitted to the NRC in November, 1984. This document has been reviewed by Plateau and any necessary revisions have been included in attachment V.

Please acknowledge receipt of this amendment request and renewal application and advise Plateau if you require any further information.

Sincerely,

PLATEAU RESOURCES LIMITED

Kenneth Webber Project Coordinator

KW:gd

Attachments: I.

NRC Form 313 Dated

List of NRC Material License Amendments II.

Extracts from NRC Amendment No. 12 III.

Stand-by Activities

Prior to Commencing Operations

Prior to Decommissioning

History of Document Submitted to NRC IV.

1993 Revisions to 1984 Application V.

Corporate Organization Changes to Section 5.0 to Plateau's Renewal VI.

Application for SUA-1371 as Revised August 1985

Current Organizational Chart Resumé of Standby Personnel

Radiation Safety Officer Resumé

Copy of Material License SUA-1371, Amendment No. 12

NRC FORM 313 (3-92) 10 CFR 30, 32, 33 34, 35 and 40 U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO 3150-0120 EXPIRES 6-30-93

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST, 3.25 HOURS, FORWARD COMMENTS RECARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH IMNBB 7714, U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, D.C. 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0120), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, D.C. 20503.

#### APPLICATION FOR MATERIAL LICENSE

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS U.S. NUCLEAR RESULATORY COMMISSION WASHINGTON, DC 20665

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOUR ARE LOCATED IN

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLDAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHO ISLAND, OR VERMONT, SEND APPLICATIONS TO:

ASING ASSISTANT SECTION
LEAR MATERIALS SAFETY BRANCH
L.S. NUCLEAR REGULATORY COMMISSION, REGION I
ASS ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

NUCLEAR MATERIALS SAFETY SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION II
101 MARRIETTA STREET, NW. SUITE 2000

IF YOU ARE LOCATED IN

ILLINDIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, BEND APPLICATIONS TO

MATERIALS LICENSING SECTION U.S. NUCLEAR REGULATORY COMMISSION, REGION HI 788 ROOSEVELT ROAD GLEN ELLYN, IL 80127

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

MATERIAL RADIATION PROTECTION SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RVAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-8064

ALASKA, ARIZONA, CALIPORNIA, HAWAII, NEVEDA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO

NUCLEAR MATERIALS SAFETY SECTION U.S. NUCLEAR REGULATORY COMMISSION, REGION V 1450 MARIA LANE WALNUT CREEK, CA 94596-5368

MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURIS	EAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED.
A NEW LICENSE  A NEW LICENSE  B. AMENDMENT TO LICENSE NUMBER SUA 1371  X C. RENEWAL OF LICENSE NUMBER SUA 1371	2 NAME AND MAILING ADDRESS OF APPLICANT (Includes Zio Cook) Plateau Resources Limited Box 2111, Ticaboo Lake Powell, UT 84533-2111
3. ADDRESSIES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED.	
Plateau Resources Limited	
Shootaring Canyon Uranium Processing Faci	lity
Box 2111, Ticaboo, Lake Powell, UT 84533	-2111
4 NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION	TELEPHONE NUMBER
Ken Webber	(307) 856-9271
SUBMIT ITEMS 5 THROUGH 11 ON 8 % x 11 PAPER. THE TYPE AND SCOPE OF INFORMATI	ON TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GLIDE
<ol> <li>RADIOACTIVE MATERIAL         <ul> <li>Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.</li> </ul> </li> </ol>	6. PURPOSEISI FOR WHICH LICENSED MATERIAL WILL BE USED.
7. INDIVIDUALISI RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE.	8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTRED AREAS.
R FACILITIES AND EQUIPMENT	10. BADIATION SAFETY PROGRAM
11 WASTE MANAGEMENT.	12. LICENSEE FEES /5ee 10 CFR 170 and Section 170,31) FEE CATEGORY   AMOUNT ENCLOSED # N/A
13. CERTIFICATION. IMust be completed by applicant! THE APPLICANT UNDERSTANDS THAT BINDING UPON THE APPLICANT.	ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE
THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF T PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 15 TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.	
WARNING 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948, 62 STAT. 746 MAKES IT A C TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITH	RIMINAL OFFICE TO MAKE A WILLFULLY FALSE STATEMENT OF REPRESENTATION HIN ITS JURISDICTION
SIGNATURE - CERTIFYING OFFICER TYPED PRINTED NAME	TITLE DATE
John L. Larsen	President & CEO
	PC USE ONLY
TYPE OF FEE FEE LOG FEE CATEGORY COMMENTS	TO USE URLT
AMOUNT RECEIVED CHECK NUMBER	
APPROVED BY	DATE

# Attachment II

# Plateau Resources Limited Shootaring Uranium Mill Site

# License SUA-1371

# List of NRC Material License Amendments

Amendment No.	Date	Amended Conditions
0	02-03-86	Interim Standby Status
1	03-05-86	02 - Mailing Address
2	12-18-86	25 - Tech Eval of Dam
3	11-23-87	02 - Mailing Address
4	11-20-87	33 - Ground Water Detection
5	04-19-88	26 - Decommissioning
6	06-07-88	33 - Modify Selenium and Arsenic Levels
7	08-28-88	39 - Financial Surety
8	06-21-90	39 - Financial Surety
9	08-28-90	22 & 35 Self Monitor & Sump Pump
10	*****	Not Issued
11	04-27-92	39 - Financial Surety
12	08-11-93	39 - Financial Surety

# Attachment III

# Platea Resources Limited Shootaring Uranium Mill Site

# Extracts from License SUA 1371 Amendment No. 12

License Condition Number	Stand By Activities	Requirements
12.	Not authorized to produce uranium concentrates	*
17.	Radiation Work Permits	As needed
18.	ALARA Audit Report	Annually
24.	Fire Detention & Suppression Equipment	Quarterly
29.	Land Survey (5 mile radius)	Annually
30.	Radiation Safety Monitoring Program	*
30.	Radon Gas & Direct Radiation Monitoring (2)	*
33B.	Ground Water Detection Program (RM 4,5&6)	Semi Annual
33F.	Ground Water Flow & Direction under tailings	Minimum of Annua
35C.	Inspect Sump Pump - Document	Weekly
37.	Inspect Tailings Disposal System	Monthly
39.	Update Financial Surety Amount (Feb)	Annually
	Prior to Commencing Operations	
25.	Conduct Technical Evaluation of Berms & Dam	*
38.	Prepare Detailed Reclamation Plan (Decomm)	6 months notice
34.	Financial Survey (3 months after 38)	*
41.	Any Design Modifications to Tailings Impoundme	nt *
	Prior to Decommissioning	
26.	Detailed Decommissioning Plan	12 months notice

# Attachment IV

# Plateau Resources Limited Shootaring Uranium Mill Site

## License SUA 1371

# History of Documents Submitted to NRC

		Submitted by	<u>Date</u>
1.	Environmental Report (Sections 1 - 12)	WCC	5-78
2.	Tailings Management Plan	WCC	6-78
3.	Final Environmental Statement	NRC	7-79
4.	License Renewal Application	PRL	11-84
5.	Revision to Application Section 5.0	PRL	8-8
6.	De ommissioning & Reclamation Plan	NS&AK	2-88
7.	Material License Amendments 0 through 9, 11 & 12	NRC Please see Attacl	8-93 hment II

# Legend

WCC	Woodward Clyde Consultants
PRL	Plateau Resources Limited
NS & AK	Noel Savignac & Alan Kuhn
NRC	Nuclear Regulatory Commission

## Attachment V

# Plateau Resources Limited Shootaring Uranium Mill Site

# License SUA 1371

# 1993 Amendments\* to the 1984 License Application and License Amendments 1 through 12

CONTENT	S:	1984 Document	1993 Amendments
1.0 PROPOS	SED ACTIVITY	Page 1-1	Attachment V Page 2 of 5
	1.1 PROPOSED LICENSE MODIFICATION	Page 1-1	Attachment V Page 2 of 5
5.0 OPERA	TIONS	Page 5-1	Attachment V Page 3 of 5
	5.1 CORPORATE ORGANIZATION ADMINISTRATIVE PROCEDURES	Page 5-1	Attachment V Page 3 of 5 and Page 4 of 5
	5.1-1 FIGURE STANDBY ORGANIZATIONAL CHART	Page 5-2	Attachment VI
APPENDIC	ES		
mana me	B. Resumes	Appendix B	Attachment VII
TABLES			
	1.1-1 Sar mary of Management Commitments	Page 1-3 thru Page 1-11	Attachment V Page 4 of 4
	* We have highlighted the changes in each section by shading the revised portions of		
	Attachment V Page 1 of 5		PLATEAU SUA-1371

#### 1.0 PROPOSED ACTIVITIES

This Application is for a renewal of our Source Material License No. SUA-1371, Docket No. 40-8698, for the Plateau Resources Limited Shootaring Canyon Uranium Processing Facility, Garfield County, Utah. Communications regarding this renewal document should be addressed to:

Plateau Resources Limited 877 North 8th West Riverton, Wyoming 82501 Attention: Kenneth Webber, Project Coordinator Telephone: (307) 856-9271 (Riverton, Wyoming, 82501) (801) 788-2120 (Ticaboo, Utah)

The processing facility is located in Garfield County, southeastern Utah, approximately 56 miles (90 km) south of Hanksville, Utah, 14 miles (22 km) north of Bullfrog Basin Marina, and 2 miles (3 km) west of Utah State Highway 276. The processing facility is currently in standby states.

#### 1.1 PROPOSED LICENSE MODIFICATIONS

This Application for renewal of Source Material License No. SUA-1371 is intended to be complete and independent from other documents submitted to the United States Nuclear Regulatory Commission (NRC) unless specifically referenced. Many of the license conditions in the earlier license are either no longer applicable or should be replaced by commitments made in this renewal Application.

#### 5.0 OPERATIONS

Section 5.0 presents the detailed radiological and environmental procedures used to control source materials both within the mill and in the environment around the mill.

## 5.1 CORPORATE ORGANIZATION AND ADMINISTRATIVE PROCEDURES

This section has been amended in its entirety.

The Corporate Headquarters are located at 877 North 8th West, Riverton, Wyoming 82501. The Shootaring Canyon Uranium Processing facility site offices are located at Ticaboo, Utah 84533.

The President is the Chief Executive Officer of Plateau and has general charge of its business, and is managing officer of Plateau with general charge of its business and operations.

The Shootaring Canyon Uranium Processing Facility is currently in an extended period of non-operations. Minimum personnel assisted by outside consultants are being utilized to maintain the facility. See Figure 5.1-1 for Plateau's current organization chart. When operations at the processing facility re-start, the mill staff will be considerably expanded. Prior to such start-up, the staff's qualifications and revised organizational chart will be submitted to the U.S. Nuclear Regulatory Commission for review. The standby Organizational Chart for quality assurance personnel, radiation protection personnel, technical site personnel and Resident Manager is in Attachment VI included as Figure 5.1-1 to this 1993 Renewal Application.

The organizational structure of the company has been designed to provide reporting channels for the standby operation personnel, the quality assurance personnel, and health and safety personnel through the Project Coordinator to the President of Plateau. The structure provides that all final approvals for implementation and revision of policies and practices rest with the President. However, the Environmental and Radiological Health Supervisor (ERHS) has the authority to partially or fully suspend standby operations that could be hazardous to workers. The ERHS also referred to by Plateau as the Radiation Safety Officer (RSO) will meet and possess all the qualifications as described in Regulatory Guide 8.31 "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Mills will be As Low As is Reasonably Achievable."

Reporting to the Resident Manager/Manager of Safety & Health are the ERHS, and Environmental Technician. The Manager of Safety and Health and his/her supervisory personnel must ensure adherence of facility operations to company procedures as well as to regulations and requirements administered by the U.S. Nuclear Regulatory

Commission and the Mine Safety and Health Administration. The safety and health personnel which include Electrical and Equipment Maintenance personnel, monitor daily operations and equipment, provide solutions to problems found during audits, and verify implementation of solutions.

Reporting to the Resident Manager are the Electrical and Equipment personnel. The Resident Manager and personnel ensure adherence of maintenance activities and operating procedures to radiation safety regulations and requirements as stipulated by the ERHS and the Project Coordinator; they also ensure adherence to standby and maintenance procedures as presented in license conditions and interpreted by the ERHS, Project Coordinator and the Quality Assurance Consultant.

The Project Coordinator acts as an advisor to the Resident Manager. Reporting to the Project Coordinator are the Quality Assurance Consultants and such other consultants as may be hired to assist in interpreting licensing and regulatory conditions affecting Plateau's operations and in obtaining necessary permits to operate. The Project Coordinator is responsible to inform the Resident Manager of the licensing conditions, radiological and environmental regulations, and changes to the same; to ensure that the quality assurance audits are conducted, to recommend, or provide solutions to any problems found during audit; to act as a liaison between the managers and licensing entities; and to administer any land transactions.

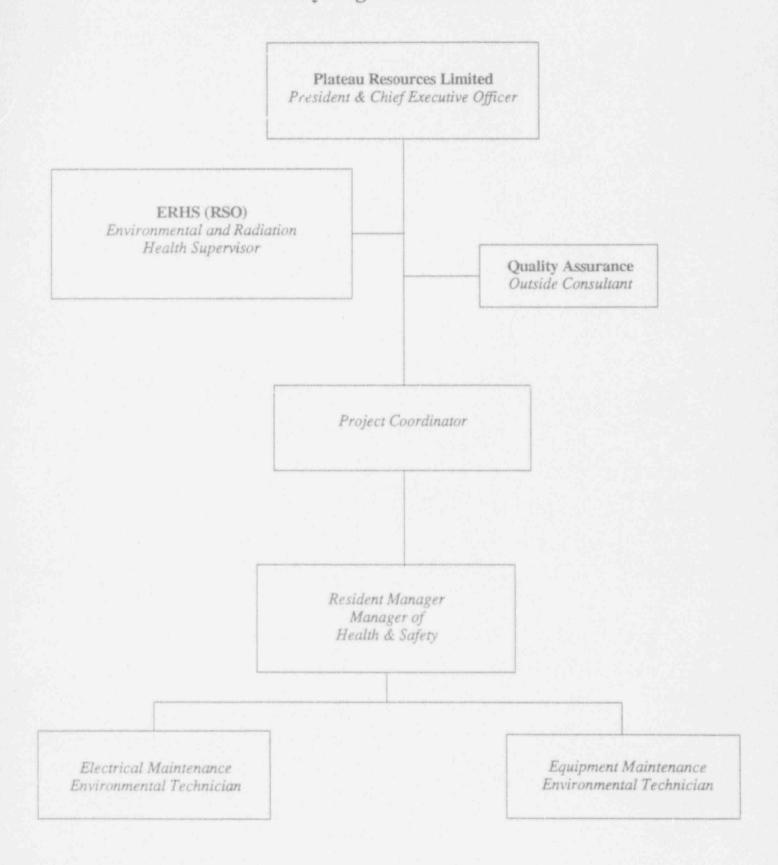
#### **TABLE 1.1-1**

#### MANAGEMENT COMMITMENTS

- A. The Summary of Management Committments are contained in the attached Materials License SUA 1371 and in accordance with statements, presentations and conditions contained in the Licensee's Renewal Application dated November 1984 and Amendments issued in 1986 through 1993 (refer to Attachment II of the Application Renewal of November 1993).
- B. Plateau will implement the Standards for Protection Against Radiation as described in 10CFR20.1001 through 20.2401.

Figure 5.1-1

# Plateau Resources Limited Shootaring Canyon Processing Facility Standby Organizational Chart



# RESUMÉ - STANDBY PERSONNEL

#### PLATEAU RESOURCES LIMITED

## KENNETH WEBBER 239 West Sunset Riverton, WY 82501 (307) 856-3204

SUMMARY 35 years experience in various phases of geology and mining. My duties over the years have included working with all agencies involved in the mining industry including environmental regulatory agencies. Responsible for environmental monitoring, waste management, surveying and data collection for maintaining records and filing of reports with regulatory agencies and obtaining permits. Directly involved in mineral property evaluations, and property and lease acquisition negotiations. In addition to my work in the mining industry. Wide background in real estate leasing including building construction and maintenance, and financing through State and Federal agencies.

#### EMPLOYMENT HISTORY

to Present

February 1987 U.S. Energy Corp./Crested Corp., Riverton, WY

Environmental Controller, Manager of Lands, Engineer. Responsible for preparing permit documents and obtaining and renewing various permits including mine permits, water appropriations, drill notifications, construction permits, NRC license renewals, other licenses, leases, etc. Project design, drafting and supervision of various phases of mining operation, environmental monitoring and radiation reporting. Responsible for preparing all reports for BLM, WDEQ, NRC and EPA including Annual Reports, assessment filings, bonding, and Mine Radon Emissions Reports. Responsible for development of interim stabilization plans, reclamation plans, decommissioning plans and Radiation Safety Programs. Other duties include evaluation, supervision and monitoring claim staking. Jeffrey City water system, Ticaboo townsite, the collection of baseline data for Permits, and consulting firms.

Chopping Chevrolet, Inc., Riverton, WY 1/77 - 2/87

President, owner and general manager of Chevrolet/Oldsmobile dealership. Responsible for over all company management and supervision of 40 employees.

P. C. Eus Lines, Riverton, WY 2/79 - 2/84

President, owner and general manager of busline company. transporting 500+ employees daily to the Gas Hills Uranium Mines for Pathfinder Mines Corporation and Union Carbide. Operated 26 buses and a complete repair shop.

U.S. Energy Corp., Riverton, WY 6/69 - 12/76

Secretary and Director, Landman, Geologist. Responsible for office management, mineral property evaluations, real estate construction and leasing, property negotiations and acquisitions, field surveying, claim staking and drafting. Responsible for preparation of annual reports and obtaining mine permits (for underground uranium projects). Obtained jade mine permits for Johnson Mines.

Kenneth Webber Resumé Revised November 1993

1/64 - 6/69 Consulting Geological Services, Riverton, WY

Supervisor of claim staking projects.

Architectural Design and Drafting Service, Riverton, WY Designed over 80 commercial and residential buildings.

9/58 - 1/64 Robert Ford & Associates, Riverton, WY Geologist and Surveyor.

#### OUTSIDE ACTIVITIES

1/77 - Present Sertoma Club of Riverton, WY

Donate services to the club. Responsible for forming four corporations involved in various phases of housing development for the elderly. President of four Sertomarelated corporations for the past 18 years. Designed and supervised construction of 100 units of housing for the elderly. Presently involved with a 40 acre, 150 unit elderly retirement complex including a 48 unit Assisted Living Unit.

1982 - Present Miniweb Leasing, Inc., Riverton, WY

Involved in all activity normally associated with a commercial real estate leasing company including construction plans, obtaining financing, building construction, maintenance and accounting for a 10 Unit Complex.

#### EDUCATION

College Michigan Technological University, 1958

Bachelor of Science Degree, Geological Engineering Major,

Mining Engineer Minor

High School Stambaugh, Michigan, 1951

#### SPECIAL TRAINING

Introduction to Hazardous Waste Management
Implementation of the Standards for Protection Against Radiation
(10CFR20.1001 - 20.2401)
Technical Conference on Rural Water Systems
Chlorination - Lead and Corrosion Control
Hazardous Substance and Related Waste Management Issues
Water Sample Collection and Preservation Techniques

Attachment VII Page 2 of 2 PLATEAU SUA-1371

## VANCE W. MORRILL 344 SOUTH CENTER P. O. BOX 29 HANKSVILLE, UTAH 84734 (801) 542-3435

Education:

Wayne High School 1970-1974

Bicknell, Utah

College of Eastern Utah 1974-1975

Training:

Emergency Medical Technician 1978

368 EMT training hrs at seminars 1978-1993

40 hrs. Purchasing Agent Training Class, Denver CO 1981 Utah Motor Vehicle Safety Inspector (Utah Highway Patrol)

40 hrs Radiation Safety Training at Oklahoma State University 1988

40 hrs Certified Cross Connection Training 1991 (Utah State Department of Health and Rural Water Association) Occupational Safety and Health Course

(Home Study) Utah State University

8 day BSA Wood Badge Leadership Training

Certifications:

Emergency Medical Technician

Mine Safety and Health Administration Instructor Cross Connection and Backflow Technician

Experience: Oct 1977 to Plateau Resources Limited

Shootaring Canyon Uranium Mine and

present

Mill, Garfield County, Utah

October 1987 to Present Environmental Health Radiation Safety Technician, Occupational

Safety Advisor and On-Site Supervisor

Supervise the day to day activities at the site. Responsible for compliance with NRC, EPA, and MSHA requirements plus all other State or Federal agencies that have an interest in Plateau's operations. This includes environmental air and groundwater sampling as well as radiation monitoring. My other duties are safety training, purchasing, taking people on tours of mill, maintenance of millsite, and anything else that needs to be done to keep the facility in operational and saleable condition.

November 1984 to October 1987 Equipment Operator and Maintenance

Due to staff reduction at the site I was moved to the maintenance department. I operated ten wheel dump trucks, 6053 and 6453 loaders, a D6 Cat and a road grader. We cleaned up contaminated ground below the tailings dam, covered the

ore stockpiles with one foot of cover, and covered the mill tailings pond with about three feet of cover. During this time, I also did mechanic's work on the equipment and maintenance work at the mill and in Ticaboo Tonwsite. I was trained to be the backup Radiation Technician. I also went into the mine one day each week to do mine maintenance. In November of 1984, we decommissioned Plateau's Ore Buying Station. I was responsible for taking down some of the buildings and removing all of the equipment. We had to load the equipment on trucks and haul it 1290 miles back to the mill. It also required that we remove one foot of soil off 60 acres. During the last part of this job, I was the leadman on one of the crews.

#### 1983 - 1984

#### Warehouse and Mine

During the last part of 1983 I went back to run the warehouse because of 'ayoffs in the Company. I was responsible for all warehouse activities and for ordering warehouse stock items. During 1984 I went back into the mine to do assessment mining and mine maintenance.

#### 1980 - 1983

#### Purchasing

During this time I was the buyer for all supplies and repair parts for the mine, mill, and Ticaboo Townsite. I had to use communication skills to deal with vendors and try to make the best buy for the Company. I was also involved in the purchase of some of the capital equipment used at the mine and Ticaboo. I was supervisor over one assistant buyer.

#### 1978 - 1980

#### Warehouse

From about May of 1978 to some time in 1980, I ran the mine warehouse. This included receiving inventory, stocking shelves, running a cardex system, setting reorder points, issuing parts and all other warehouse duties. I became very familiar with equipment, parts, and supplies used at a mining operation. I supervised from two to five other employees during this time.

#### December 1977 to May 1978

#### Underground Mine Equipment Operator

During this time I worked in the mine. My main job was operating ore buggies and underground loaders. I also did mine maintenance and had some experience with explosives.

# October 1977

#### Construction work

December 1977 Helped build concrete portals at Tony M. Mine. Took down an old uranium mill.

Operated a backhoe, dump truck and loader.

Vance W. Morrill Resumé Continued

August 1977 to October 1977 Laborer, U.S. Forest Service Thinned trees and made trails.

August 1975 to August 1977 LDS Church Mission

Summer 1975

Farmer

Summer 1974

Worked for Brick Layer

Summer 1969 to

1973

Farmer

Community Service:

Hanksville Ambulance Team 13 years

President Hanksville Water Company

Hanksville Special Service District Board Member

Bantam Wrestling Coach Hunter Safety Instructor Boy Scout Leader

Bishop of Hanksville LDS Church

Hobbies:

Woodworking

Hunting and Fishing

Camping

#### DENNIS L. WOMACK P. O. BOX 2108 - TICABOO LAKE POWELL, UTAH 84533

Education:

North Fremont High School 1956

Radar Repair Course, Ft. Monmouth, NJ

January 1958 to September 1958

Experience: 1977 to present

Plateau Resources, Limited

Ticaboo, Utah

1982 to present

Electrician A

Maintenance of electrical systems at the Mill and Ticaboo. Responsible for electrical repairs as necessary. During shutdown period, have assumed additional duties such as motel maintenance, Ticaboo water and sewer systems maintenance, trash collection, lawn care, equipment operator, (Front end loader, backhoe,

dump truck) light vehicle service and maintenance.

1977 to 1982

Electrical Supervisor, Tony M. Mine

Oversee installation of mine electrical system. Schedule the crews. Figure and

order materials.

1973 to 1977

Electrical Contractor, Green River, UT

New Residential and commercial wiring. Construction and rewiring of existing

structures.

1972 to 1973

AVCO Corporation, Maintenance Chief

Responsible for repair and maintenance of electrical meteorological equipment at

the Utah Launch Complex

1970 to 1972

Anaconda Company, Journeyman Electrician

Maintained electrical equipment at the uranium mill and open pit mine.

1965 to 1970

AVCO Corporation Field Service Rep

Worked at various locations for AVCO doing maintenance work and repairs on

electronic equipment

1963 to 1965

Russ Electric, Electrician

Worked for contractor on electrical construction, both residential and commercial

1957 to 1963

Military Service, U.S. Army

Radar repair

Rank at discharge - SP/5 (E-5) Type of discharge - Honorable

## DARYL P. WINTERS P. O. BOX 2241 - TICABOO LAKE POWELL, UT 84533

Expe	rie	nce:
		present

Plateau Resources Limited, Ticaboo Utah

1984 to present

Maintenance

Routine and specific maintenance, repairs and security required to keep the mill and Ticaboo Townsite in condition for operation or sale including: daily and routine maintenance on pumps, generators and fire systems; maintenance and repairs on vehicles and heavy equipment; operating trucks and heavy equipment (loader, Cat dozer, dump truck); lending assistance with any job needing to be done at the Ticaboo Townsite.

1982 to 1984

Shift Supervisor, Tony M. Mine

Supervised drift and stope development

1981

Centennial Development Company-Lead Miner

Underground drift development for Cypress Mining Corporation in

Montana

1977 to 1980

Western Nuclear, Jeffrey City, WY.

Grade A Miner

Stoping and drift work at Sheep Mountain I

1970 to 1976

Centennial Development Company-Lead Miner

Mined in Challis, Id; Bayhorse, Id; and Wenatchee, WA

1968 to 1970

Miner

Radiation Protection Consultant



#### RESUME

CAPABILITY SUMMARY: Noel Savignac has over 23 years experience in radiation protection, compliance with environmental and radiological regulations, hazard assessment, radiological training, and licensing for users of radioactive materials. He has worked as a Manger of Environmental Services for a uranium mining and milling firm, as a Health Physicist at a nuclear power plant, and as a university Radiation Safety Officer and Instructor.

#### PROFESSIONAL EXPERIENCE:

## Environmental and Radiological Regulations

- Prepared a radiological control manual implementation plan and a site specific RadCon Manual for a DOE contractor.
- Prepared a DOE environmental monitoring plan.
- Prepared an application to ship low-level radioactive waste to a DOE disposal site.
- Calculated radiological doses from airborne emissions for compliance with the EPA NESHAPS regulations.
- Determined contractor compliance with DOE Orders on occupational and environmental radiation protection.
- Incorporated DOE Orders into contractor performance objectives criteria.
- Assessed contractor compliance with environmental, safety, and health regulations in preparation for "Tiger Team" audits.
- Prepared environmental and radiological protection procedures for compliance with DOE Orders.
- Tested alpha-track detectors to measure radon in compliance with the EPA NESHAPS regulations.
- Determined reporting requirements under the EPA "Reportable Quantities" regulations.
- Determined DOT shipping requirements for uranium mines.
- Served on two Peer Review Panels for the DOE Uranium Mill Tailings Remedial Action Project to assess radiological measurement procedures and compliance with regulations.

Attachment VI

## Hazard Assessments

- Determined radiation doses from uranium during asbestos removal at a uranium mill.
- Determined hazards of a thorium oxide spill.
- Assessed environmental and radiological liabilities of a uranium mill prior to sales offering.
- Determined occupational doses from U-238 and Th-232 in SO<sub>2</sub> scrubber sludge from a copper smelter.
- Determined occupational doses and environmental hazards from Re-187 from a copper smelter.
- Determined occupational doses from Th-232 in a metal casting facility.
- Determined occupational doses and environmental contamination from Po-210 in kerosene-diesel fuel.
- Determined potential environmental doses from U-238 and Tc-99 in a disposal pond.
- Assessed environmental exposures from mercury released to a creek flowing through Oak Ridge, TN.
- Assessed environmental documentation on high-level nuclear waste repositories as part of a Peer Review Panel.
- Assessed remedial radiological actions required at the Fernald Feed Materials Production Center.

# Radiological Training Courses Presented

- Compliance under the revised 10 CFR 20 (NRC Standards for Protection Against Radiation)
- Radiation Protection videos for DOE subcontractors, electronics firms, and uranium mills.
- Radiation Protection of the Fetus.
- Annual Refresher Courses in Radiation Protection.

# Licensing and Registration

- Registration of a 13.5 MeV linear accelerator.
- Radioactive materials license for an 8,000 Ci Co-60 gamma irradiator.
- New radioactive materials license and several license renewals and amendments for uranium mills.

#### EMPLOYMENT HISTORY:

Noel Savignac Consultants 1980 - Present Provides consulting Health Physics services to DOE, states, and corporations.

United Nuclear Corporation 1974 - 1980 Obtained radioactive materials licenses for uranium mills, trained environmental and occupational monitoring personnel, calculated radiological exposures and prepared sections of environmental reports as the Manager of Environmental Services.

University of Wyoming 1971 - 1974 Managed the Radiation Safety Office and taught radiation safety courses as Radiation Safety Officer.

#### EDUCATION:

Colorado State University, Doctor of Philosophy (Health Physics), 1974. Colorado State University, Master of Science (Health Physics), 1968. University of New Mexico, Master of Science (Physiology), 1967. Lake Forest College, Bachelor of Arts (Biology), 1965

## ASSOCIATIONS: (current and past)

American Institute of Mining Engineers American Mining Congress, Uranium Environmental Subcommittee (Chairman, 1978-1980) American Nuclear Society Beta Beta Beta Health Physics Society Rio Grande Chapter Health Physics Society (President, 1990) National Council of Radiation Protection and Measurements, contributing author to the draft NCRP Report "Radiation Protection in the Mineral Extraction Industry" New Mexico Mining Association, Uranium Environmental Subcommittee Radiation Research Society Ronald McDonald House Board of Directors Sigma Xi Wyoming Mining Association, Uranium Environmental Subcommittee.

#### CLIENT LIST:

All-Tec Inc. Assagai Analytical Labs Atlas Minerals Corp. Aware, Inc. BDM Corp. Black Law Firm Chem-Nuclear Systems, Inc. Cyprus Miami Mining Corp. Energy Fuels Nuclear, Inc. Envir. Sci. & Engr., Inc. Federal American Partners Franchini Law Firm Giant Industries Inc. Hecla Mining Company Hollington Law Firm Homestake Mining Company ICF Kaiser Engineers, Inc. IT Corporation/D'Appolonia Inhal. Tox. Res. Inst.

Intera, Inc. Jacobs Engineering Inc. Marline Uranium Corp. Montgomery & Andrews NM Environment Department Pathfinder Mines Corp. Plains Electric Plateau Resources Ltd. Precision Castparts Corp. Remote Sensing Systems Rio Algom Corp. Sandia National Labs (through subcontactors) Simmons Law Firm Thunderbird/Red Lion Inns Titan/Spectron Dev. Labs Umetco United Nuclear Corp. Woodward Clyde Consult.

## NOEL SAVIGNAC - URANIUM PROJECT EXPERIENCE

## 1) New Mexico Operations:

- united Nuclear Corporation, Gallup, NM Principle investigator for the Church Rock Mill license application. Negotiated license conditions with the New Mexico Environmental Improvement Division (NMEID). Hired and trained entire environmental and radiation protection staff. Prepared mining plans for Dalton Pass Mine and Canyon Mines for USGS. Contributing author to mill license renewal submitted to NMEID.
- b) Homestake Mining Company, Grants, NM Contributing author to mill license renewal submitted to NMEID. Performed MILDOS computer evaluation of radiological impacts of mill on surrounding population. Wrote radiological assessment for mill.
- c) Mobil Oil Company, Crown Point, NM Conducted a MILDOS computer evaluation of radiological impacts of in situ uranium extraction facility for the NMEID. Conducted laboratory quality assessment for a laboratory processing environmental or occupational samples.
- d) Conoco Oil Company, Crown Point, NM Contributing author to environmental report for anticipated mill. Wrote radiological assessment section of environmental report.

# 2) Colorado Operations:

- a) Homestake Mining Company, Gunnison, CO -Wrote portions of environmental baseline monitoring program for an anticipated mill at the Pitch project site, submitted to the Colorado Department of Health. Attended public hearings.
- b) UMETCO, Uravan, CO Prepared radiological and environmental assessment sections of license application for Spring Creek Mesa tailings disposal facility; submitted to the Colorado Department of Health. Attended public hearings.

## 3) Wyoming Operations:

- Pathfinder Mining Company, Riverton, WY Conducted radiological and environmental audit and Ra-226 exposure assessment required by the Nuclear Regulatory Commission (NRC).
- b) Federal American Partners, Riverton, WY Negotiated with NRC a reduction of the radiological and environmental monitoring programs for shut-down status of mill. Conducted radiological audits and wrote applications for license amendments.
- c) United Nuclear Corporation, Casper, WY Prepared radiological and environmental sections of the license application for the proposed Morton Ranch Uranium Mill.

# 4) Utah Operations:

- a) Atlas Minerals Corporation, Moab, UT Project Coordinator and contributing author of mill license renewal submitted to NRC. Conducted several audits of environmental and radiological monitoring program. Wrote radiological and environmental procedures manual and radiological training manual.
- b) Energy Fuels Nuclear (UMETCO). Blanding, UT Conducted environmental and radiological audits.
- Plateau Resources Limited, Ticaboo, UT Wrote mill license renewal application submitted to NRC. Wrote and revised environmental and radiological monitoring procedures. Submitted several license amendments to NRC. Prepared mill and tailings decommissioning and reclamation plans. Served as (consulting) Environmental and Radiological Health Supervisor. Conducted audits of radiological and environmental monitoring program. Prepared groundwater monitoring program.
- d) Rio Algom Mining Company, Moab, UT Prepared license renewal application and license amendments submitted to NRC. Conducted audits of environmental and radiological monitoring programs. Prepared radiological training manual. Rewrote environmental and radiological monitoring procedures. Assessed groundwater flow patterns.

NOEL SAVIGNAC Page 3

# 5) Virginia Operations:

Marline Uranium Corporation, Danville, VA - Prepared assessment of surface water impacts and radiological impacts using MILDOS computer code of the proposed Swanson Mill submitted to the State of Virginia. Attended several public hearings and public relations sessions.

#### 6) U.S.A.

National Commission on Radiological Protection and Measurements (NCRP), U.S.A. Author of "Effluent Monitoring and Environmental Surveillance" in Radiation Protection in the Mineral Extraction Industry, NCRP report to be published.

American Miming Congress, Uranium Environmental Subcommittee past chairman.

NRC Form 374	And the same of the same of			PAGE 1 OF 8 PAGES
(5-84)			LATORY COMMISSION	
			LS LICENSE	51074 (B. NILL I 07 179) and Title 10
Code of Federal heretofore made source, and speci deliver or transfe license shall be	Regulations. Chapter I by the licensee, a licen- ial nuclear material des- er such material to pers- deemed to contain the oplicable rules, regulation	I. Parts 30, 31, 32, 33, 34, se is hereby issued authorized ignated below; to use such sons authorized to receive a conditions specified in Se	35, 40 and 70, and in ting the licensee to recei material for the purpos it in accordance with the ection 183 of the Atom	of 1974 (Public Law 93 - 438), and Title 10, reliance on statements and representations we, acquire, possess, and transfer by product, se(s) and at the place(s) designated below; to the regulations of the applicable Part(s). This sic Energy Act of 1954, as amended, and is ssion now or hereafter in effect and to any
	Licensee		0)1	
Shoot	au Resources Linearing Canyon Ura	anium	3. License number	SUA-1371, Amendment No. 12
Ticab	00		4. Expiration date	December 31, 1993
	Powell, Utah 84 icable Amendment		5. Docket or Reference No.	40-8698
6. Byproduct, so special nuclear	ource, and/or	7. Chemical and form	or physical	Maximum amount that licensee     may possess at any one time     under this license
a. Natura	1 Uranium	a. Any		a. Residual guantities
b. Uraniu	m Byproducts	b. Any		entrained in the circuit. b. Unlimited
	rized place : To eld County, Uta		's uranium milli	ng facilities located in
urani	um waste tailing	gs and other bypro	duct wastes whic	material in the form of th were generated by the orized under SUA-1371.
Secti Appen 5.5-6 Novem	ons 3.1, 4.7.1, dices A and G, 5, 5.5-7, 5.5-8 aber 26, 1984 and	4.3, 5.1.2, 53 Figures 3.0-1 a and 5.5-9 of the d the addendum day	5 1.4, 5.2, 5. 3 1 1 and Tables ensee's renewa ed August 13, 19	and conditions ontained in 3, 5.4, 5.5, 6.0, 7.0, 5.5-1, 5.5-2, 5.5-3, 5.5-5, 11 application dated 185 where it supersedes the 1 by license conditions below.
	ver the word "w rement.	ill" is used in th	e above referenc	ed sections, it shall denote
12. The 1 of th	icensee is not a	authorized to prod rm of a license am	uce uranium conc endment.	centrates without the approval
10 CF consp	R 20 for areas incuously posted	within the mill, p	rovided that all h Section 20.203	of Section 20.203(e)(3) of entrances to the mill are 3(e)(2) and with the words, terial."
		Attachm Page 1		

- 15. Mill tailings other than samples for research or analysis shall not be transferred from the site without specific prior approval of the NRC in the form of a license amendment. The licensee shall maintain a permanent record of all transfers made under the provisions of this condition.
- 16. The licensee shall submit to the NRC, Uranium Recovery Field Office, for review and approval in the form of a license amendment, at least six months prior to resuming the processing of ore, a description of the qualifications of all mill management; and radiation safety personnel, and a revised organization chart listing responsibilities appropriate for full operation.

In addition, the licensee shall assure that any consultant who carries out any of the duties of the ERHS meets the minimum qualifications of Section 2.4.1 of Regulatory Guide 8.31 dated May, 1983.

- 17. The licensee shall issue a Radiation Work Permit (RWP) to cover nonroutine activities posing a radiological risk to employees and for which no standard written procedure already exists. The RWP shall be signed by the ERHS or his designate and shall at least describe the following:
  - The scope of the work to be performed.

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- Any precautions necessary to reduce exposure to uranium and its daughters which shall include monitoring for radon progeny prior to entering the 600 area.
- C. The supplemental radiological monitoring and sampling necessary prior to, during and following completion of the work.
- 18. A copy of the annual ALARA audit report shall be sent to the NRC, Uranium Recovery Field Office, P.O. Box 25325, Denver, CO 80225, within 30 days of its submittal by the licensee's Quality Assurance Consultant to the licensee's ALARA committee.
- 19. Occupational exposure calculations shall be documented within one week of the end of each regulatory compliance period as specified in 10 CFR 20.103(a)(2) and 10 CFR 20.103(b)(2). Nonroutine ore dust and yellowcake samples shall be analyzed and the results reviewed by the ERHS or his designate within two working days after receipt of the analytical results by the ERHS or his designate.
- 20. The ERHS or his designate shall conduct an investigation of an employee's exposure conditions when an action level of 25% of the maximum permissible time weighted exposure for the week or quarter is reached depending on the material solubility. Any personnel exposure exceeding 25% of the maximum permissible external penetrating exposure in any calendar quarter shall also be investigated. Corrective actions resulting from the investigations shall be promptly implemented.

been specifically certified or had certification extended by NIOSH/MSHA shall be utilized.

- Personnel leaving the restricted area must self monitor for alpha contamination whenever a Radiation Work Permit is required by License Condition No. 17, and follow applicable procedures presented in Appendix F of the renewal application dated November 26, 1984. [Applicable Amendment: 9]
- Release of equipment or packages from the restricted area shall be in accordance with Attachment No. 1 to this license entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials" dated September 1984.
- The licensee shall maintain and inspect on a quarterly basis fire detection and suppression equipment as described in the "Inspections of Fire Suppression Equipment" section of Appendix H of the renewal application dated November 26, 1984.
- Prior to resuming operations and contingent upon demonstration of continued interim stabilization of the tailings as specified in License Condition No. 42 as rapidly as conditions allow, the licensee shall conduct a technical evaluation of the cross-valley berm and tailings dam, including a review of all embankment instrumentation data and inspection reports. This evaluation and subsequent annual evaluations shall be performed by a qualified geotechnical individual familiar with the design, construction and operation of the berm and dam. A copy of these reports shall be submitted to the NRC, Uranium Recovery Field Office, within one (1) month of completion of the report. [Applicable Amendment: 2]
- The licensee shall submit, in addition to the decommissioning plans contained in the 26. application dated November 26, 1984 and submittal dated February 8, 1988, a detailed decommissioning plan to the NRC at least twelve (12) months prior to planned decommissioning activities. [Applicable Amendment: 5]
- Before engaging in any activity within the permit boundary not previously evaluated 27. by the NRC, the licensee shall prepare a written environmental evaluation of such activities and obtain prior approval from the NRC in the form of a license amendment unless the NRC agrees in writing that no significant adverse environmental impact will result from the proposed activity.
- The licensee shall immediately notify the NRC and the Office of State Historic Preservation if artifacts are discovered during disturbance of the mill or the tailings disposal areas and shall have an archeological survey performed prior to disturbing any previously unsurveyed areas.

- 30. During the period of interim shutdown, the licensee shall implement the interim mill radiation safety monitoring program specified in Table 5.5-3 and the effluent and environmental monitoring program specified in Table 5.5-8 of the renewal application addendum dated August 13, 1985. Until interim stabilization activities have been completed, the licensee shall monitor for radon gas and direct radiation at one upwind and one downwind location.
- The results of all effluent and environmental monitoring required by this license shall be reported in accordance with 10 CFR 40. Section 40.65 with copies of the report sent directly to the U.S. Nuclear Regulatory Commission, Uranium Recovery Field Office. Data shall be reported in the format shown in Attachment No. 2 to this license entitled, "Sample Format for Reporting Monitoring Data."
- The licensee shall utilize the lower limits of detection in accordance with Section 5 of the Regulatory Guide 4.14. Revision 1 dated April 1980, for analysis of effluent and environmental samples.
- The licensee shall implement a ground-water detection monitoring program to ensure compliance with 10 CFR 40, Appendix A, which includes the following:
  - Monitor at the point of compliance and the background wells for the following A. indicator parameters: arsenic, chloride, selenium, natural uranium and pH.
  - В. The determination of compliance shall be based on sampling Wells RM-4, RM-5 and RM-6.
  - The licensee shall sample for those parameters specified in subsection (A) at those wells designated in subsection (B) at least twice annually. All semiannual samples shall be taken at least 4 months apart.
  - D. The licensee shall, within 30 days of issuance of this amendment, utilize the following threshold values: arsenic = 0.022 mg/l, chloride = 40 mg/l, selenium = 0.022 mg/l and pH = 6.8 standard units to determine if a significant change has occurred and within this 30-day period, notify the NRC. Uranium Recovery Field Office, of the finding. Should the threshold limits be exceeded, the licensee shall within an additional 60 days propose in the form of a license modification, an expanded detection monitoring program which defines the extent and concentration of hazardous constituents in the regulated unit.
  - The licensee shall report the data required by subsection (C) and perform the threshold test defined in subsection (D) semiannually along with those data

F. The licensee shall report at least annually in accordance with the reporting requirements specified in subsection (E), the rate and direction of ground-water flow under the tailings impoundment.

[Applicable Amendments: 4, 6]

- 34. No liquid effluents shall be discharged into the tailings impoundment after the free water surface in the impoundment has been eliminated.
- 35. The licensee shall implement the following corrective actions in order to prevent a future overflow of the existing tailings berm sump:
  - A. PRL shall maintain a manually controlled backup pump and spare parts for the primary sump pump.
  - B. PRL shall maintain a tailings sump pump with automatic level control as backup to the primary sump pump.
  - C. The sump pumping system shall be inspected and documented once per week.
  - D. PRL shall maintain a sump level alarm which turns on automatically if the solution level in the primary sump were to reach a point above the normal cycle level of the sump.

[Applicable Amendment: 9]

- 36. Construction, maintenance, and operation of the tailings retention system shall be in accordance with the specifications, representations, and commitments contained in the following documents.
  - A. "Tailings Management Plan and Geotechnical Engineering Studies, Shootaring Canyon Uranium Project," Woodward-Clyde Consultants, September 1978.
  - B. Letter from M. B. Bennedsen, Senior Project Engineer, Woodward-Clyde Consultants to Mr. Ross A. Scarano, NRC, January 19, 1979.
  - C. "Stage I Tailings Impoundment and Dam Final Design Report, Shootaring Canyon Uranium Project," Woodward-Clyde Consultants May 24, 1979, including contract drawings and supplemental data dated June 12, 1979.
  - D. Report, "Groundwater Monitoring Wells Shootaring Canyon Uranium Project" enclosed with letter from R. B. Sewell to Pete Garcia dated June 6, 1979.

Attachment VII Page 5 of 8

RC For		U.S. NUCLEAR REGULATORY COMMISSION	PAGE 6 OF 8 PAGES
-541		-	License number  SUA-1341, Amendment No. 12
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		SUPPLEMENTARY SHEET	40-8698
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	the	licensee shall not expand the tailings im dam beyond that specified in document (C) tional dams not specified in the document oval of the NRC obtained through applicat	above, or by constructing any s listed above without specific prior
37.			
38.	rene Offi mont	ithstanding the reclamation plan container wal application, the licensee shall submice, for review and approval in the form of the prior to resuming operations, a detail owing:	f a license amendment at least six (6)
	Α.	A post operations interim stabilization wind and water erosion and recharge of t	plan which details methods to prevent he tailings area.
	В.	A proposed methodology to dewater and/or to placement of the final reclamation co	consolidate the tailings cells prior ver.
	С.	Plan and cross-sectional views of a fina location and elevation of tailings. The thickness, physical characteristics of cover materials (specifications and QA), materials and their availability and loc	over materials, proposed testing of the estimated volumes of cover
	D.	Detailed plans for placement of rock or tailings pile and mill site area.	vegetative cover on the final reclaime
	Ε.	A proposed reclamation schedule for item sequence of events and expected time ran	ns A through D above which defines the nges.
	F.	An analysis to show that the proposed ty adequate to provide appropriate attenuat long term stability.	pe and thickness of soil cover is tion of radon and is adequate to assure
	G.	The licensee shall include a detailed correctamation plan to include contractor of based upon the schedule proposed in item the costs of long term maintenance and maintenance	costs, projected costs of inflation n E, a proposed contingency cost, and
	for	addition, the licensee shall submit within NRC review and approval in the form of a lamation plan for Cells 1-3 addressing Ite	license amendment, a proposed
		Attachment VI Page 6 of 8	

- A post operations interim stabilization plan which details methods to prevent wind and water erosion and recharge of the tailings area.
- A proposed methodology to dewater and/or consolidate the tailings cells prior 8. to placement of the final reclamation cover.
- Plan and cross-sectional views of a final reclamation cover which detail the location and elevation of tailings. The plan shall include details on cover thickness, physical characteristics of cover materials, proposed testing of cover materials (specifications and QA), the estimated volumes of cover materials and their availability and location.

- Detailed plans for placement of rock or vegetative cover on the final reclaimed 0. tailings pile and mill site area.
- A proposed reclamation schedule for items A through D above which defines the sequence of events and expected time ranges.
- An analysis to show that the proposed type and thickness of soil cover is F. adequate to provide appropriate attenuation of radon and is adequate to assure long term stability.
- The licensee shall include a detailed cost analysis of each phase of the reclamation plan to include contractor costs, projected costs of inflation based upon the schedule proposed in item E. a proposed contingency cost, and the costs of long term maintenance and monitoring.

NRC Form 374A U.S. NUCLEAR REGULATORY COMMISSION		PAGE License number	7	OF	8	PAGES
	MATERIALS LICENSE SUPPLEMENTARY SHEET	Sua-1341. Amenament #0 Docket or Reference number	40-86	198		
	Con	AUG 11	1993			
39.	The licensee shall maintain an NRC-approved fi with 10 CFR 40, Appendix A, Criteria 9 and 10 costs, if accomplished by a third party, for	, adequate to cover	the	esti	mate	d

The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR 40, Appendix A, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and mill site, for reclamation of any tailings or waste disposal areas, ground water restoration as warranted and the long-term surveillance fee. Within 3 months of NRC approval of a revised reclamation/decommissioning plan, the licensee shall submit, for NRC review and approval, a proposed revision to the financial surety arrangement if estimated costs in the newly approved plan exceed the amount covered in the existing financial surety. The revised surety shall then be in effect within 3 months of written NRC approval.

Annual Updates to the surety amount, required by 10 CFR 40, Appendix A, Criteria 9, and 10, shall be submitted to the NRC at least 3 months prior to the anniversary of the effective date of the approved surety arrangement. If the NRC has not approved a proposed revision to the surety coverage 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing surety arrangement. The least stimuse of the existing surety arrangement or 1 year. Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15 percent contingency fee, changes in engineering plans, activities performed, and any other conditions affecting estimated costs for site closure. The basis for the cost estimate is the NRC approved reclamation/decommissioning plans or NRC approved revisions to the plan. The attachment entitle "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates" outlines the minimum considerations used by the NRC in the review of site closure estimates.

Reclamation/decommissioning plans and annual updates should follo

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- 41. Prior to commencing operation, the licensee shall submit to the NRC for review and

MATERIALS LICENSE		DAGE 8 OF 8 PAGES
		Docket or Reference number
	SUPPLEMENTARY SHEET	AUG 11 1993
42.	The licensee shall implement interim stabiliz and 3 and the ore stockpile by October 1, 198 measures proposed in Section 5.5.7 of the licensee shall:	6. In addition to the stabilization
	A. Cover the stockpile with at least six in that the soil will not easily erode.	ches of soil and contour the pile such
	B. Cover the mill tailings with at least on	e foot of soil and/or rubble rock.
	Visual inspection of the stabilized areas sha Maintenance activities shall be performed as identification of need.	ll be performed and documented monthly soon as possible following
	FOR THE NUCLEAR	REGULATORY COMMISSION

AUG 11 1993

Ramon E. Hall, Director

Uranium Recovery Field Office

Region IV



## RETURN ORIGINAL TO PDR. HQ.

### ATLAS CORPORATION X

Republic Fiaza, 370 Seventeenth Street, Suite 3150 Denver, CO 80202

Telephone: (303) 825-1200 Fax: (303) 892-8808

RICHARD E. BLUBAUGH Vice President of Environmental and Governmental Affairs

December 13, 1993

HAND-DELIVERED

Mr. Ramon E. Hall Uranium Recovery Field Office U.S. Nuclear Regulatory Commission P.O. Box 25325 Denver, CO 80225

Re: License SUA-917

Docket No. 40-3453

October 8, 1993 Request for

Information

Dear Mr. Hall:

Transmitted herewith is Atlas' response to the request for information received from the NRC concerning conceptual alternative disposal site design, estimated costs and groundwater compliance issues. Canonie Environmental Services Corp. developed the information contained in the enclosed document at Atlas' request.

The estimated costs are for comparison purposes only. They include two offsite conceptual disposal designs as well as the proposed design. Actual costs will vary depending on design changes which may be necessary for final approval and contractor bids at the time the work is performed.

We trust this information is helpful in the ongoing reevaluation process. Also, we recognize that there may be additional questions as the process continues. Be assured that Atlas will cooperate to see this process completed at the earliest opportunity in order to eliminate the continuing uncertainty concerning the reclamation of the Moab Site

Riche Blog

Richard E. Blubaugh

Vice President, Environmental and Governmental Affairs

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94-0116

# GROUND WATER COMPLIANCE INFORMATION NUCLEAR REGULATORY COMMISSION REQUEST FOR INFORMATION MOAB, UTAH, URANIUM MILL SITE

#### 1.0 INTRODUCTION

Canonie Environmental Services Corp. has prepared a response to the Nuclear Regulatory Commission's (NRC's) request for information in its letter dated October 8, 1993. The request for information relates to conceptual design and cost information for alternative disposal sites and ground water compliance to Atlas Corporation's (Atlas') Moab Mill site. The requested cost information is summarized in Table 1 and includes comparisons of the costs associated with the reclamation plan versus two conceptual off-site disposal alternatives. The costs associated with ground water monitoring for the in-place reclamation site and the alternative disposal sites are included in the cost estimates. Also, a discussion is provided on how proposed alternative concentration limits (ACLs) for ground water may be permitted considering applicable laws.

#### 2.1 In-Place Reclamation

Appendix A shows the costs associated with in-place reclamation at the site consistent with the closure plan. These are direct costs exclusive of contractor profit and contingency. Table 1 provides an estimate of the total contract price. This estimate assumes a 10-percent variance from the number presented in the attachments. The range that could be expected for this scope of work, including contractor's fee and contingency, would be \$13 million to \$16 million for the reclamation. This estimate also addresses the cost associated with the current ground water treatment program. The direct costs are shown on Sheet 33 of Appendix A. The estimated costs for the ground water treatment program are \$96,000 per year. As requested, all costs are in 1993 dollars.

#### 2.2 Alternative Disposal Site "A"

Appendix B shows the cost estimate for a disposal site designated as Site "A," as discussed in the Dames and Moore report entitled "Tailings Management and Reclamation Alternatives Study for Atlas Minerals at Moab, Utah" dated October 1977. This site is located approximately 8 miles from the tailings site as shown on Figure 1. A conceptual design for the site is included as Figure 2. Alternative Disposal Site A is located in a box canyon on the west side of Moab Canyon. The site slopes gently to the northwest and has a drainage area of approximately 0.6 square mile. The soil and bedrock conditions at the site consist of a thin veneer of coarse alluvium overlying the Moenkopi Formation. The Moenkopi Formation consists of siltstone and sandstone and is generally of low permeability. The sidewalls of the box canyon are over 400 feet high. The Chinle Formation, consisting of a basal conglomeratic sandstone and overlying mudstones, siltstones, and sandstones, is exposed on the canyon sidewalls. The formation is generally well cemented and stable in vertical cuts.

The costs in this estimate include moving approximately 10.5 million tons of tailings by truck and disposing them in the repository. Assuming the same 10-percent variance as presented in the on-site alternative, the range of costs that could be expected for this scope of work would be \$89 million to \$107 million. The cost for performing an environmental impact statement for this alternative site is included in this estimate. The cost for ground water monitoring is assumed to be the same as that presented in Appendix A. Additionally, as shown on Sheets 38 and 40, the estimated cost for ground water monitoring is \$84,000 per year during the treatment operations and a total of \$139,000 for subsequent long-term monitoring.

#### 2.3 Alternative Disposal Site "B"

Appendix C shows the cost estimate for Alternative Disposal Site "B," located approximately 18 miles to the northwest of the tailings site. As shown on Figure 1, this site would be approximately 2.5 miles southwest of the airport. A conceptual design for the site is included on Figure 3. Alternative Disposal Site B is located in a relatively flat area known as Klondike Flat. The ground surface slopes up steeply north of the site and is relatively flat for several miles south, east and west of the site. The site is underlain by the Mancos Shale. The Mancos Shale consists mostly of a marine shale with some marine and non-marine sandstone units.

The costs included in this estimate include moving approximately 10.5 million tons of tailings by rail and disposing them in the repository. Assuming a 10-percent variance, the range of costs that could be expected for this scope of work would be \$94 million to \$114 million. A cost has also been included for performing an environmental impact statement for the new location. Additionally, as shown on Sheets 39 and 40, the estimated costs for ground water monitoring are the same as provided with the Alternative Disposal Site A estimate.

Provisions for establishing ACLs have been incorporated into the NRC's regulations governing the disposal of uranium mill tailings (10 CFR Part 40, Appendix A). Also, the U.S. Environmental Protection Agency's (EPA's) protection standards for uranium and thorium mill tailings (40 CFR Part 192) indicate that ACLs can be established by EPA at designated processing or depository sites. It is our understanding that NRC has not finalized the guidance or methodology for establishing ACLs at uranium mills, however, the NRC regulations (10 CFR Part 40, Appendix A) provide the factors [Appendix A to Part 40, Criterion 5B(6)] for consideration when making a present and potential hazard finding for a particular constituent ACL. If these factors are followed, the constituent ACL will provide protection of human health and the environment based on health protection standards. Also, NRC has developed a "Draft Technical Position on Alternate Concentration Limits for Uranium Mills, Standard Format and Content Guide and Standard Review Plan for Alternate Concentration Limit Application" (June, 1988).

In making the present and potential hazard finding, the factors listed below will be addressed. Preliminary responses on how these factors relate to the Moab Mill site and additional technical analyses that may be required to support ACLs are provided.

- "(a) Potential adverse effects on ground-water quality, considering-
- (i) The physical and chemical characteristics of the waste in the licensed site including its potential for migration;"

Response - The physical and chemical characteristics of the waste have been well characterized. The active dewatering system and the minimization of infiltration by runoff control and capping will prevent expansion of the contaminant plume.

"(ii) The hydrogeological characteristics of the facility and surrounding land;"

Response - The hydrogeological characteristics of the facility and surrounding land have been well characterized. However, some additional characterization of the interaction of the alluvial aquifer below the tailings with the deeper salt water or brine zone, the bedrock, and the Colorado River will be performed.

"(iii) The quantity of ground water and the direction of ground-water flow;"

Response - The direction of ground water flow is defined. Using existing data, a model will be developed indicating ground water flow conditions after completion of reclamation.

"(iv) The proximity and withdrawal rates of ground-water users;"

Response - No water supply wells exist in the vicinity of the facility.

"(v) The current and future uses of ground water in the area;"

Response - The ground water in the vicinity of the facility is not being used and future use will be precluded by institutional controls.

"(vi) The existing quality of ground water, including other sources of contamination and their cumulative impact on the ground-water quality;"

Response - The shallow ground water below the tailings has been impacted. The reduction of infiltration through the facility will improve water quality over time. The impact of infiltration on the existing ground water conditions under the reclaimed site will be evaluated.

"(vii) The potential for health risks caused by human exposure to waste constituents;"

Response - Institutional controls that prevent human exposure to hazards in the ground water will be implemented.

"(viii) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;"

Response - The reclamation plan and institutional controls will provide protection of the environment to exposure from contaminated ground water.

"(ix) The persistence and permanence of the potential adverse effects."

Response - Because of relatively low ground water velocities, uranium concentrations in the ground water below the tailings may be elevated for a number of years. However, implementation of the reclamation plan and institutional controls will minimize the impact on human health and the environment, and this persistence will have no significant adverse effect.

- "(b) Potential adverse effects on hydraulically-connected surface water quality, considering -
- "(i) The volume and physical and chemical characteristics of the waste in the licensed site;
  - "(ii) The hydrogeological characteristics of the facility and surrounding land;
- "(iii) The quantity and quality of ground water, and the direction of ground-water flow;
- "(iv) The patterns of rainfall in the region;"

Response - All of the above factors relate to the impact infiltration through the tailings will have on ground water quality. The active dewatering system and implementation of the reclamation plan will minimize infiltration. An evaluation of infiltration through the reclaimed site and the impact this infiltration will

have on ground water flow conditions and ground water quality will be performed.

- "(v) The proximity of the licensed site to surface waters;
- "(vi) The current and future uses of surface waters in the area and any water quality standards established for those surface waters;
- "(vii) The existing quality of surface water including other sources of the contamination and the cumulative impact on surface water quality;"

Response - As previously mentioned, the interaction of site ground water with vicinity surface water will be evaluated. This will include an evaluation of the impact proposed ACLs for ground water will have on the Colorado River if ground water having these concentrations is discharged to the river. Also, the current and future uses of the Colorado River will be evaluated as will any future impact on surface water quality. Currently, ground water seepage to the Colorado River has no impact on surface water quality.

- "(viii) The potential for health risks caused by human exposure to waste constituents;
- "(ix) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and
- "(x) The persistence and permanence of the potential adverse effects."

Response - A human health and ecological risk assessment will be performed to assess the potential hazards of ground water containing proposed ACLs being released to vicinity surface water.

It is recognized that Atlas must provide the basis for proposed ACLs, including consideration of practicable corrective actions and that the ACLs are as low as reasonably achievable (ALARA). Atlas has been implementing the only technically

feasible ground water remediation for the site, consisting of active dewatering of the tailings. The in-place reclamation plan will improve ground water quality further by controlling surface water infiltration to the dewatered tailings. Resultant seepage to the ground water system will be minimal.

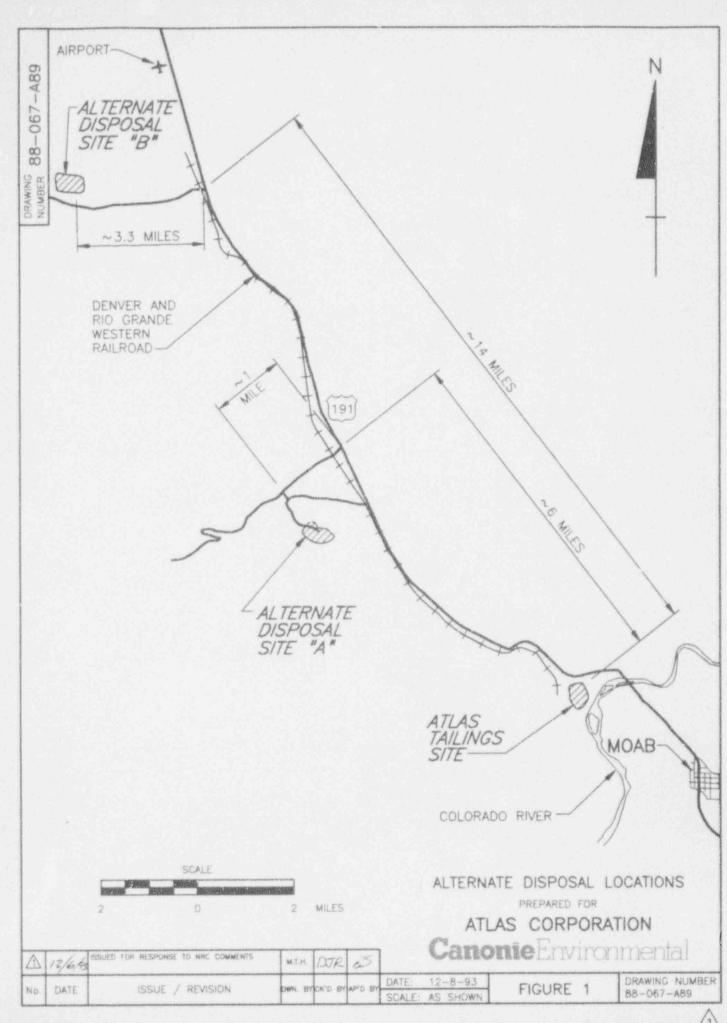
ACL application is appropriate since the majority of seepage has already entered the foundation soils; removal of the tailings will not influence seepage which has already migrated from the tailings. Pumping of that water adjacent to the Colorado River is not technically feasible. Therefore, considering the cost of off-site reclamation with little added benefit, the most practicable and cost-effective option is to implement inplace reclamation. The cost of in-place reclamation is \$10 to \$15 million. The cost of relocation is approximately \$100 million. The relocation option will require local and federal financial support.

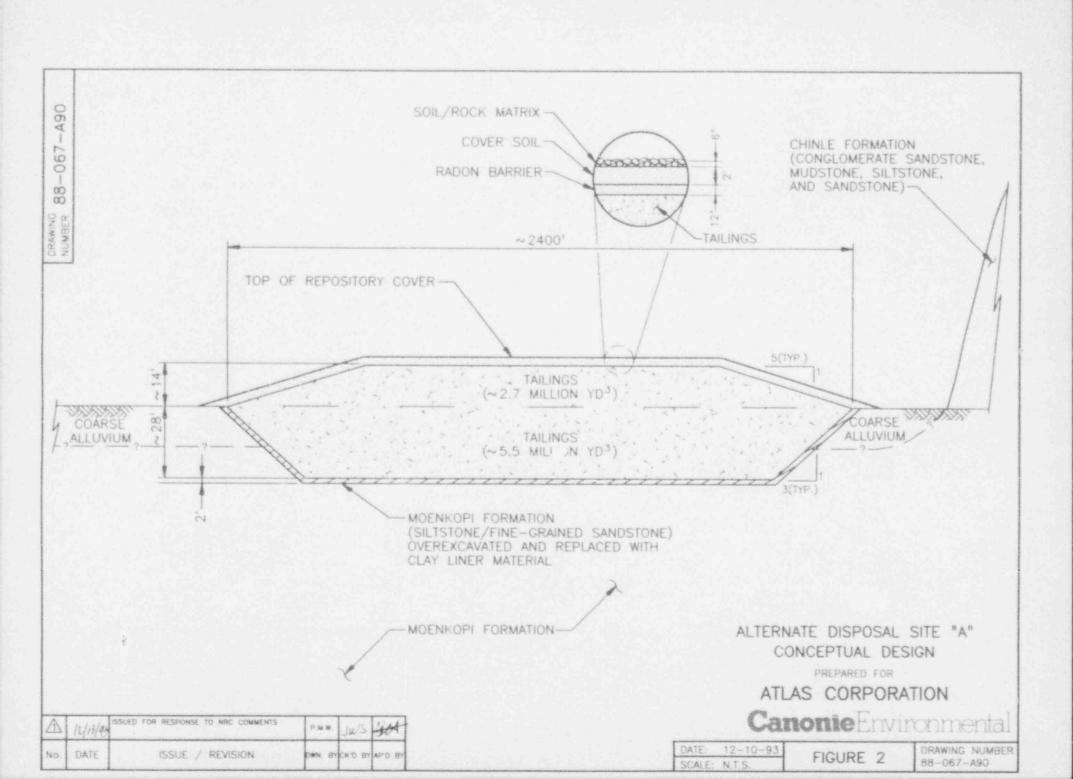
Because of the extreme cost, long duration, and impact on human health and environment related to the relocation option, Atlas chooses to establish ACLs for use as ground water protection standards at this site. The human health and environmental impacts related to relocation include air quality impacts related to excavation and transportation, increased accident and fatality frequency and a longer period of impact on tourism and property development.

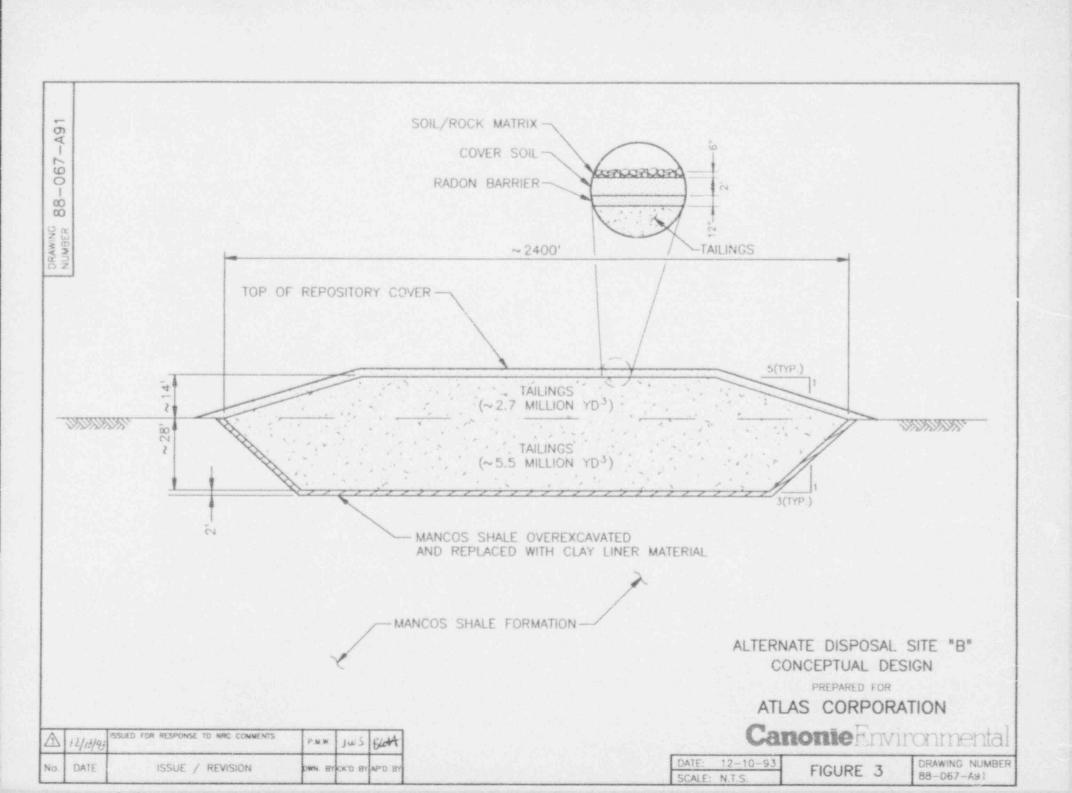
TABLE 1

# ESTIMATED RANGE OF COSTS ON-SITE CLOSURE VS. OFF-SITE DISPOSAL

Item Description	On-site Cor Estimated Range		Alternate S Estimated Rang		Alternate S Estimated Rang	
Direct Cost	\$9,429	\$11,409	\$66,526	\$80,497	\$70,804	\$85,674
Subtotal	\$9,429	\$11,409	\$66,526	\$80,497	\$70,804	\$85,674
Contractor Overhead and Profit (15%)	\$1,414	\$1,711	\$9,979	\$12,074	\$10,621	\$12,851
Subtotal	\$10,843	\$13,120	\$76,505	\$92,571	\$81,425	\$98,525
Contingency (15%)	\$1,626	\$1,968	\$11,476	\$13,886	\$12,214	\$14,779
NRC Long Term Surveillance	\$650	\$650	\$650	\$650	\$650	\$650
Total Estimated Cost	\$13,119	\$15,738	\$88,631	\$107,107	\$94,289	\$113,954







PROJECT:	Atlas #1	nerals Revised MRC	EMESTINATOR:	CES		FILE BANE:	Atore wri				S87 1 0F	587 35	
CLIENT	Atlas Mi						MINES W. M. L.				961 1.05	981 77	
JG2 NO.:	58-967-1												
LOCATION:	Boah Sis		DATE	08-Dec-93		TIKE:	64:44 PM						
ESTIMATE SURMART													
ITEM DESCRIPTION	DETAIL	QUARTITY UNIT	LABOR	INT EQUIP	EQUIP EI?	FOEL	REPAIRS	SUPPLIES	MATERIAL	SUBS	TRAVEL	UNIT	TOTAL COSTS
TOTAL FIEED COSTS SITE SEPERAL	SIOSHT &	1 1.5					-11.						
WARIABLE JOBSITS SUPERVISION	SHY 7	75 MECES	736,855	56,550	313,039			- 4			- 8	0.66	
Modilization	SBT 8	1 ea	8,728	39,239	8,293	11,706	37,013	73,875				16,860.42	1,260,03
Site Security	SHY 9	75 wks	9,110		0,473	1,260	1,686	2,566		35,986		56,361.00	56,36
Radiological Monitoring	SBT 10	75 wks								105,000		1,400.00	105,00
Regrade Impoundment Slopes	S8T 11	295,500 cy	47,569							281,250		3,750.00	281,25
Windblown Tailings	SBT 12	71,866 CF	14,027		:76,972	23, 229	15,795					9.89	263,55
Flood Dike Removal	SMT 13	14,700 cy	3,714		56,009	7,254	4,896					1.16	82,18
S.S. Contaminated Soil	SRY 14	25,000 cy	6,499		16,364	2,484	1,392				. 4	1.60	23,55
Regrade failings	SWT 15	723,500 cs	58,981		28,638	3,647	2,436					1.65	61,226
Slimes Excavation	SRT 16	15,000 cy	13,890		160,926	21,334	14,796		62,500			1.39	310,45
Stility Relocation	SET 17	1 ea	13,076		27,845	2,250	1,966					3.61	45,88
Contaminated Soils Excavation	SET 18	284,800 cy			8	- 0				1,055,803		1,055,803	1,055,88
less fill Escaration	SRT 15		42,201		156,986	20,637	13,972					1.17	233,19
Construct Bitches	SMT 26	718,389 cy 58,888 sy	144,753		538,539	70,659	48,865		- 1			1.12	882,68
Hip-Rap Ditches	S#9 21	15.505 cy	4,650		10,656	1,438	1,375					0.36	18, 125
krmor Stone, Emb. Slopen	SMY 22	49,986 CY	4,490		5,629	872	733		161,996	74,424		16.88	248,144
lockwall for Protection	SBT 23	The second secon	28,338		35,514	5,503	4,623		586,895	239,549		18.64	988,413
las Cover	SBT 24	3,852 cy	4,274		13,511	1,791	1,242		45,399	18,498	8	21.96	84,68
oil Rock Matriz (Rock)	SRY 25	73,300 cy	146,741		416,598	11,728	10,506		38,849	16,666		8.57	628,421
oil Rock Matrix (Soil)	587 26	54,268 cy	23,278		29,187	4,522	3,798		825,620	268,448		21.14	1,146,847
evegetation	S87 27	48,648 cy	9,802		37,696	5,863	3,366					1.15	\$5,927
emobilization	SRT 28	220 ac					9			226,696		1,000.00	229,686
learing and Grabbing		1 ea	8,228	- 1	8,293	1,250	1,050	2,500	- 1	15,686		56,361.00	56,361
secied and arranged	SHT 29 SHT 38	5 ac	2,286		1,730	275	225	566				1,003.20	5,016
ackfill Contaminated Soil Erc.		18,700 lf			- 6		9			143,400		7.54	148,486
ilter Bock		75,000 cy	6,435		14,100	2,296	1,500					0.32	24,235
adiological Survey	SRT 32	50,750 cg	28,831		36,143	5,681	4,784		557,888	243,619		17.28	876,786
ell Baintesauce	SRT 33	I ea								26,258		26.250.00	26,258
MC Oversight Coats	SRT 34	16 åt	387,677		164,000	26,898	20,800	106,000	66,788	258,758		95,681	956,887
mit oversight costs	SMT 35	16 41								415,872	1	41,587	415,872
USTOTAL			1,715,669	56,550	2,195,853	257,498	195, 297	185,375	2,345,827	3,419,855		beck	10,371,923

PROJECT: Atlaw Option 2 Truck Transportation DATE: #3-Dec-93 SRF 2 OF SRF 37 CLIERT: ATLAS CORF.

JOR #0.: 88-67-10 TIME: 97:17 AM LUCATION: Moab Stah

ESTIMATOR: MOTES:

SUB TOTAL SPREAD COSTS

#### 1. ASSUME THE POLLOWING PRICES FOR ROCK AND AGGREGATES

FILTER 1	75, 136 13	67,769 CT	6.28	296,168	503,485	
FILTER II	4,776 79	2,985 CT	4.52	13,492	22,937	
BOCK MULCH 1"	61,968 79	38,130 CT	7.10			
ROCK MELCH 3"	25,868 18	16,136 CT		278,723	460,229	
OPPER DRAIBAGE CHARRES	18,328 78		11.62	187,431	318,632	
LOWER S. W. DRAINAGE CHADNEL		6,455 CT	5.72	36,923	62,768	
LOWER IMPOSSIONERY CHARMEL	7,680 73	4,750 CT	6.55	31,113	52,891	
	6,886 79	4,300 CY	5.66	21,844	37,135	
19:2 BHEAFEHEET AGG	86,813 78	53,758 02	6.28	337,600	596,108	
	********	*********			PRODUCTION OF THE PARTY OF THE	
SHOTOTAL	278,843 TB	174,277 CT			2,856,186	
DRILL AND SHOOT		219,137 CY	2.50	547,843		
OVERSHOOT AT 201		43,827 CY	2.58	109,569		
HOVE 18TO STOCKPILE		262,964 CT	0.50			
PIT PERRITTING				131,482		
FIT RECLAMATION		I EA	35,998.88	35,000		
111 section111As		18 AC	3,500.00	35,000		858893.2
						9.41811848
				******		1.7
1071178 2018 189 814				2,854,186		

AVERAGE COST OF RIFRAP 6.16 PER TOR
AVERAGE COST OF ROCE MULCE 8.97 PER TOR
AVERAGE COST OF FILTER MATS. 6.48 PER TOR
AVERAGE COST 10:1 AND 10:3 6.93 PER TOR

7.31 PER TOR

ASSUME AGGREGATE PIT IS 20 MILES FROM SITE.

AVERAGE COST PER TOR

ESTIMATOR.

No.eb Stab

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		-		68.68	252

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	DESCRIPTION	108-189	SALARY	MERRICS
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Ster	TCN 1	1.651	1.631	STARDARD PROGRAL RAPE APPLIED TO ALL WASHING PAID
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75 KET OPERATOR	2		413 35				6, 121		
TO LOCAL OFTRATOR	1.80		\$17.75 \$13.70				6.128		
77 01149	2		917.10				67.178		
78 SET LABORER	2		40.30				6.328		
79 LOCAL LABORES	2		2 2				6.123		
56 PIPETITES	3		27.18				6.128	15	
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82 CARPERTER FEB.	. 8		511 65				6.135	58.80	29.90
83 CARPERTER	H		\$13 K				6.128		58.96
SM CEMENT MASONS	8.						6.121	\$1.99	35.80
85 TEARSYERS	2						6.121	25.25	25
100							6.121	22.85	59.86
ALLE PIET PERSONAL									
88 PROJECT RAMAGES	# 1	-	613 68						
	2		£27 3g				6.121	\$1.99	10.01
	#		£75 W.				6.123		
91 PRGJ. EMCIREER	2		121 68				£.128	\$1.39	56.96
92 MS OFFICES	1.80	1 100	271 63				6.178	10.00	20
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94							6.128	\$1.99	28.82
THE THE BOX SIEDLESS							6.139	23	25
96 865 TRCMICTA	- 69	\$2	878 19						
97 AST. PROJ. RBG.	1.86	183	9 10				6,123	\$1.99	28 80
THE RING PRINTS TRUE	8	9.00	\$18.73				6, 121	\$1.99	25
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LOCATION	Moad stat				11		DPON PATING	15 8	Statement State
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			RESTAL	TAI	176 88/80	RATE	RATE	0,8,8	APPLIED
***** INTERNAL SQUIPMENT	******		-					-	
121				1.60	\$8.00	\$9.60	58.60		8.00
112				1.66	\$8.99	\$8.88	58.88		9.00
123 124				1.86	\$9.98	\$8.00	\$8.88		0.00
***** EITERNAL EQUIPMENT	*****			1.99	\$8.86	\$9.86	58.60		8.99
126 CASE 580 LDR/DEN	LOADER/BACEHOR								
127 CAT 215 BEN	BACENSE BACENSE	22. 22. 220.	\$2,500	1.06	\$15.06	\$3.69	\$2.88 5		1.00
128 CAT EL 200	BACKING	(1.25 LCT)		1.86	\$8.86	\$4.90	\$3.50		8.96
129 CAY 235 BKW	BACEBOE	(1.62 LCT)	\$4,150	1.86	\$24.99	\$4.50	\$4.25 H		1.86
138 CAY 245 BEB	BACEBOE	(2.75 LCT) (3.75 LCT)	\$11,500	1.86	\$69.26	\$6.50	\$6.89 8		1.04
131	200	[3,73 M,1]	\$17,660	1.64	\$104.80	\$11.00	\$7.50 H		1.99
132 CAY 936 PEL	FEL	(2.75 LCT)		1.60	** **	44.44			
133 CAT 950 PEL	781	(3.25 LCT)		1.06	\$8.66	\$4.00	\$4.60		9.88
134 CAT 966 PEL	78L	(4.50 LCT)	\$7,650	1.66	\$6.86	\$5.89	\$5.80		9.99
135 CAT 988 PEL	PEL	(7.00 LCT)	\$16,265	1.06	\$46.07	\$7.88	\$6.88 %		1.98
136 CAT 963 FEL	FEL/track	(2.59 LCY)	\$7,390	1.06	\$97.96	\$8.88	\$19.80 H		1.00
137 CAY DS DER	BOIER		619,228	1.06	\$8.68	\$4.00	\$6.00 H		1.00
138 CAT DE DIR	DOIER		\$5,745	1.66	\$34.68	\$4.88 \$5.58	\$4.50		8.98
139 CAT DE BERILG	DOIER/LGP		\$8,610	1.06	\$51.84	25.50	\$4.50 H		1.00
148 CAY D7 DER	RELOG		4-1-1-1	1.86	\$0.98	\$7.96	\$4.50 8		1.00
141 CAT BE DER	DOIER		\$11,785	1.06	\$70.50	\$11.00	\$5.25 \$7.50 H		0.00
142 CAT D9 DIE	DOISE		\$14,660	1.96	\$88.29	\$16.00	\$10.00 H		1.00
143 CAT D9 DER	BOSER		\$16,120	1.86	\$97.09	\$15.00	\$19.96 H		1.86
144 CAT 14 GDR	GRADER		\$8,410	1.06	\$58.65	\$6.00	36.58 H		1.00
145 CAT 16 GDR	GRADER		\$13,730	1.06	\$82.69	\$8.60	E 00.82		1.88
146 CAT 12 GDR	GRADER		\$4,760	1.86	\$28.31	\$6.00	\$6.50 H		1.88
167 CAT 563 VIB COMP	COMPACTOR		\$4,315	1.86	\$25.99	\$5.00	\$4.60 H		1.00
148 BOMAG WALE BEHIND	COMPACTOR	(48 THCB)		1.86	\$0.00	\$2,08	\$2.00		6.80
149 CAT 815 COMP	COMPACTOR	SHEEPSFOOT	7985	1.96	\$48.89	\$10.00	56.00 H		1.06
150									
151 CAT 615 SCFB 152 CAT 611 SCFR	SCRAPER/ELEV	(16 LCT)	9958	1.86	\$59.93	\$8.75	\$8.75 M		1.00
153 CAT 627 SCPRIT	SCRAPER/SINGLE	[31 LCY]	20330	1.86	\$122.44	\$14.75	\$9.50 E		1.98
154 CAT 637 SCPRIT	SCRAPER/THIR	(20 LCT)	\$17,878	1.86	\$102.81	\$17.75	\$12.58 %		1.88
155	SCHAPER/?WIN	(31 LCT)	\$28,216	1.06	\$169.90	\$23.75	\$17.50 H		1.90
156 WATER WAGON	SCRAPER 631		\$13,000	1.06	\$78.38	\$7.66	\$5.00 N		
157 TABDEM WATER TRUCK	MISC. EQUIPMENT		\$3,500	1.86	\$21.68	\$3.88	54.66 H		1.90
158 4"/6" POMP	MISC. EGGIPHENT			1.06	38.88	\$1.00	\$8.58		1.00
159 350 CFM COMPRESSOR				1.86	58.99	54.00	\$2.00		9.00
168 65 TOR CRAME	MISC. EQUIPMENT			1.86	58.88	\$5.98	\$4.00		0.00
161 REBTAL TRUCK			\$8,800	1.86	\$53.00	98.62	\$8.96 %		1.86
162 End Dumps	MISC. SQUIPMENT		11400	1.86	\$68.66	98.82	58.88 M		1.88
163	HISC. EQUIPMENT			1.06	\$9.60	50.06	\$9.90		8.89

105   RECENTIC   1286   158   1885		DESCRIPTION	REQUIRED T OR E	REQUIRED QUARTITY	UBIT RATE	I LABOR	J INT EQUIP	1 113 11808	L
155 BLATTER (NO METER VIT OR BETTE PRITER)   500		*****SIPE UTILITY BOOKUPS*****						adatt	1981
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187 SERVE 188 CAS 185 CONTS****  180 CAS 185 TELEPHORE 250 185 CASS CONTS****  192 PRISICALS 150 8 6 5 TRAINING-OPERATORS 1,176 8 1,176 8 155 TRAINING-OPERATORS 1,176 8 155 TRAINING-OPERATORS 1,176 8 155 TRAINING-LARORES 1,176 8 155 TRAINING-OPERATOR STREAM 1,176 8 155 155 TRAINING-OPERATOR STREAM 1,176 8 175 175 175 175 175 175 175 175 175 175		186 MATER (BO METER VLT OR REPLE POWERS)							
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130		189 TELEPHORE							
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152 PRISICALS   1300   1310		***** INITIAL BEALTH AND SAFETY COSTS*****							
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****** TIME EXEMPT*****								
246 PROJECT MARRIER								
247 SUPERINTERDENY			75	\$1,636				
248 PROJ. SUPERVISOR	7	1	77	\$1,394	187, 138	1,631	154	
249 FBOZ, ENGINEER			75	\$1,389			124	
250 BEE OFFICER		. 1	77	\$1,172	99,244	1,203		
251 CHEMIST			5	\$1,184	5,520	74		
252			35	\$1,184				
253			75					
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*****FULL TIME BOX-EXEMPT*****								
256 BAS PECBBICIAN								
257 AST. PROJ. RAG.			75	\$1,513				
258 ENGINEER TECH.			75	\$1,513		100		
259		1	75	\$1,377	103,275	1 111		
260			15	41,411	1847.613	1,377		
			75					
*****BOTELY SITE BIRES****								
263 FIELD FORMAR								
264 MECHANIC	1	1	75	\$1,213	90,955	1.515		
265 MECELATIC RELPER	1	1.1	75	\$1,213	98,955	1,213		
266 OFFICE MARAGES	1	1	75	\$1,024	76,798	1,213		158
267 CLERY			75	2853	8	1,626		
268	7	1	75	\$772				
269			75	9116	57,960	772		
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272 PRESSURE WASKER (INTERNAL	RATE		75	434				
273 SAPETT EQUIPMENT (AIR SAMP	LING/OVA)		75	\$36				
274 SITE PICEUPS	1	1	75	\$136				
275			75	158			600	284
			23					
**** AEETERBAL BOO! PHEST RESTAL *****								
278 OFFICE TRAILER	,			Sandari I				
279 TOOL PRAILER	,	2	75	2166				288
		1	75	\$75				75

THE PARTY.							
283 FUEL TRUCK	*			75	\$221		
284 GREASE TROCE			1	75	9421		221
285 MISC. EQUIP				75	\$75		
296 SIFE SCALES				75	3594		
267 PROJECT VERICLES				75	\$150		
286 STREET SMEEPER				75	\$398		
289				75	8136		
296				75			
***** SUPPLIES****							
293 OFFICE SUPPLIES	a a		- 8	75	\$25		
294 SURVET SUPPLIES			1	75	\$59		
295 SAFETY SUPPLIES			1	75	\$600		
296 COPT MACRISE				75	\$58		
297 PHOME SERVICE	7		1	75	\$150		
298 BYILITY SERVICES				75	\$48		
299 POTABLE NATER			1	75	\$48		
300 SABITARY PACILITIES	. Y		1	75	\$36		
301 SHALL TOOLS			1	75	\$25		
362 JOBSITE PROTOS	7		1	75	\$15		
383 08-SITE OC PESTING EQUIP.				75	\$700		
304 OF SITE LAB SUPPLIES				15			
305 DECOSTANISATION SUPPLIES				75			
386				75			
307 Grader for Baul Boads	. 1		-1	75		746	2,279
368 Water freck for Haul Roads	7		1-	75		746	949
389				75			
***				75			
*****SUBCORTRACTS*****							
313 SURVEY CREW (BASED OR \$146/HR FOR	(48 SES)			75	\$5,600		
314 SECURITY (FULL TIME AT \$12/HOUR)				75	\$2,016		
315				75	85,419		
316				75			
317				75			
*****PRAYEL COSTS****							
328 TRAYEL, ESECUTIVE							
321 EST OPERATOR ADJUSTMENT				75	\$250		
322 KET LABORER ADJUSTMENT				75	58		
323				75	28		
				75			
VARIABLE JOBSITE SUPERVISION (WEE	PT W 1	*********	******		***********		
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8		# brc 4]		
27188778.		223		
		a		
Marco				
Atlas Buscals becomed 380 Satis	btiss Biserels	81-447-19	Boah Brah	Flood Bike Removal
PROJECT.	(1) (897)	708 80:	12012108.	17th MESCRIPTION,

ESTIMATION NOTES AND ASSUMPTIONS.

chie is he reseved and hanied up sate impossiblest. Waterial to he mated as fill in the regunding of impossiblent prior is capping, decings Ami Statescu s 5,400 if

MARTIN - 15 KOSS		**	**	= = = = = = = = = = = = = = = = = = = =	**	5.7
	SUPPLIES NATIONALS SEES	<b>第</b>				
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	7582	M1.25	11.16	11.86	N.	
		857.88	55 22	25.63	13.99	
	11858 187	18.43	18.84	37.78	18.54	23.03
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	232.18	1,718						
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	COST	38870751.	MPDIELS.					

PROJECT.	Atiak Miterals Revised MK Totimate	\$57188758	100	387 14	B 50	12
CLESSY	Atlan Ricerals					
	H 46 18	945	M-94:31	1186	11.54	40
10047198	Soul Stub					
13.99	S. Explanated Soil			308-36887771	77.000	8 09

ESTIMATOR MATERIAN ASSIMPTIONS.

Material to be removed and basied up sate impossiblest. Baterial to be said as foll in the regulating of impossiblest print to copping, decraps has distance + 2,590 if

	UNIT	Charlette.					
(3 N)(R)		opposite and the same of the s					
	TOTAL	WATER STREET					
DURATIOS -	PRAFEL	to the present of	8.0	30	* 8	26 4	
	SBRS	distantiant.					
	REALES SUPPLIES MATERIALS	STREET, SQUARE					
	SIMILES	SANGERS CANADA					
	REALES	**********	N 15	9.	1.80	8	
	116	Commission	(6) 75	11 80	11.89	1.86	
	117 15817	STREET, STREET,	857.88	然此	69.38	25.79	
	rate spars	***********					
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	917	SCHOOL STATE					
	QUARTITY SALT	DESCRIPTION OF STREET	7.86.23	1.66 53	2 80 15	1.86 53	2 10 21
	1138	\$	30.00	\$20 \$10	913	CAT 54.3 YES CORP.	120423
	DESCRIPTION	STATISTICS.	CAP 431 SCP8	CAT 88 1	CAPE	196 283	UKK LEDED

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837188738		MILE		
ad Strace				
Brian Minerals Breined	Atlas Sinerala	N-491-18	Brid Rab	We begrade failings
PROJECT	CLEBY	78 N.	LOCKTOR.	I'M MACHINIA

INTIBATE BYING AND ARRESTING.

Reduping of tallings impossiblent size ine extelling dratony grades prior to capping.

Necesy buil Carcare = 1400 IC.

223 83885	1.8	1500	Section Sectio							
. 801		THELL TOTAL		2	2	*	2		*	2 .
00887108			-			*				
		SPECIAL METRIALS STREET								
		SPALTS	************							
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		7383	PRINCESONS.	59.89	7	195			# 1	
	222	Sperie	CHARLESTER	485.75	26.26	N 19	25.99		16.87	
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	MSSIPTION		STREET, STREET	CUE EDI SCHI	CAT IN 953	CHE NA 1038	CAT 56.1 F18 CHRF	LOCAL LABORER	CH 346 ML	LOCKL LABORET

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÷	CLIBBE		108	96372.179
91034	CLIEB	表	100.00	172

STIMENS BOAS ARE ASSEMBLING. Sines to be excessed and heritilise but tailings to gove required cover. Excesse has distance of 1989 II.

186 91005	PRES. MENCES SPECIAL MATERIALS SINCE TRAFFIL TOTAL. COST.	
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	CHIM	SHENTAL	5 T T T T T T T T T T T T T T T T T T T

無日 報告 14年 1

HOUST. Atlas Minerals Revised MRC Estimate ESTIMATOR: CRS SMT 11 OF SMT 15 CLIENT Atlas Minerals JUB 80-58-661-18 SATE 86 Dec 5) TIME: 11:55-88 LOCATION Stook Stah 1700 MSCBIFTIME: Stiling Selecation JOE QUARTITY 1.12

#### ESTIMATOR NOTES AND ASSUMPTIONS.

-Include relocation of mil line, gam line, telephone lines, and electrical lines which are located in the area of the channel reconfiguration. Frices used are those provided by the respective (apparies for electrical and telephone (1988 estimate).

-frices used for oil and gas lines, combined are a 1993 estimate from the stility.

											80174880		8500
065(0)77108	(6887)77	9817	LABOR										7155
***************************************				60819	80817	F981	9874193	SWPPLIES	MATERIALS	5961	TRAVEL	10185	0059

											BOURLY	
CHEN		0.80	0.00	6.66	2.96	1.16	8.86	6 06	8.86	1.95	CHEM COSTS	1.00
SPETOTAL	# ROSS											9.66
APERIALS.												
Hectric line relocation	1.86								50,000		36 866	
las lise relocation	1,386.13								768, 598		745, 560	
hi lime relocation	1,399.11								258,883		256,983	
Melerhome lime relocation	1 68								7,666		7,969	
	-	ستند		-								
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Atlas Australs Second REC Estimate Atlas Riverals	15 年 18 18 18 18 18 18 18 18 18 18 18 18 18	(ROTT) 中央第一次の (ROTT) の (ROTT
PAULET. CLIBE	JOS BO. LOCATION. ITMR RESCRIPTION.	Shallon and an

ASTERNA ROTES AND ASSESSMENTEDS.
Soil is located in the area of the existing asil. Depths of excention wery and none of the external mill be below water table.
This acternal mill be toploaded into excepting mith a backbor and transported to it impossibles.
Neverage base its accept excention.

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BESCRIPTION	COP NAT SER COP NA 228 COP NA 228 COP NA 249 CORY LICAL LABORES	Ort 225 888	CHK SHICTAL MERCHAS.

· 15,144 3,461 13,912

ECTIARYM BUTS AND ASSUMENTIONS.
This material will be excaved free the area of the recomliqued chancel and basic int impossiblent area asterial is considered p.
decise has factuate = 1800 [1].

100 822 WORKS 1113 MSATION . \*\*\*\* 2882 HARIES SIPPLIES MATERIALS \* \* \* \* 1100 34.55 11.28 11.80 ENWY: QUARTITY DAILY 2 2 2 2 2

CAT NO SCIN CAT NO 828 CAT NO 928 CAT NO 918 CORP LACAL LABORR

DESCRIPTION.

\$18.13 CREW COSTS 655,45 144,753 877 90965 SHIPPE CREW

MPRINS.

2 Mt 15	11:54 88	38,886.21	
2	7186	JOS DUARTITY.	
30	#8 Dec-55		
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MESSECT. Attent Made als Exercised Wit Extracte Attach Made State State State State Attaches State Sta	報告に乗	Committee, Disches	ASSOMPTIONS.
PROJECT.	JOB 86. SUCKTION	THE MICHIGAL	ESTIMATE ROTES AND ASSUMPTIONS

Bar Boter and Grader to Escush Barth Tready moved in Clean Fill Excession.

		discount.		
175 80085	THE	SALESCE STATES OF THE PARTY OF		
	POTAL	***********		
208AT108 -	TEAME	STREET, ST.	200	70.0
	SUBS	STREET		
	FOR REFAIRS SUPPLIES MATERIALS SUBS TRANSC TOTAL	KENTRALBERT		
	\$8114485	************		
	EFRIE	and a single	1.50	6.58
	Ħ	SHEET SHEET	10.3	55.5
	ttr tpit?	transfer by the	59.85	方式
	187	orași de la constitucion de la constitución de la c		
	11808	Service and Period	18.64	18.64
	-	Sansyretees	-46	-
	plantin unit	STREET, STREET,	1 86 55	1,89 53
	DESTRICE		4 506	929
	11203	SALIVA	CAT	CRT 86 028

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		125 MOURS 4,668						
	CRES	SERVINE	12.					
	8	25	G788131.5					1

 Model of the Notice of of the

EDTILETON ROTES AND ASSEMPTIONS:

Place waterial with Car 956 [e] and agreed with small donce [Car 56]. Assume all material to Relivered to the temediace area

	MECHINA		CBT 946 FB1.	CAT 86 878	LOCAL LABORTS
	Questity unit 18838	RESOLUTION DE SERVICIONE DE LA CONTRACTION DEL CONTRACTION DE LA C	12 86 13	1. 46 E3	2.86 (3.
	111	SATISFASSA			
	11839	**********	18.14	12.50	23.89
	11 Mg	111144844111			
	TIN I	CONTRACTOR S	18.95	31.68	
	1311	CHANNES	1.89	5.5	
	HENIES	DESCRIPTION OF	1.8	31	
	SHYLIES	**********			
	APPEALS.	ASSESSEDANT			
	5885	Distriction of the last			
DESTINE .	MERGERS SHPLIES METRICALS SINS TRAVEL TOTAL	Constitutions:	2 -	2	2 -
	forsa,	WARREST STATES			
29 90 90		continue			
ŀ	18877	SERVICE STREET			

188 85	# 16		
8.00 8.00 CRS COSTS	11,138	2	
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		18.80	
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5 6	181		
5.0	113		
18.67	67876		100
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H 19	8.7		9
	24 6085	36.00 to 10.00 to 10.	
369	SMANN	MATERIALS, Top-flow feed floots	THE PERSON

St 18		11.55 AR		25, 186, 71
10				10
587 73		1186.		238-3348F17F
9		M 24c 93		
\$57:88718:		DATE		
See 600 Pringers				-
PRIJECT. At Lies States de Sende SEC "et date	At las Amerais	81-19-11	Sout trab	Armer Stone &m. 51co
PROJECT,	CLEART.	208.90:	SOCIETION	17th NEXTHERD

ENTERFOR NOTES AND ASSUMPTIONS.

Place Material with Car 56s (6) and spread with small doper (Cai 56). Assume all material is delivered to the immediace area

649 8385	1800 1307	(1) (2) (2) (2) (3) (3) (4) (4) (5) (4) (4) (5) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4
	TOTAL	
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	1885	
	REPRISE SUPPLIES MATERIALS	
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	BESCRIPTION	CHE NS FEE. CHE NS CER. LIDOX _ASHE

	680	SHITTE	MATERIALS: Selections for Next Buck	
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	18.35	25,138		
	2	*		
	11 10 10 11	15,514		
	25	1,94		
	8.81	4,423		
	** ** ** ** **	*		
	=	*	18, 89	
		**	98.80	
	*	*		
WORKY.	CASH (TAZT)	83,578	20,588	
	168.80	-		

8,511 1,591 (s2)

PRUBET.	Atlas Starrels Revised WE Estable	ESTIMATOR	8	E 18	× B
10 E	2017年本	2475	28 per 53	TIN	H 55 M
ITTRE PESCENTION.	Mean that Mean to the American			208 gasetim.	1,852 cv

### ESTIMATE BOTES MR ESSMETISME.

Assume exception of tow to 12 feet deep westerally Assume exception and buil topiccement by Scraper apparel Assume rock placement by loader and dozen. Then Suil Recembles # 18, 986 cg. Futal atoms placement of 17 M cg.

											20179300		15 SURES
MESCELETION	ii maen	III.	1901	11 12	111	FEEL	REMIRE	改	SPECIES MATRIALS 1985	*	TRIVEL	NUM	181
CAT 441 STR	双星1		78.55	11.000.000.000.000	489.75	29.65	20 21	***************************************		STATE STATE STATES	20 0	0.3 TANDA S. C.	NAME OF TAXABLE PARTY
CAT 88 529	12 96 17		18 64		95 M	8 ::	3.				2		
CAT No. 128	1.88 23		18 34		N 56	2.5	8.7				7 28		
LICKLE LABORES	1.00 53		15.67								20		
38 561 119 000	13.86.11		11.11		25.59	*							
37 96 15.	13 86 1		27.51		28.85	3	8 1						
CRF NA 028	1 15	18	18 638313		3 86	8.8	1 1						
DOCK LEBURES	2.58	12	27.873.13										
100			10.00		3 #							ROBLI	
										E		C1001 (1001)	1, 888 )
SMANTEL	11 ADRIS	in	1,274	*	11,511	(H)	1,70	*	*	*	*	39,113	
BETTELL: Substant fort hat fort	6,813								E . B	18,68		# 5 5 5	

字(E) 英(B) 中

0 13,511

	118.	JOS QUANTITY.
	18 per 51	
ESTIMATA	NIT.	
correis Revised SMC Estimate		
Atlas Krac Atlas Kras	新·報/ 译 物的 別点	Clay Coner
PAGET.	JOS NO. LOCATION.	178 MSCHIPTOR.

11.58 kg

ESTIMATION BOTES AND ASSISTENCES.

Clay had estimated at 18 5 miles facilable equipment to excensive/cod/place Trampout saxing emblome trailers

167 8085	1300	1.20 6.25 6.25 6.25 6.25 6.25 6.25 6.25 6.25
	PUTAL	
PERATION .	PRAYEL TOTAL	****
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	QUARTITY URLY	****
	MESCALITION QUESTITY UNIT	CAT NA PE. CAT NA BIB CAT NA GAR LACOL, LABORER Bed Dungs

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2	*	8	
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11.58	36.8		
# #	11,738		
12.12	8 411,518		
288.81	136,141		
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0.00	SMITTEL	BRTRAIS. Clay Seel, and Rubble	

4 19,815 19,800 W 13,51

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287.15.12		7182		JOB (DEARTITY:
90		M. Sec -9.1		
ESTIMITIS.		DATE.		
berals Reused ERC Estimate	nerels	20 年 2 年 2		attit (Bock)
HOJET.	(1,1287)	108.90:	LOCATION	THE MECETIFICAL

ESTEMPTO ROTES ARE ASSOCITIVES.

-Qry is a total of  $M_{\rm c}(M)$  cy of 1.5 unch rights and 16,1% cy of 1 such tiping Assume trucks can directly domp in place.

	TALL COST	THE PROPERTY OF THE PROPERTY O			
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		10,110			
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	QUARTITY BALT LABOR	HALL		ī	
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	200	413.	181	(87	41.00

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	16.00	1.12		

384 13	11:58 B	45 650 -	92,199 4
10			
201.20	1185	THE ORDER FO	2008 (BMR2222
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als berned MC factaire als		Made State And Approx Approx (Seed)	the Septist
Milat Riber	81 196 58	final first	MALL BOWN MALL
Modern.	778 80	LUCATION.	A THREE PROPERTY AND LABOUR

Estimates with assaurions.
This material will be exceed from the area of the reconsisposed changes and dischioses, status compacting this material sate the previously placed rost using a sheepsfoot compactor. Needs family statuse - 1989 if.

54 80885	1803 1803	CHARLES CONTRACTORS					
	nu.	STATE OF STREET					
00887108	TANKL	000000000	2.0	**	9		1.85
	188	SANASSAS					
	MATERIALS SUBS	ACCOMPANY OF					
	SHALLES	STATESAND OF					
	REFRIES SHFELES	************	25.80	3	- 1	1.00	
	Ħ	electronic	2 2	#	28	28 01	
	Epsile Epsile	SECURITARIST (SEC	423 15	25.20	59.38	11.19	
	181	*********					
	1,4879	AND CONTRACTORS	14.55	18.58	11.38	18.64	23.83
	100	contract					
	QUESTITY	ALI PERENCES PROPERTY.	12 80 1	1 86 13	2.96.83	181	2 84 25
	W571713	THE RESIDENCE OF THE PROPERTY	CMT 4,11 3/299	CMT 38 925	CM 36 203	CBT 815 CORP.	LICKE LARGER

7404		100.30	***	400,000	Tax and	40.00					17808		
1253		114 10	2	8177.33		N 10			2	3	ONER COSTS	17.88.77	
SERVINE	54, 80085			17,68 5,863	1,863	37.385	*	-		*	126,927	1 15	
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 PROJECT:
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PROJECT Atlan Riverals Benised REC Estimate ESTIMATOR CES SMT 25 OF SMT 25 CELEST Atlas Minerals JOE 80: 88 867 16 DATE: 46 Dec-93 71ME: 11-56-38 LOCATION Brab Dab ITEM DESCRIPTION: Clearing and Grubbing INE DESITTITY: 5 sc

#### ESTIMATES MOTES AND ASSUMPTIONS.

-Includes comoval of light brusk in area of S.B. Contaminated Soil excavation. S.e decer to place in piles and then burn.

											DURATION	60	54 86985
DESCRIPTION	PERMIT	8917	LANCE	181 6001P	621 60617	PHEL	887E.85	SRFFLEES	MATERIALI	5885	FREITL	TOTAL	0817 COST
CAT DE DEF LOCAL LABORER	1:00 S		18 54 27 #7	*******	34.48	5.59	1.58		***********		8 95 4 98	**********	******************

CREW		45.7)	1.10	26.58	5.58	4.58	1.66	4.60	2.00	EDERLY CHEM COSTS	10.3
SORTOTAL	59 80(8)	2,286		1,736	775	225	*			4,516	961.29
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7803ECT-753887

Atlas Minerals Revised RRC Motimate Atlas Minerals

SUTTEMPTOR

SMT 38 SF SMT 35

JOE 80: 88-667-18 LOCATION Statt Stat.

DATE

CES ## Ber 53

11-56 88

TYPE RESCRIPTION: Fencing

JOB GENETITY: 18,786 If

TIME

ESTIMATOR MOTES AND ASSESSTICAS:

installation of a total of 18,700 if of & it characters with 6 strand barbeirs. Installation of a total of 8,000 If of 4 strend barbuics.

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80485

DESCRIPTION

QUARTITY ONLY LANCE THE EXT

BORTP EQUIP FIRE REPAIRS SUPPLIES MATERIALS SHE TRAVEL TOTAL

SELT E057

CREW		1.00	6.90		1.94	8.50	1.00	1.11	6.00	CREW COSTS	1.01
SBSTOTAL	# W/RS			1		*					1 10
MATERIALS: Chain link w/Barb Wire Barbed Wire (# strans)	38,396.35							121,485 24,886		25, 686 20, 666 8	

TOTALS

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SARK COSTS 28,219 8 8.0%5 7 1083 SHRTOTAL MATERIES: Nadrological Survey CHES

CLIERT Acias Minerals 308 80 88 867 18 DATE (6) Dec-31 TIME: 11.5s. 88 LOCATION Roeb Ital 17EE DESCRIPTION: Nell Maintenance JOB QUARTITY: 18 yr. ESTIMATOR MOTES AND ASSUMPTIONS-Assume using I operator and I track full lime Labor -175 lf/year. Wells #-7- Ainch Satractica Melis Fungs # 1.5 equipear -1 i 15 ruck extraction pumps Wells and pumps need changed every two years Assume wells # 98 feet deep Period of time : 18 years BORATION -79 1696 90193 DESCRIPTION DEARTITY SELT LABOR INT SZT 1997 ADDIF ADDIF THE REPAIRS SUFFLIES MATERIALS DUBS TRAVEL NOTAL DIST LOCAL OPERATOR 1.80 EX 15 1.00 25 Fickup 5 1.00 1.00

ESTIMATOR

S8T 17 - 18

PROJECT:

Atlus Minerals Reviser MFC Estimate

CREW		18.64	1.0	5.00	1.86	1.84	3 96	+ 10	3.66	0.44	MODRLY CREW COSTS	25 64
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ESTIMATE BOTTES AND ESTAMPTIONS.

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	Affas Spills Alterante Site #				ESTIMATOR		No.		FG 62 2H5.		
TOR NO.	Mat 0 at				DATE		73 Dec -43	f	118	0.11.58	
TIEM DESCRIPTION:	MURELLIALIUM, DEMORTIZATION, DECEMBANIMATION	DECEMBATION						100	JOE GUANTITY.	1 (4	
ESTIMATOR MOTES AND ASSUMPTIONS:	SSUMPTIONS										
TITIN DELICEDATION	ATA MILE	\$64 t07AL									
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MYBILIZATION DEMOR RAIL (AF.	968	175390									
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Atlan Option Alters to Site A

ESTIMATER

SH1 9

DE 5H1 40

108 NO. 10041108

98-67-10 Mosh Ctal

DATE

Q1-Dec-93

1185

07 14 58

ITEM DESCRIPTION: KOND AFFAIRS

JOE QUANTILY:

18,500 LF

### ESTIMATOR HOTES AND ASSUMPTIONS:

-ASSUME THAT THE EIGHT MILE LENGTH OF ROAD WILL REQUITE PROFILING AND ASPHALL OVERLAY

ASSEME TIO LET TER ST ENCY ON ASPHALT

ACTUME TOTAL OF 10,000 TONE REQUIRED

DURATION -

0 HOURS

DESCRIPTIONS QUANTITY UNIT LASOR INT EXT UNIT EQUIF EQUIF FUEL REFAIRS SUPPLIES MATERIALS LUBS TRAVEL TOTAL

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PROTECT	11687	OB 80	DCATION	TEM DESCRIPTION
25.				Section

ESTIMATOR MOTES AND ASSUMPTIONS:
ASSUME CONSISTRUTION OF 2500 LF CONVEYOR SISTEM TO TRUCK LOADING AREA
ASSUME CONSISTITIVE A FEET MOTIDER SIRUCTURE FOR LOADING BY DOTER
ATTURE A TILD LOADING FACILITY AT THE SIDING MITH 1200 TH CAPACITY

1200 HOURS DURATION : ENT TMI LABOR 11811

TOTAL

TRAVEL

SUBS

REPAIRS SUPPLIES MATERIALS

FUEL

QUANTITY

DESCRIPTION

0.00 00 0 HOUREY CREW COSTS 0.00 0.00 0.00 0 00 0.00 00'0 0.00 0.00 00 0 0 900/85

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340,000,00

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ite à			PER CY 3461 E	GRADER FOR EXCAVATION AND 3 LABORERS	1.480.8	7	12.51	24 62	73.82	5	**		5,131,652	
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Atlas Option Alternate Site A ATLAS (1987.	98 s.7 - 10	EXCAVATE, LOAD TALLINGS	DMS: LOADSING FACTL CYCLE F FALLING AT AY = 3461 CY F ZEODODO CY/	LOAGING OF	QUANT) (Y	1 00 1	2.00 5	1,00 €	3 00 0	2.00			22,537 ROURS	101 201 201 201 201 201 201 201 201 201
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7801621- (LIEST	10E NO 1 DYALTON	ITEM DESCRIPTION:	ESTIMATOR NOTES AND ASSUMPTIONS: ASSUME PRODUCTION RASED ON LOADING FACILITY AND TRANSPORTATION CAPACITY ASSUME AN WINTE TESTINGS CYCLE ASSUME AVERAGE CONVERSION OF TAILING AT 1 4 TOMS PER CY PRODUCTION - 4500 185 PER DAY - 3461 CY PER DAY	-ASSUME USING 1 COT, 2-DB, 1-MATER FRUCK BND I ASSUME USING 3 CONVEYOR AND LOAGING OPERATORS	MOLLATECT 30	CAT 637 SCPR.)1 CAT 18 656	CAT DS DZ8	(AT 345 FEL	LOCAL OPERATOR	LOCAL LABORER	2		3081014,	高

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TOTALS

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Atlas Option Alternate Site Alta: USE	88 4.7 10 Work 91ath	OTF-LOAD AND DISPOSAL	A C STANDARD PROPERTY.
177501	108 MO LOCATION:	TTEM DESCRIPTION:	一十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二

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	DESCRIPTION		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	CA1 08 02R	CAT 825 COMP	MATER TRUCK	CAT 14 GDR	FEELD FORMAN	PICKUP	LOCAL OPERATOR	OCAL LABORES	
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ESTIMATOR NOTES AND ASSUMPTIONS: ASSUME MATERIALS CAN BE PLALED WITHH JOD FEET OF FILL PLACEMENT ASSUME USING A DR. GRADER, WATER TRUER AND CONDACTOR, AND FOREHAM

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11	1186	TOB QUANTITY				DUSATION : TRAVEL
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	07 Dec 93					189
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Atlas Option Alternale Site &		MOSE OTSE UTILITY RELOCATION AND				GUANTITY UNIT
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			AMD ASSU	NOTES HOPP NOTES FACE LOADING		
27.4		ITEM DESCRIPTION	ESTIMATOR NOTES AND ASSUMPTIONS	SERVICE TO BE TO THE S SERVICE TO LOADING HOPPER SERVICE TO DEST LOADING FACILITY SERVICE TO DEST LOADING FACILITY		DESCRIPTION
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NAOJECT LLENT	ON 90	ULRITUM	16.8 (9)
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ESTYMATOR MOTES AND ASSUMPTIONS:
-ASSUME RELIAMATION OF
ASSUME FLACEMENT OF SILTY SOLIS FOR GROUND COVER AT A INCHES THICK
-QUANTITY IS ASSUMED TO BE
5-9212 CY
WAS 2 SERAPTERS AT COMPINED PRODUCTION OF NG CYTHR AT 2000 FT HAUL,
OURALION -

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116 H20M3			STREETS							
		10146	*********							
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		RATERIA	THEREGERA							
		SUPPLIES	FFERENSES.							
		REPAIRS	第2世代の日本日本日本日本	35,00	7.50	6.50	3.00			1 100
		FUEL REPAIRS SUPPLIES MATERIALS SUBS TRAVEL	CHERRICAL	67.50	11.00	8.00	4.00			A 44 W W W W W W W W W W W W W W W W W W
	EXT	41/103	THERESEE	273.78	71.29	51,73	25.22			4. 44
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	LABOR		CHARLEST CO.	15.21	24.61	74.61	24.61	18.50	25,39	
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CAT DS DZR
CAT LA GDR
MATER TRUCK
LOCAL LA GDR
FILLD FORMAN

DESCRIPTION

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M65	09 Dec -13		
ESTIMATOR:	DATE		
PROJECT ALLes Cotama Alternate site &	708 NO 38 5, 10 UNCATION No.45 (9.87)	ITEM DESCRIPTION: EXCANAGE COTTEMBREN NEPOSITORY	ESTIMATOR NOTES AND ASSUMPTIONS: -ASSUME USING ASTITUTE AT 2000 FORT HAURASSUME PROBUCTION AT 1100 CF-HR -DUNATION 5000 HOURS

	UNIT	100										
ury.	5	23										
5,000 HOURS												
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			61									
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SHI 16 OF SHI 40		
200	TIME JOB GUANTITY	
599	09-Dec-93	
ESTIMATOR:	DATE	
		61400 CY OF SQ1L
Atlas Option Alternate Site A Atlas COAT	98 6 10 Musb Vtab 5011, SOCK MATRIX	SIMATOR MOTES AND ASSUMPTIONS: DUANTITY IS ASSUMED TO BE 6.1400 CF OF BOCK AND ASSUME DELIVERY OF BOCK # 1000 CF/DAY OURAIDN > 61 # DAYS OR INCLUDE CREW TO FLACE SOFIS
ALLA	108 NG: 88 6 DCATION MAD ITEM DESCRIPTION: 5011.50	ESTRATOR NOTES AND ASSUMPTIONS: ODJANTITY ES ASSUMED TO RE -ASSUME DELIVERY OF ROLE # 1000 CF/PAY -DBRATION > 61 # DA INCLUDE CREW TO FEACE SOILS

TIMO	(192)	※元のからを選出するのは、日本のはなるとのは、日本のは、日本ので、日本ので、日本ので、日本ので、日本ので、日本ので、日本ので、日本ので								
	TRAVEL TOTAL	PRINCIPLE STREET, STREET,	0.00	00.0	0.00	0.00	0.00	0 00	0	0
	\$1085	TARRESTED NAME OF PERSONS IN								
	REPAIRS SUPPLIES MATERIALS									
		TABLE SECTION STREET,	44,25 28,50			16.00 10.00		90 × 90	11 7.5	99
143	EDVIT FUEL	12.5	314.97 44			89.28 16		1, 03	71.29	22.22
191	41003	CHARLES GERRE	27	72	775	300	6.0			
UNIT LABOR		TINESPERSION OF THE PERSON OF	72.0	28.6	24.63	24.61	55.49	28.63	24 507104	24.507104
QUANTITY		* はおおおりのはいりのは、これのはいますがないない。	3.00 EA	1.00 EA	1.00 EA	1.00 EA	40 00 CA	1 00 EA	1 84	46
DESCRIPTION		STREET, STREET, STREET,	(47 6.11 5/79	CAT 14 GDR	CA1 543 478 COMP	CAT 03 02%	LOCAL LABORES	CA1 966 FEL	(AT 08 DZR	MATER TRICA

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714	SIE	MATERIAL: FOR ARBON (FOR PIT) ROCH ARMON TRANSPORTATION	
		MATE FOCK ROCK	

14.82

04 SHI 40	03:17 9R	26,000 CT
SH1 17	1116:	JOB DUANTILY
A65	(8-3ec-8)	
ESTIMATOR	DATE:	
Option Alternate site a	10.1	<b>*</b>
Atles A11AS	98-67 Work to	Ű.
PROJECT	108 NO 1 OF ATTON	ITEM DESCRIPTION

ESTIMATOR WOTES AND ASSUMPTIONS:
-ASSUME CONVENSION ALL.S. INS PER CY-FLACE ROCK BY DOZER, LOADER AND TRACK LOADER
-ASSUME OFLIVER OF STONE ALLOGO CYDAY = 1500 TW/DAY
-TOTAL LOADS ALL 21 TON PER LOAD = 65 TRUCKS PER DAY

ASSUME SAME QUANTITY OF FILTER MATERIAL

			41				
			0				
			- 6				
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ESTEMBTOR NOTES AND ASSUMPTIONS:
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ASSUME DELIVER OF STONE AT 1000 CY.ORY = 1500 TA/DAY
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ESTIMATOR MOTES AND ASSUMPTIBMS

CENTALN DRAINAGE TRUCTURES WILL BE REQUIRED, FROM BOX COLVERT TO HEADWALLS.
ASSUME AN OLLOWANT TO 100,000 FOR ENTIRE PROJECT

DURATION - HOURS

UNIT 1 1016 TEAVEL REPAIRS SUPPLIES MATERIALS SUBS FUEL 41003 TNI 1.4808 1380 SUMMITTY DESCRIPTION

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Atlas Option Alternate Site & Altes Capp.	56-87-16 Music Utah COMPACE CONDITION CLAF LINER	ASSUME ONSERVOAVAILMS I SOUT LIMER AND RECOMPACTING AND CONDITIONING.  USE SCRAFES TO MOVE THE MATERIALS INCLODE AN ADVITIONAL D'T FOR RISPING OF SOUR INCLUDE AN ADVITIONAL D'T FOR RISPING OF SOUR INCLUDE AND COMMACION TO KEEP UP WITH COMPACTION EFFORTS PRODUCTION AT 1100 CYTHS  425.000 CT/ SOURCE MATER AVAILABLE DN SITE FROM STORAGE SURGE TANK FOR DUST COMTROL AND COMPACTION NEEDS ASSUME HALL OF STANCE OF 1200-FT	
PRESECT	LOGATION LOCATION TIEM DESCRIPTION:	ESTIMATOR NOTES AND ASSUMPTIONS: -RIGHE SCAFFELTO MOVE THE MATERIALS: -INCLUDE AN APPLITUMAL D''S FOR BESTITACUDE TO PROVE THE MATERIALS: -INCLUDE THO COMPACTOR TO REFE BESTITACUDE TO PROVIDE CATALON ASSUMPTION ASSUMPTION ASSUMPTION OF STATE FROM ASSUMPTION OF STATE CATALON OF	

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Alles Option Alternate Site &	88 c. 10 Mash Ulah	PLACE RADON CAF	0F 41 1 F001 0F ALS IPF186 OF ROCK	PRODUCTION AT 1100 (YZHR DURATION - ASSUME WATCH SVAILABLE ON SITE FOR DUST CONTROL ASSUME HABL DISLAME OF 1,00 FT		DUANTITY UNIT	1.00 EA	1.00 EA	1 00 03	5.00 64	2 00 54	2 64	1 50		131 HOURS		900'012		
7803EC1	206 MO.	:M1P110N:	ESTIMATOR NOTES AND ASSUMPTIONS: -ASSUME FLACENCYS OF TG RADON LAS ASSUME FLACENCY OF TG RATERIALS -INCLUDE AN ADDITIONAL D-9 FOR RIPP	PRODUCTION AT \$100 (TV/MR DURATION = ASSUME MAJES AVAILABLE OF ASSUME HABIE DISTANCE OF		DESCRIPTION	CA1 03 028	CAT 09 0ZK	CAT 825 CONS	CAT 631 SUFE	MATER WANDE	FIELD FORMAN	Mose	135	SHETDTAL	MATERIALS	FRENCT COMPACTION		TOTALS

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Alter Scion Alternate Site	SP 67-10	TLACE CINAL CAR	SETEMATOR NOTES AND ASSUMPTIONS: ASSUME PLACEMENT OF FINAL COVER AT 2 FOOT THICK USE SERAPERS TO MOVE THE MATCHALS (MCLODE AN ADDITIONAL D-9 FOR RIPPING OF ROCK	PRODUCTION AT 1100 CY/FMS 419000 CY/ 1100 CY/FMS = ASSUME WATER AVAILABLE ON SITE FOR DUST COMFROL AND COMPACTION NEEDS ASSUME HAIR OF TAMEE OF 1200 FT		DUANTITY UNIT	1.00 FA	1.05 64	1,00 54	1.00 58	\$5.00.2	3.00°3A	2.64	10.5			181, HPUR		419,000	
PROJECT	TOP NO.	CRIPTION	ESTRATOR MOTES AND ASSUMDITORS: ASSUME PLACEMENT OF FINAL COVER AT 2 FORT THIS UDE SCRAPERS TO MOVE THE MATTRIALS -(MCLODE AN APPLITORAL D -3 FOR KIPPING OF GOCK	PRODUCTION AT 1100 CY/HG 41- OCSA110N - ASSUME WATER AVAILABLE ON SITE FO ASSUME MAIL DI TANCE OF 1200 FT		DESCRIPTION	CAT DO DZR	CA1 DB DIR	CAT BY COM	EAT 671 SCFS	MATER MAGON	LOCAL LABORER	FIELD FORMAN	PICKUE		CAEM		MATERIAL 1	PREMET COMPACTION	1014.5

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ESTIMATOR MOTES AND ASSUMPTIONS:
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ESTIMATOR NOTES AND ASSUMPTIONS:

ASTURE INSTALLATION OF 10 FIEZONETERS
ASSUME INSTALLATION OF 20 MONITORING WELLS AT 100 FF OEPTH
ASSUME ALLOWANT TOR SETTLEMEN MEREES AND SURVEY HOWING NES

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ESTIMATOR NOTES AND ASSUMPTIONS:

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10set: Atlas Option Alternate Site 4.	MANNER BESCRIPTION: Resp. 10.  Resp. DESCRIPTION: Long. 10. Journal of
PROSECT: Relat Option Alternate Site 4. CLIEMT: ARLDS (OST.	JOG NO. 88-87 10 ACATION. No. 80-85 DEAL FIRM DESCRIPTION: Long is a Maniforing

ESTIMATOR MOTES AND ASSUMPTIONS:

Ansume quarterly camples of 2 wells for 15 years

Cost becampling event approximately \$1,000 - Cost because at \$1,000 per year.

1202 10180 DUSATION > TRAVEL 20065 REPAIRS SUPPLIES MATERIALS 1301 ENIT THI LABOR QUANTITY UNIT DESCENTION

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97 T. IN 587.40 67 597.80 JUE SHANTET 100 D2 Dec 33 45. 271782175 PROJECT: Ablas Cerica Micenide Site a ablas Cerica Micenide Site a ablas of the control of the about the acut

ESTEMBION NOTES AND ASSUMPTIONS

Assume cost of ElS at 1.5 million.

11 150 FUEL REPAIRS SUPPLIES MATERIALS SUBS INAVEL FUIAL DURATION -11001 IN ALIVED 1,4809 QUANTITY UNIT DESCRIPTION

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CLIERT	ATLAS CO	RP.	THE ORNAL TOTAL ON T	evu.		Tito mone:	UTTER			- 111	ent 1 UE	SMT 41			
JOB MO.:	88-67-18														
LOCATION:	Moab Sta	h	DATE	08-Dec-93		TIME:	05:54 PM								
ESTIMATE SUMMART															
ITEM DESCRIPTION	DETAIL	QUARTITY UNI	LABOR	EGGIS	EQUIP	FORL	REFAIRS	SUPPLIES	MATERIAL	5885	TRAVEL	COSTS	TOTAL COSTS	URIT BID	TOTAL BID
TOTAL FIXED OVERHEADS	SET 6	i LS						179,025		4		175 815 88	170 475	313 316 48	
VARIABLE JOBSITE OVERREADS	SHT 7	624 WEEES	3,651,826					117,013			93,588	179,025.00	179,025		217,326
MOSILITATION, DENOSILIATION, DE		1 88	56,374				58,000			350,600	23,000	6,001.00	3,744,624		7,500,49
CORSTRUCT BEW RAIL AND EMPAREME		18,500 LF	51,310		114,772	17,625	12,338					456,974.00	456,974		582,620
RAILROAD BOULPHEET RESTAL	SHT 10	132 80	21,316		10,910,625	11,963	12,330			832,500		55.60	1,928,545		1,248,016
CONSTRUCT LOADING FACILITY	SBT 11	1 58			19,719,963							82,656.25	10,910,625		13,244,838
BECAVATE, LOAD TRILINGS	SBT 12	7,800,800 CY	5,132,452		8,628,905	7 117 010	1 000 000			2,858,888		2,850,880.00		2,384,885.10	2,384,885
OFF-LOAD ARD DISPOSAL	SBT 13	7,800,000 CY	4,733,248			2,112,829	1,059,231				. 6	2.17	16,933,417		24,726,000
OTILITY RELOCATION AND INSTALLA		1,000,000 11	+,733,298		7,922,118	1,397,294	969,091			9		2.14	16,725,403		24,102,000
SITE RECLAMATION	SHT 15	346 AC	22 481					1,000,000	- 6	149,999	9	1,148,000.00		1,376,809.60	1,376,818
BICAYATE OVERBURDER REPOST ORT	SHT 16		32,991		81,497	13,458	18,198			340,868	4	1,403.64	477,236	1,729.73	588,198
SOIL ROCK HATRIE	SHT 17	5,500,000 CT	1,542,246		4,338,700	565,000	456,250					1.27	7,882,196	1.77	9,735,000
ROCE ARMOR	SHT 18	122,880 CY	178,847		383,787	57,256	49,217		1,168,749			14.82	1,829,856	18.63	2,287,764
RIPRAF FLACENCET		26,000 CY	57,622		85,171	12,488	18,668		868,738		- 0	39.49	1,926,663	48.65	1,249,300
HISC STRUCTURES	SHT 19	25,900 CT	55,486		81,895	12,000	10,256		715,875			35.02	875,426	42.85	1,071,250
	SHT 20	1 LS			9	- 8				100,000		100,000.00	106,000	116,335.86	116,336
COMPACT COMDITION CLAY LINKS PLACE RADOW CAP	S8T 21	425,000 CY	219,900		487,518	63,874	43,659		- 0			1.92	814,151	2.74	1,164,500
	SHY 22	218,000 CT	183,959		223,847	28,111	19,664				9	1.79	375,581	2.57	539,786
PLACE FIRAL CAP	SST 23	419,000 CY	198,850		421,324	52,280	36,948	- 4				1.69	708,602	2.44	1,022,360
FRECIEG	SHY 24	15,000 LF					- 1			180,000		12.00	188,860	13.96	293,498
HORITORING CONTROL	SHT 25	1 EA		0		8				66,500		66,500.00	66,500	77,363.35	77,363
ACCESS ROADS	SHY 26	28,000 LF	47,682		60,280	9,996	7,298		32,340			7.88	155,982	11.29	225,890
MILL SITE SOILS EXCAVATION	SHT 27	300,000 CT	277,422	8	474,279	186,617	59,376			4		3.86	917,694	4.46	1,338,000
OFFLOAD MILL SOILS	SRT 28	300,000 CY	224,757	8	378,384	53,754	37,281					2.29	686,896	3.38	1,614,000
TAILING EMBANEMENT SOILS EXCEVA		160,960 CT	92,474		158,093	35,539	19,752		9		9.	3.46	305,898	4.46	445,000
OFFLOAD EMBANEMENT SOILS	SBT 30	100,000 CT	74,919		123,435	17,918	12,427					2.29	228,693	3.38	338,888
TRAMSPORT MILL DEMO DEBRIS	SBT 31	35,000 CY	286,788		458,597	9,450	11,900					19.39	678,647	28.32	991,200
DUST \ WTROL/WATER TRABSPORT	SBT 32	11 YEAR	464,116	15,000	125,666	45,386	52,000			1,565,296		286,155.64	2,267,712	277, 204. 20	3,849,246
PERMIT: BG AND ACCESS AGRESMENT		3 BA	98,863							825,000	4,160	928,823.68		1,164,843.64	1,164,844
DESIGN COSTS	SBT 34	1 EA	500,000	8				- 6				588,888.88		1,011,616.16	1,011,616
AIR MOBITORING/HEATH AND SAFETY		11 TR	1,152,637	321,000							44,689	138,021.55		252, 351.78	2,775,869
PORCHASE LAND	SHT 36	648 AC				. 8			339,200		- 6	538.88	339,200	616.58	394,611
ARALYTICAL COSTS	581 37	11 YR					. 0			289,154		26, 286, 73	289, 154	30,580.89	336,398
Well Maintenance	SRT 38	5 yr	255,914		25,584	15,600	19,498	53,000	33,390	25,375		83,852.60	419,263		713,097
MRC Surveilance	SRT 39	10 91								415,872		41,587.20	415,872	48,388.83	483,888
Long Ferm Monitoring	SRT 48	30 year								129,866		4,880.00	129,988	4,653.43	139,603
Rovironmental Impact Statement	SBT 41	1 ea								1,500,000	1	,500,000.00	# 0.365 CAS	1,745,037.88	1,745,838

SUBTOTAL

PROJECT

Atlas Option 1 RR TransportatESTIMATOR, AGS

SET 32 OF SET 41.

PROJECT: Stlad Option i RM Transportation DATR. #8-Dec 93
CLIEBT: RTLAG CORP. RTLAG CORP.
JOB BG: BG 67-16
LOCATION. BG-67-16
BG-

2) RATES ARE BESED ON PREFAILING BACE RATES FOR SUTAB

SUBSISTIBLE AND TRAFFL COST CALCULATIONS.

ANOURTS APPLIED TO THE FIELT OF BORES OF WORL

TOPALS		25.55	22.86	\$1.25	252	833		25	28.86	器 我	129	100
15 8857.578		2 2	28.85	22 12	25.00	33.80		25	# 23	業式	13. 18	22.00
ROBELT COSTS LONGING SUMSISTRICE		25.25	28.80	29 86	255	131		33.88	58.85	25.85	292	188
200 200 400 200 200		22.22	39.86	\$1.25	818	238		29 65	8.23	22.80	133	889
COST COST EN NIGHT) (PEN NEED)												
FRAFE, TESTEL (2004/06, SERSISTRO) 8465/3   COST COST COST FES-TRE) (FES RIGHT) (FES REEL)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0											
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TRAFEL   8A533  (#ES/TRP)	***	61	27					173	100	-		
CERESAL	WINE PRESCRIPTION		TRATEL BY AUTO (DISTABT)	TEATEL AT 48TO (LOCAL)			・ 河極製板の外側線形・ 続任川原・ 様似川の	TRATEL ST ALR	THEN ST ASTO (SISPANT)	TRAFFL BY APPO (LOCAL)		
CLASS	764 718		25	Į	S :	urt Arts	SIPE BIRE	H	en i		£ :	2

TAL MIS INSTRUCT CALCULATIONS.

RENARES	STABLARD FEDERAL RATE APPLIED TO ALL BACKS PAID BATT VARIES WITE STATE, APPLIED TO ALL BACKS PAID STABLARD BY CRAT SEE MACE RATE TABLE, BASE WASD DELY BASTRIC DY CRAT, COPERAGE, FIRST 48 MOURS (AVC \$354) SALART SHOLDTERS ORL, MASE BACE DELY	
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1850	MILLA MELTA LT.	STRAIGHT

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ospertation			**	25.0	# # E
on 1 RB fre				SHB & FRM,	
Atlas Opti-	86 67-18 TERS:	MONTH VLAS	v	ESCAL PACTOR SUB & TRML NBLTIPLIER CLASS	221
PROJECT			1843 U.S. 1864	0650817108	72 TELD FORMS 73 MEGRAFIC 74 MECRAFIC 75 M

***************************************												
72 PERLO PORMAS	#.		\$18.3k	7.881	\$1.99	39 86	213 18	\$23.3%	877.85	£31 63	638 13	625.36
7) SECREPT	28		\$17.80	1.88	85 15	28 85	11.1 86	\$77.71	675 548	828 66	619 38	813.37 833.38
IN MECSANIC MALPRIX	*		\$13.00	7 885	61 88	3	£11.00	617.45	616 528	632 509	816 38	262.19
75 EET OFFERFYR	*		\$17.76	3 648	60 13	28 83	\$17.78	677.86	635.55	638.95	618.27	415.28
TE LOCAL OPERATOR	2		\$17.78	7 885	61 60	12 00	617.78	603 44	874 CE	238.00	813.47	28.928
17 01589	25		\$13.96	7 883	61 80	3 3	£11 68	811 45	F19 GB	60 ECE	913.91	15.876
78 KET LABORER	2		第3.8	7 883	61 00	2 2	611.80	617.43	619 59	95.256	R 512	W.015
79 LOCAL LABORER	2		2	1 883	69 69	1 10	113.86	417.42	F10.73	942.90	914.30	200.36
50 217871758	# -		2	7 889	61 66	22.22		\$11.41	213.30	26.778	214 W	20 3
BI BLEFFICIAR	2		2	7 825	61.68		21.7	811.93	\$15.38	\$477.00	214.38	\$18.76
82 CARPERTER FRA.	2			1981	41.73	. :	21.12	17.77	N 101	27.9.88	219.18	\$23.78
\$1 7380F87F2	3			100	E :	8 :	22 22	2 2	20.	20.00	2 2	23.00
SA CEMPET MACHINE	2			100 to 10	E :	E :	B :	2	20 80	23.85	28.00	* *
St setterent mount	000		***	1	\$ 15. 35.	# R	20.00	25.55	21.22	2 2	2 2	28.89
86 BANKSINAS			213.2	7.883	\$1.99	26.96	\$15.80	819.93	\$22.56	\$26.17	\$16.58	\$21.18
"TEL THE EIRPT"												
RR PROJECT HABIGER			\$32,89	7 885	61 04	8 25	£13 88	691 48	58.86	2	NC 268	415 18
8.9 SUPERIBRIES	1 18	200	\$27.76	1 285	61 66	21 34	\$11 1E	934 58 9 54 68	24.00	10.00	928.39	332.13
94 PROJ. SUPERFISSE	2	£	375 %	7.883	£1 85	61.57	87.78	438.37	22.22	20.80	17.735	57.8.73
91 PBGJ. 8MCIRERE	2	200	571 68	1 485	21.27	41.43	262.79	459.44		E :	17.871	\$27.56
42 1855 0071759	12	12	00 77	1,968	61.73	11.13	24.2.98	26.30	20 1	8 8.	\$13.66	\$24.77
63 PERSON		60	252.82	1.001	\$1.99	\$1.23	\$21.43	\$29.22	意思	20.00	\$17.33	\$23.38
23 CREATES	1.08	55	\$43.62	7.088	11.99	21:25	\$21.63	\$29.22	20.00	25	\$17.31	\$23.38
TIGAL				7.881	28.96	2	21	28.88	25.	22.00	19.00	26.66
96 MG TRUMECIA	1.60	83	\$28.19	7,882	83 12	\$1.75	136 16	427 48	21 913	878.35	678 18	472.01
97 85T. PROJ. RSC.	*	133	\$26.19	1880	68	£1 75	678 18	277.28	678 16	£34.35	678.15	90.025
99 ERGINEER PRCH.	20.	100	\$18.27	1.881	21 99	21.25	218.27	\$25.18	818.27	571 98	\$18.77	10.854
9.6				7.881	20 20	59.86	20 25	19 99	56 MG	18 80	20 00	66.88
				7,881	28.85	業の数	25 25	28 85	58.88	18 86	2 2	2 22
"PELL PIRE ROBLL" " "									24.44		28.88	70.00
142 OFFICE RABAGES	E		35.50	7.381	31.99	20.00	£5 65	\$11.79	514 25	116 47	118 41	613 08
183 CLERG	1.86			1.881	21.39	20 55	3.2	\$12.18	\$12.75	\$14.83	\$9.35	\$17.54
761												

	CLISM*	ATLAS CORP. 17300	a dorrer shakona sa	Fram.		20 10 10		COLUMN TO SERVICE AND ASSESSMENT OF THE PERSON OF THE PERS			10.01		=
The Month of the	LOCKFION.	Road Stab				04: D: PR		HOURLY FURL BY	M 15 RM	TEN CALLOR.			
The board for marked   The control of the control	SQUENERS RESTAL SATES			STIMATOR:		865					EVEL SUBSTITUTE	CONTRACTOR DAYSON	
The parties are stored in the parties   15 miles   15				May	6.0	100	100	1			MULTINESS AND	COINTENT PALTUR	21
The color of the	OF OPERATING	175 BOURS P	ER HORTE			MOUNT I	SCSELT.	\$08F.F		ADJUSTNERT	RORTELY	20	2
1.00   29.30   20.00   20.30	8837117108	1111		REPERT	18 E	RESTAL 176 BE/MD	1111	REPAIRS	USAGE D. N. N	PACTOR	MERLI	* 0	181
1,000   1,00	THERES, EQUIPMENT	******					The second second		1				
1.00   \$0.00	21				28	28.86	29.00	58 85		8 90			
1,000   25,000   1,0	22				1 20	68 69	60 00	20.00					
1,000   1,00	233				1 42	24.70	20.00						
MARCHENG   1.25 LCT   1.40   12.30   1.40   12.30   12.40   12.40   13.30   12.40   12.40   13.30   12.40	70					24.75	20 20	10 10		8 :			
MACERIAL MACERIAL   12,147   12,147   13,144	RITERBAL ROUTHERS	131111			1.48	E	E.	82.00		2			
SACCIONAL   (1.23 LCT)   1.00   1.0	26 CAST 588 LDR/8EB	LOADER/EACTROE		47 800	1 20	613 38	61.85	81 as a					
BACKERS    1.6.2.177	27 CAF 215 BES	SACTRON	11 35 15V1	447.244	1 88	00.00	25.00	20.00		8 :			
No. 1996   12.75   1	78 (29 )75 RFS K/9020	s promise	11-12 00.1		20.	2 2	11.00	P		2			
Factories   (2.75 GCT)   7,999   1,895   25,516   51,196   57,51	46 LAS 623 555 WITSE	0.000,000	[1.62 KT]		1.68	常式	\$4.59	\$4.25		9.90			
FELT   (2.75 LCT)   15.055   1.68   21.06   25.06	23 CAT 235 SAR	88C 5808	(7.75 LCT)	13,996	1.88	\$54.36	25.25	\$5. 80 R		8			
FEL   (2.75 LCT)   516.765   188   5168   51.88   51	38 CAF 245 868	BACEBOK	(3.75 LCT)		1.48	31.88	\$11.86	\$7.58		1.00			
FEL	25 Ann ann ann												
TELL	22 CBT 738 FBL	181	(2.75 LCT)		1.69	工工	21.88	24.99		# 86			
FELT	21 C&T 988 FEL	727	(13 M)	\$16,265	99	11.81	15.68	\$5.88 H		8			
FEL-TRACK   72.74 LCT   77,394   1.63   55.45   55.46   57.09   1.00	H C87 366 FEG.		(4.56 LCT)	\$1,650	1.89	\$47.85	27.86	36.99.8		28			
DOUTES   D	IS CAT THE PRESENT	TRL/TRACE	(1.54 LCT)	\$7,396	1.63	\$45.45	25.88	11.88.1		28			
DOUTSEAN	78 17 cas ac ass	******											
180   184	0 728 Nr. 928	50228			1.68	20.00	25	5 1					
DOURNELL	d the ne health	SCIENT CO.			28:	20.	\$5°58	5.		H			
DOTES   11,599   188   51,599   188   51,599	2 CA1 DE SAS   VB	SOURSE CAR			99 :	E .	25.58	22.55					
COMPACTOR   COMP	4 CRT 07 908	30258			1.68	20.00	27.00	\$5.25		9 9			
CORNERS   S14,115   1,415   S15,115   S16,649   S15,649   S15,64	CAT 98 578	1100		\$11,599	1.88	\$71.79	\$11.86	27.56 M		1.86			
COMPACTOR   ST. 728   1.40   55.173   55.00   55.59   8   1.40   1.40   55.173   55.00   55.40   8   5.59   8   1.40   8   5.59   8   1.40   8   55.50   55.00   55.40   8	2 LMT 99 DLE	90188		\$14,515	1.89	\$89.78	\$15.80	\$10.86 8		1.86			
COMPACTOR  CONTRACTOR  CONTRAC	2 127 14 122	285585		28 418			**						
COMPACTOR   CAN INCH	5 CAT 14 GR	CREAM		20,918	9	\$31.73 par ax	8.5	S 5. 55		2 :			
COMPACTOR   CAN INCR		-		412,128	2.00	908.63	96.86	32.46 3		8			
COMPACTOR  CONTACTOR	7 (87 563 918 0089	COMPACTOR		24 158	1.86	416 8	26 25	******					
SCHAPELING SERPEPORT 18889 1.05 56.43 510.00 52.	A SCHOOL BALE ASSISTS	COMPACTOR	189 18701	34,178	7.40	20.00	20.00	E 25		2			
SCHAPER/LINY SCHAPER/LINY SCHAPER/LINY SCHAPER/LINY SCHAPER/LINY SCHAPER/LINY SCHAPER/LINY SCHAPER/LINY SCHAPER/TELS (131 LCT) 17874 1.88 536.11 537.55 53.54 8 55.64 8 55.64	S CAP BOS POSE	COMPACTOR	Case Laco	***************************************	2 :	E :	27.98	\$2.86		3			
SCRAPER/RLMY (14 LCT) 1/874 1 1 69 516/89 54/15 55/15 56/15		COMP. BC. TOR.	08887.02001	and i	1.85	296.43	218.86	20.55		96			
SCRAPER/TERM (31 LCT) 1/97/9 1/60 5/16/19 5/15	11 CAT 615 SCPR	SCRAPER/ELEY	136 1073		1.86	2	25 35	26 35					
SCRAPER/THE CALL TO STATE STAT	2 CAT 631 SCPE	SCRAPER/SIRCLE	131 1741	17678	1 41	0164.00	41.6 35	90.13		E 1			
SCRAPEA/TRIS [31 LCT] \$22,210 1.00 5136.00 221.75 517.59 H	3 CAT 621 SCREIP	STRAPER/FRIE	(130 (C4)	114 508	1 84	2167.77	9116. 73	27.78.20		8 :			
	4 CAT 617 SCPRIF	SCEADER/PRIS	(3) (58)	613, 318		\$11.65¢	\$117.73	317.36 8					
FLOCK   RECORD   SA   1046   1.8   51.5.22   51.04			171 001	A17'798	1.80	21.39.38	\$77.13	211.36 8					
FADCE   STOCK REGISTREET   FAD   STATES   STAT	S SATER TRUCT			51.100	100	\$75.77	20 17	21.88 #		1 20			
Color	7 PARTER DORF TRACE				1 30	20	20 20	28 80					
ESCORD   U.S.   ESCORD   U.S	3 250 0000 FRUT			10 888		654.43				20.00			
	A 154 CPS COMPRESCION	3125		241,144		124.13	1.3	20.29		2			
SEPTAL SECTIONS   1 CH   1 C	S LY POR CRARE	BIRE				E :	23.00	27.00		2			
100   100	1 BARTS TARE DESPET				1 88	8 :	25.5	2		11			
NAME OF THE PASSING NAME O	7 Biffe Rache				28.1	2	200	<b>2</b> 5.		E a			
2 C C C C C C C C C C C C C C C C C C C	2 81188 MINUS			张5	86	138.75	58.73	28. 15. 推		1 80			

PROJECT:	Atlas Option 1 RR 1	ransportation	DATE		88-Dec-9	1		HT 5 OF SHT 41
CLIERT	ATLAS CORF.							M.C. 2 ME ADI 91
JOB WO.;	58-67-18		7183		84.35 F	*	SALES THE BAT	I servers
LOCATION:	Roab Utah							
			55719	MTOE:	AGS			
DEPENDED TO TRANSPORT	L BED SUBCONTRACT PRICES							
ESEB IN CORREST ES	TIBATE							
		1		7 0	- 1	1	3	
				037090		2125		
DESCRIPTI	09	QUARTITY	1917	8917	SALES	PRICE	TOTAL	
				PRICE	782	BITS TAS	PRICE	
				MENT HATERIAL PRI				
349 RIF BAF ()	FOE BIF)	17 544		*************				
150 RIF RAF TI		37,500		\$6.16			3 \$244,875.00	
351 ROCE ARMON		37,500		\$3.00		9.0.0	\$119,250.00	
	E TRANSPORTATION	131,100		\$8.97	77.7		***********	
	TORE (FOR SITE)	4,406		\$3.00			\$416,898.88	
354 PERCHASE I	Control of the Contro	648		\$5.53			\$32,369.80	
	TERIAL (FOR FIT)	71,686		\$500,00			\$339,260.60	
354 Bay Pumps			25	\$5.48		and with the	\$490,518.00	
	PERIAL TRANSPORTATION	71,466		23,00			\$33,390.00	
		141446		SUPPLY PRICES:	1.80	\$3.15	\$227,452.00	
				MALLEY CHICES				
360 BLBCTRICAL		13,186,866		56.43		76.01	*********	
361				29.50	1.66	40.00		
362					1.86			
			SUBCO	FTRACT PRICES:		90.00	90.00	
			27303	***********				
365 IESTALL TR	ACI AND BALLAST	18,588	LF	\$45.66	1.54	\$45.00	\$832,500.60	
	ON OF CONCRETE LOAD SOPPER	1	Eà	\$58,000.00	1.66		558,880,84	
	WERED CONVEYOR	2,000	15	\$650.00	1.00	100000000000000000000000000000000000000	**********	
	RAIL LOADING FACILITY	1	EA	\$100,000.00	1.00	\$300,000.50	\$300,000.00	
	RAIL DELGADING FACILITY	1	EA	\$6.999,993			1460,060.00	
370 FEBCE INST		15,000	LE	\$12.00	1.86		\$180,000.00	
371 BYDROSESD		368		96.86.86	1.86	\$640.96	\$204,000.00	
372 IESTAGL MO		2,000	LE	\$25.00	1.88		\$58,800.00	
373 INSTALL PI		1,000		\$12.00	1.00	\$12.00	\$12,600.64	
	TTLEMEST MARKERS	15	200	\$380.00	1.06		\$4,500.60	
375 IRRIGATION		348	MC .	\$460.60	1.66		\$136,000.00	
	MATER LINE (SDR 21)	111,936	Ph.	\$11.00	1.00	\$11.00	*********	
377 PUMP STATE	085			\$45,000.00	1.00	\$45,000.00	\$135,866.66	
378 SEEGE TARE	Union	786,600		\$1.00	1.66	\$1.99	\$200,000.00	
379 Well Iosta	I Lac Log	875	If.	\$29.00	1.66	\$29.88	\$25,375.06	

6.861

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LOCATION Roub train (ST-1987)													
COST JORGITH OPHIGHENS		100	8	94. 35 PE									
		ESTINATOR.	MG5										
DESCRIPTION	ARQUIRED T OR N	BEQUIPES PERFITT	11 5		1,000	1 197 197 8011?	M M M M M M M M M M M M M M M M M M M	- 10	86 46 99 98 88	800 273 404 404 404 405 405	o seas	T SAN	9 101ALS
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18. 55年度			Ę										
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19.3 图 6 3 TRKIBIRG-OPSSAPORS			1.422		*					13668			159998
194 E & S TRAINING LABORERS			1,198										
195 TRAIBING CLASS COSTS EXTERNAL			25								**		
96 TRAINTING CLASS COSTS-INTERNAL			454										
THE THE STATE OF STREET			338										
X 22													
差													Ī
** 1 集化四层系统 1 表现													-
292 CLIEBY BANED AS ADDITIONAL INTERED			87.59										•
CHO GOLLGORNO RICHE INCOMENT OF THE PART OF REST. J. T. POLLGORNO E. L. BRONDER PROPERTY.													
285 SPECIAL PARES													-
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(20)													
SITE OFFICE EQUIPMENT ****													•
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AND PART PART			989							#53			※
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\$15C\$LLARBONS (0595****													*
216 PRIMITS			21										
217 BOTALITIES ON PROCESSES													
218 TEMPORARY PERCING			1.5										
219 MOWING SIPRESES (LONG TERM PROJECT)													-
228 PROJECT 51GR			158							D 10			
222													
111										- 10			
223													
223										-			

Atlas Option | AR Transportation DATE: PROJECT: 88 Dec-93 SHT 1 OF SHT 41 CLIENT: ATEAS CORF. J08 80 i 88-67-18 T19E 84: 35 PM 10087108 Moab Itah ESTIMATOR: AGS PROJECT SUBSTICE . 524.9 WEEKS WARIABLE COST JOESITE OFERMEADS - 1 REQUIRED REQUIRED UNIT TOTAL MERRLY MERRLY MERRLY MERRLY MERELL MERELT MERELT MEEKLY MEESTLY DESCRIPTION Y CR B QUARTITY DURATION BATE LABOR LABOR 187 EQUIP EXT EQUIP FUEL REPAIRS SUPPLIES SERS TOTALS TRAVEL \*\*\*\*\*FOLL TIME EXEMPERATOR 246 PROJECT MANAGER 624 \$1,659 1,835,216 1.659 1,659 247 SUPERINTENDENT 424 \$1,413 . 248 FROJ. SEPRENISOR 624 \$1,327 249 PROJ. EMCSEER 624 \$1,188 1,482,624 2,376 2,476 754 MAS OFFICER 424 \$1,119 638,256 1,115 1,169 251 CRENIST 628 \$1,119 8 252 624 753 624 \*\*\*\*\*FULL TIME BOX ETERATION 256 BAS TROBBICS 624 \$1,292 257 857, PBOJ. 10 624 \$1,792 258 ENCIRES TECH 624 \$1,177 259 524 264 624 263 FIELD FIRES 624 \$1,269 264 MECHANIC 624 \$1,185 265 MECHANIC MELPER 3975 624 266 OFFICE HARACER 624 25.97 434,928 597 697 267 CLENE 624 \$632 8 268 624 263 624 \*\*\*\*\* | RESERVAL EQUIPMENT RESTAL\*\*\*\* 272 PRESSURE WASHER (IMPERSAL NATE) 624 136 213 SAFETY EQUIPMENT (AIR SAMPLING/OVA) 624 \$1.38 278 628 275 624 \*\*\*\*\*EXTERNAL BOSTPHENT NESTAL \*\*\*\*\* 278 OFFICE TRAILER 528 5100 279 TOOL TRAILER 424 288 CHARGE TRAILER 628 \$100 281 DECOMFAMINATION TRAILER 524 \$225 282 DAR TRATLER 624 \$180 283 FUEL TRUCK 624 \$221 164 CHEASE TRUCK 624 285 MISC. BOSEP 624 \$75 286 5178 SCALES 624 \$506 287 PROJECT VERICUES 526 \$158 288 STREET SWEEPER 624 \$390

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207		\$24								
光		17.1			-					
**** \$200 \$1 125 ****										
293 OFFICE SUPPLIES		707								
THE STREET SHEELIES		903								60
255 SAPETT SUPPLIES		234								100
2% COPT RACKING 7		404								
291 NOM SEPTICE 1		RC7								
298 UPILLIPY SEWICES		101						ì		
299 POTABLE MATER		878								
388 SABITARY PACILITIES		626	200				10 s			
381 SWALL FOOLS		929								
MI JOSSITE PROPOS		624								
36 08-5175 OC 1557185 Spill.		829								
NA OR SITH LAB SUPPLIES		979								
345 DECOMPANIENTION SUPPLIES T		629								
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英		578								
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316		175								
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114 GETTER FF (FML) TIME AF C17/481001	2 000	276	23,086					-		
315		N78								
318		875								*
100		679						•		sir
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329 TRAFEL, ESECUTIVE		823	5758							
321 名高字 白色製料及竹類 為以上班公司無数數寸		1/3	22							
322 KET LABORER ADJUSTMENT		929	. 65							
323		628							0.4	
FASTA TORSITE OFFICEASS SECTION				5,851			*	400	85	196'5
VARTURE STREET STREET STREETS				7 200 200						
	174 MEES			3,653,824		***	45	*	\$1.580	1, 744 474

CLIENT:	ATLAS CORF.	FR Transp	ortation.				RST I MATOR:		AGS .	SHT 8	OF SHT &	
208 80: LOCATION:	88-67-18 Road Etab						DATE		88-Dec-93	TIME	#4:35	PR
ITEM DESCRIPTION:	#UBILITATION, DEN	OBILIATION	DECORTAN	EATION .						JOB QUARTITY:	1	EA .
ESTIMATOR BOTES AND A ITEM DESCRIPTION-	Q7Y #	TLES	SEA	TOTAL								
LOCAL LOADS RESTORAL LOADS SPECIAL LOADS	286 158 58	28 175 1280	58 589 7588	16386 99966 75898		-DECORTAR)	WATION, ASS	SUME TWO LAS	ORERS AT 2 HOUR	S PER BACB		
MOBILIZATION DENOM - BAIL CARS	486 356			175388 188388								
BOMBO SOM LATOT	762			275600						DURATION -	1,1	124 HOURS
DESCRIPTION	QGARTITY	THE	LABOR	TRY BQUIP	EXT EQUIP	FUEL	REPAIRS	SUPPLIES	MATERIALS S	NES TRAVEL	TOTAL	URIT COST
POCAT PROMES	2.66 8/		36.99		********	*********	*********	*********	***********	8.98	************	**************

SERTOTAL 1 524 BOSEC 55 274 A A A A	CREW	****************	36.99	8.50	8.60	0.00						809913	
MATERIALS:			99122	9.50	0.56	6.50	9.86	8.00	6.94	0.00	9.99	CREW COSTS	36.99
#MOSILIZATION/DEMOS 752 BA 275,600 275,600 275,600 75,000	SUBTOTAL	1,524 HOURS	56,374	. 1								56,374	56,374.66
	MOSTLIZATION/DEMOS -PERSONNEL MOSILIZATION	15 EA					58,900					75,000	
												8 8 8	

PROJECT: CELEBT:	Atlas Option ( & ATLAS CORP.	E Transportation				ESTIMATOR		AGS		SHT 9	OF SHI	41
JOB 80:	88-67-19					DATE:		68-Dec-91		TIME:	81	35 PW
LOCATION:	Moab Btab									11100		
ITEM DESCRIPTION:	CONSTRUCT NEW RAIL	TREMEMBERS ON							30	TTITRANG BO	18,5	66 Ti
ESTIMATOR BOTES AND A	SSUMPTIONS:											
-ASSEME CONSTRUCTION -ASSEME CROSS SECTION -QUARTITY - 35,000 CT -ASSEME 50,000 CY IN (	OF EMBASKMEST AT 51			-RAIL AND I	HALLAST PLAC	EMENT TO B	É DOME BY R	IO GRANDE				
-TOTAL ASSUMED QUARTY -USE SCRAPER PLEET OF -PRODUCTION - 650 CT/I -ABD MOBILITATION SETI	3 AT AVERAGE MAUL OF M- 83000 CY/ 650	CT/88 *	138.769238	"PS BOOKS								
	The things of t	****								DEPATION -		181 HOURS
			180.755238	ROURS						bessites .		191 90980
DESCRIPTION	QUARTITY U	RIT LABOR	INT	EIT								SRIT
			41809	ROBIE	POEL	REPAIRS	SWPPLIES	MATERIALS	5885	TRAVEL	TOTAL	roce
AT 631 SCPR	3.90 £8	13.82		314.97	44.25	28.50	**********	***********	********	0.00	**********	************
AT 09 STR	1.00 %	28.61		89.28	16.88	18.86				0.00		
AT DE DIR	1.00 EA	24.61		71.29	11.60	7.58				9.86		
17 14 GOR	1.06 EA	24.61		51.73	5.00	6.58				8.88		
IT 825 COMP	1.00 EA	28.61		66.63	16.66	6.00				8.60		
ATER WAGON	1.00 EA	24.61		38.75	8.75	8.75				8.86		
CREP	1.50 53	24.61		2.46	1.50	1.00				0.60		
IZLD FORMAR	1 55	25, 387314			2.20	1,99				8		
CAL LABORER	2 BA	36.398518										
CREM	***************************************	283, 64	8.06	634, 91	97,50	68.25	0.66	6.00	6,56	8.86	BOURLY CREW COSTS	
SUBTOTAL	181 HOURS			114,772	17,625	12, 338				4	196,845	1,884.5
											130,843	18.6
ATERIALS: ESTALL TRACK AND BALLI	ST 18,500 LF								832,500		012 700	
									234,300		832,508	
TOTALS		51,316		114,777	17,625	12,338						

PRGJECT: Atlas Option 1 M CLIEBT: ATLAS CORP	R framsportation		ESTIMATOR:	MGS	SET 18	107	SHT 41
JOE #5: 88-67-18 LOCATION: Noab Stab			DATE	88 Dec	-93 TIME:		84:35 PK
ITEM DESCRIPTION. RAILBOAD EQUIPMENT (	RENTAL				JOB QUANTITY	h	132 #0
ESTIMATOR MOTES AND ASSEMPTIONS: -ASSUME PERCHASE OF MAIL ROAD EQUIPMENT AN	ED AMORTIZING FOR EFFECT LIFE						
PURCHASE TWO BLECTRIC BRGIRES			-ASSUME 11	TEARS			
132 MORTHS	16.3636 + MAIRTENIE # 153 ×	36056,8181					
PUBLIBASE 30 EA GPEM COMDOLAS 5250000 * 1.15 4573 132 MONTHS	8.6363 + MAJETSECE # 15% +	52599-4318					
DESCRIPTION ON ARTITY IN	TAL	82656 . 25			DURATION		21,126 80085
gonetii a	BÖRIS ATT PROOR EX.		TORL REPAIRS	SUPPLIES MATERI	ALS SUBS TRAVEL	TOTAL	COST
AND THE PERSON NAMED IN COLUMN TO SERVICE AND ADDRESS OF THE PERSON NAMED ADDRESS OF THE PERSON NAMED IN COLUMN TO SERVICE AND ADDRESS OF	TAL BIT LABOR INT	82656-25 E87				TOTAL	

	NAME AND ADDRESS OF THE OWNER, WHEN PARTY OF		*********					*********		-	BOSBLY	
CREW		0.00	8.60	9.86	8.68	9.68	8.95	9.96	9.44	0.90	CREW COSTS	9.69
SUBTOTAL	21,120 BOURS											1.60
MATERIALS:												
- AR EQUIPMENT RENTAL	132 100		10,5	10,625						1	# #,91#,625	
											0	
TOTALS		•	8 18,5	18,625					1	9 1	P, 910, 625	82,656.25

11 Jan 10	M 55 M	
11 188	118.	JOS DIGARTITY
823	88 Dec 93	
ESTIMATOR.	2012	
Aciss Option   RM fransportation ATLAS CORP.	55-57-19 Road 31:ah	COMETRRET LOADING PACILITY
PROJECT.	JOS RO. LOCATION.	ITEM MESCRIPTION.

ESTIMATE DOTES AND ASSUMPTIONS.
-ASSUME CONSTRUCTOR OF 1980 LF CONTROL STSTEM TO SIDING FRACES.
-ASCOUND CONSTRUCTED A FERR NOFFER STRUCTURE FOR LOADING BY DOLES.
ASSUME USING A SILO LOADING FACILITY AT THE SIDING SITE 1200 PF CARACITY.

TI SO 80985 POTAL DOMATION . PANEL SHES REPAIRS SUPPLIES MAMERIALS 1934 Eps. 7 THE STATE OF 1,4308 5817 DOMETITY

MESCH PYTON

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CREW COSTS	-	# # # # # = = = = = = = = = = = = = = =
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6.8 6.8 6.8 6.8 6.8 6.8	9 30085	2,000 17
CHEN	Sustofal	MANTRAIRES CONSTRUCTOR OF COMPANY DESTALL COMBER CONVEYING CONSTRUCT BAIL UNABLES FACEL CONSTRUCT BAIL UNLOADING FACEL

7,658,888,88 968 KG L # 8 2,850,880

98f 12 9F 5Hf 41 CLIERY: ATLAS CORP. 208 \$0 88-67-18 DATE: 88 Dec 93 YIME: 84:35 PM LOCATION. Road Stab ITEM DESCRIPTION: EXCAVATE, LOAD TAILINGS 208 GBARTITY: \*\*\*\*\*\*\*\*\*\*\*\* ESTIMATOR MOTES AND ASSUMPTIONS: FUEL FOR LOCOMOTIVE # 5 SPH IDLE AND 50 SPH UNDER LOAD # AVG 7,800,000 -ASSUME PRODUCTION BASED ON LOADING PACILITY AND TRANSPORTATION CAPACITY 26 GAL PER HOUR PER BACH ASSUME 25 GORDOLA'S AT 94 THE PER BACH & THO THIPS PER DAT -FUEL COSTS FOR DIESEL AT 8.8 ASSUME AVERAGE CONVERSION OF TAILING AT 1.4 TORS PER CT -PRODUCTION . 6500 THS PER DAY . 3461 CT PER DAT - DURATION × 1888888 CT/ 3461 CY/BAT - 2253,68390 DAYS OR - 6.17647645 TEARS AT 7 DATS PER WEEK ALL TEAR ROUND 3640 HE/TR 8.46881502 FEARS AT 5 DAYS PER WEER ALL TEAR BOOMD 2580 HR/TR -ASSEME USING 1-637, 2-50, 1-MATER TRUCK AND 1 GRADER FOR SECAVATION -ASSUME USING 3 CONVEYOR AND LOADING OPERATORS AND 3 LABORERS PURATION . 22,537 80085 BESCRIPTION TIME TTITMAGE LESOR ERT EIT DEST EQUIP FUEL REPAIRS SUPPLIES MATERIALS SORS TRAVEL TOTAL BOULF CAT 631 SCPRIP 1.86 EA 24:61 136.68 23.75 17.58 8.68 CAT 14 GER 1.00 EA 51.73 6.39 6.58 EAT DE BIR 2.60 EA 49.21 142.58 22.00 15.00 8.86 PICKUP 2.00 EA 8.92 1.08 2.98 CAY 966 PEL 1.66 88 24.61 47.95 7.88 6.00 8.00 LOCAL OPERATOR 3.00 Eh 73.82 8.98 LOCAL LABORER 3.00 \$5 55.45 0.00 BOURLY CREW 227,74 \$.96 382.88 \$1.75 \$7.00 8.00 8.00 CREE COSTS 715.37 SERTOTAL 22,537 BOURS 5,132,452 8 8,628,985 1,393,650 1,059,231 0 16,212,238 2.88 MATERIALS: -FUEL 901,478 GAL 721,179 721,179

ESTIMATOR.

TOTALS 5, 132, 652

PROJECT.

Atlas Option 1 99 Transportation

# 8,628,905 2,112,829 1,859,231

0 16,931,617

2.17

480		84.15.78		Adventages
40				
588 13		7188		JOB DRAWTITY.
KGS		#8-Dec-\$3		
\$51788108.		0473.		
Transportation				
Atlas Option   RR Transportation	ATLAS CORP.	81-13-89	Node Brad	OFF-LONG MAD BISPOSAL
PROJECT.	CLEER	708 80;	LOCATION.	ITM ASSETTING

ESTEMATOR NOTES AND ASSUMPTIONS.
-ASSUME OFF-LOADING OPEN TOP GOMEOLAS WITH MODERING BACINGS.
-ASSUME NATURALIS LOADING OPEN OF STOCKPILE BY SCRAPER WITH DOCEN ASSISTANCE.
-ASSUME NATURALIS 1-20, GARGES, RATER TRUCK AND COMPACTOR, BACINGS OPENATOR NO FOREHARD.

7, 500, 805

22,517 80985 DUBARTION .

	geagriff	E E	LABOR	TEL SQUIP	RUT ROUTE	1881	REALIES	SUPPLIES	SATTRIALS	2005	THATEL	POTAL	COST	
43338	1.86 (1)		24.61	************	71.79	11.66	1.59	***********			0.86	***************************************	2 5 2 7 3 4 8 8 8 8 8 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7	
	7.89 53		49.21		289.98	23.59	13.88				3 .			
	1.04 54		24.61		66.43	20 5	6.90				2			
					25 22	9 )	3							
	1.66 53				51.12	2 3	95.9							
	12 86 13		55.39								3			
	1.86 53		78.61		2.46	25.	8				3			
	1 13		24.687186								- 100			
	2 53		16 998913											

	47.00 (16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	965,091 0 0 16,725,683	
M 20 47 44 47 47 48	#51713 B5138	9 9,625,738 1,397,256 9	
- C C	78.417	22,537 80885 4,733,248	
220		SWETOTAL	MIBINS

8 9,625,738 1,397,294 969,891 6, 733, 740

# 16,725,403

2.14

JOE NO: LOCATION:	ATLAS CORF. 58-67-10 Moab Stab						DATE		08 Dec-9)		TIME:		04:35 PK
	ETILITY RELOCATI	ON YND IN	STALLATION								OB QUARTITY		1 \$8
ESTIMATOR MOTES AND AS	SEMPTIONS.												
-RELOCATE POWER POLES -SERVICE TO LOADING NO -SERVICE TO DEP LOADIN	CILITY		35000 25000 45000 35000										
			148994										
											SOLLYWES		BOURS
DESCRIPTION	TTITHADQ	UNIT	LABOR	181	827 8001P	THEL	REPAIRS	SUPPLIES	MATERIALS	SBBS	TRAVEL	TOTAL	UNIT

ESTIMATOR: AGS SET 14 OF SET 41

PROJECT:

Atlas Option 1 RR Transportation

BLSCTRICAL -OTILITY SERVICES	1 EA					1,0	960, 960		140,000		1,000,000 140,000 8 9	
MATERIALS:												
SUBTOTAL	# MOURS											1.60
CREW		8.66	6.60	9.60	0.60	9.80	0.60	8.60	0.66	0.00	BORRLY CREE COSTS	8.86

0 285 1	26 16 58	BJ (() ) LB	38 85
SRT 15 07 SRT 43	4148	2011	JON CHASTITY.
MSS	83 -3an - 63		
ESTIMATOR.	2878.		
961			
Sties Option   RR Transportation	88-47-18	Road Utah	SITE RECLAMATION
PROJECT	JOB 80:	LUCATUR.	172k MSCRIPTION.

ASSEMB RECLAMATION OF 128 ACRES
ASSEMB FACTAGENESS OF SILTS SOLES FOR GROUNS COTEN AT 4 19CHES TRICK
QUANTITY IS ASSEMBED TO BE 59212 CT
-BSR 2 SCRAPURS AT COMBINED PRODUCTION OF SAC CT/HR AT 2000 TT MASS.
DSRAPURS.

192 80885

HATERIALS SERS TRAFEL TOTAL COST	
32 16	# # # # # # # # # # # # # # # # # # #
1357	88.5
IRT SIT SQUIP RODIF	213.28 21.13 21.13
LABOR	10 10 10 10 10 10 10 10 10 10 10 10 10 1
111111111111111111111111111111111111111	
SESCET 1108	CAT 613 SCPR   1 CAT 14 SCPR   1 CAT 14 SCPR   1 MATER TROCK   LABORER   LACCAL LABORER   LACCAL LABORER   LACCAL LABORER   LACCAL LABORER   LACCAL   LABORER   LACCAL   LABORER   LACCAL   LABORER   LACCAL   LABORER   LACCAL   LABORER   LACCAL   LABORER   LACCAL   LABORER   LACCAL   LABORER   LACCAL   LABORER   LACCAL   LACCAL

K\$40	SUBTOTAL	MATERIALS: REDROSEED AND NELCH IRRIGATION	
	192 BOURS	38 18	
166.93	11,691		
2			
403.14	31,497		
= =	13,458		
8 5	18,199		
2	-		
- 2	*		
2		281,886	
2			
30903 48 6 48 9 58 58 50 50 50 50 50 50 50 50 50 50 50 50 50	137,236	284, 889	 
713.82	19 (8)		

1,483.64

411,236

349,888

2

13,658

81,497

32,091

TOTALS

PROJECT: Atlas Option | WA fransportation ESTIMATOR: AGS SET 16 OF SET 61 CLIERT: ATLAS CORP. JOB #0: 88-67-16 DATE: 88 Dec-93 TIME: 84:35 PK LOCATION: Hoab Stab ITEM DESCRIPTION: ENCAVATE OVERBURDER REPOSITORY JOB GUARTITY: exercise of d ESTIMATES BOTES AND ASSUMPTIONS: 5,500,00 -ASSEMB BSING 631 FLEET AT 2000 FOOT BADL

-ASSUME PRODUCTION OF TIME CY/ER DURATION : 5500000 / 1100 CY/88+ 5889 BOURS

BURATION -

5,000 BOERS

DESCRIPTION	MARTITY	8817	LABOR	IRT RQUIF	EGGIF	TOKL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	BRIT COST
CAT 631 SCPR	5.00 E		123.84		524.95	73.75	67.58	********	1011112989531	********	5.68	**********	***************
CAT 89 DER	2.86 8		45.21		178.56	32.00	26.86				8.00		
CAT DO DIR	1.00 8		24.61		71.25	11.66	7.58				8.08		
CAT 14 GDR	1.90 (1		24.63		\$1.73	6.08	6.58				8.99		
MATER WAGON	1.09 1		24.61		38.75	8.75	8.75				9.56		
PICEUP	1.00 E				2.46	1.50	1.99						
FIELD FORMAN LOCAL LABORER	1.06 £		25.39								8.96		
DOLAL DESCREE	2 88		36-990918										

CREW	***************	388.45	1.10	867,74	133.86	91.25	6.00	0.00	8.64	9.68	BOURLY CREW COSTS	1,466.64
SUBTOTAL	5,600 ROOKS	1,562,246	9 4,	338,700	665,000	456,250					7,802,196	1.27
MATERIALS:												

TOTALS

# 4,338,784 665,898 456,258 1,542,246

8 8 8 8 7,002,156

1.27

PROJECT: Atlas Option ! RR frameportation ESTIMATOR: 865 SHT 17 07 SHT 41 CLIERT ATLAS CORP 208 80: 58-67-18 BATE 88-Dec-93 TIME: LUCATION: Road Stab ITEM DESCRIPTION: SOIL BOCK MATRIE JOS QUARTITY: 122,880 CY

ESTIMATOR MOTES AND ASSEMPTIONS.

-QUARTITY IS ASSURED TO BE 61488 CT OF BOCK AND

\$1400 CT OF SOIL

-ASSUME DELIFERY OF ROCK & 1889 CY/DAY

-DURATION -61.4 DATS OR 614 BOURS

-INCLUDE CASE TO PLACE SOILS

84:35 PK

										MOTTARED		616 BOURS
DESCRIPTION	QUARTIFY DELF		187 RQUIP	EET EGOLP	FUEL	REPAIRS	SUPPLIES	MAYKRIALS	5885	TRAVEL	TOTAL	EMIT COST
CAT 631 SCPR	3.00 EA	73.82		314.97	44.25	28.58	********	************	*********	8 96	***********	***************
CAT 14 GDR	1.00 EA	24.61		51.13	6.98	6.58				1.99		
CAT 563 FIR COMP	1.44 53	24.61		25.32	5.00	4.80				8.50		
CAT 09 023	1.00 ZA	24.61		89.28	15.00	10.66				8.00		
LOCAL LABORER	3.60 SA	55.49								8.00		
CAP 566 FEL	1.00 EA	24.61		47.85	7.86	6,80				8.00		
CAT DO DER	1 8A	24.687184		71.29	- 11	7.5						
WATER TRUCK	1 EA	24,687184		25,22	i	3						
CHEM		Vic ac		7 W W				×			MORMET	
1,588		276.95	6.86	625.06	93.25	65.50	8.96	9.66	8.89	9.86	CREW COSTS	1,868.76
SUBTOTAL	614 BOSRS	178,847		383,787	57,256	40,217					651,387	5.30
MATERIALS:												
ROCK ARMOR (FOB PIT)	92,100 78							875,871			875,871	
ROCE ARMOR TRANSPORTATION	52,1 <b>00 TR</b>							292,878			292,878 8 8	
TOTALS		170,047		383,787	57,256	49,217	8	1,168,749			1,828,856	14.52

PROJECT: CLIENT:	Atlas Option   RE frameportation ATLAS CORP.	ESTIMATOR:	AGS	S87 18 0	F SRT 41
J08 NO. LOCATION:	88-67-18 Weath Urah	DATE:	88 Dec 93	7195:	84:35 PM
ITEM DESCRIPTION:	BOCE ARNOR			JOB QUARTITY:	25,800 CT

ESTIMATOR BOTES AND ASSUMPTIONS:
-ASSUME CONVERSION AT 1.5 THS PER CT
-PLACE ROCK BY DOZER, LOADER AND TRACE LOADER
-ASSUME DELIVER OF STONE AT 1000 CY/DAY - 1500 TR/DAY
-TOTAL LOADS AT 23 TOR PER LOAD - 65 TRUCKS PER DAY

-ASSUME SAME QUENTIFY OF FILTER MATERIAL

		374 90063
DESCRIPTION QUARTITY URIT LABOR INT SET  ### ### ############################	TRAVEL TOTAL	GRIT COST
***************************************	**************	*******************
CAT 966 FEL 1.00 SA 24.61 47.05 7.00 6.00	0.00	
CAT DE DER 1.00 EA 24.61 71.25 11.00 7.50	0.06	
CAT 963 FEL[T 1.00 ER 24.61 45.65 6.00 7.00	0.60	
LOCAL LABORER 1.00 EA 16.39	8.00	

CREM		[18.8]	1.60	163.79	24.86	28.50	8.90	8.00	5.66	9.00	EXERCITE COSTS	312.10
SUBTOTAL	520 HOURS	57,622	-	85,171	12,680	10,660					165,933	6.38
NATERIALS; BOCK ABMOR (FOB PIT) BOCK ABMOR TRAMSPORTATION FILTER MATERIAL (FOB PIT) FILTER MATERIAL TRAMSPORTATI	35,000 TB 35,000 TB 36,400 TB 36,400 TB							379,896 124,828 256,868 115,752			376, 898 124, 826 256, 968 115, 752 8 8	
TOTALS		57,622		85,173	12,488	19,668		860,738			8 8 8 8	39.49

PROJECT: CLIENT:	Atlas Option 1 RR framsportation ATLAS comp	#STIMATOR:	AGS	SET 15 07	587 41
JOB NO: LOCATION:	88-67-18 Moah Brah	DATE:	#8-Dec-93	1182	64:35 PM
IPSM DESCRIPTION:	RIPRAP PLACEMENT			JOS QUARTITY:	25,800 CT

ESTIMATOR BOTES AND ASSEMPTIONS:

-ASSUME CONVERSION AT 1.5 THE PER CY
-PLACE ROCK BY BOIRE, LOADER AND TRACK LOADER
-ASSUME DELIVER OF STONE AT 1888 CT/DAT - 1598 TR/DAY
-TOTAL LOADS AT 23 TOR PER LOAD - 65 TRUCKS PER DAY
-ASSUME PLACING RIPRAY IS DRAINAGE DITCHES AND CRANNELS

-ASSUME SAME THICKNESS OF FILTER LATER

									Answering .		366 81683
DESCRIPTION	PIRE TTITRADQ	LABOR II	NY ENY USP EQUIP	FUEL	REPAIRS	SOPPLIES	MATSKIALS	SUBS	TRAVEL	TOTAL	UNIT COST
*** *** ***	******************	************	************	*********	*******	*******	*********	******	*********	*********	**************
CAT 966 FEL	1.90 EA	24.61	47.85	7.99	6.86				8.00		
CAT DS DIR	1.60 EA	24.61	71.25	11.06	7.58				0.00		
CAT 963 PELIT	1.00 %	24.61	85.45	6.86	7.86						
LOCAL LABORER	2.00 Eh	36.99	451.43	8.00	7.44				9.88		
	2.89 80	28.73							8.00		

TOTALS		55, 406		81,895	12,000	18,258		715,875			875,426	35.02
											:	
											:	
FILTER MATERIAL TRANSPORTATI	35,800 78							111,300			111,300	
FILTER MATERIAL (FOR PIT)	35,000 78							119,250 240,650			119,250 240,450	
RIP RAF TRANSPORTATION	37,500 TR 37,500 TB							244,875			284,875	
RATERIALS: RIP RAP (FOR PIT)	11 Fee 70											
SERTOTAL	500 BOTES	55,486		81,895	12,000	19,258					159,551	6.38
CREN		110.81	8.66	163.79	24.00	24.54	5.66	6.00	0.00	9.96	CREW COSTS	319.10
											<b>原の際に</b> す	

387 483	M. JS PN	21.1
85	*	
* 18	1116)	JOS DUMBETTV.
863	48 Dec -33	
ESTTAATOR:	DATE.	
M frassportati		
Atlas Option   28 Transportation ATLAS CORP.	85-47-1\$ 80ab 81ah	RISC STRUCTURES
PROJECT		

SSTIRATOR NOTES AND ASSERTIONS.

CESTRIB DRAIBACE STRUCTURES BILL BS REQUIRED, FROM BOE COLVERT TO SEADMLISS.
ASSUME AS ALLORANCE TO 188, 888 FOR ENTIRE PROJECT.

	2	2				
A LIBERT	6-86 6-89 6-80 6-89 8-89 8-89 CARR CARR			- 8 -	 	 
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		1445		-NISC STRUCTURES		
	CHES	SIBTOTAL	NATERIALS.	35		
			MA	新		

186,986,89

186,880

199, 989

MAIL COOK	And the second of the second											
PROJECT: CLIENT:	Atlas Option   DR fr	sesperiation				ESTIMATOR:		AGS		SET 21	OF SRI	41
208 80:	ATLAS CORP.											
LOCATION:	88-67-18					DATE:		\$8-Dec-93		TIME	84:	35 EN
	Moab Utab											
ITEM DESCRIPTION:	COMPACT COMBITION CLAY	LIMER							X	TITHADQ BO	425,4	13 69
-BSE SCRAPERS TO MO	ING 3 7007 OF LINER AND RE-		COMBITION	INC.								
	MAL D-S FOR RIPPING OF ROCI FOR TO KEEP UP WITH COMPAC											
DURATION .				***								
	425000 CT/ ABLE OR SITE FROM STORAGE I CE OF 1200 FT	SURGE TARE FOR	CT/MR * DUST COMY	386.363636 ROL AND COMP	ACTION MEED	S						
										DSD 108		384 WORKS
#SCRIFFIOR	COARTITY DRIF	LABOR	799									
Markett 1100	Annutiti nuti	PEROE.	187	EIT								5110
*************	******************	*********	10015	41002	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	COST
AT D9 DIR	2.00 Es	49.21		178.56	22.45	34 64	*********	**********	REALISTS		**********	************
AT DO DZE	1.00 EA	24.61		71.28	32.66	20.00				0.00		
AT 14 CDR	1.00 21	24.61			11.80	7.50				0.00		
AT 825 COMP	2.00 EA			51.73	5.00	5.50				9.99		
AT 631 SCPR		49.21		132.86	26.66	12.69				8.50		
	5.90 RA	123.84		524.95	73.75	47.50				0.00		
ATER HAGON	2.88 EA	45.21		77.50	17.50	17.59				8.88		
CAL LABORER	3.66 EA	55.49								0.88		
IELD TORMAR	2 88	58.174628										
ICKUP	* 2 EA			4.92	3	2						
CREW	*************	49/ 47									BOURLY	
		426.15	9.90	1841.81	163.25	113.60	0.00	9.86	9.90	0.06	CREW COSTS	1,744.
SUBTOTAL	386 WOORS	164,650		682,518	63,874	43,659					673,981	1.
ATERIALS:												
PREMET COMPACTION	625,000	55,258.00		85 500 00								
THE RESERVE	112,000	23,230,00		85,800.00							144,258	
TOTALS		219,980		487,518	63,874	63,659					814,151	1.9
											*******	1.3

Colmo .

SBT 22 OF SBT 41.	84,35 PE	219,886 CT
10		
22 (48)	1186.	JOS QUARTITY.
800	68 Dec 93	
SSTIMATOR:	DATE	
Atlas Option ( RM Thansportation ATLAS CORP.	58 47 14 Koab atab	PLACE RADOR CRP
MGRCF.		CRIPTION.

ESTIMATOR NOTES AND ASSURPTIONS.

ASSENS FLACENCES OF TO RADOR CAF AT 1 FOOT OF MATRIAL. USE SCHAPERS TO NOTE THE MATRIALS -INCLUDE AS ASSITIONAL D-9 FOR RIPPIEG OF NOCE

PRODUCTION AT 1100 CT/HM 213000 CT/ 1100 CT/SR · 136 90300 - ASSUME MATER MAXIMALE OF 1300 TO POST CONTROL AND CON

DESATION . 191 BORES

Cratavina	ANNESS DE BELLE			-								
MODEL TO THE PARTY OF THE PARTY	Now III Sent	TOPE	EDELP.	11800	7327	REPAIRS	S8PFL185	RATERIALS	SBBS	TRANSI	POTAL	TOS
CAT D9 DER	1 88 13	24.61	00 00 00 00 00 00 00 00 00 00 00 00 00	85.28	16.88	16.86			25235221	6 8 8	A * * * * * * * * * * * * * * * * * * *	THE PARTY OF PARTY OF
T 06 012	1.66 83.	24.61		11.29	11 86	1.56				9 9		
T 14 GR	22 25	24.61		\$1.73	98 9	95 9				9 90		
T 825 CDRP	2 64 23	13.61		132.86	28 20	17.86				4 80		
F 631 SCPR	5.84 23	123.64		524.95	13.78	67.58						
TER BAGGE	2.89 EA	49.21		27.56	25 (1)	25 12				2 2		
CAL LABORER	1 66 51	55,49										
ELD FORMA	2.88	36.776638										
488	1 22			2 07	*	*						

CREW	SUBTOFAL 191 BOORS	MATERIALS.	PREMET COMPACTION 218,000		
	URS				
191.55	76,659		21,386.88		
2	*				
1.88 952.53	\$ 181,847 28,111		42,988,88		
147.25	28,111				
8 (8)	19,666				
2					
2					
*					
2	8 36,281				
8.94 6.38 6.36 9.36 CRES COSTS	36,281		# # °	 ~ *	
1,686.33	39.1				

375,581

19,664

28,111

123,847

183,959

TOTALS

PROJECT Atlas Option 1 RR Transportation ESTIMATOR: AGS SHT 23 OF SHT 41 CLIENT: ATLAS CORP. 308 #0: 88-67-10 DATE #8-Dec-93 TIME 94:35 PH LOCATION Moab Blab ITEM DESCRIPTION: PLACE FIRST CAP JOB QUARTITY \$19,800 CT ESTIMATOR BOTES ASSEMPTIONS: -ASSUME PLACEMENT OF FIRST COVER AT 2 FOOT THICK USE SCRAPERS TO NOTE THE MATERIALS -INCLUDE AN ADDITIONAL D-9 FOR RIPPING OF ROCK -PRODUCTION AT 1189 CT/BR -DURATIOS = 1180 CY/88 + 380.309694 415994 CY/ -ASSUME WATER AVAILABLE OR SITE FOR DUST CORTROL AND COMPACTION MESOS -ASSUME HAUL DISTANCE OF 1200 FT - MOITARUE 381 BOURS DESCRIPTION TIRE TRITANCY LARGE 213 THIT EDBIF 41901 FUEL REPAIRS SUPPLIES MATERIALS SUBS TRAVEL TOTAL COST CAT B9 DIR 1.00 55 24.61 89.28 10.65 0.80 CAT DS DER 1.06 65 24.61 71.29 11.88 7.58 8.88 CAT 14 608 1.06 EA 28,61 51.71 6.46 6.58 8.86 CAT 825 COMP 1.08 EA 24.51 66.63 18.66 6.00 8.86 CAT 631 SCPR 5.08 EA 123.64 524.95 73.75 47.50 0.06 WATER MAGON 2.80 EA 49.21 77.58 17.58 17.58 6.88 LOCAL LABORER 3.00 ES 55.49 8.88 FIELD FORMAN 2 88 54.774628 PICEUP 2 BA 4.92 3 2 BOURLY CREW 376.94 886.18 137.25 0.00 8.88 8.80 CRBM COSTS 1,497.29 SUBTOTAL 381 BOOKS 143,580 8 337,524 52,280 36,948 8 578,332 1.36 MATERIALS: -PREWET COMPACTION 4:7,888 54, 678.68 81,868.68 138,279

TOTALS

198,858

6 421,324 52,280

36,948

1.69

17 653	16 180	84.15.79		5, 248 1.9
40	NOT 18 AT ANY ANY ANY ANY			
500 30		6182		JOR SHARFIFE.
800		88 (sc. 9)		
ESTRAFOR.		22,40		
Atlas Option 1 88 Transportation	ATLAS CHP.	81-13-88	Knab Blak	DKIK
PROJECT.	CUBBL	208 801	LOCATION.	TER DESCRIPTION. P.

ESTIMATOR NOTES AND ASSUMPTIONS.
-ASSUME TRACING OF PREHINTER OF REPOSITORY FOR INSTITUTIONAL CONTROL

BASATION . BUINES

COST TOTAL TRAVEL 2982 REPRING SUPPLIES RATERIALS 1881 EGGIP 18t spare 1,4809 guarity mir DESCRIPTION

	8	2.					
MARKET W	\$100 \$2.00 \$1.00 \$		181, 866			-	TD 400 1
	2	-					
	8.1		198, 988				
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	1.8	*					
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San San San Street, or other Street, or	2						
	9.99	*					
	# .						
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warmen and the state of the sta		8 90395	17 886 11	*			
	CHEN	SMITOTAL	MATERIALS. FERCE INSTALLATION				

12.86

183

198, 849

PU\*AL5

PROJECT: Atlas Option 1 RA Transportation CLIERT: ATLAS CORP. 208 NO: 88-47-18 LOCATION Boah Stab ITEM PESCRIPTION: MOMITORING CONTROL

ESTIMATOR: 3GS SBT 25 OF SBT 41

68-Dec-53

84:35 PM

TIME JOB QUARTITE

1 13

ESTIMATES BOTES AND ASSEMPTIONS:

ASSUME INSTALLATION OF 10 PIETOMETERS

ASSUME INSTALLATION OF 28 MONITORIES WELLS AT 188 PT DEPTH

-ASSUME ALLOWANCE FOR SETTLEMENT MARKERS AND SURVEY MOMBHERTS

DURATION - BOURS

DESCRIPTION	POARTITE	DELT			100.0	FUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	URIT COST
***************		********	*********	*********								1.47.100	1001

DATE

W-100											Tanana and	
CREM		1.90	8.66	1.60	8.66	0.00	0.00	8.80	1.90	8.90	BOURLY CREW COSTS	6.6
SUBTOTAL	• HOURS											8.0
ATERIALS:												
ASTALL MOMITOR WELLS	2,600 LF								58,888		58,906	
ASTALL PIRTOMETERS	1,000 LF								12,000		12,769	
ESTALL SETTLEMEET MARKERS	15 BA								4,500		6,580	
											4.	
Bress a								_				
TOTALS									66,500		66,500	66,588.6

PROJECT: Stlaw Option 1 RE fransportation CLIPME ATLAS COMP CLIERT-ATLAS CORP.

SSTIMATOR:

AGS SMT 16 OF SMT 41

J09 #0: 88-67-18 LOCATION-Word Stab ITEM DESCRIPTION: ACCESS ROADS

DATE 88-Der-93 \*IME:

84:35 PH

JOB QUANTITY: 29,000 13

ESTIMATOR MOTES AMP ASSUMPTIONS:

-ASSUME ACCESS ROAD ALONG MEN HAIL SPUR AMB REPOSITORT AREA -ASSUME BOAD AT 12 FOOT BIDE AND 4 INCHES THICK

QUANTITY - 2933.3333 CT

-ASSUME CONSTRUCT AT SW LF HR +

488 ROTES

DURATION -

600 HOURS

DESCRIPTION	 QUARTITY	TING	LABOR	187 91808	EIT EQUIP	TUES.	REPAIRS	SEPPLIES	MATERIALS	5085	TRAVEL	TOTAL	UNIT
CAT 14 SDR	1.00 \$		58.71		**********	********	********	*********	********	*****	********		**************
			24.61		51.73	4.86	6.58				6.98		
CAT DS DIR	1.98 E	8	24.61		71.29	11.99	7.59				8.66		
WATER TRUCK	1.06 E	A.	24.61		25.22	6.00	3.08						
LOCAL LABORER	1.00 8		18.50		27.44	0.00	2,80				8.90		
			10.78								9.00		
PICERP	1.00 8	À			2.46	1.50	1.98						
FIELS FORMAN	1.00 E	1	25.39								0.00		

SUBTOTAL 400 WIGHS 47 503 8 CA 300 0 000 3 300	TOTALS		47,082	60,280	3,886	1,200	ě	32,360		155,902	7.88
SUBTOTAL 600 MORES 17,002 0 50,200 7,000 0 0 0 123,552 5.10 MATERIALS: CRESSED STORM (FOR SITE) 6 400 TE											
SUBTOTAL 600 MORES 17,002 0 50,200 7,000 0 0 0 123,552 5.10 MATERIALS: CRESSED STORM (FOR SITE) 6 400 TE										0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
SUBTOTAL 600 HURS 47,282 0 60,250 5,000 7,200 0 0 0 123,562 5,10		8,488 TR						32,348		32,348 8 8	
CRSR 117.70 0.00 150.70 22.50 10.00 0.00 0.00 0.00 0.00 CRSM COSTS 305.50		600 ROURS	47,982	 68,288	5,000	1,298				123,562	5,18
ROURLY	CREM		117.70							BONES C	388.58

PROJECT.	Andrea Program I am M.											
CLIERT	Atlas Option   RR Tr ATLAS CORP	ausbol/stide				ESTIMATOR		MS		567 27	DF SI	FT (8)
208 #0	88-67-10					No.						
LOCATION-	Moab Stat					DATE:		48-Dec-93		TIME:	81	1-35 PM
ITEM DESCRIPTION:	MILL SITE SOILS EXCAVAT	108								OB QUARTITY	200	909 (7
ESTIMATOR BOTES AND	are many nace									ine Answeritt	309	80E (1
ASSUME PRODUCTION ( ASSUME 25 GUMBOLA'S ASSUME AVERAGE COM	BASED OF LOADING FACILITY I S AT 90 TWS PER BACK # TWO VERSION OF TAILING AT 1.4 1	TRIPS PER DAY YORS PER CY	TION CAPAC	311	ES	EL COST OF		# 8 709	CAL			
	THS PER DAT - 3461 CT PER I											
DURATION .	300000 CT/	3461	CY/DAY +	86.6881582				DAYS PER ME			3648 ER	/TE
-ASSUME USING 2-617, -ASSUME USING 3 COMP	, 2-D8, 1-BATER TRUCK AND ; FETOR AND LOADING OPERATORS	GRADER FOR E AND 1 LABORS	ICAVATION RS			4.33338219	ISAMS AT 3	DATS PER ME	RE ALL TE	AE ROUMD	2600 RE	/ 73
										DURATION		867 BOORS
MESCRIPTION	CHAMPITY SELF	LABOR	187	EIT								
			KOULE	EORIP	PUEL	REPAIRS	SUPPLIES	MATERIALS	SUBS	TRAVEL	TOTAL	COST
AT 631 SCFRIT	2 80 Ei	49.21	********	273.26	*****		*******	**********	*******		*********	***********
AT 14 COR	1.00 EA	24.61			47.58	35.00				9.88		
AT DE DER	2.00 EA	49.21		51.73	5.90	6.58				8.99		
CERP	* 3.00 EA	97-23		142.58	22.98	15.86				9.86		
IT 966 FEL	1.00 SA	28.61		7.38	4.58	3.86						
CAL OPERATOR	3.88 SA	73.82		47.85	7.98	6.00				8.66		
CAL LABORER	4.00 EA									8.80		
ATER TRUCK	1 23	73.98		25.22	- 4					8.00		
						3				٠		
CREW	***************************************	320.05	8,60	547.16	91.80	68.59	8.66	0.00	0.00	8.00	BOURLY CREW COSTS	1,426
SUBTUTAL	867 BOORS	277,422		474,279	78,879	59,376					889,956	,
TERIALS:												
UEL	28 422 500											
Ves	34,672 GAL				27,738						27,738	
											8	
											4	
											4	
TOTALS		277,422		674,279	186,617	59,376					***	
						27,218					917,694	3.1

Atlam Option 1 RR Transportation PROJECT: ESTIMATOR: AGS SBT 28 07 SHY 41 CLIERT: ATLAS CORP. JOB #0: 88-67-19 DATE: #8-Dec-93 TIME: 05:54 PM LOCATION Hoab Stah ITEM DESCRIPTION: OFFLOAD MILL SOILS JOB QUARTITY: 300,000 CT

## ESTIMATOR MOTES AND ASSEMPTIONS:

-ASSUME OFF-LOADING OPER TOF COMBOLAS MITS HOURTED BACKHOE

-ASSIME MATERIALS LOADED OUT OF STOCKFILE BY SCRAPER WITH DOZER ASSISTANCE

-ASSUME USING 2-631, 1-DB, GRADER, WATER TRUCK AND COMPACTOR, BACKHOE OPERATOR AND FOREMAN

										DURATION		867 BOORS
DESCRIPTION	QUARTITY BRIT	LABOR	EQUIP	810016 814	FUEL	REPAIRS	SUPPLIES	EATERIALS	SUBS	TRAVEL	TOTAL	UNIT
CAT DO DIA	1.80 83	24.61	*********	71.29	11.00	7.58	**********	**********	********		***********	***************
CAT 631 SCPR	2.06 EA	49.21		209.98	29.50	19.88				8.98		
CAT 825 COMP	1.00 EA	24.61		66.43	16.66					8.60		
WATER TRUCK	1.06 83	24.61		25.22	1.66	6.00				8.89		
CAT 14 GDR	1.00 EA	24.61		51.73		3.00				9.86		
FIELD FORMAN	1.00 EX	25.39		31.13	6.88	6.58				9.66		
PICKUP	1.00 51	24.61		4.60						0.00		
LOCAL OPERATOR	1 88	24.507184		2.46	1,58	1.08				8.88		
LOCAL LABORER	2 88	36.590318								. 6		
CREW	***************************************		*******	********			*********				BOURLY	
CREE		259.24	8.66	427.11	62.00	43.68	8.88	0.00	0.80	8.86	CREW COSTS	791.35
SUBTOTAL	867 HOURS	224,757		378,384	53,754	37,281					686,896	2.29
HATERIALS:												
											0	
POTALS		224,757		. 384	53,754	37,281					685,096	2.19

FROJECT: Atlas Option | RR Fransportation ESTEMATOR. AGS S#T 29 OF SHT 41 CLIENT ATLAS CORP. JOR 80: 88-67-18 DATE #8-Dec-93 刊框: #4:35 PM LOCATION: Woah Wish ITEM DESCRIPTION: TAILING EMBAREMENT SOILS EXCAVATION JOB QUANTITY: 188,968 CT ESTIMATOR BOTES AND ASSEMPTIONS: FUEL COST OF 8.8 PER GAL ASSUME PRODUCTION BASED ON LOADING PACILITY AND TRANSPORTATION CAPACITY ASSUME 25 GOMDOLA'S AT 90 THE PER BACH # TWO TRIPS PER DAY ASSUME AVERAGE CONVERSION OF TAILING MY 1.4 TORS PER CT PRODUCTION - 4500 THE PER DAY - 3461 CY PER DAY -DURATIOR -188868 CY/ 3461 CY/DAY - 28.8933834 DAYS OR - 8.97915995 YEARS AT 7 DAYS PER WEEK ALL YEAR ROUND 3549 HR/YR # 11112839 TEARS AT 5 DAYS PER WEEK ALL YEAR ROUND 2688 NR/YR ASSUME USING 2-637, 2-08, 1-WATER TRUCK AND 1 GRADER FOR ESCAVATION -ASSUME USING 3 CONVEYOR AND LOADING OPERATURS AND 3 LABORERS BURATION -289 BODRS BESCRIPTION GUARTIPY UBIT LABOR TRI 713 TIKU \$061F EGSIP FUEL BEPAIRS SUPPLIES MATERIALS SUBS TRAVEL TOTAL COST CAT 637 SCTRIT 2.00 E3 49.21 273.20 47.58 35.00 9.96 CAT 14 GDR 1.89 EA 24.61 51.73 5.00 5.50 0.00 CAT DE DER 2.00 11 49.21 142.58 22.86 15.88 8.86 PICEUP 3.80 EA 7.35 6.50 3.00 CAY 966 FEL 1.00 83 24.61 47.85 7.00 5.88 9.86 LOCAL OPERATOR 3.00 EA 73.82 8.88 LOCAL LABORER 4.00 EE 73.98 8.66 WATER TRUCK i ga 24.687184 25.22 BOURLY CHER 328.85 547.16 51.00 68.58 9.00 0.00 CREW CUSTS 1,826.71 SUBTOTAL 289 HOWES 92,474 # 158,093 26,293 19,792 296,652 2.97 MATERIALS: -FUEL 11,557 GAL 9.246 9,746

TOTALS

92,676 0 158,093 35,539 19,792

8 8 9 385,898

3.86

650 JOB (DIANT)TT. 聚 編8 98 Dec 93 803 ESTIMATION. DATE. Rilas Option 1 RM Transportation ATLAS CORF. EM-57-FR Road Erah OFFLIAD DMARREWSF SOILS FRENET: CLIEST: 308 NO: LOCKTOS: ITMS MSCEPTOS.

M. 35 FR 100, 886 CT

18 185

ESTIMATE ANTES ARE ASSUMPTIONS.

ASSUMB OFF-LOADING OFFE TOP COMBOLES WITH MOURTED BACKROU ASSUMB MATRIALS LOADING OUT OF STOCKFILE BY SCRAPEN WITH DOZER ASSISTANCE ASSUMB SSIMC 2-631, 1-00, SANDER, WITH TROCK AND COMPACTOR, BACKROU OFFRATOR AND FOLIDIAR

289 BUBNS	1813 102	
ĕ	TOTAL	N = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 =
DURATION -	FRANKL	222222
	2585	
	RATERIALS	新香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香香
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	573 686 486 85- 386 880 880	5 2 2 2 5 2
	IN.	2 5 2 2 2 5 1 5 2 7 7
	112	71.29 206.18 25.22 51.73 2.66
	TINGS .	
	LABOR	24.61 24.61
	100	
	QUANTITY.	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
1	UNSCRIPTION	CAT DB ETR CAT 631 SCPR CAT 631 SCPR RATE TRUCT CAT 14 GDR FICED FOCKL GORACION LOCAL GREATOR

791.35	2.29
NEW COSTS	228,899
8	
9.0	-
9. 90	-
8.86 8.96 8.96 8.99 CARN COSTS	
	12,427
10 H	17,918 12,427
E-88 427.11	123,435
0	*
673.18	14,515
	285 80885
	SHRIVERS

228,699

12,423

17,918

123, 435

14,919

TOTALS

PROJECT-Atlas Option | RR Transportation ESTIMATOR BGS . SH? 31 OF SH? 41 CLIEST: ATLAS CORP. 208 80: 88-57-18 DATE 88-Dec-93 TIME. 84:35 PM LOCATION-Road Stab ITEM DESCRIPTION: TRANSPORT WILL DENO DEBRIS JUE QUARTITY: 35,860 CT

ESTIMATOR MOTES AND ASSUMPTIONS:

-WITH DEMO DEERIS ASSUME IS CT PER 16 CT END DOMP -ASSUME TRANSPORTING BY TARPES ENDOUNF # 2 HE ROUND TRIP -USE 16 TRUCES AT 10 HOURS PER DAY - 50 LOAD PER DAY

35000 CT/

500 cy PER DAY .

78 DATS

798 BOSRS

DURATION -

700 BOURS

DESCRIPTION	Geraliai swil	LABOR	EGGIF	TIS TINDS	FREL	REPAIRS	SUPPLIES	MATERIALS	5985	TRAFEL	101AL	UNIT
CAT 235 BKH	1.80 EA	24.61	********	55.36	6.58	6.88		***********	*******	9.80	***********	**************
CAT 966 FEL RED DUMP TRUCK	1.00 EA 10.00 EA	24.61 246.87		47,85 541.38	7.68 9.66	5.89 5.88				8.98 8.98		

			 							BOORLY	
CREM		295,29	\$43.71	13.50	17.00	8.86	9.99	1.66	0.00	CREW COSTS	969.50
SUBTOTAL	700 BODRS	286,700	450,597	9,450	11,300	9				678,647	19.39
HATERIALS:											
										1	
										1	
TOTALS		285, 788	458 597	9.150	11 588					(3) (4)	

PROJECT: Atlas Option CLIENT: RTLAS CORP.

Atlas Option 1 89 Transportation

CSTIMATOR:

AGS

SRT 12 OF SRT 41

JOS BO: LOCATION: 88-67-18

So-bi-10 Hoab Stab

ITEM DESCRIPTION: DUST CONTROL/WATER TRANSPORT

DATE:

88-Dec-93

TIME: #4:35 PK

JOB DOWNTITT

AL YEAR

ESTIMATOR BOTES AND ASSUMPTIONS.

ASSUME DUST CONTROL IS REEDED OVER CERTAIR AREA OF HAUL AND ACCESS ROAD OVER COURSE OF PROJECT.

-USE ONE WATER TRUCE, PURP AND DRIVEN

-ASSUME INSTALLTION OF 6 INCH MOPE WATER LINE

DURATION +

22,000 BOURS

DESCRIPTION QUARTITY URIT LABOR 18T RET REGISTRATE SUPPLIES MATERIALS SUBS TRAVEL TOTAL COST

TEAMSTERS 1.00 EA 21.10

CREN		21.10	9.56	8.60	8.66	6.60	9.00	8.00	8.80	8.88	CREW COSTS	21.18
SUBTOTAL	22,000 BOURS	464,116									464,116	42,192.36
MATERIALS: HDPE 61MCH WATER LIME (SO	N 2 111,936 LF								1,231,296		1 221 262	
- PUMP	1.88		15,000						1,121,176		1,231,296	
PUMP STATIONS SURGE TANK	3 ER 200,000 CAL								135,000		135,898	
-BUT WATER TRUCK	1 EA			125,600	45,300	52,000			290,000		290,060 222,306	
											1	
B1811												
TOTALS		464,116	15,868	125,000	45,300	52,600		0 1	,566,295	- 0	2,267,712	286,155.64

PROJECT Atlas Option 1 RR Transportation ESTIMATER: AGS 587 33 OF 587 41 CL1887: ATLAS CORP. JOB 10: 35-47-18 DATE: 68 Dec-93 TIME: 84:35 PM LOCATION-Koab Stab ITEM DESCRIPTION: PERMITTING AND ACCESS ACRESHEST JOB QUARTITY. I EA ESTIMATOR MOTES AND ASSPRITTIONS-ASSUME 3 ENGINEERS FOR 1 TEAR 2888 80085 ENVIRONMENTAL INPACT STATEMENT \$750,000 ASSUME PERMIT PEES \$15,000 \$825,866 DERATION -2,080 90095 DESCRIPTION QUARTITY DRIT LABOR 187 111 1180 EQUIP EQUIP FUEL REPAIRS SEPPLIES MATERIALS SUES TRAVEL TOTAL PROJ. EMGINEER 2.00 ER 47.53 2.68

	**********				*********						BORN Y	
CREM		47.53	9.99	9.05	9.00	9.00	1.60	9.66	8,08	2.86	ROURLY CREW COSTS	49.53
SUBTOTAL.	2,050 BOUSS	38,863								4,168	183,823	183,823.88
BATERIALS:												
PERMITTING	1 88								825,000		825,960	
YOYALS		70 503									•	
191868		98,863							825,800	4,160	928,823	928,023.00

PROJECT: Atlas Option | RR Transportation ESTIMATOR: AGS SBT 34 OF SRT 41 CLIENT ATLAS CORP. JOB \$0: 85-67-19 DATE #8-Dec-93 TIME: 84:35 29 LOCATION: Moab Btab ITEM DESCRIPTION: DESIGN COSTS JOB QUANTITY 1 11 ESTIMATOR BOTES AND ASSUMPTIONS. -ASSEMB DESIGN COST OF 586986

500000

DESCRIPTION QUARTITY DRIF LABOR INT RIT RET UNIT REPAIRS SUPPLIES MATERIALS SHIS TRAVEL TOTAL COST

PROJECT: CLIENT:	Atlas Option 1 RR Transportation ATLAS CORP	ESTIMATOR:	AGS	587 35	OF 581 41
JOS NO. LOCATION.	85-67-18 Wood Stab	DATE:	88-Dec-93	TIME:	84:35 29
ITEM DESCRIPTION:	AIR MOMITORING/HEATH AND SAFETY			JOB QUARTITY)	11 11

ESTIMATOR BOTES AND ASSEMPTIONS.

-ASSUME HORITORING FOR AMBIERT DUST PH-18

-ASSUME 4 STATIONS IN THE EXCEVATION AND 3 AT THE REPOSITORY

-ASSUME ONE TECHS TO BUR SYSTEM ALONG WITH RADOR CARISTERS AND HIRI RAM AND PERSONNAL MOMITORS.

-ASSUME IGAT TEAM ONCE PER TEAM MONITORS QA/QC

OBSCRIPTION QUARTITY UNIT LABOR INT EXT

EQUIP EQUIP FUEL REPAIRS SUPPLIES MATERIALS SUBS TRAVEL TOTAL COST

MAS TECRNICIAM 2.00 EA 51.69

2.00	Control of the last		*********	dan Languago	o marine						MATERIA IN	
CREW		51.69	9.96	0.60	9.08	9.60	8.86	9.90	0.00	2.00	BOURLY CREW COSTS	53.69
SERTOTAL	22,300 HOURS	1,152,637								14,586	1,197,237	188,839.13
MATERIALS:												
-AIR MOMITORING EQUIPMENT -BIO ASSATS -TLS PANCES -MAS SUPPLIES -IQAT	1 EA 11 TR 11 TR 11 TR 11 TR		166,008 68,068 5,606 132,008 44,008								166,896 66,396 5,806 132,806 64,806	
TOTALS		1,152,637	321,000							44,500	1,518,237	138,#21.55

SHE N OF SHEET	84.25 PB	
40		
58 285	THE:	wall delicated has
224	#8-Dec-93	
\$STINKTOR.	DATE.	
Atlas Option 1 RR Pranaportation ANNAS COMP.		
Attles Option ATLAS CORP.	88-67-1# Roab Dt.ah	PURCHASE LANS
20.80T.	JOS NO. LOCKTOR.	THUS DESCRIPTION.

ESTIMATION NOTES AND ASSECTIONS.

ASSUME PURCHASE OF LAMB FOR REPOSITORY AND ACCESS ROADS

80885	1800
	TOTAL
PERKTION	783.68
	SUBS
	MATCRIALS
	SHALLES
	REALES
	1987
	ROUTE ROUTE THELE
	SQUIP SQUIP
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DESCRIPTION

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8.80 0.80 CRIN COSTS		339,286	 	
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1.60 0.50	-	339, 288		
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	8 ROBES	37 885 27		
CREW	THADLES	NATRIALS: PURCHASE LABB		

236.85

339,786

339,288

SHL 41	M. 35 78	11 78			ROUNS SWIT COST	. 85 . 285 33
	#				-	8088.7 F.2854 NOSTS 8 8 8 8 9 154 (855 8 9 154 ) 154 (855 8 9 15 )
80					TOTAL	BOOR 2269, 154
SHT 33	1135	JOS DEAFTITT.		SE SE	DURATIOS .	•
		708		AQ 35 88	SUBS	80 TELEVISION TO THE TELEVISION THE TELEVISIO
AGS	88-Dec-93			SEC. 25	NATTRIALS	-
				ASSEMB MOMITURIAG CONCE PER MESE O 7 LACAPTOS POR 11 TEADS - 6004 SAMPLES PLUS ON 0-35 PER BACK	REPAIRS SUPPLIES MATERIALS	
SSTIRATOR.	845 845 846 803			20 20 20 20 20 20 20 20 20 20 20 20 20 2	6/7) 606 907 907 908 961 861	* *
				# 7 LACATTO	Ħ	
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sportation				無機 経過ない	17804	* *
M Tran					8-1 85	
les Option i	88-67-3# World Train	TICAL COSTS	-585	78888 154154 65889 28898	рециттт	6 11 SECON 61
# 5	80 4	ARALT	ASSIMIT	( POST)		
PROJECT,		MIPTIOS.	KSTIRATOR NOTES AND ASSURPTIONS:	RADIOLOGICAL SIRVET (POST) ALB MORTPORING GROTECHNICK GROTECHNICK	S#SCR1991108	CREW SHETCH ALS. -ARAL TSIS

PROJECT: Atlas Option 1 RR Transportation ESTIMATOR: RCS SHT 18 OF SHT 41 CLIEBT: ATLAS CORF. 208 \$0-88-67-18 DATE 88-Dec-53 #4:35 PB LOCATION: Road That ITEM DESCRIPTION: Well Maintenance JOB QUARTITY: 5 17

ESTIMATOR MOTES AND ASSUMPTIONS:

-Assume Mells only operate for 5 years Labor - 104000 - Assume using 1 operator and 1 truck full time Wells 8- 175 if/year -7- 4.0cb Estractive Wells Poape 0 1.5 ea/year -7 3.75 inch estraction pumps

Mells and pumps need changed every two years Assume wells # 50 feet deep

Period of time .

5 years

DURATION - 10,400 HOURS

FOTALS		255,914	è	25,584	15,600	19,499	53,000	33,398	25, 375		419,263	83,852.68
											0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
STS for Wells ELECTRICAL	2 Ata						5,888 48,888		25, 375		25,375 5,888 45,868	
MATERIALS: Buy Fumps and Riser Well Installation	18 ea 875 lf							33,396			33,396	
SHITOTAL	18,400 BOURS	255,916		25,584	15,688	10,600					347,498	61,699.68
CHEM		24.61	1.00	2.46	1.50	1.66	8.06	8.56	0.00	0.00	BOURLY CREW COSTS	25.57

PRIJET Atlas Option 1 R# Transportation

ESTIMATOR: AGS S87 39 OF S87 41

CLIERY: ATLAS CORP. 208-80-88-67-18 LOCATION: Moab Itak

DATE: \$8-9ec-53 THE 84:35 PR

10 91

ITEM DESCRIPTION: MRC Surveilance JOB QUANTITY:

ESTIMATOR NOTES AND ASSUMPTIONS.

Assume 18 hours per month

-fotal .

year 1 192 hours/year year 2-18

114 5 per bour

384 bours/year

DURATION e ROURS DESCRIPTION QUARTITY URIT LABOR IRT EST 0817 EQUIP EQUIP PUEL REPAIRS SUPPLIES MATERIALS SUBS TRAVEL TOTAL 

CHEN		0.56	8.00	8.60	9.98	8.86	9.89	5.90		CREW COSTS	0.00
SUBTOTAL	8 NOTES										8.60
MATERIALS:											
-MRC Surveilance	3,648 hours							415,877		415,872	
FOTALS											
TOTALS								415,812	3	415,872	41,587.20

=	35 78	M years
100	*	
8		
381 89	TIME: \$44.35 PM	JOR DESERTITY.
\$28	報 965.93	
E37188708.	100	
ion i RR Transportation	94-77-99 Sold Preh	Milbring
		-
Modern.	208 NO. LOCATION.	ITEM DESCRIPTION

STRETTE BYTES (SP. ASSEMPTIONS)

Assume quarterly mamples of 2 wells for 10 pears

-Cost per sampling event opproximately 31,000 -Cost assumtion at \$4,000 per year.

685	21.00	4503	
8			**********
		16731	***************************************
New Title .		TRATEL	SALES SALES
		3083	***********
		MATERIALS	CERTERIOR
		28174485	***************************************
		REPAIRS	STATISTICS OF
		FUEL	HILLIAN IN
	111	41803	STEELINGER
	181	80017	**********
	11801		SALISMAN STREET
	1180		E271122224
	90481177		"我用我们在我们小小一把我也就有我也不得我把你不知识我们的我们的我们
	RSCR19710#		医甲状腺性溶液 医阿拉拉氏试验检检检检检检检检检检检检检检检检检检检检检检检检检检检检检检检检检检检
	Marc.		*

	# RUBS	Long term mentioning 30 year		
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		38,880		
*				
8-88 8-88 8-89 8-89 8-89 8-89 8-89 8-86 CRENICOSTS		13,66	 	
3 .	2			

1, 866.90

179,668

POTALS

PROJECT: CLIERT

Atlas Option 1 RR Transportation

ESTIBATOR:

DAYE.

AGS

SHT 41 OF SHT 41

308 WO-LOCATION: ATLAS CORP. 88-67-18

Hoab Stab

#8-Dec-93

TIME

84,35 78

ITEM DESCRIPTION: Environmental Impact Statement

JOB GEARTITY:

1 48

ESTIRATOR MOTES AND ASSEMPTIONS:

Assume cost of \$15 at 1.5 million

DURATIOE -

HOURS

DESCRIPTION

QUARTITY URIT

LABOR

INT 753

BRIT

EQUIF EQUIF FUEL REPAIRS SUPPLIES MATERIALS SUES 

CREE \$.66 SUBTOTAL 8 90595 9.00 MATERIALS: -Environmental Impact States 1 ea 1,580,880 1,560,600

POTALS

8 1,500,000

8 1,500,000

1,500,000.00

FROSECT-Sties Option | RR Transportation CLIERY ATLAS CORP. 358 NO 1 18-67-18

Boah Stab

LARGE BASED OR

S# RODES/MERKE

19,398,685 162,368 }

EQUIPMENT BASED OF 176 BOURS/MORTH CHECK ON JOR TOTAL: ""FROM RECAP PRESENTATION TOTAL SHEET

1,232,#25 |

RECAP SEET!

LISCATION

TOTAL TOTAL LABOR LABOR FOTAL SUR & 1 EQUIP EQUIP FOR 4 RENTAL 1 BODES MEEKS LABOR TRAFFL | SQUIPMENT ROURS WEEKS REPAIR COST | SUPPLIES OFF DRIT TOTAL president approximation property and the contract and the # | -DECONTANIMATION SEPPLIES SA NON REACTRICAL LOCAL LABORER 168,378 2,807.6 2,596,352 980,580,1 883\*\*\*\*\* LOCAL OPERATOR 486,463 8,129.3 18,881,879 # ICAY 631 SCPR 79,561 1,957.4 1,929,368 8,353,132 |-575 for Wells 5 918 5,000 FIELD FORMAR 31,382 627.6 796,715 # |CAT BS DZR 12,139 298.7 315,622 1,083,798 1 -PREWET COMPACTION 137,426 79,443 1,954.5 1,469,762 5,663,517 ( e icar os bis TRANSTERS 22,800 400.0 465,116 # ICAY 14 GDR 54,731 1,346.5 684.135 2,831,721 1 PROJ. ENGINEER 4,146 \$3.3 98.863 4,168 [CAT 825 COMP 25,409 625.1 486,548 1,687,935 ( -DESIGN AND SEPPORT 500,000 8 HATER BACOR 7,097 178.6 128,200 275,014 1 868 TECRETCIAN 44,600 892.8 1,152,637 64,600 PICKUP 98,323 2,222.2 225,888 222,195 1 |-RE BOSTFREET RESTAL 19,518,625 | 25,233 629.8 1,040,854 3,446,883 / ICAY 637 SCPRIT CRY 966 FEL 26.027 640.3 330,345 1,224,550 1 -FOEL 758,162 BATER TRUCE 26,055 641.0 182,385 657,167 ICAT 563 WIR COMP 614 15.1 5,526 15,669 CAT 963 FELIT 1,820 25.1 13,268 66,359 CRT 735 BEE 788 17.2 8,758 38,752 | ERD BUMP TRUCK 7,086 172.2 3,500 378,910 1 PINE 15,988 -BUY MAYER TRECE 222,368 |-BIR MOBIFORIBG EQUIPMENT 168,860 I-BIO ASSAYS 19,000 TLD BADGES 5,000 -MAS SUPPLIES 132,866 1-IDAT 11,988 RECAF SUBTOTAL 648,983 12,979.7 15,747,581 48,768 ] 635,353 10,710.7 6,747,994 38,202,052 | 1,053,060 ADMIB SUBTOTALS 3.655,824 93,680 ] 8 8 | 179,025 

6,767,994 38,202,852 |

DATE

98-Dec 53

84:35 PM

ESTIMATOR: AGS

CRCF OF 30R 7				
H E		TOTAL	775, G46  175, G46  175, G46  19, P46  19, P46  19, P46  19, P46  11, 186	8,881,297
59 NOBES   WEEK   176 NOBES   WENTH		1188 118	20 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 A A A A A A A A A A A A A A A A A A A
LANCE BASED ON EQUIPMENT BASED ON		8085	-PRESCRIETATION ORGANIS   -PRESCRIETA NATURE AND SELECTION OF CONTINUE	
action		16797	9 9 9 1 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3,176
Atias option   BM Transportation Aflas coRP. 89-67-19		1180 1170	· · · · · · · · · · · · · · · · · · ·	
	LOCATION: Mish Blah MECAF SMERT:	MATRIAL	SOCIA AMENINA (FOR FIT) SOCIA AMENINA TRANSCONTROL FILTER MATERIAL FRANSCONTROL FILTER FRANSCO	***************************************

88-bec-93 No.35 PR 1182:

SSTIMATOR.

## WESTERN NUCLEAR, INC.

UNION PLAZA SUITE 300, 200 UNION BOULEVARD, LAKEWOOD, COLORADO 80228
TELECOPIER (303) 989-8993
TELEPHONE (303) 989-8675

TH' HOA OI TYNIDINO NULLER HO. RETURN ORIGINAL TO POR, HQ.

December 1, 1993

DEC O/ 1993

DEC 1993
RECEIVED

Mr. Ramon Hall, Director Uranium Recovery Field Office U.S. Nuclear Regulatory Commission P.O. Box 25325 Denver, CO 80225

RE: DOCKET NO. 40-1162, SUA-56, LICENSE CONDITION NO. 10, DAY LOMA

Dear Mr. Hall:

In accordance with Nuclear Regulatory Commission [NRC] letters dated 02 August 1991 and 26 November 1991, please find enclosed four [4] copies of a comprehensive analysis of the long-term performance of the reclaimed Day Loma site relative to current closure criteria set forth in Appendix A, 10 CFR 40. The analysis was performed by Centurion Nuclear, Inc. [Centurion].

Western Nuclear, Inc. [WNI] believes submittal of the Centurion analysis satisfies NRC requirements regarding license termination and, therefore, requests that all references to the Day Loma site be deleted from SUA-56.

We look forward to our 01 December 1993 meeting with you to allow Centurion the opportunity to discuss the results of their analysis.

Should you have any questions, please contact us at your earliest convenience.

Sincerely,

The state of the s

Stephanie J. Baker Manager of Environmental Services

SJB/tic w/attachments cc: RWC EMS H. Shaver, Esq.

DESIGNATED ORIGINAL

Certified By many c. Hovel

94-0100

one tabor center \* suite 2500
1200 seventeenth street \* denver, colorado 80202

(303) 623-8317 twx 910-931-2561

December 1, 1993

Mr. E.M. Schern Western Nuclear, Inc. 200 Union Blvd, Suite 300 Lakewood, Colorado 80228

Dear Mr. Schern:

Re: Day Loma Property

Enclosed herewith is a report ("SMI Report") prepared by Shepherd Miller, Inc. ("SMI"), of Fort Collins, Colorado. The SMI report was prepared at the request of Centurion Nuclear, Inc. ("CNI") to evaluate the property commonly referred to as the Day Loma Heap Leach in Fremont County, Wyoming.

The SMI report is submitted to assist Western Nuclear, Inc. ("WNI") in obtaining deletion of the Day Loma Heap Leach site from its source materials license. The Nuclear Regulatory Commission ("NRC") staff, while recognizing that the reclamation work performed at the site complies with all license conditions, has questioned whether or not the site meets current "closure criteria" as developed by NRC staff.

If the site does not meet current closure criteria, the deletion may nevertheless still occur if it is demonstrated that meeting such criteria will not further enhance the protection of health nor further minimize the danger to life or property. The SMI Report shows that the existing condition at the site has reduced the risk to the public health and safety as low as reasonably achievable and therefore deletion of the site should occur.

As you will see from the data in the SMI Report, compliance with NRC staff's current interpretation of the closure requirements would cost approximately \$3.0 million despite the existing reclamation work having met all license conditions imposed by the NRC. The SMI Report demonstrates that, in the context of the Gas Hills Mining District, the Day Loma Heap Leach site does not present, by itself, any meaningful risk to the public health.

Accordingly, when (i) the cost of achieving the very minimal improvement to the public health and (ii) the other socioeconomic considerations arising from further activity in the area are considered, the only logical conclusion is to leave the site in its current condition.

As directed by Appendix A to Part 40<sup>1</sup>, the SMI Report takes into account the local and regional conditions in the area of the Day Loma Heap Leach site. Part of these conditions are, of course, the history and impacts of the mining activity in the area. Key points in time specific to the Day Loma Heap Leach site are presented in the following table.

1961	WNI obtains a source materials license that includes the Day Loma Heap Leach Site
1961	WNI begins operation of Day Loma Heap Leach
1963	Operations at Day Loma Heap Leach suspended
1966	Operations at Day Loma Heap Leach renewed
1972	Operations at Day Loma Heap Leach terminated
1978	Property sold to Energy Fuels; CNI becomes owner; Energy Fuels Nuclear, Inc. ("EFN") becomes contract operator for CNI; WNI remains as licensee
1980	WNI Source Material License renewed with requirement that reclamation plan for Day Loma Heap Leach be submitted to NRC
1981	Plan for on-site reclamation of Day Loma heap leach material submitted to NRC; NRC requests amendments to the drainage channel design; license amendment issued directing reclamation of the Day Loma Heap Leach Site in accordance with amended reclamation plan
1981	Operations at Split Rock Mill under License SUA-56 terminated
1982	Reclamation work performed at Day Loma Heap Leach Site; Construction Report submitted to NRC; NRC review and supplemental information requested and submitted

<sup>&#</sup>x27;10 Code of Federal Regulation ("CFR") 40, Appendix A

1983	NRC determines that "No further action is necessary"
1984	Inspection of reclaimed Day Loma Heap Leach Site; Vegetation, erosion and stability concerns raised;
1985	Remediation plan submitted for vegetation and erosion issues;
1986	Remedial work performed on Day Loma;
1987	WNI formally requests deletion of Day Loma Heap Leach Site from its source materials license
1989	NRC reviews reclamation activity on Day Loma Heap Leach Site concludes "reclamation activities were performed in accordance with license requirements" and that "No further action is necessary concerning site reclamation activities"; NRC inquires as to ability of WNI/CNI to transfer land to a government entity if such action is determined necessary
1989	WNI responds to NRC inquiry as to nearby residences and population centers, activity of reclaimed material, possible uses of the land and status of land ownership
1990	NRC requests submittal showing either that (i) site meets "current" closure criteria or (ii) meeting "current" criteria will not "further enhance the protection of health nor further minimize the danger to health or property"
1992	NRC denies deletion of Day Loma Heap Leach Site from source materials license
1993	BLM declares mining claims covering Day Loma Heap Leach Site void
1993	Preparation of Shepherd Miller Report

The reclamation plan as originally submitted went through revisions requested by the NRC staff. As finally implemented, the plan addressed all concerns raised. It is important to remember that the material being reclaimed was not mill tailings with their attendant concerns but rather heap leach material that was very similar to other mine spoils in the Gas Hills District.

As noted above, the mining claims that had been held by CNI and others have been declared void by the Bureau of Land Management ("BLM") for lack of ongoing assessment work. We believe the surface rights may be held by a ranching concern. As of this date, there has been no discussion of land status with the BLM. We are unable to transfer ownership of the land to any government entity. We have not addressed perpetual care given the lack of any meaningful risk to the public health and safety from this specific site.

There are several points from the SMI Report that are worth reiteration. In its current condition, the Day Loma Heap Leach site meets all radon flux criteria. In fact, under data collected by consultants to the State of Wyoming, the radon flux from the Day Loma Heap Leach site is lower than much of surrounding area.

The SMI Report shows that the Day Loma Heap Leach site will not adversely impact groundwater in the area. Prior data collected by CNI shows that there are no residences within several miles of the site and any habitation near the area is extremely remote given the general condition of the area.

It is possible that erosion of the area could expose the heap leach material. Such exposure is likely to occur, if ever, in the context of a storm event that will result in erosion of significant amounts of material surrounding the Day Loma Heap Leach site. The SMI Report evaluates this situation in terms of the contribution the heap leach material would make to the exposure of the public to radium activity in the area downstream of the Day Loma Heap Leach site.

In summary, the SMI Report concludes that the contribution of the Day Loma Heap Leach site is 1.2% of the soil loss to the downstream point and 8.5% of the radium activity at that downstream point. The balance of soil loss and radium activity comes predominantly from other mine spoil in the area. An expenditure of some \$3.0 million to reduce this very limited contribution to some slightly smaller percentage is not practicable.

Inevitably, the quarrying of rock, the moving of earth and other construction activities associated with further attempts at enhancement of the existing situation will result in the risk of industrial accidents and impacts to air quality. The risk of injury or loss of human life may be much greater, and certainly more immediate, than the small incremental increase in the concentration of radionuclides in the environment should a failure of the heap leach cover occur. These health and safety risks can be avoided by leaving the existing approved reclamation cover in place.

We anticipate that WNI will renew its request for deletion of the Day Loma Heap Leach site from its source material license based on the data and conclusions contained in the SMI Report. A meeting with the NRC staff that has been scheduled for December 1, 1993, will further that proce 5.

Sincerely,

Rich A. Munson

/ram enclosure

## OF THE DAY LOMA HEAP LEACH AREA

Prepared By:

Shepherd Miller, Inc. Fort Collins, Colorado

November, 1993

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# 1.0 INTRODUCTION

The reclaimed Day Loria Heap Leach area is located within the Gas Hills Mining District of Fremont County, Wyoming, approximately 60 miles southeast of Riverton. This report evaluates the reclamation of the heap leach and also evaluates its significance in relation to the surrounding mined lands. The evaluation includes an erosion potential analysis of the existing reclaimed heap leach area, radiological conditions of the heap leach and surrounding spoils (as a result of significant mining activity within the area), regional ground-water quality, and associated impacts in the event significant erosion occurs.

### 1.1 Background

Centurion Nuclear, Inc. (CNI), completed reclamation of the Day Loma Heap Leach area on July 2, 1982. Western Nuclear, Inc. (WNI), remained the holder of the source materials license for the site. Reclamation activities included regrading of the heap leach area, placement of random fill, placement of a two foot layer of clay material, and placement of approximately six inches of topsoil, in accordance with a plan developed by CNI in conjunction with Nuclear Regulatory Commission (NRC). Diversion channels were constructed parallel to the reclaimed area to provide runoff protection of the outslopes of the heap leach area. The NRC determined that reclamation met all license requirements and in 1987, WNI requested deletion of the site from its license. In August 1990, NRC requested that WNI review the reclamation design and construction, and compare the closure with current reclamation criteria, or show that meeting the criteria would not further enhance the protection of health.

In response to the August 1990 NRC request, CNI directed Shepherd Miller, Inc (SMI) to evaluate; (1) the erosional stability of the site pursuant to current NRC reclamation criteria, (2) the impacts to the public health from failure of the reclamation, and (3) the cost of meeting current closure criteria and the benefits therefrom. In task (1), SMI used the NRC's "Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill

Tailings Sites," (August 1990) to evaluate Day Loma erosional stability in conjunction with the reclamation criteria presented in 10 CFR Part 40, Appendix A.

In addition to the erosional stability analysis under the STP, a comparison of erosional impacts to a downstream point from the heap leach area and the surrounding spoils was conducted to assist in the determination of whether further reclamation efforts are warranted. This comparison was performed to assess the risk to human health and safety from loss of the reclaimed heap leach material, as opposed to loss of the surrounding exposed spoil material which will occur regardless of what work is performed at the heap leach site. An evaluation of current radiological conditions including the existing radon barrier covering the heap leach material was also made.

# 1.2 Purpose of Report

This report has been developed to evaluate the reclamation performed on the heap leach, the overall significance of the heap leach with respect to the surrounding disturbed and mined lands, compliance with regulatory requirements, and to determine whether any significant impacts can be anticipated which would pose a threat to human health and safety if no further work is performed. In addition, the site was evaluated to determine if any significant benefits would be gained from additional reclamation efforts and the costs for such reclamation activities.

# 2.0 CURRENT LAND STATUS

The Day Loma Heap Leach area is located in the S1/2, SW1/4 of Section 13, within Township 32 North and Range 91 West. An area of approximately 500 feet by 300 feet in size extends into the S1/2, SE1/4 of Section 14, Township 32 North and Range 91 West. Mineral ownership for these parcels is U.S. Bureau of Land Management. No patented or unpatented mineral claims are held by any entity on the property affected by the Day Loma Heap Leach area.

#### 3.0 DESCRIPTION OF THE AREA

As mentioned in Section 1, the Day Loma site lies within the Gas Hills Mining district. The following sections discuss the demographics and surrounding terrain for the area.

#### 3.1 Demographics

The Gas Hills area is open rangeland utilized for grazing by domestic stock and wildlife.

Uranium mining and milling has historically been a significant land use in the area with the Pathfinder, Umetco, Federal American Partners, and Split Rock mills and mining complexes all within a 30 kilometer radius of the Day Loma site. Mining was principally by open pit methods resulting in large disturbance areas, much of which is considered abandoned, and is unreclaimed.

The area is sparsely populated. The nearest full time resident is a security guard at the pathfinder Lucky Mac Mill located in Section 22, T33N and R90W. This resident is approximately 10 kilometers northeast of the heap leach site. The next closest residents are at the J.E. Ranch located in Section 36, T33N and R89W, approximately 23 kilometers northeast of the heap leach site. Plate 1 attached at the end of this report shows all known full time residents within a 25 kilometer radius. Jeffrey City is the closest town and is located approximately 30 kilometers south of the site. Jeffrey City has a population of approximately 100 based on a 1990 estimate.

Mineral rights survey within the SW 1/4 of Section 13 indicates four valid claims held by Power Resources, Inc., a Colorado Corporation, exist on site. These claims do not reside directly on the heap leach area, but potentially could be effected if construction activities took place on the north outslope.

# 3.2 Surrounding Terrain

The Gas Hills Mining District contains numerous mining activities and disturbances. The Day Loma Heap Leach is surrounded by exposed mine spoils and disturbed, unreclaimed lands.

Reclamation plans for these undisturbed lands have been or are currently being developed under the Abandoned Mine Land (AML) Program for the Wyoming Department of Environmental Quality, Land Quality Division. Reclamation of the mine spoils may take place if funding becomes available in the future.

The site lies to the north of the Beaver Divide and to the southeast of the Gas Hills haul road. The area is naturally drained by Coyote Creek to the east and north, and Muskrat Creek to the west. Coyote Creek joins Muskrat Creek approximately 6.5 kilometers to the north of the site. Muskrat Creek flows north and west to eventually join the Wind River near Boysen Reservoir. Both Coyote Creek and Muskrat Creek are ephemeral streams flowing only in response to rainfall events.

Within the "Day Loma Master Plan," prepared for the Wyoming Department of Environmental Quality, Abandoned Mine Land (AML) Program (Lidstone & Anderson, Inc., 1991), the Day Loma study area encompassed a total of approximately 2400 acres, approximately 1254 acres of which are disturbed and unreclaimed land. Of this total disturbed area, the reclaimed Day Loma Heap Leach area of only approximately 26 acres represents approximately 2 percent. Approximately 33,569 total acres are within the drainage area for the confluence of Coyote and Muskrat Creeks. A delineation of the drainage is shown on Drawing 1 located at the end of Appendix C.

Heap leach material consisted of an estimated 250,000 tons of low grade uranium bearing rock which was leached with sulfuric acid to recover uranium values. Spoil material is overburden and mine waste.

#### 3.3 Current Site Status

As mentioned in Section 1.1, the heap leach was reclaimed in 1982 and approved by the NRC in 1983. Since covering and placement of topsoil in 1982, vegetation has been established over the reclaimed surface and only minimal erosion has occurred. The heap leach was constructed on an impervious liner which was placed on top of mine spoil. The spoil material extends north

and east from the heap leach area at the existing angle of repose, and several large gullies exist in the spoil outslopes. Coyote Creek, an ephemeral drainage, is adjacent to the toe of the spoils material on the eastern end and near the toe of the spoils material to the north (see Figure 1). Due to the presence and close proximity of spoils material in relation to Coyote Creek, erosion of spoils material has occurred and creek alignment has been altered.

# 4.0 EXISTING RADIOLOGICAL CONDITIONS

The following sections discuss the radium activity of the heap cover, heap leach material, and surrounding spoils, and radon emanation from the reclaimed heap leach area and the mine spoil piles. An evaluation was performed to assess the radiological conditions of the reclaimed heap leach and to determine the impact of the reclaimed heap leach pad with respect to impacts to public health and safety.

# 4.1 Radium Activity of Heap Cover and Heap Leach Material

The concentration of radium 226 within the heap leach material covering the heap leach was determined by drilling and sampling of the heap leach area. A hollow stem auger was used to collect cover and heap samples for physical and radiochemical analysis, and to determine the average thickness of cover. Drilling was performed on October 12 and 13, 1992. Appendix D includes a drilling/sampling report prepared by Inberg-Miller Engineers of Riverton, Wyoming and contains a complete description of methods, logs of test borings and test borehole locations.

As presented in Appendix D, a total of seven borings were drilled in the reclaimed heap leach. Boring HL-8 was chosen to represent the average profile through the reclaimed heap leach. Materials from HL-8 were tested to determine the radium content of the cover and heap leach material. Additionally, heap leach material from HL-1, HL-2, HL-9, and HL-10 were also analyzed for radium.

On the basis of these analyses, average radium 226 content in the cover was determined to be 3.5 pCi/g. Average radium 226 content in heap leach material was approximately 119.5 pCi/g based on four individual samples and two composite samples. This average radium content is discussed in more detail in Appendix B. Testing for physical characteristics of samples were performed by Inberg-Miller Engineers and radiological testing was performed by Energy Laboratories, Inc. of Casper, Wyoming. Test results are provided in Appendix D.

# 4.2 Radium Content of Surrounding Spoils

In July of 1993, CNI and Energy Laboratories personnel of Casper, Wyoming collected soil samples from 19 locations on two spoil piles in close proximity to the heap leach area. These sites are identified on Figure 2. Test results indicate an average radium content of the surrounding spoils to be approximately 61 pCi/g. Average radium content was determined to be 98.3 pCi/g for areas where runoff from spoils would enter Coyote or Muskrat Creeks. Analytical results are provided in Appendix D.

At the same locations spoil samples were taken for analysis, radon flux measurements were also performed. The results of this testing is provided in Section 4.3 below.

Radium content of spoil in the Day Loma mining area was also determined by consultants working for the Wyoming AML program (Lidstone & Anderson, Inc., 1991). The results of AML's analysis indicate an average radium-226 content of 17.7 pCi/g from 978 individual surface measurements within the Day Loma mining area. Approximately 245 acres were identified as extreme surface radiological hazards, some areas reporting as high as 100-200 pCi/g. These values are consistent with the recent measurements taken by CNI.

With the surrounding spoils averaging 61 pCi/g, background concentration of radium is now considerably higher than before mining activity was initiated in the area. Additionally, the radium concentrations in the heap are only slightly higher than the concentrations in the nearby spoils. This is not surprising since the heap material was low grade ore. Given that the heap material is only slightly higher in radium content than the much larger volume of adjacent spoil

material, the relative impact of the slightly higher radium in the heap is insignificant compared to the surrounding materials.

#### 4.3 Radon Emanation

Radon flux measurements were conducted over the surface of the reclaimed heap leach and over the surface of surrounding spoils materials. The large Area Activated Charcoal Canister (LAACC) method (EPA Method 115 per 40 CFR 61, NESHAPS) for determining radon flux was used for the analysis. Locations of where measurements were taken on the surrounding spoils are shown on Figure 2, and for the reclaimed heap leach the locations are identical to the drill hole locations shown on Figure B.1 within Appendix B. Canisters were delivered to Energy Laboratories, Inc., for analysis. Results indicate the average radon flux from the cover of the reclaimed heap leach system to be 8.10 pCi/m2s. The average flux from the surrounding spoil is 92.4 pCi/m<sup>2</sup>s. The radon flux measured from the reclaimed heap leach is much less than 20 pCi/m<sup>2</sup>s and furthermore, is much less than the measured value from the spoil area. The AML plan includes placing the spoil with the highest radium content into pits and covering them with soil. The other spoils will be regraded and covered with topsoil. It is not expected that these activities will significantly reduce the radon flux from the spoils since only the most radioactive spoils will have a significant thickness of cover material. Spoil material similar to that measured for radon flux will be covered only with a thin layer of topsoil which will not significantly attenuate radon flux.

Based on existing heap leach material and cover soil characteristics, radon flux was also calculated using the RADON computer model. This analysis is discussed in Section 5.1 below.

# 5.0 ANALYSIS OF EXISTING RECLAMATION SYSTEM RELATIVE TO CURRENT REGULATORY STATUS

In order to evaluate the effectiveness of the existing reclamation system, radon barrier and ground water quality, analyses were performed and are described below.

# 5.1 Analysis of Existing Radon Barrier

The existing reclamation cover was evaluated for effectiveness in reducing radon flux. Radon flux calculations were performed for the cover surface using the RADON (USNRC, 1989) computer model. Input into the RADON model was based upon both measured and default parameters of the site specific reclamation cover and heap leach materials. Existing average cover thickness was obtained from field investigations performed during October 1992. During the field investigation, samples were collected for laboratory testing in order to classify the types of soils present. Average radium activity for the heap leach material was determined from laboratory testing of samples collected during the field investigation.

# 5.1.1 Heap Leach Material Characteristics

Samples collected during the drilling program performed in October 1992, and subsequent laboratory testing indicate the average radium content of the heap leach material is approximately 119.5 pCi/g. Results of testing performed on a sample collected from the heap leach material indicated the material has a dry density of 110.8 lb/ft<sup>3</sup>, a moisture content of 10.4 percent, and 15.8 percent passing the #200 sieve. Test methods and results are included in Appendices B and D. Figure 1 delineates the areal extent of the reclaimed heap leach.

At Day Loma, the cutoff ore grade during mining was approximately 0.06% U<sub>3</sub>O<sub>8</sub> as presented in the "Environmental Statement (ES) Related to Operation of Split Rock Uranium Mill," NRC 1980, corresponding to a radium activity of approximately 170 pCi/g. Also presented in the ES is the assumption of ore grade for the heap leach material of 0.05 U<sub>3</sub>O<sub>8</sub>, corresponding to a radium activity of approximately 142 pCi/g. These values are slightly higher than the 119.5 pCi/g obtained from actual sampling of the material as discussed above. For analysis of the existing radon barrier, both the maximum ore grade corresponding to a radium activity of 170 pCi/g and the testing results on heap leach material of 119.5 pCi/g were used in the RADON model.

# 5.1.2 Existing Reclamation Cover Material Thickness and Characteristics

The drilling program indicated 8 to 13 feet of existing reclamation cover soil exists over the heap leach material and consists of interbedded sands and clays with varying dry densities and moisture contents. Test results are provided in Appendix D. From the samples tested, the two lowest percent passing the #200 sieve (24.7 and 34.7) and the two highest percent passing the #200 sieve (92.4 and 95.9) were averaged and used as separate input into the radon flux computer model analyses to provide a range of radon flux calculations. The average low percent passing the #200 sieve was determined to be 29.7 percent and the average high percent passing the #200 sieve was 94.2 percent. Densities and moisture contents were analyzed for one of the low percent passing #200 sieve samples and for one of the high percent passing #200 sieve samples. Corresponding dry densities and moisture contents were determined to be 109.2 lb/ft³ and 13.6 for the low percent passing the #200 sieve, and 104.0 lb/ft³ and 18.9 percent for the high percent passing the #200 sieve.

Long term moistures for the existing reclamation cover soil were calculated and used as conservative input to the RADON computer model. Long term moisture contents were based upon the percent passing the #200 sieve and were calculated using the equation presented in the "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design," NUREG/CR-3533 (NRC, 1984). Appendix B presents the calculations in more detail. Long term moisture contents for the cover soil ranged from 6.0 percent for the soil with 29.7% passing the #200 sieve and 9.1 percent for the soil with 94.2% passing the #200 sieve. These values represent the range of soils that exist within the cover. These values were used in the RADON computer model for determining the adequacy of the cover for radon attenuation.

#### 5.1.3 Radon Model Results

The RADON model indicates approximately 5 to 8 feet of soil cover is required to meet an exit flux of less than 20 pCi/g specified by 10 CFR Part 40, Appendix A. The average depth of existing cover is approximately 8 to 13 feet. Therefore, the existing cover is more than

sufficient to attenuate radon flux to less than 20 pCi/m²sec. A summary of the results are provided in Table 1 below. Results and model output are provided in Appendix B.

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Table 1 - Radon Model Results

		Heap Leach Activity of 119.5 pCi/g	Heap Leach Activity of 170.0 pCi/g					
Cover Material Moisture Content (%)	Cover Material Mass Density (lb/ft³)	Required Depth (ft)	Required Depth (ft)					
6.0	109.2	6.52	7.75					
9.1	104.0	5.26	6.27					

#### 5.2 Ground Water

Existing data from surrounding nearby ground water monitoring wells were reviewed to determine previous and current water quality in area. The data along with a discussion of ground water quality impacts are discussed in the following sections.

#### 5.2.1 Available Data

Water-quality data were taken from AML's 1990 data presented in the "Day Loma Master Plan" (Lidstone & Anderson, Inc., 1991).

# 5.2.2 Discussion of Ground Water Impacts

The impact of the heap leach area on ground water was evaluated by comparing water quality from up-gradient wells and the up-gradient pits to the well down-gradient from the reclaimed heap area. Data from the AML sampling program conducted in October 1990 were used since they represent the most current and complete data base for the Day Loma area.

Figure 3 shows the ground water contours and the sampling points for the area around the reclaimed heap leach area. Wells P-1, P-2, DL-2 and the Clyde and Day Loma pits are upgradient from the heap leach area. Well P-5 is immediately down-gradient from the heap leach area. While the pit water levels are currently lower than the water level in P-5, the pits will likely be up-gradient of the heap leach area after steady state conditions are achieved, as shown by the regional ground water contours provided in Figure 3. Therefore the water quality of the pits was included in the background water quality determination.

The range of sulfate, TDS and uranium for the three up-gradient wells, the two pits and the down-gradient well are presented on Table 2. Sulfate, TDS and uranium were chosen since these parameters are typically used as indicators of seepage from uranium process facilities. Uranium was chosen since it is the most mobile of the radionuclides. Sulfates and TDS are both considered conservative contaminates that are indicative of overall changes in water quality. In addition, sulfuric acid was used in the leach process and, therefore, sulfates should be elevated in P-5 if the heap leach area were contributing to ground water contamination.

As can be seen from Table 2 below, the sulfate, TDS and uranium values in the down-gradient well (P-5) are the same or less than measured in the up-gradient wells (P-1, P-2 and DL-2). The sulfate, TDS and uranium values from the pits are higher than for P-5. The Clyde pit has values that are much greater than the values in the down-gradient well.

It can therefore be concluded that if there is any contribution to ground water quality from the reclaimed heap leach system, the contribution is negligible and indistinguishable from the regional ground water quality baseline. In fact, the existing water quality down-gradient from the heap is as good or better than the up-gradient wells and much better than the waters in both the Clyde and Day Loma pits. Table 2 below provides a summary of the ground water quality observed.

TABLE 2 - Ground-Water Quality

	Constituent (mg/l)							
Sample location	Sulfate	TDS	Uranium					
Well P-1	620	1216	0.005					
Well P-2	495	1037	0.010					
Well DL-2	708	1102	0.051					
Day Loma Pit	845	1336	0.736					
Clyde Pit	2340	3442	1.076					
Well P-5	450	1096	0.020					

# 5.3 Analysis of Erosional Stability

An erosional stability analysis of the site was performed in order to provide a comparative evaluation of current site conditions as they relate to long-term site performance. The NRC's letter dated August 31, 1990 specifically requests a comparison of current site conditions to reclamation criteria as described in 10 CFR Part 40, Appendix A. Current NRC position includes an assessment of the site pursuant to the NRC's "Final Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites," August 1990. Therefore, for purposes of this report, the guidelines presented in the STP were assumed to be the proper guidelines to be used to determine erosional stability of the Day Loma Heap Leach area.

In reviewing the reclaimed Day Loma Heap Leach area, various alternatives were considered. For example, storm events less severe than the full PMP were analyzed. For initial analysis, the 200-year 24-hour storm event was used to determine the erosional stability. This storm event was considered the smallest event that could be considered for the site. Analyses indicated that the cost of erosional protection for the 200-year event was unreasonable and therefore

analysis of larger events that would require even more extensive erosion protection was not necessary. Section 6.0 below describes the costs in more detail.

# 5.3.1 Hydrology

The erosional stability of the site was evaluated using the 200-year 24-hour storm event which CNI feels is appropriate for the existing as-built configuration. The 200-year 24-hour storm event of 3.7 inches was developed by extrapolation using less severe storm events obtained from the National Oceanic and Atmospheric Administration (NOAA), 1973.

Under the storm event cited above, erosional stability was analyzed for the existing cover surface, the outslopes located on the northern edge of the heap leach area, he cover channels immediately below the heap leach area to the north and south, the southern edge of the heap leach area, and Coyote Creek (see Figure 1). The following sections and Appendix A discuss the approach and analyses in more detail.

# 5.3.2 Hydraulic Analysis

Hydraulic analyses were performed for the reclamation cover surface, the outslopes, and Coyote Creek for the storm event previously discussed. Hydraulic analyses for each area are discussed separately in the following sections.

#### 5.3.2.1 Cover Surface

Cover surface erosional stability was analyzed under the 200-year 24-hour storm event. Following STP guidelines, stable slope, sacrificial slope, and permissible velocity methods were employed to determine the stability under these storm events.

The stable slope calculations were performed. Input parameters are presented in Appendix A. The storm intensity was derived as presented in Appendix A; allowable shear stress was obtained from Temple (Temple, 1987) based on laboratory testing on site specific cover soils, and the

slope length representing the steepest section on the cover surface. Results indicate the surface will require modification to meet the guidelines presented in the STP.

Due to the thickness of the existing cover, sacrificial slope calculations were performed to determine if erosion would impact the heap leach material. Potential gullying depth was calculated under the 200-year 24-hour storm event using the sacrificial slope procedures presented in the STP. Analyses indicate a potential approximate gully depth of greater than 10 feet. This gully depth exceeds the cover thickness in some areas of the heap leach obtained from the field investigation carried out October 11 and 12, 1992.

# 5.3.2.2 Outslopes

The outslopes on the northern edge of the heap leach area were evaluated for erosional stability. Due to the steep slopes in this area, sacrificial slope calculations were performed to determine the erosional stability. The steepest sections were used in the analysis.

Sacrificial slope calculations were used to determine if potential gullying would encroach into the heap leach material under extreme storm events. The type of cover material was determined during the field investigation, and based on the laboratory testing for percent passing #200 sieve indicated this material to be a fine sand. Under the 200-year 24-hour storm event, the analysis indicates these areas would require modification to meet guidelines presented in the STP since potential gullying depths affect the reclaimed heap leach material.

#### 5.3.2.3 Cover Channels

Two cover channels were constructed during reclamation, one immediately below the heap leach area to the north (labelled the North Cover Channel), and a second below the heap leach area to the south (labelled the South Cover Channel) (see Figure 1). These channels prevent run-on to the outstopes by intercepting flow from the cover and surrounding areas and conveying it away fro. The existing diversion channels were thus analyzed for stability under the 200-year 24-hour storm event.

Using the site specific channel soils (and not accounting for vegetation) the channels were analyzed using the STP permissible velocity method. The permissible velocity was obtained from Chow, 1959. See Appendix A for more details. For the 200-year 24-hour storm event, the flow velocities exceed the permissible velocity for a majority of the channel reach.

# 5.3.2.4 Coyote Creek Drainage

The Coyote Creek drainage, which lies north of the heap leach area, was analyzed for erosional stability to determine potential heap leach area impacts under extreme storm events. Currently, the outslope of spoils to the northeast of the heap leach area directly contacts the Coyote Creek drainage. Therefore, this area was selected for analysis in the initial calculations.

The 200-year 24-hour storm event was used for the analysis. The drainage basin area that contributes to Coyote Creek is presented in Appendix A. Results of the analyses indicate Coyote Creek has erosive velocities at the northeastern outslope of the heap leach area.

Although the remaining drainage down-gradient of the outslope of spoils northeast of the heap leach area does not directly contact the outslopes, flow resulting from extreme storm events may still impact the outslopes. Although geomorphic studies were not performed, it is very probable that drainage movement (incision) may occur in the future because of the fine sandy material present in the natural drainage. In any event, analyses indicate the 200-year 24-hour storm flow will impact the existing spoil outslopes directly north of the heap leach area. Calculated velocities indicate erosional instability. Modifications to the Coyote Creek drainage would be required to establish stability along the northern edge of the heap leach area. Appendix A presents the analysis in more detail.

# 5.4 Summary

In summary, all components of the existing reclamation system are not erosionally stable as they currently exist under the 200-year 24-hour storm event.

#### 6.0 CURRENT SITUATION ALTERNATIVES

An evaluation was performed of the existing reclamation system to determine the benefits and risks associated with implementing additional reclamation efforts to the site, and the costs, benefits, and associated risks with no additional reclamation to the reclaimed heap leach area.

Provided below is a conceptual alternative for additional reclamation efforts on the cover surface, outslopes, cover channels, and Coyote Creek. Implementation of this alternative would provide additional long-term stability and ensure design guidelines presented in the STP are achieved. Also provided below is an analysis of the current reclamation, associated costs, benefits, and risks associated without modifying the existing reclaimed heap leach area.

# 6.1 Existing Completed Reclamation

The approved reclamation was evaluated to determine costs, benefits and associated risks for performing no additional reclamation work.

# 6.1.1 Description

Figure 1 shows the existing configuration of the reclaimed heap leach area and spoil outslopes. The reclamation cover and configuration was described in Section 1.1. As mentioned previously, the reclaimed heap leach area resides above mine spoil material. Spoil outslopes at angle of repose surround the reclaimed heap leach area to the north and northeast. Coyote Creek lies to the east and north of the area and contacts the spoil outslope to the northeast of the heap leach area.

#### 6.1.2 Costs

No rosts are associated with this option. Existing reclamation would remain as is and modifications to the site would be performed.

#### 6.1.3 Benefits

No additional disturbance would be necessary if reclamation was left in place. Established vegetation would remain undisturbed and allowed to continue development.

With no further activity, the benefits would also include no consumption of fuel for equipment, no reduction in air quality, no deaths of wildlife resulting from equipment usage and activities, no occupational risk to human injury or death from construction activity, and would maintain the potential environmental and mine resources of the site.

#### 6.1.4 Risk Evaluation

If no additional reclamation work is performed on the heap leach area, the risks would be the release of heap leach material to the environment. Erosion would occur as a result of the 200-year 24-hour storm event to undisturbed natural ground in the vicinity, the cover surface, the spoil material outslopes immediately below the heap leach area, and spoil dumps surrounding the project area. To quantify the risk associated with no action, a fluvial sedimentation analysis was performed using SEDCAD+ Version 3 computer model developed by Civil Software Design (Warner and Schwab, 1992). The purpose of the analysis was to demonstrate the relative impacts in the event the integrity of the existing cover is altered, resulting in the loss of heap leach material, and a comparison of this material loss to erosion from natural land and surrounding spoils material containing elevated levels of radium.

The fluvial sedimentation analysis indicates the majority of the soil loss at the confluence of Muskrat and Coyote Creeks to be contributed by the undisturbed areas for the 200-year 24-hour storm event. The relative comparison of radium contents within spoil and heap leach material indicates a large percentage of radium being contributed by the spoils material. Given this fact, relative impacts should the heap leach material be transported to the confluence of Muskrat and Coyote Creeks are minimal. The resulting soil loss and corresponding radium contributions for the various surfaces are summarized in Table 3 below. A complete description of the analysis is provided in Appendix C.

TABLE 3 - Fluvial Sedimentation Results

Material	Soil Loss Tons	Radium Activity pCi/g	Percentage of Total	Incremental Increase pCi/g				
Heap Leach Material	1,046	119.5	8.5	1.5				
Spoils	12,736	98.3	86.9	14.7				
Undisturbed	71,217	1 1	4.6	0.8				
TOTAL	84,999	NA	100 .	17				

Incremental increase if radium in pCi/g contributed by heap leach material is calculated by:

# 6.2 Stabilize Heap Leach Cover and Outslopes at 2.5H:1V

An alternative conceptual design was developed that would meet the guidelines presented in the STP and comply with 10 CFR 40, Appendix A. A description of the design and associated costs and benefits along with the risks are presented below.

# 6.2.1 Description

The conceptual alternative includes placement of a rock mulch over the cover surface, placement of rock protection in the existing diversion channels, regrading the outslopes to 2.5H:1V, placement of rock protection on the surface of the outslopes, redesigning Coyote Creek in certain locations, and placement of rock protection in ". Coyote Creek drainage. These items are described in more detail below.

In order to provide erosional stability for the cover surface under STP guidelines, a rock mulch constructed over the entire surface of the heap leach area (approximately 26 acres, see Figure 4) would be required. Analyses for the design of the rock mulch are presented in Appendix A. The analyses indicate a rock mulch of approximately 1 inch  $D_{50}$  is required on the surface for establishing stability under the 200-year 24-hour storm event.

Regrading and the placement of rock protection would be required to establish erosional stability of the northern outslopes under the 200-year 24-hour storm event. This would include establishing a 2.5H (horizontal):1V (Vertical) slope and placement of rock protection on the regraded surface. A cut and fill package within AutoCAD was used to determine the amount of fill required to obtain a 2.5H:1V slope, which totaled approximately 132,400 cubic yards. For establishing erosional stability, the required rock size on the outslopes is 1 inch  $D_{50}$ .

The existing north and south cover channels require modifications to fully meet stability guidelines. The channels would require 2 inch  $D_{50}$  rock protection.

As presented above, rock protection is required in the Coyote Creek drainage to prevent erosive velocities from impacting the heap leach area outslopes. For the majority of the drainage, approximately 3 inch to 18 inch D<sub>50</sub> rock is required to provide protection under the 200-year 24-hour storm event. One area of the drainage will require a 4.8 feet D<sub>50</sub> for erosional stability, and is described in Appendix A. This area has a greater bed slope resulting in higher flow velocities.

#### 6.2.2 Costs

A cost estimate was prepared by Bartell & Associates based on the estimated quantities of earthwork and rock protection for the proposed configuration. Included in the estimate were costs for all equipment including mobilization and demobilization, purchasing and hauling of rock protection including filter material from an existing operating quarry, excavation and placement of fill material, supervisors, operators, laborers, quality control, surveying, service

and repair, engineering, lab testing, revegetation of disturbed areas, and a 15 percent contingency. Based on the activities, the total estimated costs for this alternative totals approximately \$2,779,000. CNI has escalated the amount to account for additional cost associated with riprap protection to a total of \$2,943,000. The assumptions and basis for the associated costs are included in Appendix E.

#### 6.2.3 Benefits

The additional reclamation work would establish stability according to the guidelines presented in the STP. The conceptual alternative would limit the loss of heap leach material by adding additional erosion protection to the cover, adjacent outslopes, and Coyote Creek. The benefit would be the establishment of long-term stability for the site.

#### 6.2.4 Risk Evaluation

For the additional reclamation work, significant earth moving equipment would be required for establishing the final configuration. Additional activity would result in reduced air quality, consumption of large quantities of gasoline and diesel fuel. Environmental resources such as vegetative growth and animal habitat would be lost, wildlife kill as a result of equipment usage would most likely occur, as well as risk to human health and safety during construction.

#### 7.0 CONCLUSION

The analyses of the existing reclamation and the cost estimates for the alternative reclamation lead to the following conclusions:

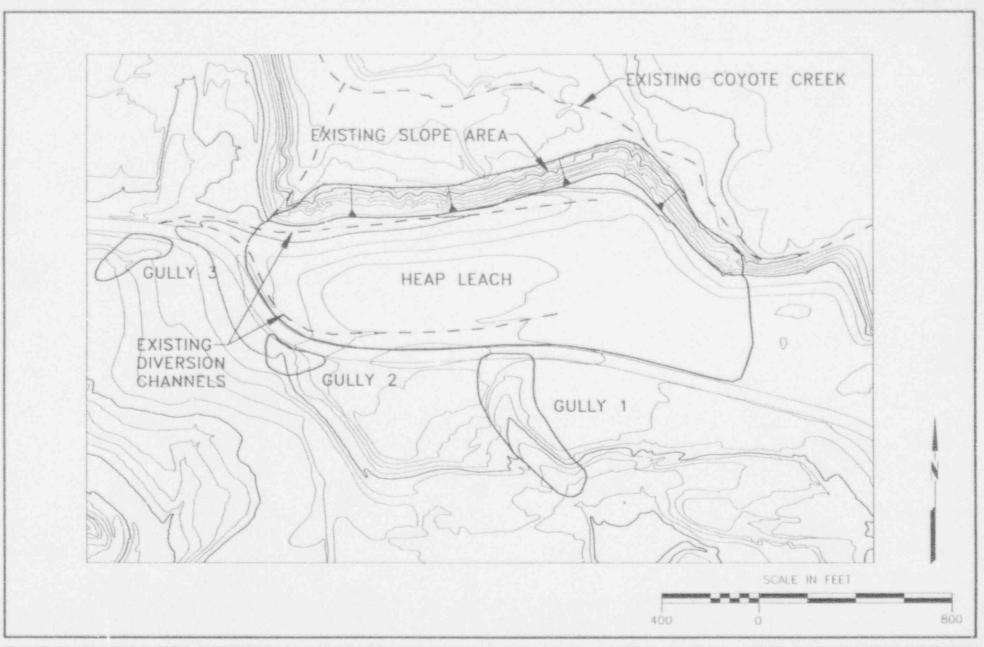
- The existing reclamation is presently performing all of the objectives required. The radon flux, both measured and calculated is less than 20 pCi/m²/sec. Ground water quality is not being impacted by the heap. Physical isolation of the heap leach material has been accomplished.
- Erosional stability analysis indicates the site will not be erosionally stable under extreme events (i.e. 200-year 24-hour storm).
- The additional costs required to provide erosional stability for the 200-year 24hour event is approximately \$3,000,000.
- 4. Since the surrounding spoil and the heap leach material have very similar radium concentrations, and the area of the spoils is much greater than the heap, the contribution of the heap to sediment in Coyote Creek during an extreme storm event would be very small.

Given the results of the analyses it is concluded that while the existing reclamation does not provide the long-term erosional stability required in the STP, additional reclamation to meet the requirements of the STP would be extremely expensive and little if any benefits would result. Therefore additional reclamation activities at the Day Loma heap leach area are not warranted.

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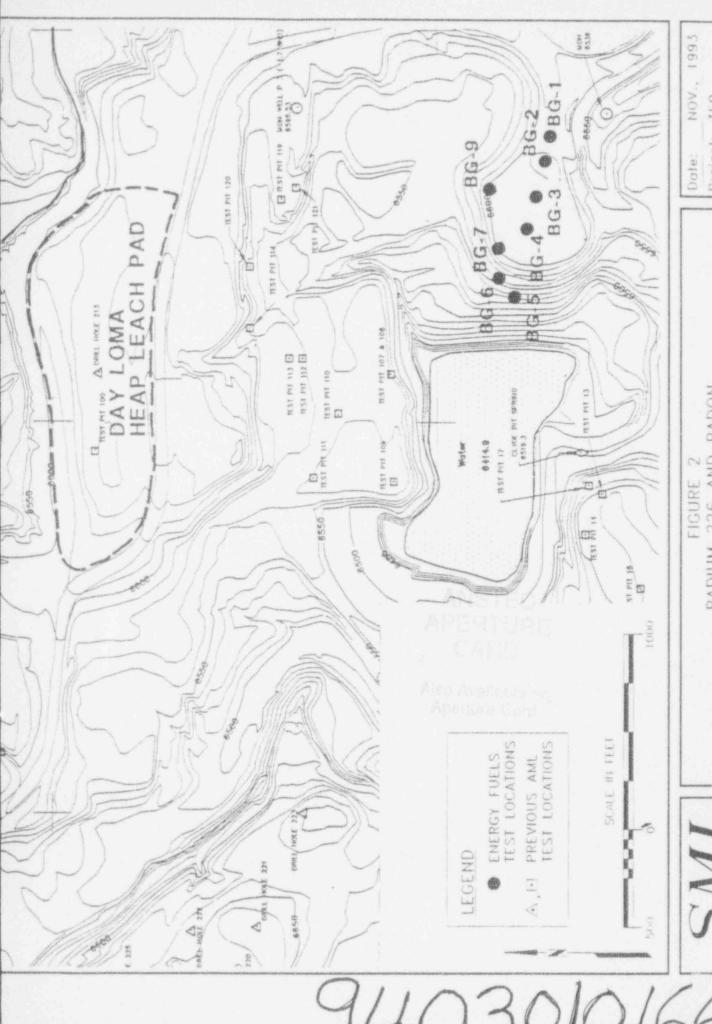
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SMI SHEPHERD M LLER, INC. FIGURE 1
EXISTING CONFIGURATION
DAY LOMA HEAP LEACH AREA

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Project: 350
File: EXISTING





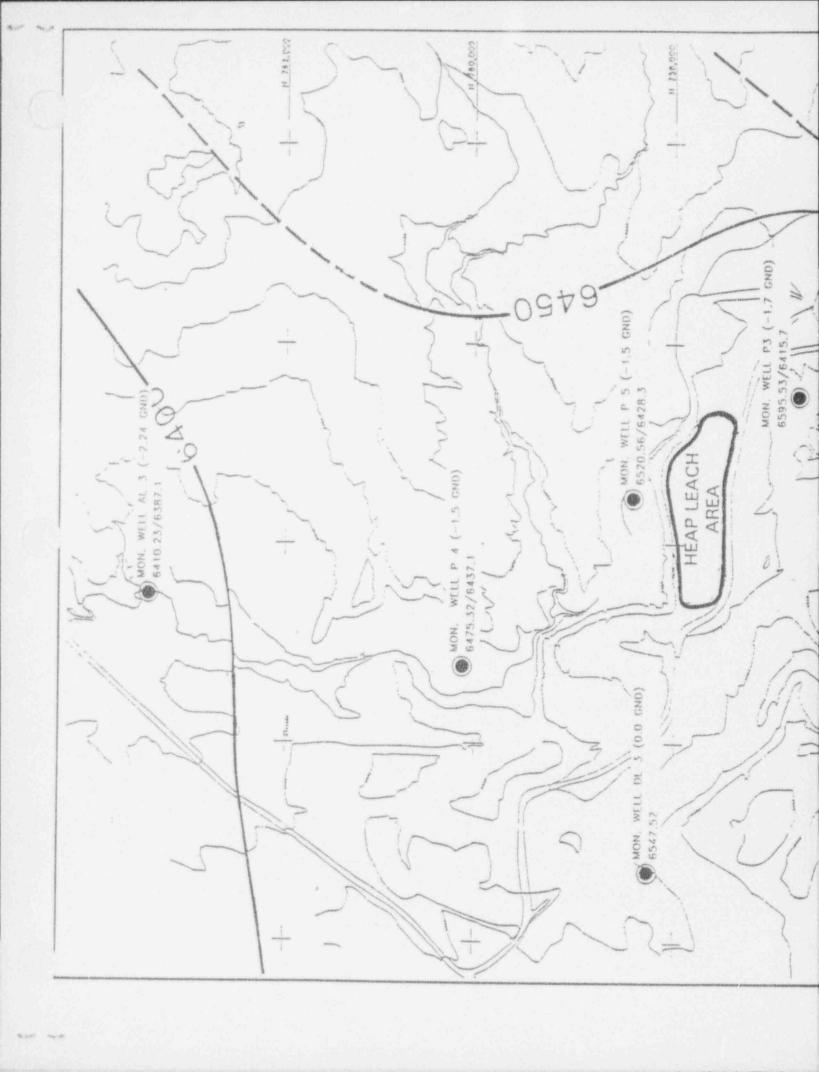
SAMPLE LOCATIONS DAY LOMA AREA

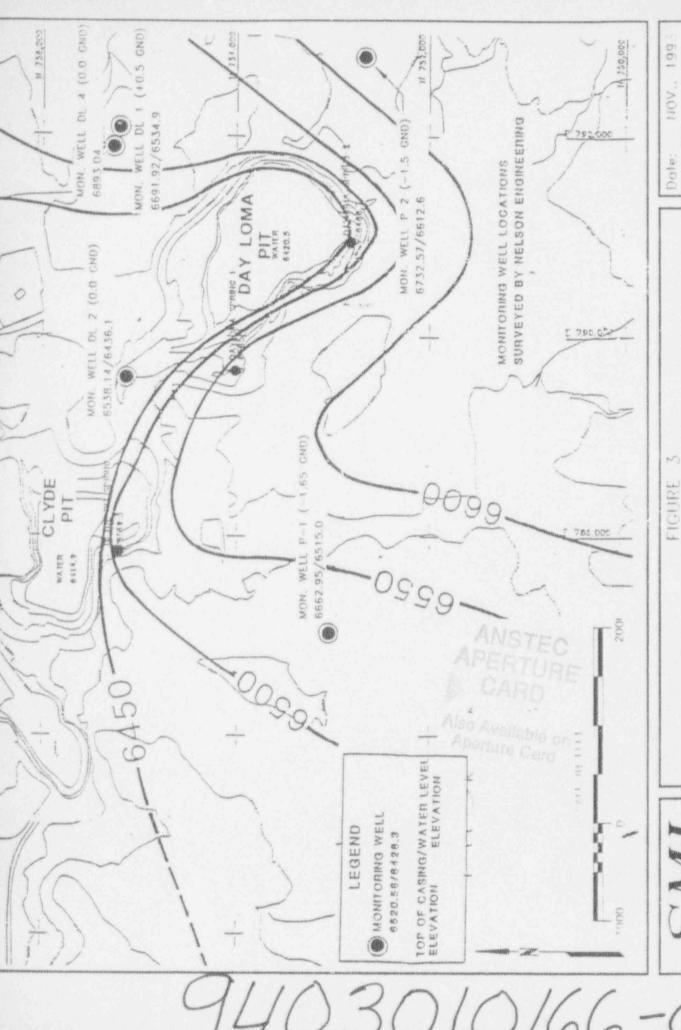
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SHIPTHERD MILER, INC.





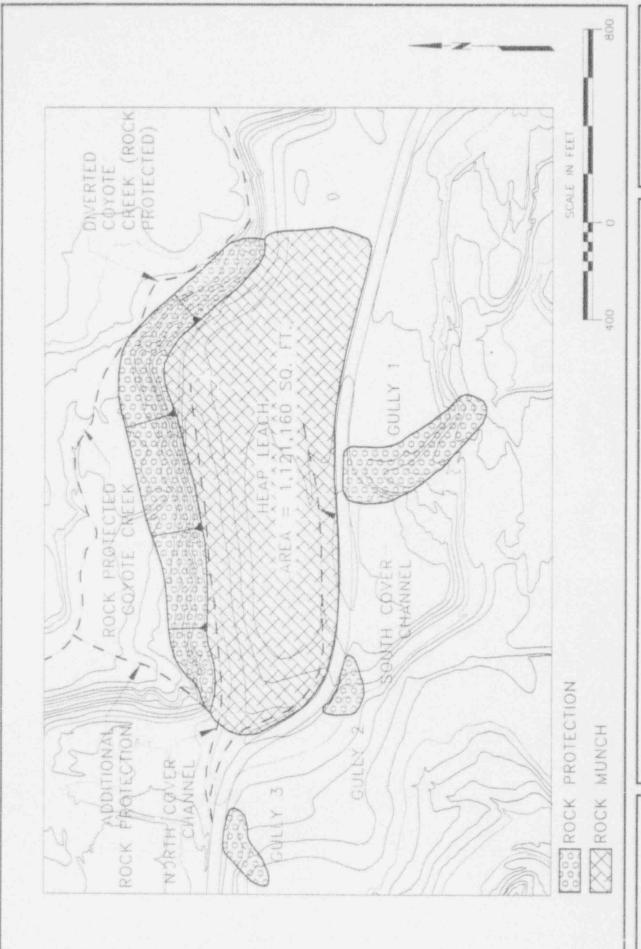
POTENTIOMETRIC SURFACE MAP DAY LOMA AREA (FROM LIDSTONE & AHDERSON, INC. 1991)

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SINTHERN MILLE, INC.



CONCEPTUAL COVER DESIGN DAY LOMA HEAP LEACH AREA

Project: 350 File: VOLUME



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APPENDIX A
HYDROLOGIC/HYDRAULIC ANALYSIS

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#### A.1 HYDROLOGIC ANALYSIS

The Day Loma Heap Leach area was evaluated to determine if the site is erosionally stable under the 200-year 24-hour storm event. The U. S. Army Corps of Engineers (COE) HEC-1 computer model was used to estimate the magnitude of the peak discharges generated by the storm events for the cover surface, outslopes, diversion channels, and Coyote Creek. This model predicts watershed response to precipitation events. The required parameters include rainfall depth and distribution as well as sub-basin area, curve number, average basin slope, hydraulic length, and lag time. These parameters are discussed in more detail below. Methods referenced in the STP were employed to determine rainfall intensities resulting from the storm events.

#### A.1.1 Storm Events

The 200-year 24-hour storm event was used to model basin runoff. The 200-year 24-hour storm event of 3.7 inches was developed by extrapolation using subsequently smaller storm events (the 2, 5, 10, 25, 50, and 100-year 24-hour storms) obtained from the National Oceanic and Atmospheric Administration (NOAA), 1973. The resulting precipitation was distributed over the 24-hour time interval using the SCS Type II distribution (SCS, 1973). Rainfall intensity for the 200-year 24-hour storm event corresponding to the time of concentration was developed as outlined in NOAA. Although the 200-year storm event is not specifically referenced in NOAA, extrapolation procedures were performed simulating those presented for subsequently smaller storm events to develop rainfall intensity.

#### A.1.2 Watershed Characteristics

Discussed below are the parameters mentioned in Section A.1 above used to represent the watershed characteristics. These parameters represent existing site conditions and estimates were made where no specific information was available.

The curve number is based on soil type, land use, and vegetation in each sub-basin. The areal soil best fits an overall SCS classification of hydrologic soil group "C". The areal land use is described as pasture or range land in fair condition for the undisturbed areas. To be conservative, Antecedent Moisture Condition III (AMC III), representing saturated soil conditions, was used to adjust the curve number when analyzing the storm event runoff. For these conditions the corresponding curve number, adjusted to AMC III, was determined to be 91 (Barfield, 1981).

Each watershed was divided into sub-basins to more adequately model the storm event. The average basin slope for each sub-basin was determined from topographic maps of the surrounding area. Weighted averages were taken to provide an estimated average basin slope. Figure A.1 shows a delineation of the watersheds.

Lag time is defined as the time from the center of mass of the effective rainfall to the peak of the runoff hydrograph and is calculated by the equation:

$$t_i = \frac{L^{0.8}(S+1)^{0.7}}{1900y^{0.5}}$$

where:

 $t_1 = lag time (hours),$ 

L = hydraulic length (feet),

y = average basin slope (%), and

S = (1000/CN)-10, where CN = curve number.

The parameters for all sub-basins are given in Table A.1. Where multiple sub-basins exist, flood routing, per the Muskingham routing method, was performed within HEC-1 to determine peak discharges.

## A.1.3 Description of Areas Analyzed

The hydrologic and hydraulic analyses were performed for four different areas; the cover surface, the outslopes, the cover channels immediately below the Heap Leach area, and Coyote Creek drainage. These areas are described below.

#### A.1.3.1 Cover Surface

The steepest slope section of the cover surface was analyzed for the calculation of permissible velocity and for sizing rock protection. The watershed consisted of a 100-foot wide strip that parallels the direction of surface flow. This area was input into HEC-1, along with watershed characteristics, to calculate runoff. For the stable slope and sacrificial slope calculations, the steepest slope section on the cover surface was again used in the runoff analysis.

## A.1.3.2 Outslopes

The outslopes to the north of the Heap Leach area were analyzed for erosional stability for the 200-year 24-hour storm event. For the sacrificial slope calculations, the steepest slope section of the outslopes was used in the analysis. The same area was used for sizing rock protection. Three additional conceptual outslope geometries were also evaluated for long term erosional stability.

Currently, three existing gullies are present to the south and west of the Heap Leach area (see Figures 1-4). These areas were also analyzed for erosional stability under the 200-year 24-hour storm event.

#### A.1.3.3 Cover Channels

Diversion channels exist below the heap leach area. The North Cover Channel collects and conveys flow off and away from the northern leach area and the South Cover Channel collects and conveys flow off and away from the southern portion of the leach area. These channels were evaluated for erosional stability using permissible velocity criteria.

The slope directly above the North Cover Channel was divided into small sub-basins approximately 200 feet wide in order to determine the magnitude of runoff contributing to channel flow at regular intervals. Calculated channel velocities under the design storm events were then compared to the maximum permissible velocity.

The Southern Cover Channel was considered analogous to the North Cover Channel. Although, less watershed exists for the catchment area of the Southern Cover Channel, considering the same peak discharge for this channel provides a conservative estimate.

## A.1.3.4 Coyote Creek

The entire area contributing to the Coyote Creek drainage upgradient from the Heap Leach area was used in the erosional stability analysis. Depth of flow and corresponding velocities were analyzed adjacent to the Heap Leach area.

#### A.1.4 Results

The results of the hydrologic analysis provides peak discharges for Coyote Creek, the Cover Channels, the outslopes, and the cover surface. Peak discharges for these areas are presented in Table A.1 below.

Table A.1 Sub-Basin Hydrologic Parameters

Basin ID	Basin Slope (%)	Hydraulic Length (ft)	Basin Area (miles²)	CN	Lag Time (hrs)	Discharge (cfs) 200 yr/24 hr
Coyote Creek						
1	9	6024	0.46	91	0.300	669
2	7	8020	0.26	91	0.428	310
3	8	7023	0.35	91	0.357	1428
4a	4	7004	0.149	91	0.537	1438
4b	15	570	0.058	91	0.035	1452
4c	15	550	0.041	91	0.034	1462
4d	15	875	0.052	91	0.050	1476
100 ft Wide Cover Strip						
1	7.7	130	0.00046	91	0.015	1
2	25	80	0.00028	91	0.006	2
3	8	100	0.00036	91	0.012	2
Cover Channel						
	4.7	800	0.00474	91	0.083	10
2	20	250	0.00573	91	0.016	23
3	20	250	0.00484	91	0.016	33
4	13	100	0.00309	91	0.009	40
100 ft Wide Outslope Strip	40	215	0.00072	91	0.010	2

#### A.2 HYDRAULIC ANALYSIS

Long term erosional stability of the Day Loma Heap Leach area was evaluated under several reclamation configurations. Flow characteristics of the diversion channels and of Coyote Creek were evaluated using Manning's equation and the U.S. Army Corps of Engineers (1991) HEC-2 water surface profiles computer model. The HEC-2 model calculates water surface profiles and associated hydraulic conditions in natural and designed channels. Data requirements for the HEC-2 program include:

- 1. Discharge,
- 2. Flow regime,
- 3. Starting water surface elevations,
- 4. Manning's "n" values,
- 5. Cross-section geometry, and
- 6. Reach length.

The discharge values are resulting storm event HEC-1 peak flows. The peak discharge for watersheds above each channel was input into HEC-2. Using peak flows in this manner produces conservative (maximum) calculated flow depths and velocities.

Flow regime refers to whether subcritical or supercritical flow conditions prevail for a given channel. HEC-2 results indicate flow from the design storm events is supercritical in most of the existing un-lined channels as well as the reclaimed rock-lined channels.

The slope-area method for specifying starting water surface elevation was used for the analysis of stream profiles. The HEC-2 model performs a normal depth calculation using a specified energy grade line which is estimated as the starting channel bed slope.

The Manning's "n" values for the existing Coyote Creek drainage were obtained from the Day Loma Master Plan (Lidstone & Anderson, AML-16-G, 1991). The method used to calculate Manning's "n" for the reclaimed, rock-lined channel was obtained from application of equations developed by Abt, et. al. (1988) and Anderson, et al. (1970) and are a function of the median stone size, as presented below.

Abt - for slopes greater than 2 percent.

$$n = 0.0456 (d_{50}*s)^{0.159}$$

where d<sub>50</sub> is the median diameter of the rock, in inches.

Anderson - for slopes less than 2 percent

$$n = 0.0395 \ (D_{50})^{0.167}$$

where:

n = Manning's "n"

D<sub>50</sub> = Median stone size

Geometry for water surface profile computations is specified in the HEC-2 program by stream cross-sections and distances along the stream between the cross sections. The sections are placed at representative locations along each channel characterizing the channel shape. HEC-2 outputs for the North Cover Channel and Coyote Creek drainage are included at the end of this appendix.

## A.2.1 Cover Analysis

Unit discharges for the steepest sections were obtained by dividing the resulting discharge by the watershed width of 100 feet. Depths of flow and velocities were then determined using Manning's equation. Manning's "n" values were calculated with the same procedures as presented in Section A.2 above. The results for the cover stability calculations are presented below. HEC-1 output is attached at the end of this appendix.

The cover surface stability was analyzed using the Comparative Shear Stress (Temple, 1987), Permissible Velocity (Chow, 1959) methods as well as Stable Slope and Sacrificial Slope Criteria (NRC, 1990). The cover soil varied from clayey to sandy material. However, the sandy material was determined to control erosional stability and was therefore used in the subsequent analyses. Permissible velocity was obtained from Chow using appropriate methods for reducing permissible velocities for shallow depths.

## A.2.1.1 Comparative Shear Stress

Manning's "n" for the cover was obtained using the same procedures as presented in Section A.2. Equations for determining allowable stress for various soil types are presented in Temple (1987). Calculation of the effective soil stress required determining several additional parameters. The effective stress equation is:

$$\tau_{\varepsilon} = \gamma D S (1-C_F) (n_s/n)^2$$

where:

 $\tau_e$  = actual, or effective, stress in lb/ft<sup>2</sup>,

 $\gamma$  = unit weight of water (62.4 lb/ft<sup>3</sup>),

D = maximum depth of flow in ft,

S = slope of the energy grade line in ft/ft and is approximately the slope of the ground surface,

C<sub>F</sub> = vegetal cover factor,

n, = soil grain roughness coefficient, and

n = Manning's roughness value.

Depth of flow was determined from Manning's Equation. Slope was obtained from a topographic relief map of the reclamation site. The vegetal cover factor,  $C_F$  was conservatively assumed to be 0.0 for nonvegetated soil slopes. Soil grain roughness,  $n_s$ , for noncohesive soils is 0.0156 (Temple, 1987).

Using the Temple method, the effective stress for the steepest section was determined to be  $0.095 \text{ lb/ft}^2$  for the 200 year storm event. This value is greater than the allowable stress of  $0.02 \text{ lb/ft}^2$  obtained from Temple, 1987, for noncohesive soils with  $D_{75} < 0.05$  inches.

# A.2.1.2 Permissible velocity

Runoff analysis for the cover was performed using a 100-foot wide strip oriented parallel to the direction of flow. HJ:C-1 was used to determine the peak flow of the strip. The permissible velocity of 5 ft/s (Chow, 1959) was multiplied by the correction factor (correction factors are also presented in the 3TP) of .5 to obtain a new permissible velocity of 2.5 ft/s. The maximum velocity for the steepest section was determined to be 1.6 ft/s for the 200-year storm event. Therefore, the steepest section on the existing cover surface meets the permissible velocity requirements with the 200-year storm event.

## A.2.1.3 Stable Slope

The STP presents a stable slope equation for direct solution of the stable slope necessary to prevent the initiation of gullying due to a single, intense rainfall event. The stable slope derived from this equation should also reflect the slope able to resist gullying due to several rainfall events, of lower intensities, which would be expected over a 200 to 1000 year period. This equation is:

$$Ss^{7/6} = \frac{65(\tau)^{5/3}}{P \ L \ F \ n}$$

where:

Ss = Stable Slope (ft/ft)

 $\tau$  = Allowable Shear Stress (lb/ft<sup>2</sup>)

P = Rainfall intensity (in/hr)

L = Flow length (ft)

F = Flow Concentration Factor

n = Manning's Roughness Coefficient

The allowable shear stress ( $\tau$ ) of 0.02 lb/ft was obtained from Temple, 1987 for a noncohesive soil with a  $D_{75} < 0.05$  inches. The rainfall intensity (P) for the 200-year storm event was developed from precipitation-duration curves. The flow length was determined from topographic maps of the study area. The flow concentration factor (F) was set equal to 3.0 as per the STP. Manning's roughness coefficient (n) was estimated to be 0.030 for the sandy cover material based on Chow, 1959. The existing soil cover stable slope was calculated to be 0.0038 ft/ft for the 200-year storm event, significantly less than the existing cover slope indicating that modification of the cover is required for long term erosional stability.

## A.2.1.4 Sacrificial Slope

The STP presents a procedure for determining sacrificial slope requirements (i.e., specific depth of gullying and heap leach material setback distance from edge of embankment crest) for protective slopes. This procedure assumes no drainage area above the embankment crest and is based on the assumption that a specific depth of gullying will not be exceeded within ~ 200 year period.

For this analysis the stable slope was calculated for the cover as described above. The transitional slope (S<sub>t</sub>) was then determined using the relationships presented in Nelson et al., 1986, and the following equation:

$$S_i = S_i e^{-G S_i t}$$

where:

S<sub>t</sub> = Transitional Slope (ft/ft)

 $S_i = Initial Slope (ft/ft)$ 

G = Coefficient (Nelson et al., Table 4.3)

t = Time (years, not to exceed 200 years)

S, = Stable Slope (ft/ft)

The transitional slope (S<sub>0</sub>) was calculated to be 0.052 ft/ft for the 200-year storm event. A uniformity coefficient ( $C_0 = D_{60}/D_{10}$ ) for the cover material of 10 was assumed. Using Nelson et al., 1986, the location and maximum depth of gullying were calculated with the following equations:

$$D_{\text{max}} = \frac{L_D}{L} [H - L(S_t)]$$

where:

L<sub>D</sub> = Distance from toe of maximum depth of gullying (ft)

L = Horizontal distance of heap leach material from toe of embankment

(ft)

H = Vertical distance from crest of embankment to toe of slope (ft)

S<sub>t</sub> = Transitional slope (ft/ft)

The location and maximum depth of gullying  $(D_{max})$  for the cover analyses are summarized in Table A.2.

Table A.2 Summary of Gullying Calculations

Storm Event	Slope Length (ft)	Stable Slope (%)	G (Nelson et al., 1986 Table 4.3)	Initial Slope (%)	Transition Slope (%)	L <sub>D</sub> /L (Nelson et al., 1986. Table 4.4)	Depth of Gullying (ft) (D <sub>max</sub> )	Location of Maximum depth (ft) (L <sub>D</sub> )
200 yr	80	0.39	2	25	5.2	0.66	10.4	52.8

#### A.2.1.5 Rock Protection

For the 200-year storm event, the rock size for the rock mulch to be placed on the surface was calculated using the Stephensen's method (Abt, 1988). The Stephensen equation is given by:

$$D_{50} = \left[ \frac{q (\tan \theta)^{7/6} n^{1/6}}{C g^{1/2} [(1-n) (s-1) \cos \theta (\tan \phi - \tan \theta)]^{5/3}} \right]^{2/3}$$

where:

q = maximum unit discharge,

n = rockfill porosity,

g = acceleration due to gravity,

s = relative density of the rock,

 $\theta$  = angle of the slope measured from horizontal,

\$\display = angle of friction of the rock, and

C = empirical factor.

The unit discharge was determined from the HEC-1 and Manning's equation presented above. The unit discharge for the cover surface is 0.016 cfs/ft. The friction angle of the rock used in the equation was 40 degrees. The rockfill porosity was assumed to be 0.32, and the specific gravity was determined to be 2.65. The steepest slope of the cover is approximately 25 percent. The empirical factor, C, varies from 0.22 for gravel and pebbles to 0.27 for crushed granite; a value of 0.25 was used because this most closely represents the type of rock present. The maximum flow rate q was multiplied by Oliviers' constant to ensure stability (Abt et al, 1988). The Oliviers' constants are 1.2 for gravel and 1.8 for crushed rock. The value used was 1.8 for the crushed rock present. The D<sub>50</sub> of rock required to protect the cover from the erosive forces is 1 inch.

#### A.2.2 Cover Channels

Diversion channels at the toe of the heap leach cover prevent cover runoff from contributing to erosion of the outslope below. As mentioned in Section A.1.3.3 above, two cover channels exist at the toe of the heap leach cover, one on the south and one on the north side of the cover. The erosional stability of these channels was evaluated using the permissible velocity criteria described in Section A.2.1.2.

## A.2.2.1 Permissible Velocity

The permissible velocity is defined as the maximum flow velocity which will not cause erosion of the channel bed soils. The permissible velocity for the channels was determined to be 5 feet per second (fps). This value was based on tables presented in Chow (1959) for unvegetated slopes composed of graded loam to cobbles when noncolloidal. The north diversion channel was modeled using the U. S. Army Corps of Engineers (COE) HEC-1 computer model to estimate the magnitude of the peak discharges in the channels under the design storm events. The South Cover Channel, very similar in geometry and grade, was modeled by analogy with the North Cover Channel. HEC-2 was used to determine corresponding depths of flow and velocities at selected cross sections.

#### A.2.2.2 Rock Protection

The required rock size was determined with the HEC-2 results in accordance with the criteria set forth in NUREG/CR-4651 (Abt, et al, 1988). The method used to examine the appropriate sizes of riprap was the U.S. Army Corps of Engineers Method (COE). The COE method was developed to protect embankments from local shear forces and localized high velocities. The COE method utilizes depth of flor and velocity (calculated from HEC-2) to determine riprap size. Other data pertinent to the disign of the riprap include channel roughness (wherein D<sub>50</sub>, the representative median stone size, is used as a measurement of the roughness), the side slope and bed slope of the channel, and the riprap angle of repose.

Several equations are used to determine the  $D_{50}$  of the riprap size in the COE method. The equation used to calculate the local boundary shear is as follows.

$$\tau_0 = \frac{(\gamma_w V^2)}{(32.6 \log_{10} \frac{12.2D}{k})^2}$$

where:

 $\tau_0 = local$  boundary shear,  $lb/ft^2$ ,

 $\gamma_w = \text{unit weight of water,}$ 

V = average cross-sectional velocity, fps,

D = depth of flow, ft, and

k = equivalent channel boundary surface roughness, with D<sub>so</sub> substituting for k.

The design shear for the riprap to be placed on the slope or bank of the open channel is calculated from

$$\tau_D = \tau \left(1 - \frac{\sin^2 \theta}{\sin^2 \phi}\right)^{0.5}$$

where:

$$\tau = a(\gamma_s - \gamma_w)D_{50}$$

and:

 $\tau_{\rm D} = {\rm design \ shear, \ lb/ft^2,}$ 

 $\tau = initial design shear, lb/ft^2$ ,

 $\theta$  = the angle of the side slope with the horizontal,

 $\phi$  = the angle of repose of the riprap (normally 40°),

 $\gamma_*$  = the specific weight of surface-dry but saturated stone,

 $\gamma_w = \text{unit weight of water, and}$ 

a = 0.04

Using the above equations, the ratio of design shear to local boundary shear is used to calculate a factor of safety. A recommended  $D_{50}$  size for riprap in each of the channels is then determined by obtaining a factor of safety of 1.0. These riprap sizes are the highest values obtained in each channel and only occur in limited areas.

Based on the above analyses, a  $D_{50}$  of 2 inches is required to stabilize the channels for the 200-year storm event.

## A.2.3 Outslopes

The existing outslope below the heap leach cover to the north was evaluated for erosional stability using the sacrificial slope criteria described in Section A.2.1.4. The geometry consisted of a continuous 2.5H:1V slope extending from the toe of the cover to the flood plain of Coyote Creek.

To the south of the Heap Leach area exists three apparent gullies. These gullies were analyzed in order to provide adequate stability for the storm events mentioned above.

# A.2.3.1 Sacrificial Slope

The embankment outslope surface below the cover was analyzed for long term stability by using the sacrificial slope calculations described in Section A.2.1.4. The results of the analysis are summarized in Table A.3. The existing outslope was determined to be insufficient to provide long-term protection of the heap leach material from gullying. Therefore, an alternative conceptual outslope geometry was evaluated for long term erosional stability. The surface geometry was also evaluated with the sacrificial slope criteria and found to require rock protection for erosional stability. This analysis is summarized in Table A.3

Table A.3
Summary of Gullying Calculations

Location	Slope Length (ft)	Stable Slope (%)	G (Nelson et al., 1986 Table 4.3)	Initial Slope (%)	Transition Slope (%)	$L_{\rm D}/L$ (Nelson et al., 1986. Table 4.4)	Depth of Gullying (ft) (D <sub>max</sub> )	Location of Maximu m depth (ft) (L <sub>D</sub> )
Out- Slope: Existing								
200 yr	97	0.34	2.3	57.5	12.0	0.42	16.1	40.7
2.5H:1V Slope								
200 yr	200	0.179	5	40	6.7	0.60	40"	120

<sup>\*</sup> Approximate depth.

#### A.2.3.2 Rock Protection

The required riprap size to maintain stability for the various outslope options was determined using the resulting peak discharge for the outslope surface. The Stephensen method referenced in Section A.2.1.5 was used to size the riprap on the surface of the outslope. The unit discharge was determined from the HEC-1 and Manning's equation presented above. The unit discharge for the outslope is 0.016 cfs/ft, 0.04 cfs/ft, and 0.01 cfs/ft, for the 200 year storm event. The friction angle of the rock used in the equation was 40 degrees. The rockfill porosity was assumed to be 0.32, and the specific gravity was determined to be 2.65. The slope of the outslope options ranges from 25 to 40 percent. The empirical factor, C, varies from 0.22 for gravel and pebbles to 0.27 for crushed granite; a value of 0.25 was used for the type of rock most likely to be used in this area. The maximum flow rate q was multiplied by Oliviers' constant to ensure stability (Abt et al, 1988). The Oliviers' constants are 1.2 for gravel and 1.8 for crushed rock. The value used was 1.8 for crushed rock. The required riprap D<sub>50</sub> for the outslope was determined to be 1 inch.

The three existing gullies south of the Heap Leach area were determined to require rock protection of greater than 36 inch  $D_{50}$ . Rock size was determined using the U.S. Army Corps of Engineers method. This large rock size in these areas is due to the concentrated flow resulting from the extreme storm events.

# A.2.4 Coyote Creek

Coyote Creek runs from west to east along the north side of the Day Loma Heap Leach area as shown on Figure A.2. As mentioned in Section A.1.3.4, the drainage was analyzed for erosional stability. Erosional stability of the drainage was analyzed for the existing condition, and for all three conceptual options mentioned above. Permissible velocity method was used in the analyses, along with the U.S. Army Corps of Engineers method for sizing of appropriate rock size to establish erosional stability.

The analyses indicate the 200-year design flow from the existing Coyote Creek drainage would impact the northern toe of the heap leach area outslope by approximately two feet of flow depth. Therefore, rock protection is required within the Coyote Creek drainage with minor stream rerouting.

## A.2.4.1 Permissible Velocity

As defined in Section A.2.2.1 above, the permissible velocity is the maximum flow velocity which will not cause erosion of the channel bed soils. The permissible velocity for Coyote Creek drainage was determined to be 5 feet per second (fps). This value was based on tables presented in Chow (1959) for unvegetated slopes composed of graded loam to cobbles when noncolloidal. For the 200-year 24-hour storm event, velocities in the drainage ranged from approximately 8 feet/second to greater than 20 feet/second in some locations, exceeding the permissible velocity. Therefore, sizing the required rock protection for establishing erosional stability of the drainage was performed.

#### A.2.4.2 Rock Protection

Based on the HEC-2 analysis for resulting depths of flow and velocities, and using methods described in Section A.2.2.2 above, appropriate rock sizes were determined throughout the drainage reach. In addition to the COE method for sizing the riprap as presented in A.2.2.2, the Safety Factors method also presented Abt, et al. 1988, was used for a particular area in Coyote Creek, namely between cross-sections 10.5 and 20, because higher elevation change was required to meet natural channel gradients and the COE method did not converge under these flow characteristics.

With changing bed slope along the drainage reach, appropriate rock sizes varied. Figure A.2 shows the Coyote Creek cross-section locations. The following rock sizes for channel protection were calculated:

Table A.4
Riprap Sizes for Coyote Creek

Cross-Section Location  0 to 10  10 to 10.5  10.5 to 20  20 to 30  30 to 40  40 to 50	Required D <sub>so</sub>				
0 to 10	11 inches				
10 to 10.5	5 inches				
10.5 to 20	4.8 feet (Safety Factors Method)				
20 to 30	1.5 feet				
30 to 40	1.5 feet				
40 to 50	3 inches				

HEC-2 output and riprap sizing results are included at the end of this appendix.

## A.2.5 Summary

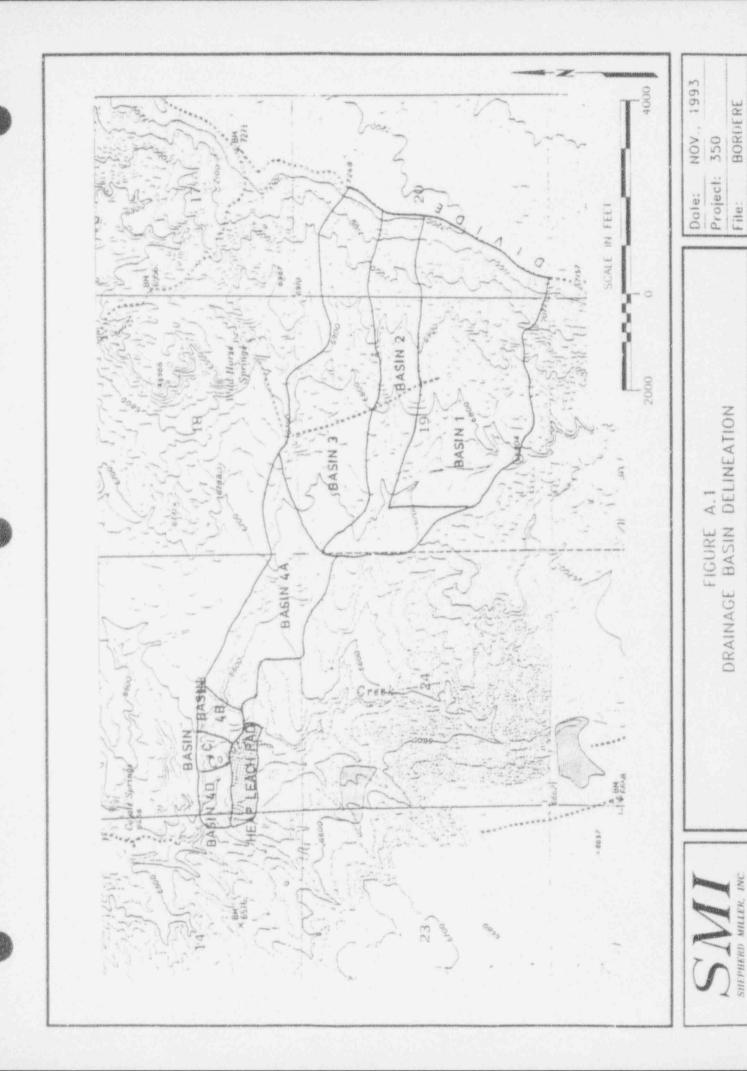
In establishing STP criteria for erosional stability of the Day Loma Heap Leach, at a minimum regrading and the addition of rock mulch or rock protection is required for a large percentage of an area. This is a result of the Heap Leach being in close proximity to a natural drainage, the odible soils existing in the area, not accounting for vegetation on the cover surface, and the extreme storm events used in analyzing the stability. Although with more information and testing the requirements may be refined, those presented above provide a close approximation for establishing erosional stability and compliance with STP criteria.

#### REFERENCES

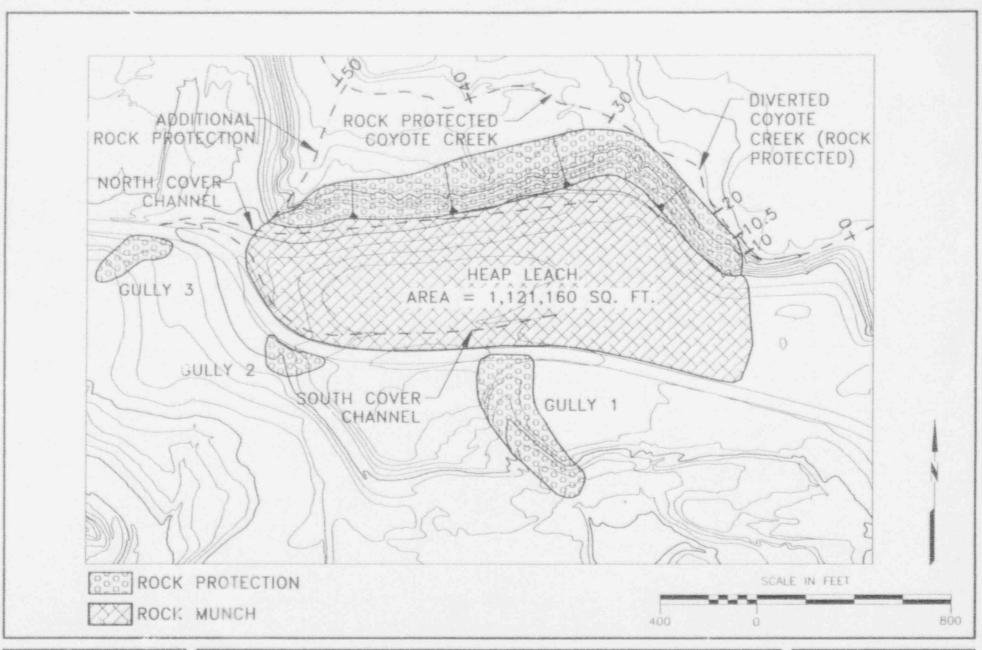
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BORDERE



SMI SHEPHERD MILLER, INC. FIGURE A.2 CONCEPTUAL COVER DESIGN DAY LOMA HEAP LEACH AREA Date: NOV., 1993
Project: 350
File: VOLUME

HEC-1 OUTPUT

\* FLOOD HYDROGRAPH PACKAGE (HEC-I) \* \* U.S. ARMY CORPS OF ENGINEERS \* HYDROLOGIC ENGINEERING CENTER \* \* 609 SECOND STREET \* \* DAVIS, CALIFORNIA 95615 \* \* RUN DATE 11/30/92 TIME 07:12:17 \* \* (916) 351-1748 \* \*

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE: GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-I INPUT

PAGE 1

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8
        10
            5
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       HC 2
32
       KK ROUTE TO NODE 3

KO 0 0 0 0 21

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57 ZZ
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FLOOD HYDROGRAPH PACKAGE (HEC-I) \*

MAY 1991 \* VERSION 4.0.1E \*

\* RUN DATE 11/30/92 TIME 07:12:17 \*

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U.S. ARMY CORPS OF ENGINEERS

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\* HYDROLOGIC ENGINEERING CENTER \*

609 SECOND STREET

DAVIS, CALIFORNIA 95616

\* (916) 551-1748

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME DLCOVR24.IH1
HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD

200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION

RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION STA			E FLOW		AXIMUM PERIOD AREA			
+	OPERATION STA	6-H	OUR 24	HOUR	72-HO	UR	SIAUE	MAA STAGE	
	HYDROGRAPH AT								
*	NORTH	1. 12.00	0.	0.	0.	0.00			
	ROUTED TO	11.00				2.00			
+	R-NZ	1. 11.98	0.	U.	u.	0.00			
	HYDROGRAPH AT NORTH		0	0	0	0.00			
						0.00			
*	2 COMBINED AT C-N2		0.	0.	0.	0.00			
	ROUTED TO								
+	ROUTE		0.	0.	0.	0.00			
	HYDROGRAPH AT								
+	NORTH		0.	0.	0.	0.00			
	2 COMBINED AT								
*	C-N3	2. 12.00	0.	0.	0.	0.00			
	HYDROGRAPH AT								
*	SOUTH	1. 12.00	0.	0.	0.	0.00			
	ROUTED TO					0.00			
+	SR N2	1. 12.00	0.	0.	U.	0.00			
	HYDROGRAPH AT SOUTH	1 12 00				0.00			
	5001H	1. 12.00	0.	U.	u.	0.00			
	2 COMBINED AT					Delete PL			
*	C-52	2. 12.00	0.	0.	0.	0.00			

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
INTERPOLATED TO
COMPUTATION INTERVAL

# ISTAQ ELEMENT DT PEAK TIME TO VOLUME DT PEAK TIME TO VOLUME PEAK

(MIN) (CFS) (MIN) (IN) (MIN) (CFS) (MIN) (IN)

R-N2 MANE 0.30 1.03 719.89 2.73 1.00 1.02 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6698E-01 EXCESS=0.0000E+00 OUTFLOW=0.6694E-01 BASIN STORAGE=0.5606E-04 PERCENT ERROR= 0.0

ROUTE MANE 0.34 1.65 719.96 2.73 1.00 1.65 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW = 0.1077E + 00 EXCESS = 0.0000E + 00 OUTFLOW = 0.1077E + 00 BASIN STORAGE = 0.1304E-03 PERCENT ERROR = -0.1

SR N2 MANE 0.43 1.20 719.72 2.73 1.00 1.20 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.7862E-01 EXCESS=0.0000E+00 OUTFLOW=0.7854E-01 BASIN STORAGE=0.1084E-03 PERCENT ERROR= 0.0

\*\*\* NORMAL END OF HEC-1 \*\*\*

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC! (JAN 73), HEC!GS, HEC!DB, AND HEC!KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS; WRITE STAGE FREQUENCY, DSS; READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE: GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT PAGE 1

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         ID Input File NAME DLCDV24.IH1
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              200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
            RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
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 6
         TT
 7
         IN
            15 0
 8
         10 5 0
 9
         KK BASINI
         KO 0
PB 3.7
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         PC 0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
 14
         PC 0.1080 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
 15
         PC 0.1800 0.1900 0.2020 0.2160 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
 17
         PC 0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8476
         PC 0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
 18
         PC 0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
 19
         PC 0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
         PC 0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
         BA .00474
 23
         LS 0 91
 24
         UD .08255
```

```
25 KK R1-2
26 KO 0 0 0 0 21
27 RK 550 .021 .020 0 TRAP 5 4
 28
       KK BASINZ
       BA .00573
LS 0 91
 29
 30
 31
       UD .01578
       KK C-1
KO 0 0 0 0 21
HC 2
 32
 33
 35
       KK R2-3
       KO 0 0 0 0 21
 36
       RK 500 .005 .020 0 TRAP 5 4
 37
 38
       KK BASIN3
       BA .00484
 39
 40
       LS 0 91
       UD .01578
 41
42
       KK C-2
       KO 0 0 0 0 21
HC 2 HEC-1 INPUT
43
                                            PAGE 2
LINE
      ID.....1....2.....3.....4.....5.....6.....7....8.....9....10
       KK R3-4
45
       KO 0 0 0 0 21
RK 700 .01 .020 0 TRAP 5 4
48
       KK BASIN4
49
       BA .00309
       LS 0 91
UD 00940
50
51
52
       KK C-3
53
       KO 0 0 0 0 21
54
       HC 2
55
       7.7
```

1

FLOOD HYDROGRAPH PACKAGE (HEC-1) \* MAY 1991 \* VERSION 4.0.1E \* \* RUN DATE 12/01/92 TIME 07:05:53 \*

. U.S. ARMY CORPS OF ENGINEERS \* HYDROLOGIC ENGINEERING CENTER \* 609 SECOND STREET DAVIS, CALIFORNIA 95616 \* \* (916) 551-1748

**用物的外的电影型的的种种的电影的电影的电影的电影电影电影的影响的电影** 

\*\*\*\*\*\*\*\*\*\*\*\*

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92 Input File NAME DLCOV24 IH1
HEC-1 RUNOFF CALC. FOR WATERSHED ON HEAP LEACH PAD 200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

#### RUNOFF SUMMARY FLOW IN CUBIC FEET PER SECOND TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION STA	PEAK TIME OF	AVERA	GE FLOW	FOR N	AXIMUM PERIOD	BASIN	MAXIMUM	TIME OF
+	0728311011 013	6-F	IOUR 2	4-HOUR	72-H	OUR	STAGE	MAX STAGE	
	HYDROGRAPH AT								
+	BASI	10. 12.02	1.	0.	0.	0.00			
	ROUTED TO								
+	R1-2	10. 12.02	11	0.	0.	0.00			
	HYDROGRAPH AT								
*	BASIN2	13, 12.00	1.	0.	0.	0.01			
	2 COMBINED AT								
*	C-1	23, 12.00	2.	1,	14	0.01			
	ROUTED TO								
*	R2-3	23. 12.00	2.	3.5	. I.	0.01			
	HYDROGRAPH AT								
+	BASIN3	11. 12.00	1.	0.	0.	0.00			
	I COMBINED AT								
de.	C-2	33. 12.00	4.	1	1.	0.02			
	ROUTED TO								
+	R3-4	33. 12.02	4.	1.	L	0.02			
	HYDROGRAPH AT								
*	BASIN4	7. 12.00	1.	0.	0.	0.00			
	2 COMBINED AT								
*	C3	40. 12.00	4.	1.	1.	0.02			
		SUMMARY OF (FLOW IS DI	KINEMAT RECT RU	NOFF WIT	HOUT	KINGUM-CUNGE RO BASE FLOW)	UTING		
				INTER		ED TO INTERVAL			
	TETTACK OF TRANSPORT	DOT			100 1000	MARK AND			

ISTAQ ELEMENT DT PEAK TIME TO VOLUME DT PEAK TIME TO VOLUME

PEAK

PEAK

# (MIN) (CFS) (MIN) (IN) (MIN) (CFS) (MIN) (IN) R1-2 MANE 0.63 10.11 721.64 2.73 1.00 10.10 721.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW = 0.6892E + 00 EXCESS = 0.0000E + 00 OUTFLOW = 0.6889E + 00 BASIN STORAGE = 0.643JE-03 PERCENT ERROR = 0.0

R2-J MANE 0.75 22.55 720.14 2.73 1.00 22.52 720.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1523E+01 EXCESS=0.0000E+00 OUTFLOW=0.1522E+01 BASIN STORAGE=0.1771E-02 PERCENT ERROR= 0.0

R3-4 MANE 0.61 33.16 720.49 2.73 1.00 33.10 721.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2226E+01 EXCESS=0.0000E+00 OUTFLOW=0.2226E+01 BASIN STORAGE=0.2532E-02 PERCENT ERROR= -0.1

\*\*\* NORMAL END OF HEC-1 \*\*\*

\* FLOOD HYDROGRAPH PACKAGE (HEC-1) \* MAY 1991 \* VERSION 4.0.1E \* RUN DATE 12/06/92 TIME 16:59:16 \*

\* U.S. ARMY CORPS OF ENGINEERS

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET \*

DAVIS, CALIFORNIA 95616 \*

(916) 551-1748 \*

\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*\*\*\*

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRANT? VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL. LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT PAGE 1

```
LINE
         ID....1...2...3...4...5...6...7...8....9....10
         ID Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
         ID
             Input File NAME OUTSL2.IH1
             HEC-1 RUNOFF CALC. FOR OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
             200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
         ID RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
 6
         II
             1 0 0000 1440 0000
            15 0 0
         IN
 H
         10
            5 0
         KK NORTH SIDE SEGMENT 1
 4
         KO 0 0 0 0 21
PB 3.7
 10
         PC 0.0000 0.0030 0.0050 0.0080 0.0110 0.0130 0.0160 0.0190 0.0220 0.0250
         PC 0.0280 0.0310 0.0340 0.0370 0.0410 0.0440 0.0480 0.0510 0.0550 0.0580
 14
         PC 0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
         PC 0.1980 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
 15
         PC 0.1800 0.1900 0.2020 0.2150 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
 17
         PC 0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8470
 18
         PC 0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
 19
         PC 0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
         PC 0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
         PC 0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
         BA .00072
         LS 0 91
24
         UD .00989
 25
         22
```

\* FLOOD HYDROGRAPH PACKAGE (HEC-I) \* MAY 1991 \* VERSION 4.0.1E \* RUN DATE 12/06/92 TIME 16:59:16 \*

\*

\* U.S. ARMY CORPS OF ENGINEERS \*

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET \*

DAVIS, CALIFORNIA 95616 \*

(916) 551-1748 \*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME OUTSL2.IH1
HEC-1 RUNOFF CALC. FOR OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

PEAK TIME OF AVERAGE FLOW FOR MAXIMUM PERIOD BASIN MAXIMUM TIME OF OPERATION STATION FLOW PEAK AREA STAGE MAX STAGE 6-HOUR 72-HOUR

HYDROGRAPH AT

NORTH 2, 12.00 0. 0. 0. 0.00

\*\*\* NORMAL END OF HEC-1 \*\*\*

\* FLOOD HYDROGRAPH PACKAGE (HEC-1) \* 

\* MAY 1991 \* 

\* VERSION 4.0.1E \* 

\* AUN DATE 12/08/92 TIME 16:22:29 \* 

\* (916) 551-1748 \*

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RITMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRANT? VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE: GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT

PAGE I

```
LINE
         ID....1....2....3....4....5.....6.....7....8.....9....10
         ID Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
         ID Input File NAME OUTSL8.IH1 (OPTION 2)
         ID HEC-1 RUNOFF CALC. FOR AML OPTION OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
         ID 200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
             RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
              1 0 0000 1440 0000
         IT
 6
                  0
         IN
             15
 8
         10
             5 0
 Q
         KK NORTH SIDE SEGMENT 1
         KO 0 0 0 0 21
         PB 3.7
         PC 0.0000 0.0030 0.0050 0.0080 0.0110 0.0130 0.0160 0.0190 0.0220 0.0250
         PC 0.0280 0.0310 0.0340 0.0370 0.0410 0.0440 0.0480 0.0510 0.0550 0.0580
         PC 0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
 14
 15
         PC 0.1080 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
        PC 0.1800 0.1900 0.2020 0.2160 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
 16
         PC 0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8470
 17
 18
         PC 0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
 19
        PC 0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
        PC 0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
 21
        PC 0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
         BA .00162
         LS 0 91
 24
         UD .02570
 25
         22
```

\* FLOOD HYDROGRAPH PACKAGE (HEC-I) \*
MAY 1991
VERSION 4.0.1E \*
RUN DATE 12/08/92 TIME 16:22:29 \*

\* U.S. ARMY CORPS OF ENGINEERS \*

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET \*

DAVIS, CALIFORNIA 95616 \*

(916) 551-1748 \*

\*

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME OUTSL8 JH1 (OPTION 2)
HEC-1 RUNOFF CALC. FOR AML OPTION OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

PEAK TIME OF AVERAGE FLOW FOR MAXIMUM PERIOD BASIN MAXIMUM TIME OF OPERATION STATION FLOW PEAK AREA STAGE MAX STAGE 6-HOUR 24-HOUR 72-HOUR

HYDROGRAPH AT NORTH 4. 12.00 0. 0. 0. 0. 0.00

\*\*\* NORMAL END OF HEC-1 \*\*\*

\* FLOOD HYDROGRAPH PACKAGE (HEC-I) \*

\* MAY 1991 \*

\* VERSION 4.0.1E \*

\* RIJN DATE 12/08/92 TIME 10:17:21 \*

\* U.S. ARMY CORPS OF ENGINEERS \*

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET \*

DAVIS, CALIFORNIA 95616 \*

(916) 551-1748 \*

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRANT! VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT

PAGE 1

```
LINE
         ID....1...2...3....4...5...6....7...8...9...10
         ID Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
         ID Input File NAME OUTSL4.IH1 (OPTION 3)
         ID HEC-1 RUNOFF CALC. FOR OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
         ID 200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
        ID RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
        TT 1 0 0000 1440 0000
        IN 15 0 0
 8
        10
             5 0
        KK NORTH SIDE SEGMENT 1
 10
        KO 0 0 0 0 21
        PB 3.7
 11
         PC 0.0000 0.0030 0.0050 0.0080 0.0110 0.0130 0.0160 0.0190 0.0220 0.0250
 12
        PC 0.0280 0.0310 0.0340 0.0370 0.0410 0.0440 0.0480 0.0510 0.0550 0.0580
 13
        PC 0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
 14
        PC 0.1080 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
 15
        PC 0.1800 0.1900 0.2020 0.2160 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
 16
         PC 0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8470
 17
        PC 0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
 18
 19
         PC 0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
        PC 0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
 20
        PC 0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
 22
        BA .00033
 23
        LS 0 91
 24
         UD .00536
```

25	KK	BENCE	4			
26	KO	0	0	0	0	21
27	BA	.00011				
28	LS	0	91			
29	UD	.00420				
30	KK	COMB:	37.			
31	KO	0	1,5	0	0	21
32	HC	2				
33	ZZ					

\* FLOOD HYDROGRAPH PACKAGE (HEC-1) \*

\* MAY 1991

\* VERSION 4.0.1E \*

\* RUN DATE 12/08/92 TIME 10:17:21 \*

\* U.S. ARMY CORPS OF ENGINEERS

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET \*

DAVIS, CALIFORNIA 95616 \*

(916) 551-1748 \*

\*

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME OUTSL4.IH1 (OPTION 3)
HEC-1 RUNOFF CALC. FOR OUTSLOPE WATERSHED BELOW HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION STATION		AVERAGE FLOW PEAK HOUR 24-HOUR	FOR MAXIMUM 72-HOUR	PERIOD	BASIN	MAXIMUM MAX STAGE	TIME OF
+	HYDROGRAPH AT NORTH	1. 12.00	0. 0.	0. 0.00				
+	HYDROGRAPH AT BENCH	0. 12.00	0. 0.	0. 0.00				
	2 COMBINED AT COMBIN	1. 12.00	0. 0.	0. 0.00				

<sup>\*\*\*</sup> NORMAL END OF HEC-1 \*\*\*

\* FLOOD HYDROGRAPH PACKAGE (HEC-I) \* U.S. ARMY CORPS OF ENGINEERS \*

\* MAY 1991 \* \* HYDROLOGIC ENGINEERING CENTER \*

\* O99 SECOND STREET \*

\* DAVIS, CALIFORNIA 95616 \*

\* RUN DATE 12/08/92 TIME 13:58:07 \* (916) 551-1748 \*

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1 DB, AND HEC1 KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT

PAGE 1

```
LINE ID 1 2 3 4 5 6 7 8 9 10
        ID Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
        ID Input File NAME OUTSL6.IH1 (option 3)
ID HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD
         ID 200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
        ID RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II
        rr 1 0 0 1640 0 0
              5 0
 8
        243
        KK BASINI
                    0 0 0 21
        KO 0
FB 3.7
 10
         PC 0.0000 0.0030 0.0050 0.0080 0.0110 0.0130 0.0160 0.0190 0.0220 0.0250
 12
        PC 0.0280 0.0310 0.0340 0.0370 0.0410 0.0440 0.0480 0.0510 0.0550 0.0580
        PC 0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
 14
 15
        PC 0.1080 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
       PC 0.1800 0.1900 0.2020 0.2160 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
      PC 0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8470
17
      PC 0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
 18
 19
         PC 0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
        PC 0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
        PC 0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
       BA .00033
      LS 0 91
UD 00536
 24
```

```
KX BENCH SECTION 1
26
      BA .00011
27
       LS 0 91
       UD .00420
28
29
       KK COMBINE
      KO 0 0 0 0 21
HC 2
30
31
32
       KK R1-2
       KO 0 0 0 0 21
33
       RK 200 .005 .028 3 TRAP 0 1
34
35
       KK BASIN2
36
       BA .00033
       LS 0 91
37
       UD 00536
38
       KK BENCH SECTION 2
39
       BA .00011
40
      LS 0 91
UD 00420
41
42
43
       KOK C-1
       KO 0 0 0 0 21
HC 3
44
45
               HEC-1 INPUT
                                                 PAGE 2
      ID.....1....2.....3.....4.....5......6.....7.....8.....9.....10
LINE
       KK R2-3
KO 0 0 0 0 21
46
47
       RK 200 .005 .028 0 TRAP 0 1
48
49
       KK BASIN3
       BA .00033
50
51
       LS 0 91
       UD .00536
52
53
       KK BENCH SECTION 3
54
       BA .00011
55
       LS 0 91
       UD 00420
 56
      KK C-2
KO 0 0 0 0 21
HC 3
57
 58
 59
       KK R3-4
 60
       KO 0 0 0 0 21
61
       RK 200 005 028 0 TRAF 0 1
62
 63
       KK BASIN4
 64
       BA .00033
       LS 0 91
65
       UD 00536
66
 67
       KK BENCH SECTION 4
68
       BA .00011
       LS 0 91
69
       UD .00420
 70
 71
       KK C-3
       KO 0 0 0 0 21
 72
```

1

```
KK R4-5
75
       KO 0 0 0 0 21
       RK 200 .005 .028 0 TRAP 0 1
76
77
      KK BASINS
78
       BA .00033
       LS 0 91
UD .00536
79
80
       KK BENCH SECTION 5
81
82
       BA .00011
       LS 0 91
83
       UD .00420
84
                     HEC-1 INPUT
                                        PAGE 3
LINE ID....1...2....3....4....5....6.....7....8....9....10
85
       KK C4
       KO 0 0 0 0 21
87
       HC 3
88
       KK R5-6
       KO 0 0 0 0 21
RK 200 .005 .028 0 TRAP 0 1
89
90
       KK BASING
91
92
       BA .00033
       LS 0 91
93
       UD .00536
94
95
       KK BENCH SECTION 6
96
       BA .00011
       LS 0 91
97
       UD .00420
98
99
       KK C-5
       KO 0 0 0 0 21
100
       HC 3
       KK R6-7
KO 0 0 0 0 21
RK 200 :005 :028 0 TRAP 0 1
102
103
104
       KK BASIN7
105
       BA .00033
106
       LS 0 91
107
108
       UD .00536
109
       KK BENCH SECTION 7
       BA .00011
       LS 0 91
       UD 00420
112
113
       KK C-6
       KO 0 0 0 0 21
114
       HC 3
115
       KK R7-8
116
       KO 0 0 0 0 21
RK 200 005 028 0 TRAP 0 1
117
119
       KK BASINS
```

HC 3

73

```
LS 0 91
UD .00536
121
                                                   PAGE 4
                      HEC-1 INPUT
       ID....1....2....3....4....5....6....7....8....9....10
LINE
      KK BENCH SECTION 8
123
124
        BA .00011
125
        LS 0 91
        UD .00420
126
127
        KK C-7
128
        KO 0 0 0 0 21
129
        HC 3
130
       KK R8-9
       KO 0 0 0 0 21
RK 200 .005 .028 0 TRAP 0 1
131
132
133
        KK BASIN9
134
       BA .00033
       LS 0 91
135
        UD .00536
136
137
       KK BENCH SECTION 9
138
        BA .00011
        LS 0 91
UD .00420
139
140
141
        KK C-8
142
        KO 0 0 0 0 21
       HC 3
143
144
        KK R9-10
       KK R9-10
KO 0 0 0 0 21
RK 200 .005 .028 0 TRAP 0 1
145
146
147
        KK BASIN10
148
        BA .00033
        LS 0 91
149
150
        UD .00536
        KK BENCH SECTION 10
151
152
        BA .00011
        LS 0 91
UD .00420
153
154
155
        KK C-9
156
        KO 0 0 0 0 21
        HC 3
157
158
        KK R10-11
        KO 0 0 0 0 21
RK 200 .005 .028 0 TRAP 0 1
159
160
                       HEC-I INPUT
                                                        PAGE 5
LINE
       ID....1...2....3....4.....5....6.....7....8....9....10
       KK BASINII
      BA .00033
162
163
        LS 0 91
        UD .00536
164
```

1

120

BA .00033

```
165
        KK BENCH SECTION 11
         BA .00011
LS 0 91
166
167
         UD .00420
168
         KK C-10
KO 0 0 0 0 21
HC 3
169
170
171
        KK R11-12
KO 0 0 0 0 21
RK 200 .005 .028 0 TRAP 0 1
172
173
174
175
         KK BASIN12
        BA .00033
LS 0 91
UD .00536
176
177
178
179
        KK BENCH SECTION 12
         BA .00011
LS 0 91
180
181
182
         UD .00420
        KK C-11
KO 0 0 0 0 21
HC 3
183
184
185
186
         ZZ ·
```

FLOOD HYDROGRAPH PACKAGE (HEC-I) \*
MAY 1991 \*
VERSION 4.0.1E \*

\* RUN DATE 12/08/92 TIME 13:58:07 \*

\*

\* U.S. ARMY CORPS OF ENGINEERS \*

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET \*

DAVIS, CALIFORNIA 95616 \*

(916) 551-1748 \*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92 Input File NAME OUTSL6.IH1 (option 3) HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD 200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC II

# RUNOFF SUMMARY FLOW IN CUBIC FEET PER SECOND TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION STAT	EAK TIME OF TION FLOW	PEAK					MAXIMUM MAX STAGE	
+		6-F	IOUR	24-HOUR	72-H	OUR			
+	HYDROGRAPH AT BASI	1. 12.00	0.	0.	0.	0.00			
	HYDROGRAPH AT BENCH		0.	0.	0.	0.00			
+	2 COMBINED AT COMBI		0.	0.	0.	0.00			
	ROUTED TO R1-2	1. 12.00	0.	0.	0.	0.00			
+	HYDROGRAPH AT BASIN2	1, 12.00	0.	0.	0.	0.00			
+	HYDROGRAPH AT BENCH		0.	0.	0.	0.00			
+	3 COMBINED AT C-1	2. 12.00	0.	0.	0.	0.00			
+	ROUTED TO R2-3	2. 12.00	0.	0.	0.	0.00			
*	HYDROGRAPH AT BASIN3	1. 12.00	0.	0.	0.	0.00			
	HYDROGRAPH AT BENCH		0.	0.	0.	0.00			
+	3 COMBINED AT C-2	3. 12.00	0.	0,	0.	0.00			
+	ROUTED TO R3-4	3. 12.00	0.	0.	0.	0.00			
	HYDROGRAPH AT								

		BASIN4	1 17.00				0.00
			1. 14.00	Ma	0.	u.	0.00
,	*	HYDROGRAPH AT BENCH	0. 12.00	0.	0.	0.	0.00
	+	3 COMBINED AT C-3	4. 12.00	0.	0.	0.	0.00
	*	ROUTED TO R4-5	4. 12.00	0.	0.	0.	0.00
	*	HYDROGRAPH AT BASINS	1. 12.00	0.	0.	0.	0.00
	+	HYDROGRAPH AT BENCH	0. 12.00	0.	0.	0.	0.00
	+	3 COMBINED AT C-4	5. 12.00	1.	0.	0.	0.00
	+	ROUTED TO R5-6	5. 12.00	1.	0.	0.	0.00
	*	HYDROGRAPH AT BASIN6	1. 12.00	0.	0.	0.	0.00
	+	HYDROGRAPH AT BENCH	0. 12.00	0.	0.	O.	0.00
	+	3 COMBINED AT C-5	6. 12.00	i.	0.	0.	0.00
)	*	ROUTED TO R6-7	6. 12.00	1.	0.	0.	0.00
	+	HYDROGRAPH AT BASIN7	1. 12.00	0.	0.	0.	0.00
	+	HYDROGRAPH AT BENCH	0. 12.00	0.	0.	0.	0.00
	*	J COME/NED AT C-6	7. 12.00	1.	0.	0.	0.00
	+	ROUTED TO R7-8	7. 12.00	1.	0.	0.	0.00
		HYDROGRAPH AT BASINS	1. 12.00	0.	0.	0.	0.00
	+	*Ordroge *** AT RENCH	0. 12.00	0.	0.	0.	0.00
	+	3 COMBINED AT C-7	8. 12.00	1.	0.	0.	0.00
	+	ROUTED TO R8-9	8. 12.00	1.	0.	0.	0.00
		HYDROGRAPH AT BASIN9	1. 12.00	0.	0.	0.	0.00
	*	HYDROGRAPH AT BENCH	0. 12.00	0.	0.	0.	0.00

-	3 COMBINED AT C-8	9. 12.00	1.	0.	ō.	0.00
	ROUTED TO R9-10	9. 12.00	L.	0.	0.	0.00
	HYDROGRAPH AT BASIN1	1. 12.00	0.	0.	0.	0.00
*	HYDROGRAPH AT BENCH	0. 12.00	0.	0.	0.	0.00
*	3 COMBINED AT C-9	10. 12.00	1.	0.	0.	0.00
	ROUTED TO RIO-11	10. 12.00	1.	G.	0.	0.00
+	HYDROGRAPH AT BASINI	1. 12.00	O.	0.	0.	0.00
+	HYDROGRAPH AT BENCH	0. 12.00	0.	0.	0.	0.00
+	3 COMBINED AT C-10	11. 12.00	1.	0.	0.	0.00
+	ROUTED TO R11-12	11. 12.00	1.	0.	0.	0.00
	HYDROGRAPH AT BASINI	1. 12.00	0.	0.	0.	0.00
	HYDROGRAPH AT BENCH	0. 12.00	0.	0.	0.	0.00
*	3 COMBINED AT C-11	12. 12.00	1.	0.	0.	0.01

# SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW) INTERPOLATED TO

COMPUTATION INTERVAL

ISTAQ ELEMENT DT PEAK TIME TO VOLUME DT PEAK TIME TO VOLUME PEAK

(MIN) (CFS) (MIN) (IN) (MIN) (CFS) (MIN) (IN)

RI-2 MANE 0.56 0.98 720.58 2.73 1.00 0.98 720.00 2.74

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6407E-01 EXCESS=0.0000E+00 OUTFLOW=0.6412E-01 BASIN STORAGE=0.6441E-04 PERCENT ERROR= -0.2

R2-3 MANE 0.51 1.96 720.03 2.73 1.00 1.96 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1283E+00 EXCESS=0.0000E+00 OUTFLOW=0.1283E+00 BASIN STORAGE=0.1012E-03 PERCENT ERROR= -0.1

R3-4 MANE 0.51 2.94 719.82 2.73 1.00 2.93 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1923E+00 EXCESS=0.0000E+00 OUTFLOW=0.1922E+00 BASIN STORAGE=0.1372E-03 PERCENT MERROR= 0.0

R4-5 MANE 0.49 3.90 719.71 2.73 1.00 3.90 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2562E+00 EXCESS=0.0000E+00 OUTFLOW=0.2561E+00 BASIN STORAGE=0.1713E-03 PERCENT ERROR= 0.0

RS-6 MANE 0.48 4.87 719.81 2.73 1.00 4.87 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFL 7W = 0.3201E + 00 EXCESS = 0.0000E + 00 OUTFLOW = 0.3200E + 00 BASIN STORAGE = 0.2018E-03 PERCENT ERROR = 0.00

R6-7 MANE 0.47 5.84 720.14 2.73 1.00 5.84 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3840E+00 EXCESS=0.0000E+00 OUTFLOW=0.3838E+00 BASIN STORAGE=0.2294E-03 PERCENT ERROR= 0.0

R7-8 MANE 0.48 6.80 720.06 2.73 1.00 6.80 720.00 2.73

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.4478E+00 EXCESS=0.0000E+00 OUTFLOW=0.4477E+00 BASIN STORAGE=0.2557E-03 PERCENT ERROR= 0.0

R8-9 MANE 0.47 7.77 720.00 2.73 1.00 7.77 720.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.5117E+00 EXCESS=0.0000E+00 OUTFLOW=0.5116E+00 BASIN STORAGE=0.2793E-03 PERCENT ERROR= 0.0

R9-10 MANE 0.33 8.73 720.40 2.72 1.00 8.73 720.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.5755E+00 EXCESS=0.0000E+00 OUTFLOW=0.5754E+00 BASIN STORAGE=0.3009E-03 PERCENT ERROR= 0.0

RIO-11 MANE 0.31 9.70 720.32 2.72 1.00 9.69 720.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6394E+00 EXCESS=0.0000E+00 OUTFLOW=0.6392E+00 BASIN STORAGE=0.3219E-03 PERCENT ERROR= 0.0

R11-12 MANE 0.32 10.64 720.14 2.72 1.00 10.64 720.00 2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.7032E+00 EXCESS=0.0000E+00 OUTFLOW=0.7030E+00 BASIN STORAGE=0.3448E-03 PERCENT ERROR= 0.0

\* FLOOD HYDROGRAPH PACKAGE (HEC-1) \* U.S. ARMY CORPS OF ENGINEERS

\* MAY 1991 \* \* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET \*

\* DAVIS, CALIFORNIA 95616 \*

\* (916) 551-1748 \*

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC! (JAN 73), HECIDS, HECIDS, AND HECIKW,

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT PAGE 1

```
ID Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
        ID Input File NAME DL20024.IH1
        ID HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD ID 200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
        ID RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC III
5
        TT 1 0 0000 1440 0 0
IN 15 0 0
        10 5 0
8
0
        KK BASINI
10
        PB 3.7
        PC 0.0000 0.0030 0.0050 0.0080 0.0110 0.0130 0.0160 0.0190 0.0220 0.0250
        PC 0.0280 0.0310 0.0340 0.0370 0.0410 0.0440 0.0480 0.0510 0.0550 0.0580
12
        PC 0.0620 0.0660 0.0700 0.0740 0.0790 0.0830 0.0880 0.0920 0.0970 0.1020
13
        PC 0.1080 0.1130 0.1190 0.1250 0.1310 0.1380 0.1450 0.1530 0.1610 0.1700
14
15
        PC 0.1800 0.1900 0.2020 0.2160 0.2350 0.2570 0.2900 0.4000 0.6600 0.7100
        PC 0.7350 0.7560 0.7720 0.7880 0.8000 0.8100 0.8200 0.8300 0.8390 0.8470
16
        PC 0.8550 0.8620 0.8690 0.8750 0.8810 0.8870 0.8920 0.8980 0.9030 0.9080
17
        PC 0.9120 0.9170 0.9210 0.9260 0.9300 0.9340 0.9380 0.9420 0.9450 0.9490
18
        PC 0.9520 0.9560 0.9590 0.9630 0.9660 0.9690 0.9720 0.9750 0.9780 0.9810
19
20
        PC 0.9840 0.9870 0.9890 0.9920 0.9950 0.9970 1.0000
        BA .46
L5 0 91
21
22
        UD .300
        KK ROUTE A TO B
```

```
KO 0 0 0 0 21
       RK 2000 0.0286 0.03 0 TRAP 20 10
      KK BASIN2
 27
      BA .26
UD .428
 28
 29
       KK BASIN3
30
       BA .35
31
       UD .357
32
      KK COMBINE BASINS 2 AND 3 WITH ROUTED BASIN 1
33
       KO 0 0 0 0 21
34
 35
       KM COMBINE 3
       HC 3
 36
       KK ROUTE B TO C
37
       KO 0 0 0 0 21
38
       RK 3600 .017 .03 0 TRAP 20 10
39
       KK BASINAA
40
       KO 0 0 0 0 21
41
       BA .0149
42
       UD .537
43
                     HEC-1 INPUT
                                                  PAGE 2
       ID.....1....2.....3.....4.....5.....6.....7.....8.....9.....10
LINE
       KK COMBINE BASIN 4A WITH ROUTED B TO C
       KO 0 0 0 0 21
45
       KM COMBINE 2
46
       HC 2
47
 48
       KK ROUTE C TO D
       KO 0 0 0 0 21
RK 1270 .012 .03 0 TRAP 20 10
49
 50
 51
       KK BASIN 4B
       KO 0 0 0 0 21
       BA .058
 53
       LS 0 91
 54
       UD 035
 55
       KK COMBINE BASIN 4B WITH ROUTED C TO D
 56
57
       KO 0 0 0 0 21
       KM COMBINE 2
 58
       HC 2
 59
 60
       KK ROUTE D TO E
       KO 0 0 0 0 21
 61
       RK 1050 0333 03 0 TRAP 20 10
 62
 63
       KK BASIN 4C
       KO 0 0 0 0 21
 64
 65
       BA .041
       LS 0 91
UD 034
 56
 67
       KK COMBINE BASIN 4C WITH ROUTED D TO E
 68
       KO 0 0 0 0 21
 69
 70
       KM COMBINE 2
 71
       HC 2
 72
      KK ROUTE E TO F
```

73	ко	. 0	0	0	0	21		
74	RK	1100	.023	.02	0	TRAP	20	10
75	KK	BASIN	4D					
76	КО	0	0	0	0	21		
77	BA	.052						
78	LS	0	91					
79	UD	.05						
80	KK	COMB	NE BA	SIN 4D	WITE	ROUTE	DETO	g
8.1	KO	0				21		
82	KM	COMB	INE 2					
83	HC	2						
8.4	77							

FLOOD HYDROGRAPH PACKAGE (HEC-1) \*
MAY 1991 \*
VERSION 4.0.1E \*

\* RUN DATE 11/27/92 TIME 15:58:02 \*

\* U.S. ARMY CORPS OF ENGINEERS \*

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET \*

DAVIS, CALIFORNIA 95616 \*

(916) 551-1748 \*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Project: ENERGY FUELS DAY LOMA #350 SMI, 11/92
Input File NAME DL20024.IH1
HEC-1 RUNOFF CALC. FOR WATERSHED ABOVE HEAP LEACH PAD
200 YR, 24 HOUR STORM: SCS TYPE II DISTRIBUTION
RANGE LAND, GOOD CONDITION, SCS CN VARIABLE, AMC III

# RUNOFF SUMMARY FLOW IN CUBIC FEET PER SECOND TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION STAT	EAK TIME OF	AVERAGE	FLOW	FOR MAJ	CIMUM PERIOD	BASIN	MAXIMUM MAX STAGE	TIME OF
+		6-H	OUR 24-1	HOUR	72-HOU	AREA R		MIN. 21790	
+	HYDROGRAPH AT BASINI	669. 12.18	107.	34.	34.	0.46			
+	ROUTED TO ROUTE	667. 12.22	107.	34.	34.	0.46			
+	HYDROGRAPH AT BASIN2	310. 12.30	60.	19.	19.	0.26			
	HYDROGRAPH AT BASIN3	463. 12.23	81.	26.	26.	0.35			
*	3 COMBINED AT COMBIN	1428. 12.23	249.	78.	78.	1.07			
	ROUTED TO ROUTE	1423. 12.30	249.	78.	78.	1.07			
+	HYDROGRAPH AT BASIN4	15. 12.40	3.	1.	1.	0.01			
+	2 COMBINED AT COMBIN	1438. 12,30	253.	79.	79.	1.08			
+	ROUTED TO ROUTE	1437. 12.32	253.	79.	79.	1.08			
	HYDROGRAPH AT BASIN		14.	4.	4.	0.06			
+	2 COMBINED AT COMBIN		266.	83.	83.	1.14			
	ROUTED TO ROUTE	1452. 12.32	266.	83.	83.	1.14			
	HYDROGRAPH AT								

BASIN 91, 12,00 10, 3, 3, 0.04

2 COMBINED AT

COMBIN 1463, 12,32 276, 86, 86, 1,18

ROUTED TO

ROUTE 1462, 12.33 276, 86, 86, 1.18

HYDROGRAPH AT

BASIN 115. 12.00 12. 4. 4. 0.05

2 COMBINED AT

COMBIN 1476, 12,33 288, 90, 90, 1,24

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

INTERPOLATED TO

COMPUTATION INTERVAL

ISTAQ ELEMENT DT PEAK TIME TO VOLUME DT PEAK TIME TO VOLUME

PEAK

PEAK

(MIN) (CFS) (MIN) (IN) (MIN) (CFS) (MIN) (IN)

ROUTE MANE 0.88 667.82 732.31 2.71 1.00 667.33 733.00 2.71

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6664E+02 EXCESS=0.0000E+00 OUTFLOW=0.6658E+02 BASIN STORAGE=0.9697E-01 PERCENT ERROR= -0.1

ROUTE MANE 1.00 1425.14 737.40 2.70 1.00 1423.29 738.00 2.70

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1548E+03 EXCESS=0.0000E+00OUTFLOW=0.1543E+03 BASIN STORAGE=0.5166E+00 PERCENT ERROR= 0.0

ROUTE MANE 0.77 1436.85 738.40 2.70 1.00 1436.59 739.00 2.70

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1564E+03 EXCESS=0.0000E+00OUTFLOW=0.1563E+03 BASIN STORAGE=0.1797E+00 PERCENT ERROR = 0.0

ROUTE MANE 0.41 1452.12 738.90 2.70 1.00 1452.07 739.00 2.70

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1647E+03 EXCESS=0.0000E+00 OUTFLOW=0.1646E+03 BASIN STORAGE=0.1080E+00 PERCENT ERROR= 0.0

ROUTE MANE 0.43 1462.29 739.96 2.70 1.00 1462.18 740.00 2.70

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1706E+03 EXCESS=0.0000E+00 OUTFLOW=0.1705E+03 BASIN STORAGE=0.1331E+00 PERCENT ERROR= 0.0

HEC-2 OUPUT

\* HEC-2 WATER SURFACE PROFILES \*

Version 4.6.2; May 1991

\* RUN DATE 01DEC92 TIME 15:55:58 \*

\* U.S. ARMY CORPS OF ENGINEERS \*

\*\*\*\*\*\*\*\*\*\*\*

HYDROLOGIC ENGINEERING CENTER
 609 SECOND STREET, SUITE D

\* DAVIS, CALIFORNIA 95616-4687

\* (916) 756-1104

01DEC92 15:55:58

PAGE 1 .

THIS RUN EXECUTED 01DEC92 15:55:58

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

T1 DAY LOMA - EXISTING COVER CHANNEL, DLCOV.DAT (Subcritical)

T2 OVERBANK N=0.020, CHANNEL N=0.020, Q=varies SUBCRIT., PMP,1/2 PMP,200yr

T3 WESTERN NUCLEAR/ENERGY FUELS, JOB#350, SHEPHERD MILLER, 11/92 imw

JI ICHECK INQ NINV IDIR STRT METRIC HVINS Q WSEL FQ

0 2 0 0 0.002 0 0 6597.9

12 NPROF IPLOT PRFVS XSECV XSECH FN ALLDC IBW CHNIM ITRACE

1 0 -1 0 0 0 -1

#### 13 VARIABLE CODES FOR SUMMARY PRINTOUT

		0	38	43	1 2	26	8				
	6 4 30										
	NC	.02	.02	.02	0	0					
	QT	3	40	146	315						
		SECT	ION 8								
	XI	8	7	47.5	72.5	0	0	0	0.000	6500	0
	GR.	99.2	47.5	96.7	57.5	96.4	58.5	96.2	60	95.4	61.5
	OR	96.7	62.5	99.2	72.5						
		SECT	TON 7.1								
	XI	7.1	7	47.5	72.5	150	150	150	0.000	6500	0
	GR	99.5	47.5	97	57.5	96.7				96.7	
k	GR			99.5	72.5					79.7	21.15

	SECTI	ON 7								
X1	7	7	47.5	72.5	50	50	50	0.000	6500	0
GR	99.6	47.5	97.1	57.5	96.8	58.5	96.6	60	96.8	61.5
GR	97.1	62.5	99.6	72.5	96.8					
QT	- 3	34	123	261						
	SECTI									
X1.	6	7	47.5	72.5	75	75	75	0.000	6500	0
GR	99.8	47.5	97.3	57.5	97	58.5	96.8	60	97	61.5
GR	97.3	62.5	99.8	72.5						
	SECTI	ON 5								
- X1	5	7	47.5	72.5	200	200	200	0.000	6500	0
GR	100.2	47.5	97.7	57.5	97.4	58.5	97.2	60	97.4	61.5
	97.7	62.5	100.2	72.5						
1										
01	DEC92	15:55	38							PAGE 2
	SECTION	SM 4								
371			47.5	77 5	200	200	200	0.000	6500	0
GR	100.6	47.5	98 1	57.5	97.8	58.5	07 6	60	07.8	61.5
				72.5		20.0	37.13	- 00	27.12	91.2
100.00	EM18	30-3	400.0	7.86.166						
OT	3	23	76	165						
	SECTIO	ON 3								
			47.5	72.5	200	200	200	0.000	6500	0
GR	103	47.5	100.5	57.5	100.2	58.5	100	60	100.2	61.5
GR	100.5	62.5	103	72.5						
	SECTIO	DN 2								
X1	2	7	47.5	72.5	210	210	210	0.000	6500	0
GR	105	47.5	102.5	57.5	102.2	58.5	102	60	102.2	61.5
GR	102.5	62.5	105	72.5						
			35	74						
	SECTIO									
X1	1	7	47.5	72.5	210	210	210	0.000	6500	0
					110.2	58.5	110	60	110.2	61.5
	110.5	62.5	113	72.5						
1										
01	DEC92	15:55:	58						P	AGE 3

THIS RUN EXECUTED 01DEC92 15:56:04

HEC-2 WATER SURFACE PROFILES

THE REST OF THE PARTY OF THE PA

Version 4.6.2; May 1991

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NOTE- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WESTERN NUCLEAR/ENERGY F

SUMMARY PRINTOUT

SECNO Q CWSEL CRIWS VCH DEPTH

```
40.00 6597.89 6597.52
                                   3.06
                                          1.69
   8.000
   8.000 146.00 6599.01 6598.48
                                  4.24
                                           2.81
   8.000 315.00 6599.94 6599.32
                                   5.49
                                          3.74
   7,100
          40.00 6598.19 6597.81
                                   3.05
                                           1.69
   7.100
          146.00 6599.32 6598.79
                                    4.22
                                           2.82
   7.100
         315.00 6600.24 6599.62
                                    5.48
                                           3.74
   7,000
          40.00 6598.29 6597.92
                                   3.05
                                           1.69
   7.000 146.00 6599.42 6598.88
                                   4.22
                                           2.82
   7.000 315.00 6600.34 6599.72
                                   5.48
                                           3.74
          34.00 6598.46 6598.02
   6.000
                                   2.72
                                           -66
                                           L 83
   5.000
          123.00 6599.63 6598.92
                                    3.53
   5.000
         261.00 6600.63 6599.72
                                    4.37
                                           3.23
  5.000
         34.00 6598.80 6598.42
                                   2.89
                                           1.50
  5.000 123.00 6599.90 6599.33
                                           2.70
                                   3.85
   5.000 261.00 6600.85 6600.12
                                    4.72
                                           3.65
   4.000
          34.00 6599.19 6598.83
                                   2.92
                                          1.58
  4.000
         123.00 6600.26 6599.72
                                    3.98
                                           2.66
   4.000
         261.00 6601.15 6600.52
                                    4.94
                                           3.55
   3.000
          23.00 6601.03 6601.03
                                    4.33
                                           1.03
   3.000
          76.00 6601.73 6601.73
                                   5.53
                                           1.73
   3.000
          165.00 6602.40 6602.40
                                           2.40
                                    6.47
   2.000
          23.00 6603.03 6603.03
                                    4.35
                                           1.03
   2.000
          76.00 6603.74 6603.74
                                           1.74
                                   5.51
   2.000
          165.00 6604.41 6604.41
                                           2.41
01DEC92
           15:55:58
                                                                            PAGE 13
  SECNO
           Q
                  CWSEL CRIWS VCH
                                            DEPTH
   1.000
          10.00 6610.71 6610.71
                                   3.67
                                           .71
   1.000
          35.00 6611.24 6611.24
                                   4.71
   1.000
          74.00 6611.72 6611.72
                                   5.49
01DEC92
          15:55:58
                                                                            PAGE 14
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#### SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO =
                  3.000 PROFILE = 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO=
                  3.000 PROFILE = 1 MINIMUM SPECIFIC ENERGY
CAUTION SECNO =
                  3.000 PROFILE = 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO=
                  3.000 PROFILE = 2 MINIMUM SPECIFIC ENERGY
CAUTION SECNO =
                  3.000 PROFILE = 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO =
                  3.000 PROFILE = 3 MINIMUM SPECIFIC ENERGY
CAUTION SECNO =
                  2.000 PROFILE = 1 CRITICAL DEPTH ASSUMED
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                  2.000 PROFILE = 1 MINIMUM SPECIFIC ENERGY
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                  2.000 PROFILE = 2 CRITICAL DEPTH ASSUMED
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CAUTION SECNO=
CAUTION SECNO =
                  2.000 PROFILE = 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO =
                  2.000 PROFILE = 3 MINIMUM SPECIFIC ENERGY
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CAUTION SECNO = 1.000 PROFILE = 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO = 1.000 PROFILE = 1 MINIMUM SPECIFIC ENERGY
CAUTION SECNO = 1.000 PROFILE = 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO = 1.000 PROFILE = 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO = 1.000 PROFILE = 3 MINIMUM SPECIFIC ENERGY

Ref: COE, 1970. Hydraulic Design of Flood Control Channels, EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1

cation:

11/04/93 DAY LOMA

**SECTION 10 10.5** 

INPUT: radius of curv. (ft)=	250	
INPUT: topwidth of flow (ft)=	41.65	Flow (cfs): 1476
R/W=	6.0	Riprap D-50 (ft): 0.416666
INPUT: side slope (xH:1V)=	2	Manning's n: 0.0341
side slope angle (deg)=	26.6	Bottom Width (ft): 20
INPUT: angle of repose (deg)=	40	Right Side Slope, z: 2
INPUT: rock specific gravity=	2.65	Left Side Slopa, z: 2
		Channel Slope (ft/ft): 0.00561
INPUT: velocity (fps)=	8.510	
INPUT: depth (ft)=	5.630	

	D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	BOTTOM SHEAR (psf)	SIDE SLOPE SHEAR (psf)	BOTTOM SF	SIDE SLOPE SF
	0.9166	1.210	1.556	3.775	2.712	2.43	1.74
4500	0.8333	1.158	1.489	3.432	2.465	2.30	1.66
	0.5	0.930	1.196	2.059	1.479	1.72	1.24
Affilia	0.41666	0.865	1.112	1.716	1.233	1.54	1.11
	0.333	0.794	1.021	1.371	0.985	1.34	0.97

Ref: COE, 1970. Hydraulic Design of Flood Control Channels, EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1

cation:

11/04/93 DAY LOMA

SECTION 20 30

INPUT: radius of curv. (ft)=	355	
INPUT: topwidth of flow (ft)=	36.08	Flow (cfs): 1476
R/W=	9.8	Riprap D-50 (ft): 1.5
INPUT: side slope (xH:1V)=	2	Manning's n: 0.0404
side slope angle (deg)=	26.6	Bottom Width (ft): 20
INPUT: angle of repose (deg)=	40	Right Side Slope, z: 2
INPUT: rock specific gravity=	2.65	Left Side Slope, z: 2
		Channel Slope (ft/ft): 0.0258
INPUT: velocity (fps)=	13.090	
INPLIT: depth (ft)=	4 030	

	D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	BOTTOM SHEAR (psf)	SIDE SLOPE SHEAR (psf)	BOTTOM SF	SIDE SLOPE SF
	1.5	4.380	4.398	6.178	4.437	1.40	1.01
and the	0.8333	3.208	3.222	3.432	2.465	1.07	0.77
	0.5	2.534	2.544	2.059	1.479	0.81	0.58
ARION.	0.41666	2.344	2.354	1.716	1.233	0.73	0.52
	0.25	1.912	1.920	1.030	0.740	0.54	0.39

Ref: COE, 1970. Hydraulic Design of Flood Control Channels, EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1

Date: 11/04/93 cation: DAY LOMA

SECTION 30 40

INPUT: radius of curv. (ft)=	325	
INPUT: topwidth of flow (ft)=	36.45	Flow (cfs): 1476
R/W es	8.9	Riprap D-50 (ft): 1.5
INPUT: side slope (xH:1V)=	2	Manning's n: 0.0393
side slope angle (deg)=	26.6	Bottom Width (ft): 20
INPUT: angle of repose (deg)=	40	Right Side Slope, z: 2
INPUT: rock specific gravity=	2.65	Left Side Slope, z: 2
		Channel Slope (ft/ft): 0.0217
INPUT: velocity (fps) =	12.710	
INPUT: depth (ft)=	4.110	

	D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	BOTTOM SHEAR (psf)	SIDE SLOPE SHEAR (psf)	BOTTOM SF	SIDE SLOPE SF
	1.5	4.083	4.307	6.178	4.437	1.43	1.03
and the	0.8333	2.996	3.160	3.432	2.465	1.09	0.78
600	0.5	2.368	2.498	2.059	1.479	0.82	0.59
A. C. C.	0.41666	2.191	2.312	1.716	1.233	0.74	0.53
	0.333	2.000	2.110	1.371	0.985	0.65	0.47

Ref: COE, 1970. Hydraulic Design of Flood Control Channels, EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1

ation:

11/04/93 DAY LOMA SECTION 40 50

INPUT: radius of curv. (ft)=	275	
INPUT: topwidth of flow (ft)=	54.12	Flow (cfs): 1476
R/W=	5.1	Riprap D-50 (ft): 0.25
INPUT: side slope (xH:1V)=	2	Manning's n: 0.0313
side slope angle (deg)=	26.6	Bottom Width (ft): 35
INPUT: angle of repose (deg)=	40	Right Side Slope, z: 2
INPUT: rock specific gravity=	2.65	Left Side Slope, z: 2
		Channel Slope (ft/ft): 0.0025
INPUT: velocity (fps)=	6.930	
INPUT: depth (ft)=	4.780	

	D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	SHEAR (psf)	SIDE SLOPE SHEAR (psf)	SF	SIDE SLOPE SF
	1.5	1.116	1.559	6.178	4.437	3.96	2.85
4500	0.8333	0.828	1.158	3,432	2.465	2.96	2.13
	0.5	0.660	0.922	2.059	1.479	2.23	1.60
-elito.	0.41666	0.612	0.856	1.716	1.233	2.01	1.44
	0.25	0.503	0.703	1.030	0.740	1.46	1.05

RIPRAP SIZING
SAFETY FACTOR METHOD

### NORMAL DEPTH CALCULATION AND RIPRAP SIZING USING SAFETY FACTOR METHOD

Location: Day Loma - Coyote Creek Drop Structure

20.66

#### mennel hydraulic properties:

Flow (cfs):		1476		
Riprap D-50 (ft):		4.8		
Manning's n:		0.0513	Calculated Manning's n =	0.051305
Bottom Width (ft		20		
Right Side Slope,	z	2		
Left Side Slope, 2				
Channel Slope (f	/ft):	0.079		
QPro "Solve For"	tool:	*************	**************	
		Depth (ft) =	3.270	
variable:	formula:	Hydraulic Radius (ft) =	2.507	
		Cross "~rtional Area (sq	ft) = 86.79	
Depth	F(y)	Ave locity (fps) =	17.05	
-	201242201122422	Topwidth (ft) =	33.08	

Froude Number =

Flow Condition:

1.86

supercritical

#### Riprap size:

3.2700

	SLOPE	RADS	DEGREES
	-		
Bed slope:	0.079	0.079	4.52
Bank slope:		0.464	26.57
Angle of repose (degrees):		0.698	40,00
Side slope shear reduction factor:		0.75	
Specific gravity of riprap:		2.65	

### Side Slope:

	The second second						
30.2	1 10 10 10 10 10 10						
	D-50	TRACTIVE	STABILITY	В	В		SAFETY
	(ft)	FORCE	PARAM., N	(RADS)	DEGREES	N'	FACTOR
	-	estant.	90000	*****	inches.		100,000
	4.8	12.09	0.51	0.43	24.84	0.38	1.03
	0.75	12.09	3.29	1.19	67.99	3.21	0.26
	0.667	12.09	3.70	1.22	69.78	3.63	0.23
	0.5	12.09	4.93	1.28	73.52	4.88	0.18
	0.13	12.09	18.97	1.44	82.29	18.95	0.05

#### Channel Bottom:

ni m		20 00 00			
	D-50	TRACTIVE	STABILITY	SAFETY	
(ft)		FORCE	PARAM., N	FACTOR	
	-504-504		and the same of th	4900,000	
ellin.	4.8	16.12	0.68	1.28	
	0.75	16.12	4.38	0.22	
-	0.667	16.12	4.93	0.20	
	0.6	16.12	5.48	0.18	
	0.11	16.12	29.89	0.03	

RIPRAP SIZING STEPHENSON'S METHOD

### STEPHENSON'S METHOD FOR SIZING RIPRAP BASED UPON PHASE II, ABT ET AL.

# DAY LOMA-HEAP LEACH AREA COVER WITH 200 yr/24 hr EVENT SMI #350, CONCEPTUAL COVER DESIGN

FLOW RATE PER UNIT WIDTH	=	0.016	CFS/FT		
ROCKFILL POROSITY	222	0.32			
SPECIFIC GRAVITY	100	2.65			
SLOPE OF EMBANKMENT	==	25	PERCENT		
FRICTION ANGLE	==	40	DEGREES		
EMPIRICAL FACTOR	201	0.25			
OLIVIERS' CONSTANT	=	1.8			
					,
MENTANI CTONE CITE DEC		0.04	groups	0.4	TST
MEDIAN STONE SIZE D50	100	0.04	FI	0.4	TIN

STEPHENSON'S METHOD FOR SIZING RIPRAP BASED UPON PHASE II, ABT ET AL.

# DAY LOMA-HEAP LEACH PAD OUTSLOPE WITH 200yr/24hr EVENT SMI #350, CONCEPTUAL DESIGN OPTION 1, 2.5:1 SLOPE

FLOW RATE PER UNIT WIDTH	I =	0.016	CFS/FT			
ROCKFILL POROSITY	===	0.32				
SPECIFIC GRAVITY	=	2.65				
SLOPE OF EMBANKMENT	=	40	PERCENT			
FRICTION ANGLE	202	40	DEGREES			
EMPIRICAL FACTOR	22	0.25				
OLIVIERS' CONSTANT	= -	1.8				
					×	
MEDIAN STONE SIZE D50	122	0.08	FT	0.9	IN	

\* . U.S. ARMY CORPS OF ENGINEERS \* HEC-2 WATER SURFACE PROFILES HYDROLOGIC ENGINEERING CENTER \* 609 SECOND STREET, SUITE D Version 4.6.2; May 1991 \* DAVIS, CALIFORNIA 95616-4687 \*

> X X XXXXXXXXX XXXXXXX XXXXXXX XXXXXXX XXXXXXX XCCCCCCX XCCCX X X X XXXXXXXXX XXXXXX XXXXXXXXX

PAGE I . 01DEC92 16:54:03

THIS RUN EXECUTED 01DEC92 16:54:03

\* (916) 756-1104

HEC-2 WATER SURFACE PROFILES

\* RUN DATE 01DEC92 TIME 16:54:03 \*

Version 4.5.2; May 1991

T1 DAY LOMA - EXISTING COVER CHANNEL, DLCOV.DAT (Supercritical) TI OVERBANK N=0.020, CHANNEL N=0.020, Q=varies SUBCRIT., PMP.1/2 PMP.200yr T3 WESTERN NUCLEAR/ENERGY FUELS, JOB#350, SHEPHERD MILLER, 11/92 lmw II ICHECK INQ NINV IDIR STRT METRIC HVINS Q WSEL FQ 0 2 0 1 .02 0 0 0 6610.7 0 J2 NPROF IPLOT PRFVS XSECV XSECH FN ALLDC IBW CHNIM ITRACE 1 0 1 0 0 0 4

13 VARIABLE CODES FOR SUMMARY PRINTOUT

0 38 43 1 2 26 8

				0						
QT				74						
	SECTIO	I MC								
XI.	1	7	47.5	72.5	210	210	210	0.000	6500	0
GR	113	47.5	110.5	57.5	110.2	58.5	110	60	110.2	61.5
GR	110.5	62.5	113	72.5						
QT	3	23	76	165						
	SECTIO	ON 2								
X1	2	7	47.5	72.5	210	210	210	0.000	6500	0
									102.2	
				72.5						

	SECTIO	DN 3									
1/1	- 1	-	47.5	72.5	200	200	200	0.000	6500	0	
GR	103	47.5	100.5	57.5	100.2	58.5	100	50	100.2	61.5	
				72.5							
	SECTIO										
X1	- 4	7	47.5	72.5	200	200	200	0.000	6500	0	
GR					97.8	58.5	97.6	60	97.8	61.5	
GR	98.1	62.5	100.6	72.5							
	3	34	123	261							
1	DEC92	12.71	199							2.00	
521	DPCAY	19:34:	U3							PAGE 2	
	SECTION	ON 5									
			47.5	72.5	200	200	200	0.000	6500	0	
GR	100.2	47.5	97.7	57.5	97.4	58.5	97.2	60	97.4	61.5	
				72.5							
XI-	- 6	7	47.5	72.5	75	75	75	0.000	6500	0	
GR	99.8	47.5	97.3	57.5	97	58.5	96.8	60	97	61.5	
GR	97.3	62.5	99.8	72.5							
QT			146	315							
						20					
X1		7	47.5	72.5	50 96.8	50	50	0.000	6500	0	
	99.6	47.5	97.1	57.5	96.8	58.5	96.6	60	96.8	61.5	
GR	97.1	62.5	99.6	72.5							
	0 E (~94)	ON 7.1									
XI			47.5	75 6	150	150	150	0.000	6500	6	
GR	00.5	47.5	07	57.5	96.7	68 5	06.5	60	06.7	61.5	
GR			99.5		2617	25.2	70.2	90	20.7	93.3	
1000		0.01.0	22.00								
	SECTIO	ON 8									
X1	8	7	47.5	72.5	0	0	0	0.000	6500	0	
GR	99.3	47.5	96.7	57.5	96.4	58.5	96.2	50	96.4	61.5	
GR	96.7	62.5	99.2	72.5						61.5	
1											
01	DEC92	16:54:	03							PAGE 3	

THIS RUN EXECUTED 01DEC92 16:54:11

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

NOTE- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WESTERN NUCLEAR/ENERGY F

SUMMARY PRINTOUT

SECNO Q CWSEL CRIWS VCH DEPTH 1.000 10.00 6610.59 6610.71 5.08 .59

	1.000	35.00	6611.00	6611.24	7.00	1.00
	1.000	74.00	6611.36	6611.72	8.43	1.36
*	81999	23.00	6602.71	6603.04	8.53	.71
*	2.000	76.00	6603.20	6603.74	11.07	1.20
-96	2.000	165.00	6603.67	6604.42	12.88	1.67
	3.000	23.00	6601.03	6601.03	4.36	1.03
	3.000	76.00	6601.71	6601.73	5.68	1.71
*	3.000	165.00	6602.25	6602.40	7.37	2.25
	4.000	23.00	6598.44	6598.63	6.21	.84
			6598.98	6599.34	8.35	1.38
	4.000	165.00		6600.00	9.27	1.98
*	5.000	34.00		6598.43	4.70	1.23
*	5.000	123.00	5599.32	6599.32	6.11	2.12
*	5.000	261.00	6600.12	6600.12	7.07	2.92
*	6.000	34.00	6598.03	6598.03	4.68	1.23
- 90	6.000	123.00	5598.93	6598.93	6.04	2.13
	6.000	261.00	6599.72	6599.72	7.03	2.92
	7.000	40.00	6597.92	6597.92	4.85	1.32
			6598.89		6.29	2.29
	2.2500000	315.00			7,48	3.12
	1,000	22.00	W 7 - 1 W	-	1.70	
	7.100	40.00	6597.82	6597.82	4.83	1.32
*	7,100	146.00	6598.79	6598.79	6.29	2.29
	7.100	315.00	6599.63	6599.63	7.46	3.13
1						
	01DEC92	16:54	1:03			
	SECNO	0	CWSE	L CRIW	s vc	H DEPTH
	52 1 57 50 50		6597.52		4.85	1.32
			6598.49		6.27	3.29
*	8.000	315.00	6599.33	6599.33	7.45	3.13
1						
	01DEC92	16:54	1:03			

#### SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO	2.000	PROFILE =	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO	2.000	PROFILE =	2	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=	2.000	PROFILE =	3	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO =	3.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION SECNO=	3.000 1	PROFILE =	Ţ	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO =	3.000 1	PROFILE =	i	WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO=	3.000 1	PROFILE =	1	20 TRIALS ATTEMPTED TO BALANCE WSEL
WARNING SECNO =	3.000	PROFILE=	2	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=	3.000	PROFILE =	3	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=	4.000	PROFILE =	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO#	4.000	PROFILE =	2	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=	5.000	PROFILE =	1	CRITICAL DEPTH ASSUMED

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CAUTION SECNO =
                  5.000 PROFILE # 1 PROBABLE MINIMUM SPECIFIC ENERGY
                 5.000 PROFILE = 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO =
CAUTION SECNO =
                 5.000 PROFILE = 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO =
                 5.000 PROFILE = 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO =
                 5.000 PROFILE = 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=
                  5.000 PROFILE = 3 CRITICAL DEPTH ASSUMED
                  5.000 PROFILE = 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=
                  5.000 PROFILE = 3 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=
CAUTION SECNO=
                6.000 PROFILE = 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO = 6.000 PROFILE = 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO = 6.000 PROFILE = 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO = 6.000 PROFILE = 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO =
                  6.000 PROFILE = 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=
                  6.000 PROFILE = 2 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=
                  6.000 PROFILE = 3 CRITICAL DEPTH ASSUMED
                  6.000 PROFILE = 3 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO =
CAUTION SECNO=
                6.000 PROFILE = 3 20 TRIALS ATTEMPTED TO BALANCE WSEL
                 7.000 PROFILE = 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO =
CAUTION SECNO=
                  7.000 PROFILE = 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO =
                  7.000 PROFILE = 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
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 01DEC92 16:54:03
                                                                   PAGE 17
CAUTION SECNO =
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CAUTION SECNO =
                 8,000 PROFILE = 3 PROBABLE MINIMUM SPECIFIC ENERGY
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8.000 PROFILE = 3 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO =

\* HEC-2 WATER SURFACE PROFILES 

\* U.S. ARMY CORPS OF ENGINEERS

\* HYDROLOGIC ENGINEERING CENTER 

\* 609 SECOND STREET, SUITE D

\* DAVIS, CALIFORNIA 95616-4687

\* RUN DATE 01DEC92 TIME 15:55:58 

\* (916) 756-1104

01DEC92 15:55:58

PAGE 1

THIS RUN EXECUTED 01DEC92 15:55:58

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

TI DAY LOMA - EXISTING COVER CHANNEL, DLCOV DAT (Subcritical)

T2 OVERBANK N=0.020, CHANNEL N=0.020, Q=varies SUBCRIT., PMP,1/2 PMP,200yr

T3 WESTERN NUCLEAR/ENERGY FUELS, JOB#350, SHEPHERD MILLER, 11/92 Imw

JI ICHECK INQ NINV IDIR STRT METRIC HVINS Q WSEL FQ

0 2 0 0 0.002 0 0 0 6597.9 0

J2 NPROF IPLOT PRFVS XSECV XSECH FN ALLDC IBW CHNIM ITRACE

1 0 -1 0 0 0 -1

13 VARIABLE CODES FOR SUMMARY PRINTOUT

0 38 43 1 2 26 .02 .02 3 40 .02 0 0 315 145 SECTION 8 47.5 72.5 0 0 0 0.000 6500 0 XI 99.2 47.5 96.7 57.5 96.4 58.5 96.2 60 96.4 61.5 GR 96.7 62.5 99.2 72.5 SECTION 7.1 7.1 7 99.5 47.5 72.5 X1 47.5 150 150 150 0.000 6500 0 97 57.5 96.7 58.5 96.5 60 96.7 99.5 97.0 62.5

XI		XN 7								
	7	7	47.5	72.5	50	50	50	0.000	6500	0
GR	99.6	47.5	97.1	57.5	96.8	58.5	96.6	60	96.8	61.5
GR	97.1	62.5	99.6	72.5					96.8	
QT	3	34	123	261						
	SECTIO									
X1									6500	
GR					97	58.5	96.8	50	97	61.5
GR	97.3	62.5	99.8	72.5						
	SECTIO	ON 5								
XI	5	7	47.5	72.5	200	200	200	0.000	6500	0
GR	100.2	47.5	97.7	57.5	97.4	58.5	97.2	60	6500 97.4	61.5
GR	97.7	62.5	100.2	72.5						
-011	DEC92	15:55:	58							PAGE
	SECTION									
X1	- 4	. 7	47.5	72.5	200	200	200	0.000	6500	0
GR	100.6	47.5	98.1	57.5	97.8	58.5	97.6	60	97.8	61.5
GR	98.1	62.5	100.6	72.5						
QT	3	23	76	165						
	SECTION	ON 3								
									6500	
GR	103	47.5	100.5	57.5	100.2	58.5	100	60	100.2	61.
GR.	100.5	62.5	103	72.5						
	SECTION	5N 2								
X1	2	7	47.5	72.5	210	210	210	0.000	6500	- 0
GR	105	47.5	102.5	57.5	102.2	58.5	102	60	6500 102.2	61.
GR	102.5	52.5	105	72.5						
OT	3	10	35	74						
	SECTION									
				72.5	210	210	210	0.000	6500	.0
GR	113	47.5	110.5	57.5	110.2	58.5	110	60	110.2	61
	2.55	62.5	113	79.5	1.000				110.2	
GR	110.5	-57-40 Hot	1.0.00	1.610						

THIS RUN EXECUTED 01DEC92 15:56:04

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

VERSON W.U.L. May 1771

NOTE- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WESTERN NUCLEAR/ENERGY F

SUMMARY PRINTOUT

SECNO Q CWSEL CRIWS VCH DEPTH

	8.000	40.00	6597.89	6597.52	3.06	1.69	
	8.300		6599.01	6598.48	4.24	2.81	
	8.000		6599.94		5.49	3.74	
	7,100	40.00	6598.19	6597.81	3.05	1.69	
	7.100	146.00	6599.32	6598.79	4.22	2.82	
	7.100	315.00	6600.24	6599.62	5.48	3.74	
	7,000	40.00	6598.29	6597.92	3.05	1.69	
	7.000	146.00	6599.42	6598.88	4.22	2.82	
	7.000	315.00	5600.34	6599.72	5.48	3.74	
	6,000		6598.46	6598.02	2.72	1.66	
	6,000			6598.92	3.53	2.83	
	6.000	261.00	6600.63	6599.72	4.37	3.83	
	5.000			5598.42	2.89	1.60	
	5.000		6599.90		3.85	2.70	
	5,000	261.00	6600.85	6600.12	4.72	3.65	
	4.706	24.700	6599.19	6598.83	2.92	1.58	
	4.000	34.00 123.00		6599.72	3.98	2.66	
	4,000		6601.15		4.94	3.55	
	7,000	#61 WY	0001.13	1000102	4.24	4.00	
	3.000	23.00	6601.03	6601.03	4.33	1.03	
*					5.53	1.73	
*		165.00			6.47	2.40	
		100.000					
*	2.000	23.00	6603.03	6603.03	4.35	1.03	
*	2.000		6603.74		5.51	1.74	
*	2.000		6604.41		6.43	2.41	
b							
î.							
	OIDEC92	15:55	:58				
	SECNO	Q	CWSE	L CRIW	s vc	H DEPTH	
*	. 4.54.0.0		6610.71		3.67		
*	1-10-64		6611.24		4.71	1.24	
į.	1.000	74.00	6611.72	6611.72	5.49	1.72	
Į.	Action as many						
	OIDEC92	15:55	1:58				

## SUMMARY OF ERRORS AND SPECIAL NOTES

	CAUTION	SECNO=	3.000	PROFILE =	1	CRITICAL DEPTH ASSUMED
	CAUTION	SECNO=	3.000	PROFILE =	1	MINIMUM SPECIFIC ENERGY
	CAUTION	SECNO=	3.000	PROFILE =	2	CRITICAL DEPTH ASSUMED
	CAUTION	SECNO =	3.000	PROFILE =	2	MINIMUM SPECIFIC ENERGY
	CAUTION	SECNO=	3.000	PROFILE =	3	CRITICAL DEPTH ASSUMED
	CAUTION	SECNO=	3.000	PROFILE =	3	MINIMUM SPECIFIC ENERGY
	CAUTION	SECNO=	2.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
	CAUTION	SECNO=	2.000	PROFILE =	1	MINIMUM SPECIFIC ENERGY
	CAUTION	SECNO=	2,000	PROFILE=	2	CRITICAL DEPTH ASSUMED
b	CAUTION	SECNO=	2,000	PROFILE =	2	MINIMUM SPECIFIC ENERGY
ğ	CAUTION	SECNO=	2.000	PROFILE =	3	CRITICAL DEPTH ASSUMED
	CAUTION	SECNO =	2.000	PROFILE=	3	MINIMUM SPECIFIC ENERGY

CAUTION SECNO = 1.000 PROFILE = 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO = 1.000 PROFILE = 1 MINIMUM SPECIFIC ENERGY
CAUTION SECNO = 1.000 PROFILE = 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO = 1.000 PROFILE = 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO = 1.000 PROFILE = 3 MINIMUM SPECIFIC ENERGY
CAUTION SECNO = 1.000 PROFILE = 3 MINIMUM SPECIFIC ENERGY

\* U.S. ARMY CORPS OF ENGINEERS \*

\* KYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET, SUITE D \*

\* DAVIS, CALIFORNIA 95616-4687 \*

(916) 756-1104 \*

\* HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

\* RUN DATE 01DEC92 TIME 16:54:03 \*

01DEC92 16:54:03

PAGE 1

THIS RUN EXECUTED 01DEC92 16:54:03

HEC-2 WATER SURFACE PROFILES

\*\*\*\*\*\*\*\*\*\*\*

Version 4.6.2; May 1991

TI DAY LOMA - EXISTING COVER CHANNEL, DLCOV DAT (Supercritical)

T2 OVERBANK N=0.020, CHANNEL N=0.020, Q=varies SUBCRIT., PMP,1/2 PMP,200yr

T3 WESTERN NUCLEAR/ENERGY FUELS, JOB#350, SHEPHERD MILLER, 11/92 Imw

II ICHECK INQ NINV IDIR STRT METRIC HVINS Q WSEL FQ

0 2 0 1 .02 0 0 0 6610.7 0

12 NPROF IPLOT PREVS XSECV XSECH FN ALLDC IBW CHNIM ITRACE

1 0 -1 0 0 0 -1

13 VARIABLE CODES FOR SUMMARY PRINTOUT

0 38 43 1 2 26 .02 .02 .02 0 NC 0 74 35 SECTION I 47.5 72.5 210 210 210 0.900 6500 XI 47.5 110.5 57.5 110.2 58.5 110 60 110.2 GR 110.5 62.5 113 72.5 GR 76 QT 3 23 165 SECTION 2 210 210 210 0.000 6500 0 47.5 72.5 105 47.5 102.5 57.5 102.5 62.5 105 72.5 102.2 58.5 102 60 102.2

	SECTIO	N 3								
XI	3	7	47.5	72.5	200	200	200	0.000	6500	0
GR					100.2					
GR			103		2.00					
1100		1000								
	SECTIO									
X1	4	7	47.5	72.5	200	200	200	0.000	6500	0
GR	100.6	47.5	98.1	57.5	97.8	58.5	97.6	60	97.8	61.5
GR	98.1	62.5	100.6	72.5						
QT	3	34	123	261						
1-1										
.01	DEC92	16:54:	03							PAGE 2
	SECTION	DN 5								
301	5		47.5	72.5	200	200	200	0.000	6500	0
					97.4					
				72.5						
	SECTION									
X.1-	6	7	47.5	72.5	75	75	75	0.000	6500	0
GR	99.8	47.5	97.3	57.5	97	58.5	96.8	60	97	61.5
GR.	97.3	62.5	99.8	72.5						
				41.5						
QT			146	315						
44.4		ON 7		Mrs. 6	60	2/1	*0	0.000	6500	0
X1	200	471 6	97.3	14.3 69.4	96.8	50.5	06.6	0.000	0.500	61.5
GR			97.1		90.8	38.3	90.0	00	90.0	01.3
UK	97.1	52.5	99.0	1,612						
	SECTION	ON 7.1								
X1	7.1	7	47.5	72.5	150	150	150	0.000	6500	0
GR	99.5	47.5	97	57.5	96.7	58.5	96.5	60.	96.7	61.5
GR			99.5							
	SECTI	ON 8								
X1	8	7	47.5	72.5	0	0	0	0.000	5500	0
CHR	99.2	47.5	96.7	37.3	96.4	58.5	96.2	60	90.4	01.3
	96.7	62.5	99.2	72.5						
1	NO. 20. 404 Ca. 40	10.00	AM .							DACE 1
. 01	DEC92	15:34	03							PAGE 3

THIS RUN EXECUTED 01DEC92 16:54:11

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

NOTE: ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

WESTERN NUCLEAR/ENERGY F

SUMMARY PRINTOUT

SECNO Q CWSEL CRIWS VCH DEPTH

1.000 10.00 6610.59 6610.71 5.08 .59

	1.000	35.00	6611.00	6611.24	7.00	1.00
	1.000	74.00	6611.36	6611.72	8.43	1.36
	2.000	23.00	6602.71	6603.04	8.53	.71
	2.000	76.00	6603.20	6603.74	11.07	1.20
*	2.000	165.00	6603.67	6604.42	12.88	1.67
	3.000	23.00	6601.03	6601.03	4.36	1.03
*	3.000	76.00	6601.71	6601.73	5.68	1.71
*	3.000	165.00	6602.25	6602.40	7.37	2.25
*	4.000	23.00	6598.44	6598.63	6.21	.84
10.	4,000	76.00	6598.98	6599.34	8.35	1.38
	4.000	165.00	6599.58	6600,00	9.27	1.98
	5.000	34.00	6598.43	6598.43	4.70	1.23
*	.5.000	123.00	6599.32	6599.32	6.11	2.12
*	5.000	261.00	6600.12	6600.12	7.07	2.92
*	6.000	34.00	6598.03	6598.03	4.68	1.23
*	6.000	123.00	6598.93	6598.93	6.04	2.13
	6.000	261.00	6599.72	6599.72	7.03	2.92
	7.000	40.00	6597.92	6597.92	4.85	1.32
*	7.000	146.00	6598.89	6598.89	6.29	2.29
*	7.000	315.00	6599.72	6599.72	7.48	3.12
	7.100	40.00	6597.82	6597.82	4.83	1.32
*	7.100	146.00	6598.79	6598.79	6.29	2.29
*	7.100	315.00	6599.63	6599.63	7.46	3.13

01DEC92 16:54:03

PAGE 15

PAGE 16

	SECNO	Q	CWSE	L CRIW	s vc	H DEPTH
	8.000	40.00	6597.52	6597.52	4.85	1.32
*	8.000	146.00	6598.49	6598.49	6.27	2.29
*	8.000	315.00	6599.33	6599.33	7.45	3.13
1						
	01DEC92	16:54	:03			

# SUMMARY OF ERRORS AND SPECIAL NOTES

	WARNING SECNO ==	2.000	PROFILE =	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
	WARNING SECNO=	2.000	PROFILE =	2	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
	WARNING SECNO=	2.000	PROFILE =	3	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
	CAUTION SECNO=	3.000 1	PROFILE=	1	CRITICAL DEPTH ASSUMED
	CAUTION SECNO	3.000 1	PROFILE =	1	PROBABLE MINIMUM SPECIFIC ENERGY
	CAUTION SECNO =	3.000 3	PROFILE ==	1	WSEL ASSUMED BASED ON MIN DIFF
	CAUTION SECNO≈	3.000 1	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL
	WARNING SECNO	3.000	PROFILE =	2	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
	WARNING SECNO=	3.000	PROFILE	3	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
	WARNING SECNO#	4,000	PROFILE =	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
No.	WARNING SECNO	4,000	PROFILE =	22	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
9	CAUTION SECNO =	5.000	PROFILE =	1	CRITICAL DEPTH ASSUMED

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5,000 PROFILE = 1 PROBABLE MINIMUM SPECIFIC ENERGY
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 01DEC92 16:54:03
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CAUTION SECNO =
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                  8.000 PROFILE = 3 20 TRIALS ATTEMPTED TO BALANCE WSEL
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CAUTION SECNO =

\* U.S. ARMY CORPS OF ENGINEERS \*

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET, SUITE D \*

\* DAVIS, CALIFORNIA 95616-4687 \*

\* (916) 756-1104 \*

04NOV93 22:02:04

PAGE 1

THIS RUN EXECUTED 04NOV93 22:02:04

C-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

T1 COYOTE CREEK RECLAMATION, AML-16-G EXISTING CHANNEL DESIGN

TZ SUPERCRIT, 200YR (24HR), PMP --FILE: R:\PROJECTS\350\HEC2\RREVSPXS.DAT

T3 ENERGY FUELS, JOB#350, SHEPHERD MILLER, 10/93 kmw

J1 ICHECK ING NINV IDIR STRT METRIC HVINS Q WSEL FQ

0 2 0 1 -015012 0 0 0 6555.17 0

J2 NPROF IPLOT PREVS XSECV XSECH EN ALLDC IBW CHNIM ITRACE

1 0 -1 0 0 0 -1

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

38 43 8 26 25 5 42 17 33 4

QT 1 1476

NC	.0389	.0389	.0389	.1	.3					
ж1	0	4	0	42	100	100	100	0	6000	0
6	556	0	550.5	11	550.5	31	556	42		
Х1		4	0	42	100	100	100	0	6000	0
GR	554.61	0	549	11	549	31	554.61	42		
X1	2	4	0	42	100	100	100	0	6000	0
GR	553.23	0	547.50	11	547.50	31	553.23	42		
×1	3	4	0	42	100	100	100	0	6000	0
GR	551.84	0	546	11	546	31	551.84	42		
X1	4	4	0	42	33	33	33	0	6000	0
GR	550.46	0	544.5	-11	544.5	31	550.46	42		
NC	.0341	,0341	.0341		.3					
X1	10	4	0	44	50	50	50	0	6000	0
GR	550	0	544	12	544	32	550	64		
1	0/110/107	37.02.0/								200
	04NOV93	22:02:04								PAGE Z
0	)			44	40	40	40	0	4000	
	)	22:02:04	0 543.72	44 12	40 543.72	40 32	40 549_44	0 42	6000	PAGE Z
X1 GR	10.2 549.44	4 0	543.72	12	543.72				6000	
X1 GR	10.2 549.44	4 0	.0513	12	543.72	32	549_44	42		0
X1 GR	10.2 549.44	.0513	543.72	12	543.72				6000	
X1 GR NC X1 GR	10.2 549.44 .0513 10.5 549	.0513 4 0	.0513 0 543.5	.1 42 11	.3 .50 543.5	50 31	549_44 50 549	4 <b>2</b> 0 42	6000	0
X1 GR	10.2 549.44 .0513 10.5	.0513	.0513	12 .1 42	543.72 .3 50	32 50	549_44 50	42		0
X1 GR NC X1 GR	10.2 549.44 .0513 10.5 549	.0513 4 0	.0513 0 543.5 0 539.54	12 .1 42 11	543.72 .3 50 543.5 50 539.54	50 31 50 31	50 549 50 549 50 545,04	0 42 0 42	6000	0
X1 GR NC X1 GR	10.2 549.44 .0513 10.5 549	.0513 4 0	.0513 0 543.5	12 .1 42 11	543.72 .3 50 543.5	32 50 31	549.44 50 549	0 42 0	6000	0
X1 GR NC X1 GR X1 GR	10.2 549.44 .0513 10.5 549	.0513 4 0	.0513 0 543.5 0 539.54	12 .1 42 11 42 31	543.72 .3 50 543.5 50 539.54	50 31 50 31	50 549 50 549 50 545,04	0 42 0 42	6000	0
X1 GR NC X1 GR	10.2 549.44 .0513 10.5 549	.0513 4 0	.0513 0 543.5 0 539.54	12 .1 42 11 42 31	543.72 .3 50 543.5 50 539.54	50 31 50 31	50 549 50 549 50 545,04	0 42 0 42	6000	0

X1	21	4	0	42	100	100	100	0.000	6000	0
GR	535.42	0	529.92	11	529.92	31	535.42	42		
Allen.										
Altho	22	4	0	42	100	100	100	0.000	6000	0
GR	532.84	0	527.34	- 11	527.34	31	532.84	42		
X1	23	4	0	42	100	100	100	0	6000	0
GR	530.26	0	524.76	- 11	524.76	31	530.26	42		
×1	24	4	0	42	100	100	100	0	6000	0
GR			522.18		522.18	31	527.67	42	0000	
- 100	481.181									
X1	25	4	0	42	100	100	100	0	6000	0
GR	525.10	0 -	519.60	11	519.60	31	525.10	42		
X1	26	- 4	0	42	20	20	20	0 +	6000	0
GR	522.52	. 0	517.016	- 11	517,016	31	522.52	42		
					1000					
NC	.0393	.0393	.0393		- 3					
1										
	04NOV93	22:02:04								PAGE 3
AND.	04NOV93	22:02:04								PAGE 3
	04NOV93	22:02:04								PAGE 3
() X1		22:02:04	0	42	100	100	100	0.000	6000	PAGE 3
0		4	0 516.5	42 11	100 516.5	100	100 522	0.000 42	6000	
() X1	30	4							6000	
() X1	30	4 0	516.5	11	516.5				6000	
X1 GR	30 522	4 0	516.5	11	516.5		100	0.000	6000	
X1 GR	30 522	4 0	516.5	11	516.5	31	522	42		0
X1 GR	30 522	4 0	516.5	11	516.5	100	100	0.000		0
X1 GR	30 522 31 519.82	4 0 4 0	516.5 0 514.33	11 42 11	516.5 100 514.33	100 31	522 100 519.82	0.000 42	6000	0
X1 GR X1 GR	30 522 31 519.82	4 0 4 0	516.5 0 514.33	11 42 11	516.5 100 514.33	100 31	100 519.82	0.000 42		0
X1 GR	30 522 31 519.82	4 0 4 0	516.5 0 514.33	11 42 11	516.5 100 514.33	100 31	522 100 519.82	0.000 42	6000	0
X1 GR X1 GR	30 522 31 519.82	4 0 4 0	516.5 0 514.33	11 42 11	516.5 100 514.33	31 100 31 100 31	100 519.82	0.000 42	6000	0
X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65	4 0	516.5 0 514.33 0 512.15	42 11 42 11	516.5 100 514.33 100 512.15	100 31 100 31	100 519.82 100 517.65	0.000 42 0.000 42	6000	0
X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65	4 0	516.5 0 514.33 0 512.15	42 11 42 11	516.5 100 514.33 100 512.15	100 31 100 31	100 519.82 100 517.65	0.000 42 0.000 42	6000	0
X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65	4 0 4 0	0 514.33 0 512.15	42 11 42 11	516.5 100 514.33 100 512.15	100 31 100 31	100 519.82 100 517.65	0.000 42 0.000 42	6000	0
X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65	4 0	516.5 0 514.33 0 512.15	42 11 42 11	516.5 100 514.33 100 512.15	100 31 100 31	100 519.82 100 517.65	0.000 42 0.000 42	6000	0
X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65	4 0 4 0	0 514.33 0 512.15	42 11 42 11	516.5 100 514.33 100 512.15	100 31 100 31	100 519.82 100 517.65	0.000 42 0.000 42	6000	0
X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65	4 0	516.5 0 514.33 0 512.15	42 11 42 11	516.5 100 514.33 100 512.15	100 31 100 31	100 519.82 100 517.65	0.000 42 0.000 42 0.000 42	6000 6000	0
X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65	4 0 4 0	516.5 0 514.33 0 512.15	42 11 42 11 42 11	516.5 100 514.33 100 512.15	100 31 100 31 100 31	100 519.82 100 517.65 100 515.48	0.000 42 0.000 42 0.000 42	6000 6000	0
X1 GR X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65 33 515.48	4 0 4 0 4 0	0 514.33 0 512.15 0 509.97	42 11 42 11 42 11	516.5 100 514.33 100 512.15 100 509.97	100 31 100 31 100 31	100 519.82 100 517.65 100 515.48	0.000 42 0.000 42 0.000 42	6000 6000	0
X1 GR X1 GR X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65 33 515.48	4 0 4 0 4 0	516.5 0 514.33 0 512.15 0 509.97	42 11 42 11 42 11	100 514.33 100 512.15 100 509.97	31 100 31 100 31 100 31	100 519.82 100 517.65 100 515.48	0.000 42 0.000 42 0.000 42	6000 6000	0
X1 GR X1 GR X1 GR X1 GR	30 522 31 519.82 32 517.65 33 515.48	4 0 4 0 4 0	0 514.33 0 512.15 0 509.97	42 11 42 11 42 11	516.5 100 514.33 100 512.15 100 509.97	100 31 100 31 100 31	100 519.82 100 517.65 100 515.48	0.000 42 0.000 42 0.000 42	6000 6000	0

. X1	36	- 4	. 0	42	67	67	67	0.000	6000	0
GR	508.96	0	503.46	11	503.46	31	508.96	42		
-										
1	.0313	.0313	.0313	- 1	.5					
X1	40	4	0	57	100	100	100	0.000	6000	0
GR	507.5	0	502	- 11	502	46	507.5	57		
×1	41	4	0		100	100	100	0.000	6000	0
GR	507.25	0	501.75	11	501.75	46	507.25	57		
×1	42	. 4	0	57	100	100	100	0.000	6000	0
GR	507	. 0	501.5	11	501.5	46	507	57		
					100	400	100		7000	
X1	43	. 4	0	57	100	100	100	0.000	6000	0
GR	506.75	0	501.25	11	501.25	46	506.75	57		
x1	44	4	0	57	100	100	100	0.000	6000	0
GR	506.5	0	501	11	501	46	506.5	57	0000	· ·
	20012									
1										
	04NOV93	22:02:04								PAGE 4
dia										
X1	45	- 4	0	57	97	97	97	0.000	6000	0
GR	506.25	. 0	500.75	11.	500.75	46	506.25	57		
X1	50	4	0	53	200	200	200	0.000	6000	0
GR	506	0	500.5	. 9	500.5	66	506	53		
NC	.0329	.0329	.0329	-,1	,5					
X1	51		0	82	0	0	0	0.000	6000	0
GR	503	0	500	6	500	76	503	82		

THIS RUN EXECUTED 04NOV93 22:02:08

HEC-2 WATER SURFACE PROFILES

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Version 4.6.2; May 1991

# FUELS, JOB#350, SHEPH

	SECNO	Q	DEPTH	VCH	AREA	10*KS	ELMIN	K*XNCH	K*CHSL	TOPWID
	.000	:476.00	4.68	10.74	137,47	157.09	6550.50	38.90	.00	38.73
	1.000	1476.00	4.69	10.77	137.00	157.41	6549.00	38.90	-15.00	38.40
	2.000	1476.00	4.71	10.80	136.62	157.42	6547.50	38.90	-15.00	38.07
	3.000	1476.00	4,72	10.82	136.39	157.07	6546.00	38.90	-15.00	37.78
*	4.000	1476.00	4.73	10.85	136.00	157.17	6544.50	38.90	-15.00	37.47
	10.000	1476.00	4.40	11.70	126.18	153.72	6544.00	34.10	-15.15	37.54
*	10.200	1476.00	4.70	10.81	136.54	121.29	6543.72	34.10	-5.61	38.08
*	10.500	1476.00	4.67	10.77	137.09	275.33	6543.50	51.30	-5.49	38.69
	11,000	1476.00	3.26	17,05	86,59	1018.91	6539.54	51,30	-79.20	33.06
-110-	12,000	1476.00	3.58	15.19	97.18	731.93	6535.59	51,30	-79.00	34.33
	20.000	1476.00	3.33	16.63	88.75	588.73	6532.50	40.40	-79.23	33.32
*	21,000	1476.00	4.59	11.02	133.97	182.21	6529.92	40.40	-25.80	38.36
	22,000	1476.00	4.03	13.09	112,77	296.69	6527.34	40,40	-25.80	36.09
	23.000	1476.00	4.31	11.96	123.41	229.77	6524.76	40.40	-25.80	37.25
	24.000	1476.00	4.13	12,63	116.84	268.45	6522.18	40.40	-25.80	36,56
	25,000	1476.00	4.24	12.26	120.35	246.70	6519.60	40.40	-25.80	36.92
	26,000	1476.00	4.15	12.56	117.52	263.82	6517.02	40.40	-25.84	36.60
1	O would	22.02.00								
	04NOV93	22:02:04								
	SECNO	o	DEPTH	VCH	AREA	10*KS	ELMIN	K*XNCH	K*CHSL	TOPWID
	30.000	1476.00	4,21	12.38	119.20	239.90	6516.50	39.30	-25.81	36.79
	31.000	1476.00	4.44	11.53	128.06	195.97	6514.33	39.30	-21.70	37.77

	32.000	1476.00	4.26	12.14	121.56	226.93	6512.15	39.30	-21.80	37.05
	33.000	1476.00	4.38	11.74	125,68	206.37	6509.97	39,30	-21.80	37.47
0	34.000	1476,00	4.30	12.02	122.75	220.73	6507.80	39.30	-21.70	37.18
	35.000	1476.00	4.34	11.88	124.25	213.31	6505.63	39.30	-21.70	37.34
	36,000	1476.00	4.29	12.01	122.90	219.99	6503.46	39.30	-21.70	37.19
	40.000	1476.00	2.45	15.08	97.85	368.61	6502.00	31.30	-21,79	44.81
*	41,000	1476.00	3.54	9,90	149.09	103,60	6501.75	31.30	-2.50	49.17
	42.000	1476.00	3,54	9.92	148.73	104.35	6501.50	31.30	-2.50	49,14
*	43.000	1476.00	3.54	9.92	148.73	104.35	6501.25	31.30	-2.50	49.14
	44,000	1476.00	3.54	9.92	148.73	104.35	6501.00	31,30	-2.50	49.14
*	45.000	1476.00	3.54	9.92	148.73	104.35	6500.75	31.30	-2.50	49.14
*	50.000	1476.00	3.59	10.05	146.85	103.10	6500.50	31.30	-2.58	46,76
*	51,000	1476.00	2.34	8.46	174.39	125.15	6500.00	32.90	-2.50	79.34

04NOV93 22:02:04

PAGE 14



CAUTION	SECNO=	.000	PROFILE=	11.	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	1.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	1,000	PROFILE=	71.	PPCBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECNO=	1.000	PROFILE=	3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECNO=	2.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	2,000	PROFILE=	10	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECNO=	2.000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECNO=	3.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	3.000	PROFILE=	4.	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECNO=	3.000	PROFILE	1	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECNO=	4.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	4.000	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECNO	4.000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECNO#	10.200	PROFILE=	13	CRITICAL DEPTH ASSUMED

CAUTION	SECHO=	10.200	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY		
CAUTION	SECNO	10.200	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL		
CAUTION	SECNO	10.500	PROFILE=	1	CRITICAL DEPTH ASSUMED		
JON	SECNO=	10.500	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY		
CHUTTON	SECNO=	10.500	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL		
WARNING	SECNO=	11.000	PROFILE=	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE		
WARNING	SECNO=	21.000	PROFILE=	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE		
CAUTION	SECNO=	41.000	PROFILE=	1	CRITICAL DEPTH ASSUMED		
CAUTION	SECNO=	41.000	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY		
CAUTION	SECNO=	41,000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL		
CAUTION	SECNO=	42.000	PROFILE=	1	CRITICAL DEPTH ASSUMED		
CAUTION	SECNO=	42,000	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY		
CAUTION	SECNO=	42.000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL		
CAUTION	SECNO=	43.000	PROFILE=	1	CRITICAL DEPTH ASSUMED		
CAUTION	SECNO	43.000	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY		
CAUTION	SECNO=	43.000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL		
CAUTION	SECK 3=	44,000	PROFILE=	1	CRITICAL DEPTH ASSUMED		
CAUTION	SECH O=	44.000	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY		
CAUTION	SECNO=	44,000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL		
CAUTION	SECNO=	45,000	PROFILE=	1	CRITICAL DEPTH ASSUMED		
CAUTION	SECNO=	45.000	PROFILE	1	PROBABLE MINIMUM SPECIFIC ENERGY		
KION	SECNO=	45.000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL		
CAUTION	SECNO=	50.000	PROFILE=	1	CRITICAL DEPTH ASSUMED		
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04NO	V Y 3	25102104				TAGE	
CAUTION	SECNO=	50,000	PROFILE=	1	PROBABLE MINIMUM SPECIFIC ENERGY		
CAUTION					20 TRIALS ATTEMPTED TO BALANCE WSEL		
CAUTION					CRITICAL DEPTH ASSUMED		
CAUTION					PROBABLE MINIMUM SPECIFIC ENERGY		
CAUTION	SECNO=	51,000	PROFILE=	1	20 TRIALS ATTEMPTED TO BALANCE WSEL		

\* U.S. ARMY CORPS OF ENGINEERS \*

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET, SUITE D \*

\* DAVIS, CALIFORNIA 95616-4687 \*

(916) 756-1104 \*

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04NOV93 22:00:53

PAGE 1

THIS RUN EXECUTED 04NOV93 22:00:53

MCC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

T1 COYOTE CREEK RECLAMATION, AML-16-G EXISTING CHANNEL DESIGN

TZ SUBCRIT, 200YR (24HR), PMP -- FILE: R:\PROJECTS\350\HEC2\SUBCRICO.DAT

T3 ENERGY FUELS, JOB#350, SHEPHERD MILLER, 10/93 kmw

J1	1 CHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	.025	0	.0	0	6502.34	0
75	NPROF	IPLOT	PRFVS	XSECV	KSECH	PN	ALLDC	1BW	CHNIM	ITRACE
	1	0		0	0	0	-1			

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

38 43 8 26 25 5 42 17 33 4

QT 1 1476

NC	.0329	.0329	.0329	-,1	.5					
X1	51	4	0	88	0	0	0	0.000	6000	0
GR	505	0	500	- 9	500	79	505	88		
dillo										
	50	4	0	53	200	200	200	0.000	6000	0
GR	506	0	500.5	9	500.5	44	506	53	8000	
NC	.0313	.0313	.0313	.1	.5					
X1	45	4	0	57	97	97	97	0.000	6000	0
GR	506.25	0	500.75	- 11	500.75	46	506.25	57		
X1	44	4	0	57	100	100	100	0.000	6000	0
GR	506.5	0	501	11	501	46	506.5	57	5505	
×1	43	4	0	57	100	100	100	0.000	6000	0
GR	506.75	0	501.25	- 11	501.25	46	506.75	57		
. 1	0.1.4400.407	25.00.52								
	04NOV93	22:00:53								PAGE
×1	42	4	0	57	100	100	100	0.000	6000	0
GR	507	0	501.5	- 11	501.5	46	507	57		
dia										
X1	41	4	0	57	100	100	100	0.000	6000	0
GR	507.24	0	501,75	- 11	501.75	46	507.24	57		
X1	40	4	0	57	100	100	100	0.000	6000	0
	507.5	0		11		46	507.5	57		
NC	.0393	.0393	.0393	-,1-	.3					
li de	97									
X1 GR	36 508.96	0	503.46	42	67 503.46	67 31	67 508 04	0.000	6000	0
- Un	200.70		203.45		303.40	31	508.96	46		
X1.	35	4	0	42	100	100	100	0.000	6000	0
GR	511.13	0	505.63	11	505.63	31	511.13	42		
X1	34	4	0	42	100	100	100	0.000	6000	0
GR	513.30	0	507.B	11	507.8	31	513.3	42		
×1	33	4	0	42	100	100	100	0.000	6000	0
				-	1.00	140	150	0.000	3000	

GR	515.48	0	509.98	11	509.98	. 31	515.48	42			
<u>X1</u>	32	4	0	42	100	100	100	0.000	6000	0	
0	517.65	0	512.15	11	512.15	31	517.65	42			
X1	31	4	0	42	100	100	100	0.000	6000	0	
GR	519.82	0	514.33	11	514.33	31	519.82	42			
X1	30	4		42	100	100	100	0.000	6000	0	
GR	522	0	516.5	- 11	516.5	31	522	42			
NC	.0404	.0404	.0404	1.1	.3						
K1 GR	26 522.52	0	517.02	42 11	20 517.02	20 31	20 522.52	0 42	6000	0	
	25 525.10	0	519.60	11	100 519.60	100 31	100 525.10	42 ,	6000	0	
1	Y New YOR	22:00:53								PAGE 3	
	MANUARY	26100133								PAGE 3	
Х1	24		0	42	100	100	100	0	6000	0	
0	527.67	0	522,18	11	522.18	31	527.67	42			
X1	23		0	42	100	100	100	0	6000	0	
GR	530.26	0	524.76	- 11	524.76	31	530.26	42			
х1	22	4	0	42	100	100	100	0.000	6000	0	
GR	532.84	0	527.34	- 11	527.34	31	532.84	42			
х1	21	4	0	42	100	100	100	0.000	6000	0	
GR	535.42		529.92	11	529.92	31	535.42	42			
X1		4	0			100	100	0.000	6000	0	
GR	538	0	532.5	11	532.5	31	538	42			
NC V1	.0513	.0513	.0513 G	41	.3	70	39	0	6000	0	
X1 GR	12 541.08	0	535.59	11	535.59	39 31	541.08	42	5000	J	
X1	11		0	42	50	50	50	0	6000	0	

GR	545.04	0	539.54	11	539.54	31	545.04	42			
400	10.5	4	0	42	50	50	50	0	6000	0	
	549	0	543.5	11	543.5	31	549	42			
NC	.0341	.0341	.0341	-1	.3						
X1	10.2	4	0	44	40	40	40	0	6000	0	
GR	549.44	0	543.72	12	543.72	32	549.44	42			
X1	10	4	0	44	50	50	50	0	6000	0	
GR	550	0	544	12	544	32	550	44			
NC	.0381	.0381	.0381	.1	.3						
×1	4	4	0	42	33	33	33	0	6000	0	
GR	550.46	0	544.5	11	544.5	31	550.46	42			
1											
	04NOV93	22:00:53								PAGE 4	
ba.					460						
X1 GR	. 3 551.84	4 0	0 546	42 11	100 546	100	100 551.84	0 42	6000	0	
UK.	221.04	U	240		240	31	221.04	46			
400											
	2	4	0	42	100	100	100	0	6000	0	
GR	553.23	. 0	547.50	11	547.50	31	553.23	42			
-					100	***	120		/ 000		
X1 GR	1	4	0 549	42 11	100 549	100	100 554.61	0 42	6000	0	
UK	554.61		247	- 11	247	2.1	224.01	46			
X1											
	0	4	0	42	100	100	100	0	6000	0	
GR .	556	0	550.5	42 11	100 550.5	100	100 556	0 42	6000	0	

THIS RUN EXECUTED 04NOV93 22:00:57

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

\*\*\*\*\*\*\*\*\*\*\*

NOTE- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

GY FUELS, JOB#350, SHEPH

0	SECNO	Q	DEPTH	VCH	AREA	10*KS	ELMIN	K*XNCH	K*CHSL	TOPWID	
	51.000	1476.00	2.35	8.48	174.10	124.20	6500.00	32.90	.00	78,44	
	50.000	1476.00	3.84	9.31	158.50	90.61	6500.50	32.90	2.50	47.57	
	45.000	1476.00	4.78	6.93	212.93	36.23	6500.75	31.30	2.58	54.12	
	44,000	1476.00	4.93	6.67	221.41	32.34	6501.00	31.30	2,50	54.74	
	43,000	1476.00	5.03	6.52	226.34	30.33	6501.25	31.30	2.50	55.10	
	42.000	1476.00	5.10	6.42	230,01	28.95	6501.50	31.30	2.50	55.36	
	41,000	1476.00	5.15	6.34	232.98	27.91	6501,75	31.30	2.50	55.61	
	40.000	1476.00	5.19	6.28	235.11	27.16	6502.00	31.30	2.50	55.73	
	36.000	1476.00	4.68	10.75	137.24	161.08	6503.46	39.30	21.79	38.70	
*	35,000	1476.00	4.68	10.74	137.43	160.46	6505.63	39.30	21.70	38.72	
	34.000	1476.00	4.68	10.75	137.30	160,90	6507.80	39.30	21.70	38.71	
*	33.000	1476.00	4.58	10.75	137.30	160.90	6509.98	39.30	21.80	38.71	
0	32.000	1476.00	4.68	10.75	137.30	160.90	6512.15	39.30	21.70	38.71	
	31.000	1476.00	4,68	10.74	137.38	160.74	6514.33	39,30	21.80	38.74	
	30.000	1476.00	4,48	10.75	137.30	160.90	6516.50	39.30	21.70	38.71	
*	26.000	1476,00	4.68	10.75	137.30	170.03	6517.02	40.40	26.00	38.71	
	25.000	1476.00	4.68	10.75	137.30	170.03	6519.60	40.40	25.80	38.71	
,											
04	4NOV93	22:00:53									PAGE
	SECNO	q	DEPTH	VCH	AREA	10*KS	ELMIN	K*XNCH	K*CHSL	TOPWID	
	24.000	1476.00	4.68	10.74	137.38	169.86	6522.18	40.40	25.80	38.74	
	23.000	1476.00	4.68	10.75	137.30	170.03	6524.76	40.40	25.80	38.71	
	22.000	1476.00	4.68	10.75	137.30	170.03	6527.34	40.40	25.80	38.71	

\* 21,000 1476,00 4.68 10.75 137.30 170.03 6529.92 40.40 25.80 38.71

PAGE 13

	.000	1476.00	4.72	10.63	138.79	146.67	6550.50	38.10	15.00	38.86
	1.000	1476.00	4.70	10.74	137.40	149.79	6549.00	11,10	15.00	38.44
	2.000	1476.00	4.78	10.57	139.62	142.03	6547.50	38.10	15.00	38.37
*	3.000	1476.00	4.71	10.86	135.97	152.00	6546.00	38.10	15.00	37.74
	4.000	1476.00	5.25	9.47	155.83	102.79	6544.50	38.10	15.15	39.38
	10.000	1476.00	5.76	8.13	181.55	55.41	6544.00	34.10	5.61	43.04
*	10.200	1476.00	5.67	8.43	175.10	60.38	6543.72	34.10	5.49	41.80
*	10.500	1476.00	4.68	10.75	137.30	274.15	6543.50	51.30	79.20	38.71
0	11.000	1476.00	4.68	10.75	137,30	274.15	6539.54	51.30	79.00	38.71
	12.000	1476.00	4,68	10.74	137.38	273.90	6535.59	51.30	79.23	38.74
*	20.000	1476.00	4.68	10.75	137.30	170.03	6532.50	40,40	25.80	38.71

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# SUMMARY OF ERRORS AND SPECIAL NOTES



70000						
CAL	UT10N	SECNO=	51,000	PROFILE=	ă.	CRITICAL DEPTH ASSUMED
WA	RNING	SECNO=	45.000	PROFILE=	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CA	UTION	SECNO=	36.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CA	UTION	SECNO	36.000	PROFILE	1	MINIMUM SPECIFIC ENERGY
CAI	UTION	SECNO=	35.000	PROFILE=	Ŧ	CRITICAL DEPTH ASSUMED
CA	UTION	SECNO=	35.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CA	MOITU	SECNO=	34,000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CA	UTION	SECNO=	34,000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CA	UTION	SECNO=	33.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CA	UTION	SECNO*	33.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CA	UTION	SECNO=	32.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CA	UTION	SECNO=	32.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
FA	UTION	SECNO=	31.000	PROFILE=	Ŷ.	CRITICAL DEPTH ASSUMED
CA	UTION	SECNO=	31.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CA	UTION	SECNO=	30,000	PROFILE=	1	CRITICAL DEPTH ASSUMED

CAUTION	SECNO=	30.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION	SECNO=	26,000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=				MINIMUM SPECIFIC ENERGY
TON TON	SECNO=	25.000	PROFILE:	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	25.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION	SECNO=	24,000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	24.000	PROFILE	1	MINIMUM SPECIFIC ENERGY
CAUTION	RECHOW	23,000	PROFILE	1	CRITICAL DEPTH ASSUMED
CAUTION		23.000			MINIMUM SPECIFIC ENERGY
CAUTION	SECNO=	22.000	PROFILE=	7	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	22,000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION	SECNO=	21,000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	21.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION	SECNO=		PROFILES	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	20.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION	SECNO	12,000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	12.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY
CAUTION	SECNO=	11 000	PROFILE	1	CRITICAL DEPTH ASSUMED
	SECNO=				MINIMUM SPECIFIC ENERGY
1					
04NO	V93	22:00:53			
CAUTION	SECNO=	10,500	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	10,500	PROFILE=	1	MINIMUM SPECIFIC ENERGY
WARNING	SECNO=	10.200	PROFILE:	1	CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION	SECNO=	3.000	PROFILE=	1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO=	3.000	PROFILE=	1	MINIMUM SPECIFIC ENERGY

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RIPRAP SIZING CORPS OF ENGINEERS METHOD

# NORMAL DEPTH CALCULATION AND RIPRAP SIZING USING COE METHOD

Location: DAY LOMA HEAP LEACH PAD

CONCEPTUAL DESIGN

RECLAIMED COVER - CHANNEL RIPRAP DESIGN: 200yt/24 hr EVENT



## Channel hydraulic properties:

	$m \equiv m \equiv m$
Flow (cfs):	40
Assumed D-50 (ft):	0.16
Manning's n:	0.0291
Bottom Width (ft):	0
Right Side Slope, z:	4
Left Side Slope, z:	4
Channel Slope (ft/ft):	0.01

#### OPro "Solve For" tool:

THE REAL PROPERTY OF THE PROPERTY	The state of the s	n
	Depth (ft) = 1.540	
variable: formula:	Hydraulic Radius (ft) = 0.747	
	Cross-Sectional Area (sq ft) = 9.49	
Depth F(y)	Average Velocity (fps) = 4.22	
material decreases and the same of the sam	Topwidth (ft) = 12.32	
1.5402 -0.00	Froude Number = 0.85	
	Flow Condition: subcritical	



### INPUT COEFFICIENTS: (see manual for description)

Safety Factor:	1.1	(no addition is applied)
Shape Coefficient:	0.3	(for angular rock)
Curvature Coefficient:	1.28	(adjusted for R/W)
Thickness Coefficient:	1	(thickness = 1 * D100)
INPUT Side Slope (H:1V):	4	
side slope angle (deg):	14.0	
INPUT angle of repose (deg):	40	
constant K1:	0.926	
INPUT rock specific gravity:	2.65	
Velocity (f, 1);	4.216	
Depth (ft):	1.540	
D-30 rock size (ft):	0.11	
D-30 rock size (in):	1.3	
D-50 rock size (ft):	0.15	(assuming D30 = 0.7 * D50)
D-50 rock size (in):	1.8	

# RIPRAP SIZING USING 1970 COE METHOD

Ref: COE, 1970. Hydraulic Design of Flood Control Channels, EM 1110-2-1601, pp. 37 - 47.

File: R:\PROJECTS\350\QPRO\COE70.WQ1

ation:

11/04/93 DAY LOMA SECTION 0 10

# INPUT COEFFICIENTS: (see manual for description)

INPUT: radius of curv. (ft)=	275	计可以存储器 计可以存储器 计数据数据 医线线线
INPUT: topwidth of flow (ft)=	38.02	Flow (cfs): 1476
R/W=	7.2	Riprap D-50 (ft): 0.91666
INPUT: side slope (xH:1V)=	2	Manning's n: 0.0389
side slope angle (deg)=	26.6	Bottom Width (ft): 20
INPUT: angle of repose (deg)=	40	Right Side Slope, z: 2
INPUT: rock specific gravity=	2.65	Left Side Slope, z: 2
		Channel Slope (ft/ft): 0.0151
INPUT: velocity (fps)=	11.070	
INPUT: depth (ft)=	4.600	

D-50 (ft)	BOUNDARY SHEAR (psf)	BEND SHEAR (psf)	SHEAR (psf)	SIDE SLOPE SHEAR (psf)	BOTTOM	SIDE SLOPE SF
0.9166 0.8333	2.253 2.152	2.639 2.521	3.775 3.432	2.712 2.465	1.43	1.03 0.98
0.5 0.41666	1.712 1.587	2.005 1.859	2.059 1.716	1.479 1.233	1.03 0.92	0.74 0.66 0.58
	0.9166 0.8333 0.5	(ft) SHEAR (psf)  0.9166 2.253 0.8333 2.152 0.5 1.712 0.41666 1.587	(ft)         SHEAR (psf)         SHEAR (psf)           0.9166         2.253         2.639           0.8333         2.152         2.521           0.5         1.712         2.005           0.41666         1.587         1.859	(ft)         SHEAR (psf)         SHEAR (psf)         SHEAR (psf)         SHEAR (psf)           0.9166         2.253         2.639         3.775           0.8333         2.152         2.521         3.432           0.5         1.712         2.005         2.059           0.41666         1.587         1.859         1.716	(ft)         SHEAR (psf)         SHEAR (psf)         SHEAR (psf)         SHEAR (psf)         SHEAR (psf)           0.9166         2.253         2.639         3.775         2.712           0.8333         2.152         2.521         3.432         2.465           0.5         1.712         2.005         2.059         1.479           0.41666         1.587         1.859         1.716         1.233	(ft)         SHEAR (psf)         SHEAR (psf)         SHEAR (psf)         SHEAR (psf)         SHEAR (psf)         SF           0.9166         2.253         2.639         3.775         2.712         1.43           0.8333         2.152         2.521         3.432         2.465         1.36           0.5         1.712         2.005         2.059         1.479         1.03           0.41666         1.587         1.859         1.716         1.233         0.92

APPENDIX B
RADON CALCULATIONS

# TABLE OF CONTENTS

B.1	INTRODUCTION	B-
B.2	COVER THICKNESS	B-1
B.3	SOIL CLASSIFICATION	B-1
B.4	RADIUM ACTIVITY	B-3
B.5	RESULTS	B-4
REF	ERENCES	B-5

# List of Tables

Table B.1 - Soil Testing Results

Table B.2 - Radium Activity

# List of Figures

Figure B.1 - Existing Configuration, Boring Locations

### **B.1 INTRODUCTION**

Radon flux calculations were performed for the cover surface using the RADON (NRC, 1989) computer model. Input into the program was based upon the characteristics of the site specific cover and heap leach materials. Existing average cover thickness was obtained from field investigations performed during October, 1992. During the field investigation, samples were collected for laboratory testing in order to classify the types of soils present. Average radium activity for the heap leach material was determined from laboratory testing on samples also collected during the field investigation. This average radium activity was compared to the source term concentrations based upon the cutoff ore grade during mining. Parameters used in the model are described in more detail below.

### **B.2 COVER THICKNESS**

Based on the field investigation, the cover thickness ranged from approximately 8.0 to 13.0 feet. Bore hole locations from the field investigation are shown on Figure B.1. The depth to heap leach material below the cover was based upon visual inspection and the change in radium activity of the soil. Drill logs from the field investigation are included in Appendix D.

# **B.3 SOIL CLASSIFICATION**

Laboratory testing was performed on selected samples from the field investigation to determine moisture content, dry density, and percent passing the #200 sieve. Table B.1 below provides a summary of the test results. Additional test results and drill logs are provided in Appendix D.

	TABLE	B.1	
SOIL	TESTING	RESU	LTS

Sample No.	Sample Depth (ft)	Percent Passing No. 200 Sieve	Dry Unit Weight (lb/ft³)	Moisture Content (%)
HL-1-3B	5.5 - 6.5	80.2	photologic from any financial sufficients of the construction of t	
HL-2-2A	2.5 - 3.0	34.7	109.2	13.6
HL-2-4	7.5 - 9.0	14.5		
HL-3-6B	13.0 - 14.0	42.6		700 TO
HL-8-3	5.0 - 6.5	24.7		
HL-8-4B	8.0 - 8.5	95.9	104.0	18.9
HL-8-5	10.0 - 11.5	92.4		
HL-8-6C	13.5 - 14.0	15.8	110.8	10.4
HL-9-2	2.5 - 4.0	36.5		

Based upon the percent passing the #200 sieve, long term moisture was calculated using the equation below (NRC, 1984):

$$m_{r} = (0.124P^{1/2} - 0.0012E - 0.04 + 0.156f_{cm})$$

where:

m, = residual soil moisture (fraction of saturation)

P = annual precipitation (in)

E = annual lake evaporation (in)

f<sub>cm</sub> = soil fraction passing #200 sieve

Average annual precipitation was determined to be 8-12 inches and average annual evaporation was determined to be 40 inches (Midwest Plan Service, 1983).

Several types of soil were apparent in the field investigation. The 8 to 13 feet of existing reclamation cover soil consists of interbedded sands and clays with varying dry densities and

moisture contents. From the samples tested, the two lowest percent passing the #200 sieve and the two highest percent passing the #200 sieve were averaged and used as separate input into the radon flux computer model analyses to provide a range of radon flux calculations. Average low percent passing the #200 sieve was determined to be 29.7 percent and the average high percent passing the #200 sieve was 94.2 percent. Densities and moisture contents were analyzed for one of the low percent passing #200 sieve samples and one of the high percent passing #200 sieve samples. Corresponding dry densities and moisture contents were determined to be 109.2 lb/ft<sup>3</sup> and 13.6 for the low percent passing the #200 sieve, and 104.0 lb/ft<sup>3</sup> and 18.9 percent for the high percent passing the #200 sieve, respectively.

These values represent the range of soils that exist within the existing reclamation cover. These values were used in the RADON computer model for determining the adequacy of the reclamation cover for radon attenuation. Long term moistures for the cover soil were calculated and used as conservative input to the RADON computer model. Long term moisture contents were based upon the percent passing the #200 sieve and were calculated using the equation presented in the "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design," NUREG/CR-3533 (NRC, 1984). Based upon the soil characteristics described above, and using the long term moisture equation, long term moisture contents for the cover soil ranged from 6.0 to 9.1 percent.

#### **B.4 RADIUM ACTIVITY**

Heap Leach samples were collected during the field investigation to determine radium activity. Sample locations are shown on Figure B.1. Listed below are the laboratory test results for heap leach radium activity.

TABLE B.2 RADIUM ACTIVITY

SAMPLE IDENTIFICATION	*APPROXIMATE DEPTH (FT)	RADIUM ACTIVITY pCi/g
HL - 1	11.5	86.9
HL - 2.1	19.0	86.8
HL - 8.5	14.0	413
Composite HL-1-5,HL-1-6	10.0-11.5,12.5-14.0	58.9
Composite HL-9-6,HL-9-7	12.5-14.0,15.0-16.5	34.4
HL - 10.4	-6.0	37
	AVERAGE	119.5

Depth below existing ground surface.

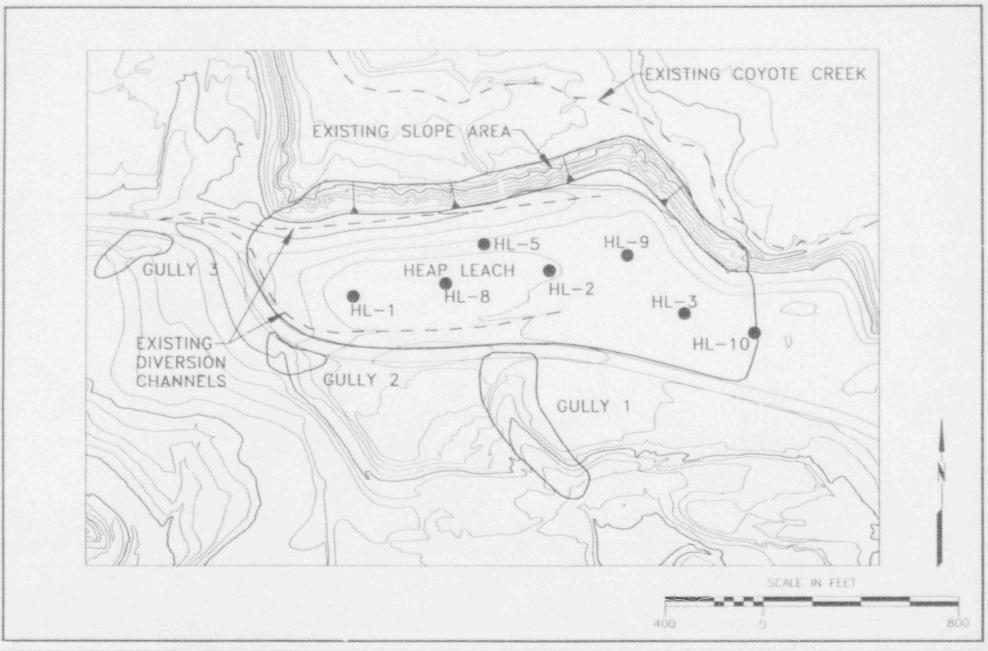
Laboratory test results indicate the heap leach samples collected during the field investigation averaged approximately 119.5 pCi/g for radium activity. "The Environmental Statement Related to Operation of Spilt Rock Uranium Mill" (NRC, 1980) indicates the Day Loma site heap leaching consisted of low-grade ore, with a cutoff grade of approximately 0.06% U<sub>3</sub>O<sub>8</sub>, corresponding to approximately 170 pCi/g. Both the 119.5 pCi/g average tested value and the higher value of radium activity, 170 pCi/g, were used as input into the model.

#### **B.5 RESULTS**

The Radon model indicates approximately a maximum of 6.3 to 7.8 feet of soil depth using the 170 pCi/g value and a minimum of 5.3 to 6.5 feet of soil depth for the 119.5 pCi/g value is required to meet an exit flux of less than 20 pCi/g specified by 10 CFR Part 40, Appendix A. Average depth of cover is approximately 8 to 13 feet, exceeding the required soil depth for radon attenuation. Radon output is included for reference at the end of this appendix.

# REFERENCES

- Midwest Plan Service, 1983. "Structures and Environment Handbook," Eleventh Edition. Iowa State University, Ames Iowa.
- Nuclear Regulatory Commission, 1980. "Environmental Statement Related to Operation of Split Rock Uranium Mill, Western Nuclear, Inc." Docket No. 40-1162, NUREG 0639, February.
- Nuclear Regulatory Commission, 1984. "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design," NUREG/CR-3533. Prepared by Rogers, et al, April.
- Nuclear Regulatory Commission, 1989. "Calculation of Radon Flux Attenuation by Earthen Uranium Mill Tailings Covers," Regulatory Guide 3.64, Task WM 503-4). Version 1.2, G.F. Birchard, June.



SMI SHEPHERD MILLER, INC. FIGURE B.1
EXISTING CONFIGURATION WITH BORING LOCATIONS
DAY LOMA HEAP LEACH AREA

Date: NOV., 1993
Project: 350
Fite: BORING

RADON MODEL OUTPUT

Version 1.2 - MAY 22, 1989 - G.F. Birchard tel.# (301)492-7000 U.S. Nuclear Regulatory Commission Office of Research

RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS

ARE CALCULATED FOR MULTIPLE LAYERS

OUTPUT FILE: 1A.OUT

DESCRIPTION: DAY LOMA HEAP LEACH AREA

### CONSTANTS

RADON DECAY CONSTANT	.0000021	87-1
RADON WATER/AIR PAPTITION COEFFICIENT	.26	
DEFAULT SPECIFIC GRAVITY OF COVER & TAI	LINGS	2.65

### GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS	2	
RADON FLUX LIMIT	20	pCi m^-2 s^-1
NO. OF THE LAYER TO BE OPTIMIZED	2	
DEFAULT SURFACE RADON CONCENTRATION	0	pCi l^-1
SURFACE FLUX PRECISION	.01	pCi m^-2 s^-1

### LAYER INPUT PARAMETERS

STEMPENDS.	
TO THE PERSON IN THE	HEA
AND THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS	1180.11

HEAP LEACH

THICKNESS	500	cm
CALCULATED PORDSITY	0.332	
MEASURED MASS DENSITY	1.77	g cm^-3
MEASURED RADIUM ACTIVITY	119.5	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	4.6820-04	pCi cm^-3 s^-1
WEIGHT % MOISTURE	10.4	X
MOISTURE SATURATION FRACTION	.554	
CALCULATED DIFFUSION COEFFICIENT	7.8960-03	cm^2 s^-1

# LAYER 2 SANDY COVER

THICKNESS	300	cm
CALCULATED POROSITY	0.340	
MEASURED MASS DENSITY	1.75	g cm^-3
MEASURED RADIUM ACTIVITY	0	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	0.0000+00	pCi cm^-3 s^-1
WEIGHT % MOISTURE	6	%
MOISTURE SATURATION FRACTION	.309	
ULATED DIFFUSION COEFFICIENT	2.3180-02	cm^2 s^-1

## DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

H	F01	CN1	ICOST	CRITJ	ACC
2	-1.000D+00	0.0000+00	2	2.0000+01	1.0000-02

LAYER DX D P Q KMS RHO
1 5.000D+02 7.896D-03 3.321D-01 4.682D-04 5.543D-01 1.770
2 3.000D+02 2.318D-02 3.396K 01 0.000D+00 3.092D-01 1.750

BARE SOURCE FLUX FROM LAYER 1: 9.5300+01 pci m^-2 s^-1

## RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS	EXIT FLUX	EXIT	CONC
	(cm)	(pCi m^-2 s^-1)	(pCi	1^-1
1	5.0000+02	6.7260+01	6.56	0D+04
2	1.9880+02	1.9830+01	0.000	00+00

Osio S. N

mion 1.2 - MAY 22, 1989 - G.F. Birchard tel.# (301)492-7000 5. Nuclear Regulatory Commission Office of Research

### RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS

ARE CALCULATED FOR MULTIPLE LAYERS

OUTPUT FILE: 4A.OUT

DESCRIPTION: DAY LOMA HEAP LEACH AREA

### CONSTANTS

RADON	DECAY CONSTANT	.0000021	s^-1
RADON	WATER/AIR PARTITION COEFFICIENT	.26	
DEFAUL	T SPECIFIC GRAVITY OF COVER & TA	AILINGS	2.65

## GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS		
RADON FLUX LIMIT	20	pCi m^-2 s^-1
NO. OF THE LAYER TO BE OPTIMIZED	2	
DEFAULT SURFACE RADON CONCENTRATION	0	pCi 1^-1
SURFACE FLUX PRECISION	.01	pCi m^-2 s^-1



LAYER INPUT PARAMETERS

LAYER 1 HEAP LEACH

THICKNESS	500	cm
CALCULATED POROSITY	0.332	
MEASURED MASS DENSITY	1.77	g cm^-3
MEASURED RADIUM ACTIVITY	119.5	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	4.6820-04	pCi cm^-3 s^-1
WEIGHT % MOISTURE	10.4	X .
MOISTURE SATURATION FRACTION	.554	
CALCULATED DIFFUSION COEFFICIENT	7.8960-03	cm^2 s^-1

#### LAYER 2 GLAYEY COVER

THICKNESS	300	cm
CALCULATED POROSITY	0.370	
MEASURED MASS DENSITY	1.67	g cm^-3
MEASURED RADIUM ACTIVITY	0	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	0.0000+00	pCi cm^-3 s^-1
HT % MOISTURE	9.1	X X
MOISTURE SATURATION FRACTION	.411	
CALCULATED DIFFUSION COEFFICIENT	1.6160-02	cm^2 s^-1

#### DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

N F01 CN1 ICOST CRITJ ASC 2 -1.0000+00 0.0000+00 2 2.0000+01 1.0000-02

LAYER DX D P Q XMS RHO
1 5.000D+02 7.896D-03 3.321D-01 4.682D-04 5.543D-01 1.770
2 3.000D+02 1.616D-02 3.698D-01 0.000D+00 4.109D-01 1.670

BARE SOURCE FLUX FROM LAYER 1: 9.5300+01 pci m^-2 s^-1

#### RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS	EXIT FLUX	EXIT CONC.
	(cm)	(pCi m^-2 s^-1)	(pCi (^-1)
1	5.0000+02	6.3330+01	7.4800+04
2	1.6020+02	1.0800+01	0.0000+00



on 1.2 - MAY 22, 1989 - G.F. Birchard tel.# (301)492-7000 Nuclear Regulatory Commission Office of Research

RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS

ARE CALCULATED FOR MULTIPLE LAYERS

OUTPUT FILE: SANDY6\_OUT

DESCRIPTION: DAY LOMA HEAP LEACH AREA

## CONSTANTS

RADON DECAY CO	INSTANT	.0000021 8^-1
RADON WATER/AL	R PARTITION COEFFICIENT	.26
DEFAULT SPECIF	IC GRAVITY OF COVER & TAILIN	IGS 2.65

#### GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS	2	
RADON FLUX LIMIT	20	pCi m^-2 s^-1
NO. OF THE LAYER TO BE OPTIMIZED	2	
DEFAULT SURFACE RADON CONCENTRATION	0	pCi (*-1
SURFACE FLUX PRECISION	.01	pCi m^-2 s^-1



LAYER INPUT PARAMETERS

LAYER 1 HEAP LEACH

THICKNESS	500	cm
CALCULATED POROSITY	0.332	
MEASURED MASS DENSITY	1.77	g cm^-3
MEASURED RADIUM ACTIVITY	170	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	6.6600-04	pCi cm^-3 s^-1
WEIGHT % MOISTURE	10.4	X
MOISTURE SATURATION FRACTION	.554	
CALCULATED DIFFUSION COEFFICIENT	7.8960-03	cm^2 s^+1

LAYER 2 SANDY COVER

THICKNESS	300	cm
CALCULATED POROSITY	0.340	
MEASURED MASS DENSITY	1.75	g cm^-3
MEASURED RADIUM ACTIVITY	0	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	0.0000+00	pCi cm^-3 s^-1
HT % MOISTURE	6	X
MOISTURE SATURATION FRACTION	.309	
CALCULATED DIFFUSION COEFFICIENT	2.318D-02	cm^2 s^-1

## DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

N F01 CN1 ICOST CRITJ ACC 2 -1.0000+00 0.0000+00 2 2.0000+01 1.0000-02

LAYER DX D P Q XMS RHO
1 5.000D+02 7.896D-03 3.321D-01 6.660D-04 5.543D-01 1.770
2 3.000D+02 2.318D-02 3.396D-01 0.000D+00 3.092D-01 1.750

BARE SOURCE FLUX FROM LAYER 1: 1.3560+02 pC1 m^-2 s^-1

## RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS	EXIT FLUX	EXIT CONC.
	(cm)	(pCi m^-2 s^-1)	(pCi (^-1)
14.	5.000p+02	9.5030+01	9.4860+04
2	2.363D+02	1.9820+01	0.0000+00

Version 1.2 - MAY 22, 1989 - G.F. Birchard tel.# (30°)492-7000 U.S. Nuclear Regulatory Commission Office of Research

RADON FLUX, CONCENTRATION AND TAILINGS COVER THICKNESS

ARE CALCULATED FOR MULTIPLE LAYERS

OUTPUT FILE: CLAYEY91.OUT

DESCRIPTION: DAY LOMA HEAP LEACH AREA

#### CONSTANTS

RADON DECAY CONSTANT	.0000021	8^-1
RADON WATER/AIR PARTITION COEFFICIENT	.26	
DEFAULT SPECIFIC GRAVITY OF COVER & TAIL	INGS	2.65

#### GENERAL INPUT PARAMETERS

LAYERS OF COVER AND TAILINGS	2	
RADON FLUX LIMIT	20	pCi m^-2 s^-1
NO. OF THE LAYER TO BE OPTIMIZED	2	
DEFAULT SURFACE RADON CONCENTRATION	0	pCi 1^-1
SURFACE FLUX PRECISION	.01	pCi m^-2 s^-1

#### LAYER INPUT PARAMETERS

A000/00.	
R 1	HEAP LEACH
76500	THE PART BUILDINGS

THICKNESS	500	cm
CALCULATED POROSITY	0.332	
MEASURED MASS DENSITY	1,77	g cm^-3
MEASURED RADIUM ACTIVITY	170	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	6.6600-04	pCi cm^-3 s^-1
WEIGHT % MOISTURE	10.4	%
MOISTURE SATURATION FRACTION	.554	
CALCULATED DIFFUSION COEFFICIENT	7.8960-03	cm^2 s^-1

#### LAYER 2 CLAYEY COVER

THICKNESS	300	cm
CALCULATED POROSITY	0.370	
MEASURED MASS DENSITY	1.67	g cm^-3
MEASURED RADIUM ACTIVITY	0	pCi/g^-1
DEFAULT LAYER EMANATION COEFFICIENT	.35	
CALCULATED SOURCE TERM CONCENTRATION	0.0000+00	pCi cm^-3 s^-1
WEIGHT % MOISTURE	9.1	X
MOISTURE SATURATION FRACTION	.411	
ULATED DIFFUSION COEFFICIENT	1.6160-02	cm"Z s"-1

#### DATA SENT TO THE FILE 'RNDATA' ON DRIVE A:

H	F01	CN1	ICOST	CRITJ	ACC
2	-1.000p+00	0.0000+00	2	2.0000+01	1.0000-02

LAYER	DX	0	p	0	XMS	RHO
1	5.0000+02	7.8960-03	3.3210-01	6.6600-04	5.5430-01	1.770
2	3.0000+02	1.6160-02	3.6980-01	0.0000+00	4.1090-01	1,670

BARE SOURCE FLUX FROM LAYER 1: 1.3560+02 pCi m^-2 s^-1

#### RESULTS OF THE RADON DIFFUSION CALCULATIONS

LAYER	THICKNESS	EXIT FLUX	EXIT	COAC.
	(cm) (	pCi m^-2 s^-1)	(pCi	(^-1)
	5.0000+02	8.9290+01	1.05	50+05
2	1.9120+02	1.9940+01	0.000	0D+00

APPENDIX C
FLUVIAL SEDIMENTATION ANALYSIS

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- Table C.1 Soil Loss From The 200-Year, 24-Hour Storm Event
- Table C.2 Radium Activity Comparison 119.5 pCi/g
- Table C.3 Radium Activity Comparison 170 pCi/g

Attached Table SEDCAD Basin Parameters

## LIST OF FIGURES

- Figure 1 Basin Delineation Total Drainage Areas
- Figure 2 Basin Delineation Day Loma Area
- Figure 3 Basin Delineation Additional Mining Disturbance
- Figure 4 Drainage Area Flow Diagrams
- Figure 5 Particle Distributions For Sedimentology

## C.1 INTRODUCTION

A fluvial sedimentation analysis was performed for Muskrat Creek and Coyote Creek located within Fremont County, Wyoming. The area generally consists of undisturbed natural land with sagebrush and small bunch grasses, and mining disturbance resulting in areas of bare ground, open pits, spoil stockpiles, and reclaimed surfaces. The purpose of this fluvial sedimentation investigation is to determine the sedimentation loss from each watershed to determine relative impacts of the unreclaimed spoils and the reclaimed Day Loma heap leach area, with respect to soil lost by surrounding undisturbed areas during a particular storm event.

## C.2 ASSUMPTIONS

Several assumptions were made in the analysis in completing the fluvial sedimentation analysis. These assumptions include:

- Entire undisturbed area considered soil covered, with no bedrock outcroppings present.
- Reduced the number of representable undisturbed surface soils in the area to two. Averages were taken from the most prominent soils in the area to develop the two soil groups used in the computer model. This was done to alleviate tedious soil group delineations and also to meet the limitations of the computer model used to calculate the sediment loss.
- Where particle distributions of the various soils were incomplete, distributions were assumed based on typical values for these types of materials. No hydrometer tests were performed for any of the soils.
- Assumed no cover present on the Day Loma heap leach area to provide a conservative soil loss estimate. Results of field tests, however, show an average of 8 to 13 feet of reclamation cover overlies the heap leach materials; therefore, this assumption is very conservative.

- Soil erodibility factor for the surrounding undisturbed natural watersheds was set equal to 0.32 (representing a loam soil). Soil erodibility for the heap leach area and spoils was set equal to 0.15 (sand).
- Maximum slope length (LS) was set equal to 400 feet even though some areas had total overland flow lengths much greater. A slope length of 400 feet is considered the maximum slope length before deposition is expected to occur (estimated). Where total slope lengths did not exceed 400, actual slope lengths for these areas were used.
- The CP factor for undisturbed watersheds was set equal to 0.045. CP for spoils and heap leach material was set equal to 0.90. The CP factor is defined below.
- Gullies were used in the total soil loss with the assumption that one gully every 200 feet on the heap leach area and surrounding spoils would occur.

## C.3 METHOD OF ANALYSIS

Fluvial sedimentation was performed using the SEDCAD+ Version 3 computer model, developed by Civil Software Design (Warner and Schwab, 1992). SEDCAD+ is a hydrology and sedimentology computer model developed to predict peak discharge and soil loss as a result of a particular storm event. The model uses a double triangular unit hydrograph along with a user specified distribution to develop the corresponding peak discharges. For this analysis, the SCS Type II distribution was used to predict runoff.

RUSLE was used as the method for determining soil loss. Required inputs for RUSLE are rainfall-runoff erosivity factor, soil erodibility factor, slope length and steepness factors, cover-management factor, and support practice factor.

## C.4 STORM EVENT

The 200-year 24-hour storm event of 3.7 inches was used for the analysis. The derivation of this storm is presented in Appendix A.

## C.5 WATERSHED CHARACTERISTICS

Particular characteristics of each watershed within the drainage areas were determined based on a site investigation performed in October, 1992, and from SCS soil survey data obtained from the Wyoming state office (currently unpublished information for this area of Fremont County). In addition, laboratory testing was performed for the Day Loma heap leach area cover soil and sub-soils for percent passing the #200 sieve. Figure 5 provides the gradation curves for the soils used in the analysis. The numbers 148-136 and 174-131 correspond to SCS symbols for various soils in the vicinity.

The Curve Number (CN) for the undisturbed areas used in Appendix A were also used in the sedimentation analysis with minor adjustments for the types of soils present, and the heap leach and spoil areas were assigned CN's of 84. A CN of 84 represents an SCS classification of hydrologic soil group "A", adjusted to Antecedent Moisture Condition III (AMC III), representing saturated soil conditions prior to the storm event.

Time of concentration for each basin was determined using the SCS Upland Curve Method (SCS, 1973) which is the primary method within SEDCAD+. In SEDCAD+, the model requires input for the particular land use(s) that are apparent for each basin. For undisturbed land, the land use for overland flow was set to "short grass pasture" and for concentrated flow the land use was set to "low flowing streams." For the heap leach and spoils, overland flow land use was set to "bare & untilled soil surface," and for concentrated flow the land use was set to "large gullies." These settings were discussed with Civil Software Design, Inc. staff, and were determined to be realistic and appropriate for the regional area and soil types.

The CP factor is made up of two separate characteristics; C representing the cover-management factor, and P representing the support-practice factor. Although there exists variability in the undisturbed soil groups present within the surrounding area, 0.045 was chosen to represent the entire undisturbed area, representing average cover on natural land. The 0.9 value for the spoils/heap leach representing a loose bare soil condition (Barfield, 1981).

## C.6 WATERSHED DELINEATIONS AND ROUTING PROCEDURES

SEDCAD+ uses networking to accurately model peak Gacharges and sedimentation from a multiple structured diverse hydraulic system. In order to provide necessary input into SEDCAD+, watersheds were delineated throughout the entire area and appropriate routing procedures between watersheds were calculated and were used as input into the model. The entire drainage basin is shown on Drawing 1 with watersheds shown on Figures 1-3. A flow diagram depicting the routing procedures used in the analyses is shown on Figure 4.

## C.7 RESULTING SOIL LOSS

The attachment included at the end of this appendix provides the SEDCAD+ output data and results. In addition to the SEDCAD+ soil loss predictions, gullies were assumed to be formed during the storm events at a frequency of one for every 200 feet of spoils and heap leach material and included in the total soil loss calculations, providing a maximum estimate of soil loss. Table 1 below provides the soil loss results of the various watersheds, with the gullies included as a separate item.

TABLE 1 - Soil Loss From The 200-Year, 24-Hour Storm Event

MATERIAL	SEDCAD+ SOIL LOSS (TONS)	PERCENT	GULLY SOIL LOSS (TONS)	TOTAL W/GULLY (TONS)	TOTAL PERCENT
Heap Leach	146	0.18	900	1,046	1.2
Mine Spoils	9,436	11.72	3,300	12,736	15.0
Undisturbed	71,217	88.10	NA	71,217	83.8
TOTAL	80,799	100	,,200	84,999	100

## C.8 RADIUM ACTIVITY COMPARISON

A relative comparison of the contributing amount of radium was performed at the confluence of Muskrat and Coyote Creeks. Average radium content of the spoils material in areas that would potentially erode into Coyote or Muskrat Creeks was obtained from actual surface sampling performed by Centurion Nuclear, Inc., and was determined to be 98.3 pCi/g. This value was assumed to be consident and representative for all spoils material that would potentially erode and reach the creeks.

For the heap leach materia—average radium content of 119.5 pCi/g was used. This value represents the average tested radium content from samples collected of actual leached material during the October, 1992 drilling program. An analysis was also made using the assumption that there was no radium loss from leaching activity. In this analysis, 170 pCi/g was used for representation of the heap leach material as this value corresponds to the cut-off ore grade as presented in "The Environmental Statement Related to Operation of Spilt Rock Uranium Mill," (NRC, 1980).

With these radium contents and corresponding soil loss tonnages, the following relative impacts at the confluence of Muskrat and Coyote Creeks were developed. Table 2 represents the heap leach material radium activity of 1.0.5 pCi/g and Table 3 represents heap leach radium activity of 170 pCi/g.

TABLE 2 - Radium Activity Comparison - 119.5 pCi/g

Material	Soil Loss Tons	Radium Activity pCi/g	Percentage of Total	Incremental Increase pCi/g
Heap Leach Material	1,046	119.5	8.5	1.5
Spoils	12,736	98.3	86.9	14.7
Undisturbed	71,217	1	4.6	0.8
TOTAL	84,999	NA	100	17

TABLE 3 - Radium Activity Comparison - 170 pCi/g

Material	Soil Loss Tons	Radium Activity pCi/g	Percentage of Total	Incremental Increase pCi/g
Heap Leach	1,046	170	11.8	2.1
Spoils	12,736	98.3	83.7	14.7
Undisturbed	71,217		4.5	0.8
	84,999	NA	100	17.6

#### C.9 CONCLUSIONS

The fluvial sedimentation analysis indicates the majority of the soil loss at the confluence of Muskrat and Coyote Creeks to be contributed by the undisturbed areas for both storm events evaluated. The relative comparison of radium contents indicates a large percentage of radium being contributed by the spoils material. With these analyses, relative impacts should the heap leach material be transported to the confluence of Muskrat and Coyote Creeks are minimal in comparison.

# REFERENCES

Warner, Dr. Richard C., and Pamela Schwab, 1992. SEDCAD+ Version 3 developed by Civil Software Design, Ames, Iowa.

TABLE 7. SEDCAD BASIN PARAMETERS

SOIL	GROUP	SHAR	Designa	ete ve	Caures	nitytei	-	-	p+	MESSES.	27	priorita pri	107	25)	75	N.	position per	a meta	Asitivaçõe	SPICIN	No.		A
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STRUCTURE	SLOPE	(%)																					
H-1 TO	STRUCTURE	(11)			e e e e e e e e e e e e e e e e e e e		2965	0	0	risio	3985	3682	3122	1,269	1269		1810				Linuseus		0
V-1 TO 1	STRUCTURE STRUCTURE	(11)					99	0	0		100	88	99	8	200	0	0#	9			**************************************		0
CREEK	SLOPE	(%)					MA	MA	N.		NA	NA	5.4	11.2	4.5	ing to take a	MA	NA	igrafician				X X
H-1 TD	CREEK	(11)					0	0	0		0	0	373	672	448		0		-				0
V-1 TO	CHEEK	0.0					0	0	0		0	0	50	IC.	8		0				Line Asserts		0
BASIN	SLOPE	(%)					7.4	5.5	8.4		NA	0.4	MM	MA	NA	NA	N.A.	N.			i major di		3.7
BASIN	TC2-H	(4)					4619	731	7108		0	6575	-8							e animalia			13796
BASIN	TC2-V	(11)		201-041		ettiqui Ga	340	16	6000		0	52				- A			atessates				510
BASIN - 1	SLOPE	(N)		enan k		-	7.3	4.5	21.0		9.0	00 +	3.8	4.5	34.6	44.0	5.5	8.0	0.000000.43				17.2
BASIN	TC1 - H	(11)		el eller		min	1092	286	11142	CONTRACT	2363	5363	784	323	27.52	250	2488	506					1383
BASIN	TC1 -V	(40					90	13	240		130	100	30	50	76	013	130	90		* NOT AP			240
	N.T.	STRUCTURE		7000		inster	z	>	3-		Z	z	z	z	Z	>	z	>		EMP 9			>
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	AREA	(scres)			*****		989	46	787		69	42	13	1.4	10	1	37	27					1076
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	SUNCTION	NO.		JUNCTION 1																	JUNCTION 1		

TABLE 7. SEDCAD BASIN PARAMETERS

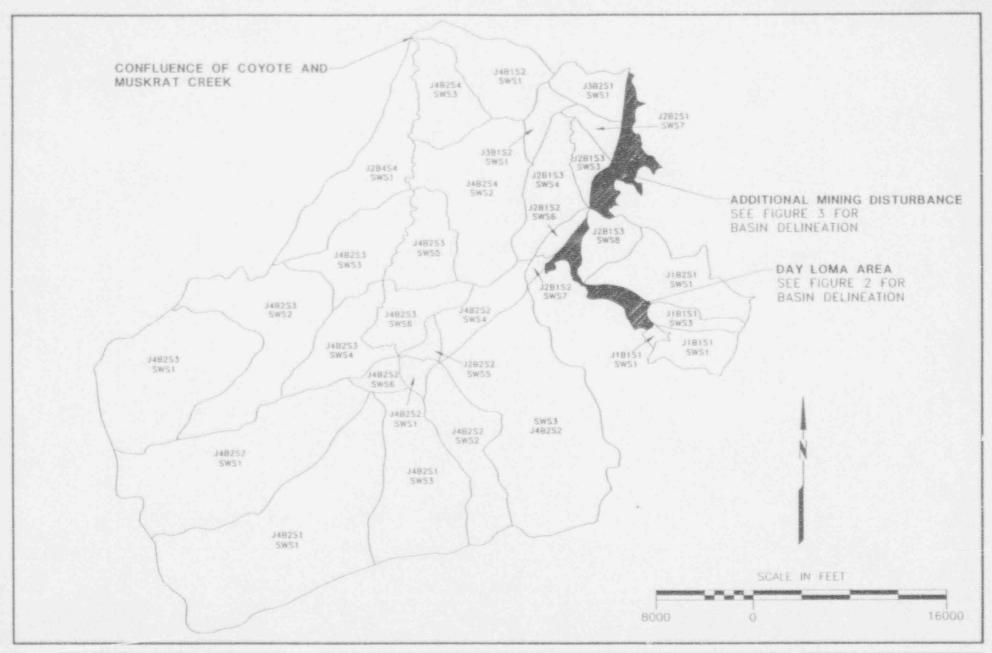
							BASIN	BASIN	BASIN - 1	BASIN	BASIN	BASIN	V-1 TO	H-I TO	CREEK	V-1 TO	H-1 TO	STRUCTURE	SOR
JUNCTION	BASIN	BASIN	NO.	AREA	LAND	, AE	TC1-V	TC1 - H	SLOPE	TC2-V	TC2 - H	SLOPE	CREEK	CREEK	SLOPE	STRUCTURE	STAUCTURE	SLOPE	GROS
MEX	IDENTITY			(scres)	DISTURBANCE	STRUCTURE	(10)	(21)	(%)	(8)	(ft)	(%)	(7)	(ft)	(%)	(11)	(70)	(%)	
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			1 1													12.11			1
			1.1			1 1										1 1 1 1 1			
UNCTION 2	BRANCH 1		1. 1																-
	J2R151	SWS			SP	Y	125	500	25.0	à	*	NA			NA.	@		NA.	1
			ЕI																
	J281S2	SWS		8	SP	N.	127	721	17.6			NA	40	336	11.9	70	7289	1.0	4
	J28:S2	SWS	5	12	SP	N	100	672	14.9			NA	20	995	2.0	57	6668	0.9	
	J28152	SWS	3	25	UND	N.	20	350	5.7	50	1940	2.6	. 0	- 1	NA.	57	6668	0.9	
	328152	SWS	1 *	40	SP	N.	40	1841	2.2	30	768	3.9	. 0	0	NA.	115	3781	3.0	4
17.11-7	J28152	SWS	5	47	UND	N	40	855	4.7	20	944	2.1	. 0	0	NA NA	35	1891	1.9	1
	J28152	SWS	6	40	UND	Y	60	1230	4.9	220	4582	4.8	- 0	0	NA.	. 0	0	NA.	1
	J281S2	SWS	7	54	UND	19	80	2040	3.9	*		NA:	0	.0	NA.	170	5219	2.7	
	J28152	SWS	8	423	UND	Υ	160	2090	8.6	160	2686	5.5	0	0	NA.	0	0	NA.	
	159185	SWS	9	12	UND	N	55	506	10.9		6	0.0	0	. 0	NA.	70	2836	2.5	1
	J2B132	SWS	10	77	UND	Y	45	1032	4.4	150	2825	5.3	- 0	0	NA	0	- 0	NA.	
20.00	J28182	SWS	111	17	SP	N	50	740	6.6			NA:	0	0	NA.	140	2444	5.7	4
m 2.								100											
	J2B1S3	SWS	1	87	UND	N N	190	1539	11.6	*	*	NA:	0	0	NA	90	10000	0.9	2
	J28183	SWS	2	18	UND	N	140	920	15.2	125	789	15.8	G.	0	NA	120	7512	1.6	2
	J281S3	SWS	3	273	UND	Y	100	1442	6.9	50	5005	3.0	- 0	0	NA	0	0	NA.	2
PT Act	J28183	SWS	4	862	UND	* * * ·	40	1020	3.9	220	7674	2.9	0	. 0	NA	0	. 0	NA.	5
UNCTION 2	BRANCH 2																		
													ROAD	ROAD			b		
	J28281	SWS	- 5	69	UND	N	95	1085	8.6	22	1035	2.1	0	0	NA.	160	6266	2.6	- 1
	J2B2S1	SWS	5	17	UND	- N	50	904	5.5	- 80	741	8.1	140	2954	4.7	160	6266	2.6	- 1
	J282S1	SWS	3	45	SP	N	120	668	18.0	25	502	5.0	80	1788	4.5	160	6266	2.6	4
	J282S1	SWS	4	69	UND	. N	33	520	6.3	80	3250	2.5	0	0	NA.	160	6266	2.6	-
	J2B2S1	SWS	5	25	SP	N	95	632	15.0	20	599	3.3	30	1710	1.8	160	266	60.2	
	J28281	SWS	6	36	UND	N.	190	1500	127	55	396	13.9	75	2835	2.6	160	5266	2.6	
	J28291	SWS	7	207	UND	Y	80	995	80	160	6735	2.4	0	0	NA.	0	0	NA I	1

## TABLE 7. SEDCAD BASIN PARAMETERS

						parameter	BASIN	BASIN	BASIN - 1	BASIN	BASIN	BASIN	V-1 TO	H-1 TO	CREEK	V-1 TO	H-1 TO	STRUCTURE	SOIL
JUNCTION	BASIN	BASIN	NO.	AREA	LAND	AT	TC1 -V	TC1 - H	SLOPE	TC2 - V	TC2 - H	SLOPE	CREEK	CREEK	FLOPE	STRUCTURE	STRUCTURE	SLOPE	GROUP
NO.	IDENTITY			(acres)	DISTURBANCE	STRUCTURE	(7)	(11)	(%)	(fi)	(ft)	(%)	(71)	(75)	(%)	(h)	(ft)	(%)	
			1																
		100																	
JUNCTION 3	BRANCH 1																		
0.000		Maked																	
Maria 1	J381S1	SWS	1.1														100		
	J3B152	SWS	11	261	UND	Y	40	1124	3.6	100	4238	2.4	- 0	0	NA	. 0	0	NA.	1
			1 1																
JUNCTION 3	BRANCH 2		1 1																
	J382S1	SWS		449	UND		180	8756	2.1			NA.	0		NA			NA.	
			1 1																
	J382S1	SWU	2	30	UND	N	50	970	5.2			NA	0	- 6	NA	. 540	7413	1.9	5
	338281	SWS	3	51	SP	N	45	1000	4.5	55	1990	2.6	0	0	NA	160	7612	2.1	A

TABLE 7. SEDCAD BASIN PARAMETERS

			T				BASIN	BASIN	BASIN - 1	BASIN	BASIN	BASIN	V-1 TO	H-1 TO		V-1 TO	H-1 TO	STRUCTURE	SOL
JUNCTION	BASIN	BASIN	NO.	AREA	LAND	.AT	TG1 -V	TC1 - H	SLOPE	7C2 - V	TC2 - H	SLOPE	CREEK	CREEK	SLOPE	STRUCTURE	STRUCTURE	SLOPE	GROW
NO I	IDENTITY			(acres)	DISTURBANCE	STRUCTURE	(8)	(ft)	(%)	(ft)	(n)	(%)	(ft)	(ft)	(%)	(11)	(%)	(%)	
			1 1																1
			1 1																
JUNCTION 4	BRANCH 1		1 1																
			1 1																
	J481S1	SWS	1.31												NA.	0	0	NA	
	J4B1S2	SWS	1.1	1000	UND	, Y	80	1692	4.7	200	6249	3.2	. 0	- 0	7925				1
			1																
AINCTION 4	DO ANCHO		1 1																
JUINEL STUNE A	Brianuri 2		1. 1															1000	
	J4B2S1	SWS		3024	UND	v	120	1343	8.9	700	23432	3.0	. 0	0	NA	0	G	NA	1
	J482S1	SWS	2	3916	UND	Y	120	1388	8.5	280	23383	1.2	0	0	NA	0	0	NA	1
	J482S1	SWS	3	1905	UND	Y	80	1791	4.5	400	14428	2.6	. 0	0	NA	. 0		NA.	1
	J48252	SWS		153	UND	Y	20	2299	0.9	40	1196	3.3	.0.	6	NA	0	- 0	NA.	1
	J48252	SWS	2	1134	UND	N	60	1891	3.2	400	14726	2.7	. 0	.0	NA	-60	3731	1.6	1
	J4B252	SWS	3	3540	UND	N	30	3234	0.9	440	23084	1.3	0	0	NA.	60	3731	1.6	1
	J4B2S2	SWS	4	567	UND	N	40	1493	2.7	140	10199	1.4	0	0	NA	60	3731	1.6	1
	J482S2	SWS	1 5	136	UND	Y	20	1144	1.7	120	2430	4.8	0	0	NA.	-0	0	NA	1
- 1	J482S2	SWS	6	202	UND	Y	100	2587	3.9		*	NA.	0	- 0	NA.	. 0	0	. NA	1
	J4B2S3	SWS	1 1	2431	UND	N	487	2637	18.5	420	12736	3.3	260	19051	1.3	. 0	0	NA.	1
	J4B2S3	SWS	5	2092	LIND	74	120	2090	5.7	360	16716	2.2	140	12288	1.1	0	. 0	NA.	1
	J482S3	SWS	3	1028	UND	74	80	1243	6.4	280	13144	2.1	0	- 0	NA	. 0	0	NA.	2
	J4B2S3	SWS	4	908	UND	N	40	1636	2.4	280	7572	3.7	. 0	5	NA	40	13283	0.3	1
Part I	J4B2S3	SWS	5	777	UND	Y	129	1393	8.6	220	4577	4.8	0	0	NA	0		NA	
	J482S3	SWS	6	664	UND	N N	20	1767	1.1	300	6479	4.6	0	- 6	NA	40	13283	0.3	1
																0	0	N/A	1
7 - 17	J482S4	SWS	1 1	1449	+JND	Y	80	1124	7.1	333	15151	2.2	0	. 0	NA.			NA NA	
	J482S4	SWS	3	1970	UND	N	25	597	4.2	400	15273	2.6	0	.0	NA.	55	8159	0.7 NA	2
	J48254	SWS	3	840	UND	Y	60	1294	4.6	120	5871	2.0	0	0	NA			NA.	1
						E 17-1								- 14	15.0		25.		
JUNCTICALS.	BRANCH 1							2.37										CO.	
	JSBISI	SWS										100					A	V	- 1



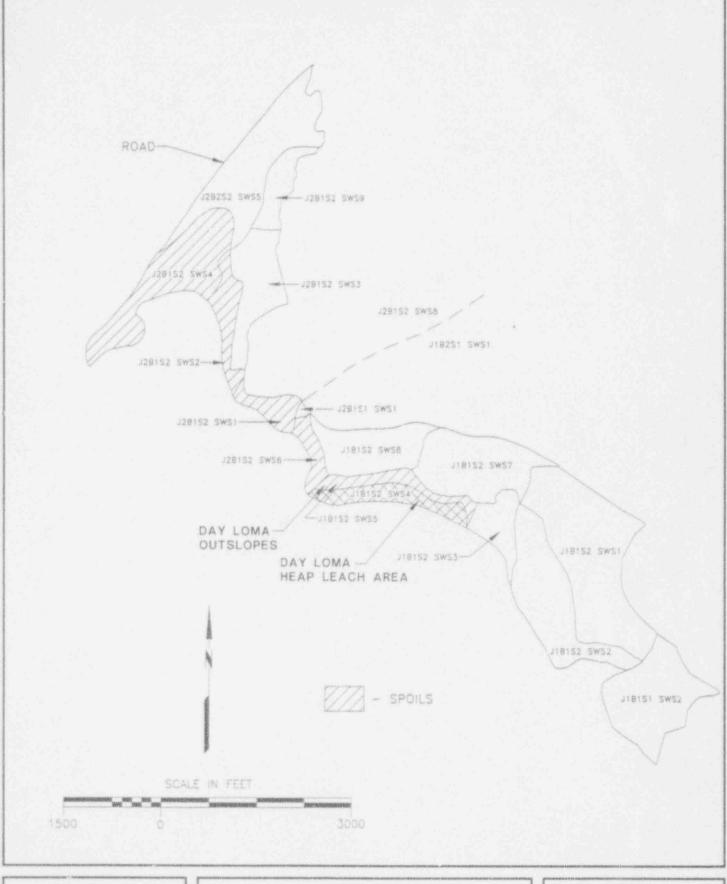
SMI SHEPHERD MILLER, INC.

FIGURE 1
BASIN DELINEATION TOTAL DRAINAGE AREA
CONFLUENCE OF COYOTE & MUSKRAT CREEKS

Date: SEPT., 1993

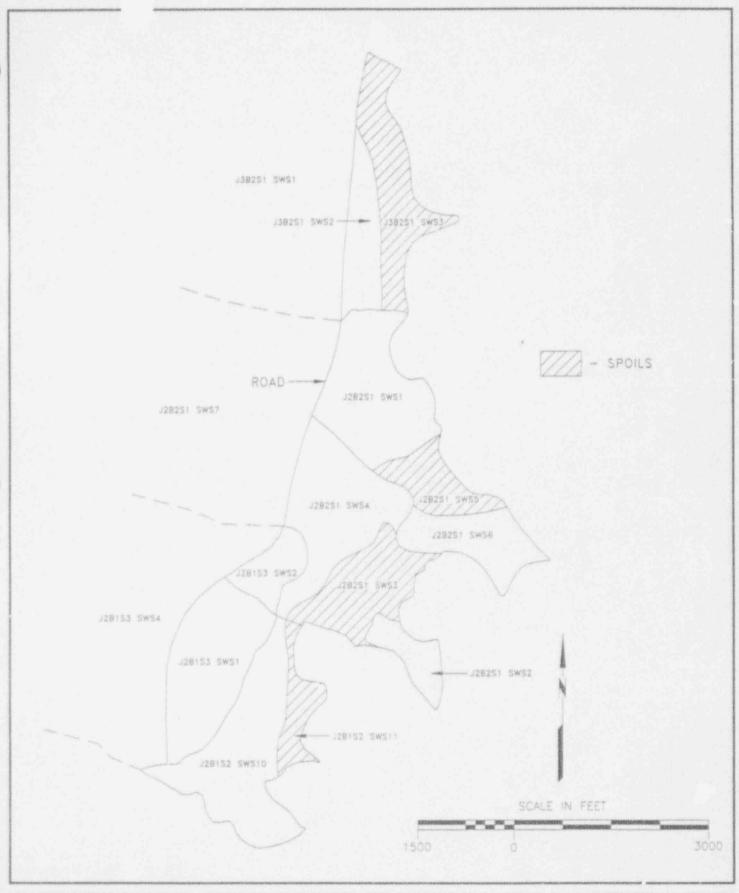
Project: 350

File: CONFLNCE



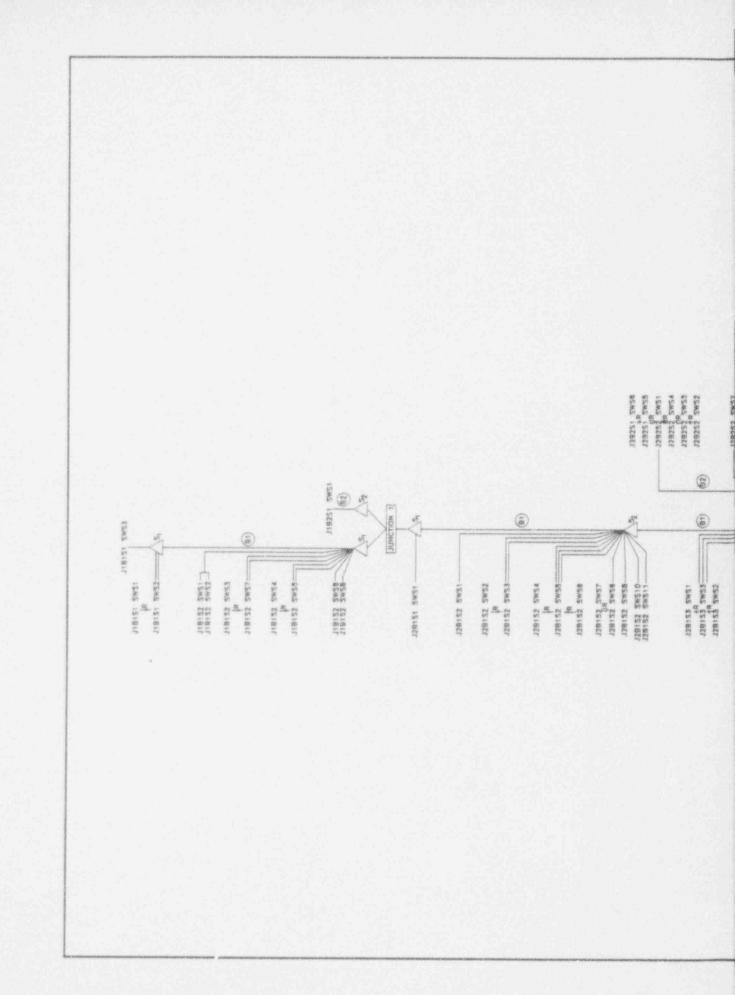
SMI SHEPHERD MILLER, INC. FIGURE 2 BASIN DELINEATION DAY LOMA AREA

Date:	SEPT., 1993
Project:	350
File:	DAYLOMA

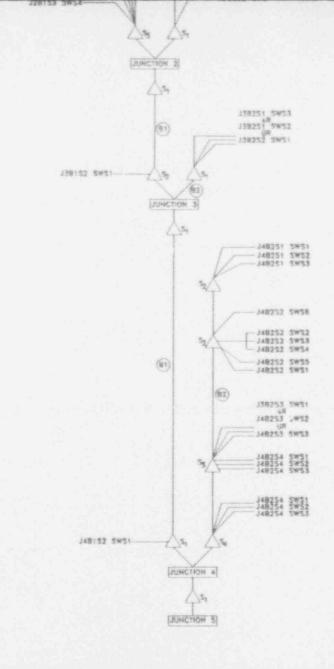


SMI SHEPHERD MILLER, INC. FIGURE 3
BASIN DELINEATION
ADDITIONAL MINING DISTURBANCE

Date: SEPT., 1993 Project: 350 File: BASIN-U



the yell



APERTURE CARD

NA STRUCTURE

@ BRANCH

JERISS SWS4 BASIN

\*\* ROUTE THROUGH BASIN

SMI SHEPHERD MILLER, INC. FIGURE 4
DRAINAGE AREA FLOW DIAGRAM
MUSKRAT AND COYOTE CREEKS

Date:	SEPT., 1993
Project:	
File:	350FLOW

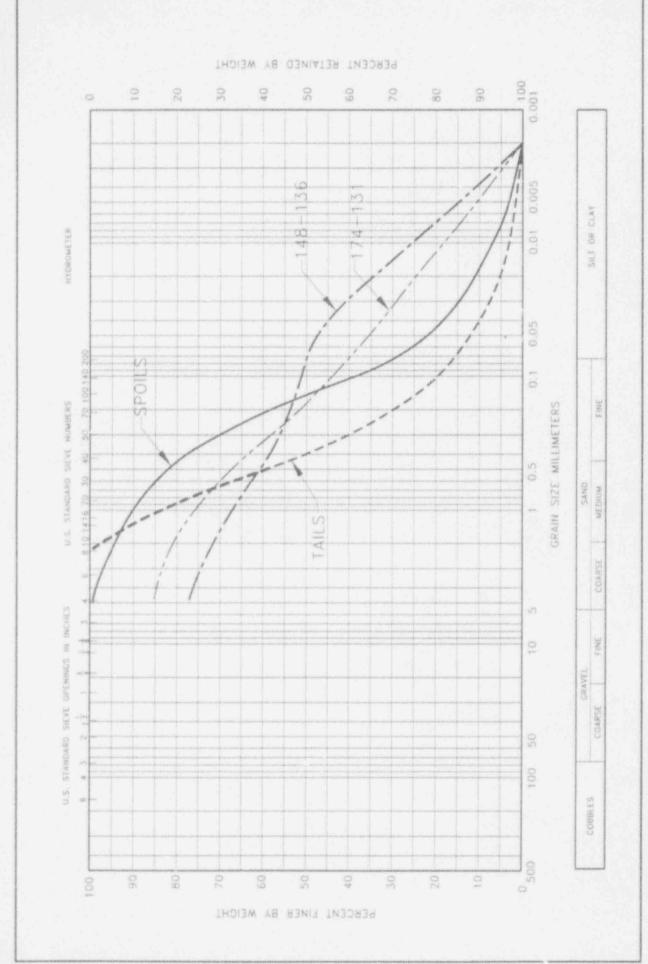


FIGURE S
PARTICLE DISTRIBUTIONS
FOR SEDIMENTOLOGY

Uate:	SEPT.,	1993
Project:	350	

APPENDIX C ATTACHMENT SEDCAD+ OUTPUT CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

DAY LOMA FLUVIAL SEDIMENTATION ANALYSIS - COYOTE & MUSKRAT CREEKS

by

Name: BLC & KMW

Company Name: SHEPHERD MILLER INC. File Name: C:\SEDCAD3\DAYLOMA

Date: 09-29-1993

Civil Software Design -- SEDCAD+ Version 3.1 Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: SHEPHERD MILLER INC.

Filename: C:\SEDCAD3\DAYLOMA User: BLC & KMW

Date: 09-29-1993 Time: 13:53:04

Day Loma Fluvial Sedimentation Analysis - Coyote & Muskrat Creeks

Storm: 3.70 inches, 200 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

GENERAL INPUT TABLE

Specific Gravity: 2.50 Submerged Bulk Specific Gravity: 1.35

#### Particle Size Distribution(s):

Size	Group 174-131	Group 148:136	TAILINGS	SPOILS
(1985)	% Finer	% Finer	% Finer	% Finer
******	**********	************	**********	************
5.0000	100.00	100,00	100.00	100.00
4.7500	86.00	77.00	99.90	99,90
2.0000	83.00	73.00	99.80	95.00
0.4250	64.00	59.00	55.00	80.00
0.0750	41.00	51.00	15.80	27.30
0.0020	0.00	0.00	0.00	0.00

#### Detailed Between Structure Routing:

		To	Seg.	Land Flow				Segment	Muski	าเวเมต
J	8	S	#	Condition	Distance (ft)	Slope (%)	Velocity (fps)	Time (hr)	K (hr)	Х
di i	133	100 20 4	******	*****	******	******	*********	******	S COMMAN	THE PERSON
1	1	2	1	8	5772.95	2,60	4.84	0.33	0.331	0.369
2	į.	1	1	8	1400,14	1,43	3.59	0.11	0.108	0.339
that i	1	2	1	8	8358.43	1.02	3.03	0.77	0.767	0.320
2	Ť.	3	1	8	10846.66	1.11	3.16	0.95	0.954	0.324
3	1	2	1	8	4726.10	0.63	2.39	0.55	0.549	0.272
4		2	1	8	14975.96		3.20	1.30	1.301	0.326
4	2	2		8	3881.46	1.55	3.73	0.29	0.289	0.343
4	2	3	.1	8	21102.77	0.85	2.77	2.12	2,115	0.309
4	2	4		8	16755.97		3.11	1.50	1.496	0.323

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Company Name: SHEPHERD MILLER INC.

Filename: C:\SEDCAD3\DAYLOMA User: BLC & KMW

Date: 09-29-1993 Time: 13:53:04

Day Loma Fluvial Sedimentation Analysis - Coyote & Muskrat Creeks

Storm: 3.70 inches, 200 year-24 hour, SCS Type II Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrelogy-

1000 0000		Les and	A 14 M 15 Table					Runoff	Peak
JBS SWS	Area	CN	UHS		K		FLOW	Volume	Discharge
	(ac)			(hrs)				(ac-ft)	and the second second
111 1	458.00	91			0.188				10.75.00.5.77.00.
111 2	461.00		М						945.56
111 3	267.00		М		0.000			60.76	272.20
	Type:	NU	121	Label:	J18151	- SWS1-/	k.		
111 Structure	1186.00							269.91	
***		1000				N. S. S. S. S. S.			
111 Total IN/OUT									1372.74
国际推荐政策基础公司公司宣司法							to an arrangan	ERKEDEEK.	INTERESTE
112 1	69.00	91	М	0.399	0.253	0.360	0.0	15.70	119.84
A 2	42.00	91	M	0.455	0.253	0.360	0.0	9,56	69.04
3	13.00*	84	F	0,111	0.223	0.361	0.0	2.28	27.76
112 4	14.00*	84	F	0.050	0.063	0.403	0.0	2.46	29.89
112 5	10.00*	26	F	0.010	0.113	0.361	0.0	1.76	21.35
112 6	7.00*	84	P	0.010	0.000	0.000	0.0	1.23	14.95
112 7	37.00	91	343	0.431	0.094	0.367	0.0	8.42	62.30
71 × 8	27.00	91	M	0.139	0.000	0.000	0.0	6.14	60.66
	(1)	уре:	NU	1 Lat	set: J15	152			
112 Structure	219.00							317.47	
****		1.00	10 10 10 10						Annexase.
112 Total IN/OUT	1405.00							317.47	1558,26
UN MANUA SUR EXPERSE	******	1000	ini te di s	REMEZES		FERRES			********
111 to 112 Routin	ng				0.331	0.369			
***********	*********	0 10 10 10	(SEMERLE				******	BREEFERE	********
121 1	1076.00	1	H	0.797	9.000	0.000	0.0	0.00	0.00
				L Lab					
121 Structure	1076.00							0.00	
	i e i e e e e e e e e e		- N. H. H. H.		***			*****	*******
121 Total IN/OUT	1076.00							0.00	0.00
DEFERREDATION OF STREET		n ieru in	10 10 10 10		*****	STREET	SEENSON		CHERNALIN
211 1	1.00*	84	F	0.027	0.000	0.000	0.0	0.18	2.14
				L Lab					
211 Structure	1,00	illinor.						317.65	
4455050505050								***	
211 Total IN/OUT	2482.00							317 65	1539.70
*************		1220	9955				*******		
to 211 Routin					0.108				
Canada and Angelow		r u a u	2225				****		******
212 1				0.047					17.08
212 2	12.001								25.62
212 3	25.00							5.69	37.96
	4.0 - 3/4	8.9	-	0.337	0.007	4.410	0.0	2.04	37.70

212	4	40.00*	84	g.	0.382	0.200	0.377	0.0	7.03	64.91
212	5	47.00	91	м	0.216	0.128	0.352	0.0	10.70	98.96
212		40.00	91	М	0.414	0.000			9.10	68.48
212		64.00	91	м		0.348		0.0	14.57	110.21
艦		423.00	91	M	0.396	0.000		0.0		736.72
<b>THE</b>										
212	9	12.00	91	М	0.060	0.167			2.73	30.56
212	10	77.00	91	M	0.309	0.000	0.000	0.0	17.52	144.97
212	11	17.00*	84	8	0.079	0.094	0.404	0.0	2.99	36.30
			ype:	Mul	L Lab	et: JZE	1152			
212	Structure	765.00							487.75	
***										
212	Total IN/OUT	3247,00							487.75	1695.91
-	****		azan	****		412205			PRESERVE	
211	to 212 Routin	a				0.767	0.320			
1000	************	*	0.000	8855						
									15.25	
213					0.093					48.38
213										
213					0.324				62.13	
213	4	862.00	91	M	0.624	0.000	0.000	0.0	196.18	1206.23
		7	ype:	Nul	l Lab	mel: J29	1153			
213	Structure	1221.00							765.63	
			* 0 1 1		****					
213	Total IN/OUT	4468.00							765.63	1941.87
20000		********	BEER		******	nzzaza	********		******	200000000
212	to 213 Routin	ď				0.954	0.324			
,	THE RESERVE ASSESSED.		***	0 O H S	*****					NESSEES.
	1	69.00	91		0.211					146.04
221									3.87	37.75
221		17.00		M			0.379			
221	3	45.00*			0.050			0.0	7.91	
	4		91	M	0.273					135.38
都能	5	25.00*	84	ř	0.075	0.482	0.365	0.0	4.39	53.38
221	6	36,00	91	M	0.177	0.524	0.369	0.0	8.19	79.84
221	7	207.00	91	М	0.543	0.000	9.000	0.0	47.11	312.51
		- 85.2	ype:	Nui	l Lab	el: J28	3251			
221	Structure	468.00							102.88	
4.69		*****	energie							
221	Total IN/OUT	468.00							102.88	750.42
	***********		20 00 00 00		******			222252	*******	*******
311										0.00
211					Lab					0.00
***			Abe:	-MANA	7 5.80	M1: 200	1131		040 51	
311	Structure								868.51	
***										
1,000,000	Total IN/OUT									2621.82
0.000	CHARACTE CARE	MELUEUSES		gans	MUNERUS		CHRESTS	CHERRIC .	******	NEEDELLESS.
	to 311 Routin					0.000				
922	**********	*****	医电影	RUES		******	-		. TRAUETTO	OKTORDESE.
312	1 1	261.00	91	M	0.491	0.000	0.000	0.0	59.40	414.39
			ype:	Nul	1 Lab	et: 338	1152			
312	Structure	261.00							927.91	
				****						
	Total IN/OUT									2617.07
	DIGITIAL INTOUT									
	to 312 Routin					0.549				
00.00	************									
4	1	449.00								
	5									67.21
321	3	51.00*	84	F	0.241	0.486	0.359	0.0	8.96	95.85
		1	ype:	Nul	Lab	bei: J38	8251			
321	Structure	530.00							117.97	
		*******		A 90.70						****

321 Total IN/OUT	530.00							117.97	299.15
************	******		an man		******		WZZZZZ		
411 1								0.00	
					bel: J4				0.100
Structure	0.00							1045.88	
The state of the s								1042.00	
411 Total IN/OUT									
								The second second	2900.83
3007503465523633		- CHARLE	- CHR	TREMESE:			BULERS	BETRESCE:	
312 to 411 Routi						0.000			
*************									
412 1	1000.00	91	н	0.632	0.000	0.000	0.0	227.58	1391.98
		Type:	Nul	1 La	bel: J4	8152			
412 Structure	1000.00							1273.46	
412 Total IN/OUT	6727.00							1273 44	2995.21
***********	TERRESESS	SERVE			****				
411 to 412 Routi					1.301				*********
						20 10 10 10 10 10			
	3024.00								
421 2	3916.00								
421 3	1905.00						0.0	433.54	1865.79
		Type:	Nul	La	bel: J4	8251			
921 Suructure	8845.00							2012.96	
******		****							
421 Total IN/OUT	8845.00							2012.96	6346.47
*************	OBSERVED	25522		PERESE	******				
422 1		91	м			0.000			158.89
422 2		91				0.345			1000000
422 3	3640.00	91	M					258.08	200,000,000,000
40002 4								828,40	
CONTRACT.		91						129.04	
5 11 11 11	136.00	91						30.95	
422 6	202.00	91	М	0.522	0.000	0,000	0.0	45,97	311.22
		Type:	Nul	Lab	el: JA	8252			
422 Structure	5832.00							3340.21	
***********	*****				******				
422 Total IN/OUT	14677.00							3340.21	9256.75
***********		unanai		CERESEE		******	DESER	STERRES	
421 to 422 Routin					0.289				
SPERMENDERSONS	NUSSESSES.						NE AL REAL PROPERTY.		
423 1	2431.00								
423 2	2092.00	-04	54	4 7 55	1 045	0.354	0.0	333.23	6771.31
423 3	1070.00	71		1,400	1.005	0.360	0.0	476.10	1785.61
	1028.00	91	M	1.028	0.000	0.000	0.0	233.95	1074.09
423 4	908.00	91	M	0.279	2.241	0.245	0.0	205.64	1122.42
423 5	777.00	91	М	0.381	0.000	0.000	0.0	176.83	1371.93
423 6	664.00	91	М	0.937	2.241	0.245	0.0	151.11	734.62
		ype:	Null	Lab	el: J48	253			
423 Structure	7900.00							5138.11	
********									
423 Total IN/OUT	22577.00							5138.11	2077 78
************		inana.	10000		and the same as the same				
422 to 423 Routin									
					2.115				
年取回車回車車車車車車車車車車 とうと 4									
424 1	1449.00	91	M	1-117	0.000	0.000	0.0	329.77	1436.27
424 2	1970.00	91	M	0.989	0.920	0.295	0.0	448.34	2108.30
424 3	846.00	91	M	0.618	0.000	0.000	0.0	192.53	1192.30
	1	ype:	NULL	Lab	el: J48	254			
Structure	4265.00						1	5108.74	
************		****				******			*******
424 Total IN/OUT								6108.74 1	
· · · · · · · · · · · · · · · · · · ·		阿斯烈克斯	NESS	BREEK		ERREVEY			
				1-1			- m - m - m - m - m - m - m - m - m - m		

1,496 0.323 运动自由或关系化学的 李宇 计未示式语句描述 网络自由共享完全在 医中部线 自己证明者 可以用证证的 医电性动性 经过路 医原代谢拉拉德氏氏性原动性神经炎性病 医皮肤炎 医克里氏征 电电子电话 511 1 0.00 0 M 0.000 0.000 0.00 0.00 0.00 Type: Null Label: JSB1S1 Structure 0.00 7382.21 511 Total IN/OUT 33569.00 7382.21 14222.80 412 to 511 Routing 0.000 0.000 SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE -Sedimentology-

SED: Sediment

211 Total IN/OUT

SCp: Peak Sediment Concentration

SSp: Peak Settleable Concentration 244W: Volume Weighted Average Settleable Concentration - Peak 24 hours 24AA: Arithmetic Average Settleable Concentration - Peak 24 hours JBS EWS K L S CP Tt # SED SCD SSD 24VW 24AA (ft) (%) (hrs) (tons) (mg/l) (ml/l) (ml/l) (ml/l) R 111 1 0.32 400.0 7.3 0.045 0.188 1 1112.7 R 111 2 0.32 400.0 4.5 0.045 0.000 1 961.2 R 111 3 0.32 400.0 21.0 0.045 0.000 1 2618.6 Type: Null Label: J1B1S1-SWS1-A 1 Structure 4653.8 111 Total IN/OUT 4653.8 20353 10.76 6.63 2.89 R 112 1 0.32 400.0 5.5 0.045 0.253 1 126.2 R 112 2 0.32 400.0 4.2 0.045 0.253 1 54.4 R 112 3 0.15 400.0 3.8 0.900 0.223 4 88.9 R 112 4 0.15 323.0 4.6 0.900 0.063 3 146.1 R 112 5 . 0.15 217.0 34.6 0.900 0.113 4 955.7 R 112 6 0 15 250.0 44.0 0.900 0.000 4 877.0 R 112 7 0.32 400.0 5.2 0.045 0.094 1 58.5 R 112 8 0.32 400.0 8.0 0.045 0.000 1 72.9 Type: Null Label: J181S2 112 Structure 7072.0 112 Total IN/OUT 7032.0 74290 41.91 9.05 4.04 0.331 111 to 112 Routing R 121 1 0.32 400.0 17.2 0.045 0.000 1 0.0 Type: Null Label: J18251 121 Structure 0.0 121 Total IN/OUT 0.0 0 0.00 0.00 0.00 1 0.15 400.0 25.0 0.900 0.000 4 74.7 Type: Null Label: J281S1 211 Structure 7072.8

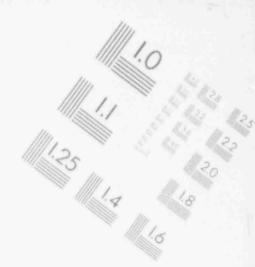
7072.8 76327 43.06 9.10 4.06

```
112 to 211 Routing 0.108
  # 212 1 0.15 400.0 17.6 0.900 0.697 4 514.8
  212 2 0.15 400.0 14.9 0.900 0.732 4 661.8
  212 3 0.32 350.0 5.7 0.045 0.667 1 36.3
 R 212 4 0.15 400.0 2.2 0.900 0.200 4 163.0
 R 212 5 0.32 400.0 4.7 0.045 0.128 1 78.8
 R 212 6 0.32 400.0 4.9 0.045 0.000 1 60.9
 R 212 7 0.32 400.0 3.9 0.045 0.348 1 59.3
 R 212 8 0.32 400.0 8.6 0.045 0.000 1 1544.0
 R 212 9 0.32 400.0 10.9 0.045 0.167 1 59.5
 R 212 10 0.32 400.0 4.4 0.045 0.000 1 120.9
 R 212 11 0.15 400.0 6.8 0.900 0.094 4 292.9
              Type: Nutl Label: J28182
  212 Structure
                                8867 n
  212 Total IN/OUT
                               8867.0 38889 21.25 7.22 3.16
  211 to 212 Routing 0.767
  我们就是我们的自己的证据,我们可以是我们的证明,我们可以是我们的证明的证明,我们可以是我们的证明的的的,我们就是我们的证明,我们可以是我们的证明。
R 213 1 0.32 400.0 11.6 0.045 0.976 2 408.0
R 213 2 0.32 400.0 15.2 0.045 0.550 2 154.4
R 213 3 0.32 400.0 6.9 0.045 0.000 2 758.6
R 213 4 0.32 400.0 3.9 0.045 0.000 2 973.1
                  Type: Null Label: J281S3
 213 Structure
                                8478.2
  213 Total IN/OUT
                       8478.2 21594 10.59 3.97 1.90
  我们我们就是我们的,我们也没有的,我们就是我们的,我们就是我们的,我们就是我们的,我们就是我们的,我们就是我们的我们就是我们的我们就是我们的我们,我们就会是我们
"我们我们就是我们就是我们的我们就是我们就是我们就是我们的,我们就是我们的我们就是我们是我们的我们就是我们的我们就是我们的我们的,我们就会会会会会会会会会会会
  12 to 213 Routing 0.954
 · 我们就是我们的,我们们就是这个,我们就是这些的,我们就是我们的,我们就是我们的,我们就是我们的,我们就是我们的,我们就是我们的,我们就是我们的,我们就是我们
R 221 1 0.32 400.0 8.8 0.045 0.363 1 234.3
R 221 2 0.32 400.0 5.5 0.045 0.488 1 30.2
R 221 3 0.15 400.0 18.0 0.900 0.440 4 3658.8
R 221 4 0.32 400.0 6.3 0.045 0.363 1 153.8
R 221 5 0.15 400.0 15.0 0.900 0.482 4 1518.3
R 221 6 0.32 400.0 12.7 0.045 0.524 1 232.4
R 221 7 0.32 400.0 3.1 0.045 0.000 1 165.9
                  Type: Null Label: J2B2S1
 221 Structure
                               5983.4
 221 Total IN/OUT 5983.4 104729 66.42 26.27 7.42
 R 311 1 0.00 0.0 0.0 0.000 0.000 0 0.0
           Type: Nuil Label: J38151
 311 Structure
                            14461.7
 311 Total IN/OUT
                              14461.7 36193 19.87 6.66 2.82
 213 to 311 Routing
                         0.000
 你就是要是我们也会们还是们就会是我们的,我就是这些的,我们们就会的的,我们也可以是我们的的的,我们也是我们的的,我们也是我们的的,我们也会会们也会会们也会会们也
"我们是我们也会们也会们也是我们的,我们可以是我们们就会现在我们是我们的的话题,我可以我们也是我们的,我们就是我们的我们是我们的,我们就会会们也会们也会们也会
R 312 1 0.32 400.0 3.6 0.045 0.000 1 254.1
                 Type: Null Label: J3B1S2
 312 Structure
                     14691.2
                14691.2 34010 18.67 6.34 2.73
 311 to 312 Routing 0.549
 如果我们的现在分词 10 年末 10 年代 10 年代
```

```
# 321 1 0.32 400.0 2.1 0.045 0.000 2 162.4
 R 321 2 0.32 400.0 5.2 0.045 0.499 2 54.3
 R 321 3 0.15 400.0 4.5 0.900 0.486 4 630.6
                                                    Type: Wull Label: J382S1
       21 Structure
                                                                                         626.2
     321 Total IN/OUT 626.2 20623 11.10 2.12 0.82
     R 411 1 0.00 0.0 0.0 0.000 0.000 0 0.0
                                        Type: Null Label: J481S1
     411 Total (N/OUT 15317.4 31464 17.26 5.87 2.48
     表面是全有,我们也是有一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就
     312 to 411 Routing 0.000
     R 412 1 0.32 400.0 4.7 0.045 0.000 1 1918.6
                    Type: Null Label: J481S2
acture 15506 6
     412 Structure
                                                15506.6 25897 13.69 4.72 2.25
     412 Total IN/OUT
     411 to 412 Routing 1.301
     BONNELEX TERRETORNULO SEGGLA DE GOSTA DE CONTROLES DE CON
R 421 1 0.32 400.0 8.9 0.045 0.000 1 9804.6
 R 421 2 0.32 400.0 8.6 0.045 0.000 110549.9
R 421 3 0.32 400.0 4.5 0.045 0.000 1 3113.0
                                                  Type: Nutl Labet: J482S1
    421 Structure
                                                   23467.4
       1 Total IN/OUT 23467.4 12965 6.11 4.06 2.05
    R 422 1 0.32 400.0 0.9 0.045 0.000 1 33.3
R 422 2 0.32 400.0 3.2 0.045 0.272 1 870.9
R 422 3 0.32 400.0 0.9 0.045 0.272 1 778.3
R 422 4 0.32 400.0 2.7 0.045 0.272 1 351.6
R 422 5 0.32 400.0 1.7 0.045 0.000 1 63.9
R 422 6 0.32 400.0 3.9 0.045 0.000 1 202.0
                             Type: Null Label: J48282
                                          25763.6
   422 Structure
    422 Total IN/OUT
                                                               25763.6 9509 4.49 2.79 1.33
    SPORTS CARREST SALES RESTRICTED AS COUNTY OF THE SPORTS OF CHEAT CHARLES CHARLES CARREST CONTRACTORS
    421 to 422 Routing 0.289
    ACCRETE DESCRIPTION OF THE PROPERTY OF THE PRO
R 423 1 0.32 400.0 18.5 0.045 1.581 128586.0
R 423 2 0.32 400.0 5.7 0.045 1.065 1 4003.7
R 423 3 0.32 400.0 5.4 0.045 0.000 2 2259.5
R 423 4 0.32 400.0 2.4 0.045 2.241 1 615.8
R 423 5 0.32 400.0 8.6 0.045 0.000 1 3074.3
R 423 6 0.32 400.0 1.1 0.045 2.241 1 209.2
                                              Type: Null Label: J48253
   423 Structure
                                                                                      61425.3
     423 Total IN/OUT 61425.3 21420 10.50 4.36 2.44
      122 to 423 Routing 2.115
   R 424 1 0.32 400.0 7.1 0.045 0.000 1 3558.9
R 424 2 0.32 400.0 4.2 0.045 0.920 1 3183.4
```

R 424 3 0.32 400.0 4.6 0.045 0.000 2 1569.8 Type: Nuil Label: J482S4 424 Structure 65292.3 65292.3 18063 8.61 3.79 2.21 24 Total IN/OUT **发展的现在分词发展的发展的发展的发展的现在分词使用的发展的现在分词使用的发展的现在分词使用的现在分词使用的使用的使用的更加的现在分词使用的现在分词使用的使用的** 423 to 424 Routing 1.496 R 511 1 0.00 0.0 0.0 0.000 0.000 0 0.0 Type: Null Label: J581S1 tructure 80799.0 511 Structure 511 Total IN/OUT 80799.0 17595 8.57 3.98 2.26 在沙室在1900年2015日,但我们的新国家区域的国际社会主义,在1900年2015日的国际政策和特别的对应企业的国际企业工工工工程等在国际企业的企业和企业的 412 to 511 Routing 0.000 THE REPORT OF THE PROPERTY OF

IMAGE EVALUATION TEST TARGET (MT-3)



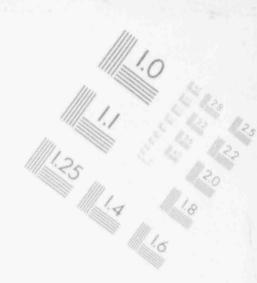




507 Bill SETI

O'I WILL STILL O'I

## IMAGE EVALUATION TEST TARGET (MT-3)

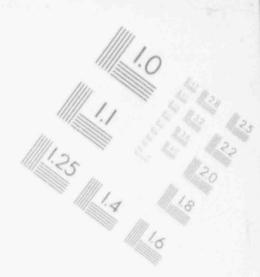






91 Villi GZilli Oilli

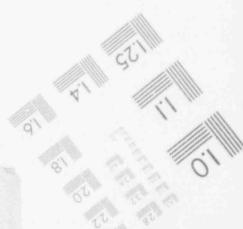
# IMAGE EVALUATION TEST TARGET (MT-3)











# IMAGE EVALUATION TEST TARGET (MT-3)











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Company Name: SHEPHERO MILLER INC.

Filename: C:\SEDCAD3\DAYLOMA User: BLC & KMW

Date: 09-29-1993 Time: 13:53:04

Day Loma Fluvial Sedimentation Analysis - Coyote & Muskrat Creeks

Storm: 3.70 inches, 200 year-24 hour, SCS Type II

Hydrograph Convolution Interval: 0.1 hr

## DETAILED SUBWATERSHED INPUT/OUTPUT TABLE

		Seg.	Land Flow				Segment	Time	Musk	ingum
JBS	SWS	#	Condition	Distance	Slope	Velocity	Time	Conc.	K	X
				(ft)	(%)	(fps)	(hr)	(hr)	(hr)	
REBEEF		-	*********							MENNER
111	1	· a	3	1092.00	7.33	1.89	0.16			
		-b	3	4619.00		1.90		0.835		
				*************		1220	0.00	0.000		
111	4	- 1	8	2005 40	2 4/	/ 70	0.10		0 100	* ***
				2985.69					0.188	
								STERRES	RADDONE	222224
111				286.00			0.05			
		-12	3	731,00	2.46	1.10	0.18	0.238		
242002	EERS	i nana	**********	********		*******	******	********	*****	SECTION
111	3	- a	3	1942.00	21.02	3.21	0.10			
		-ip	3	7109.00	8.44	2.03	0.97	1.069		
y.endun		MV.CO		CECHERREE		******	*****	******		EDRESE
427	P	- 8	3	2363.00	5.50	1.64	0.40	0.399		
W										
112	4	-1	8	3992.90	2.13	4.38	0.25		0.253	0.360
			LEGARES TRES	1917 10 90 0 10 10						
			3						NO. 20. 30. 30. 40. 40. 40.	
114	-			2303.00	4.23	1 , 10-10	0.40	0.433		
				2002 00				******		
112	16.		8	3992 90		4.38	2.000		0.253	
									HERRORS	EFFARE
112	3	. 5	5	784.00	3.83	1.96	0.11	0.111		
							* * * * * * * *			
112	3	-1	8	373.54	5.36	6.95	0.01			
		-2	8	3122.58	1.92	4.16	0.21		0.223	0.361
-		-	********						BURBERE	*****
112	4	- 8	5	323.00	3.10	1.76	0.05	0.050		
112	6	-1	5	323.35	4.64	2,15	0.04			
		-2	8			14,17				
		-3	р	448.70	5.58		0.02		0.063	0.403
	un me do ya		EDDIEDNIKE:							
112									N. D. S. S. S. S. S. S. S.	****
114	3	- 8	5	217.00	34.30	3,60	0.01	0.010		
							******	***- **		
112	2		8	448.45			0.02			
		-2	8	1269.16	1.58	3.77	0.09		0.11.7	0.361
SPIESE			*******	INSTRUCTION	CEREBRO	********		DEFENSE		'nnenz
112	6	-8	5	250.00	44.00	6.63	0.01	0.010		
A	***	****	*********	*********	******	*******	******	unnaca.	*****	
2 600	7	- 25	3	2488.00	5.23	1.60	0.43	0.431		
******										
112	7	-1	8	1610.50	2.48	4.73	0.09		0.094	0.367
nannen	ENDE		********							
112				995.0						
								41.000		

	NAME	12.0	10 (M. (M. ))	neanz	**********	********		******	******	BERREES	PREVUEU:	******
					3							
					8							
-CERTS		1	. 1	- 8	5	500.00	25.00	5.00	0.03	0.027		
	2 1	2	1	- 8	5	721.00	17.61	4.20	0.05	0.047		
		2	1	-1	8	338.37	11.90	10.35	0.01			
				-2	8	7289.34	0.96	2.94	0.69		0.697	0.328
	2 1	2	5	- 8	**************************************	672.00	14.88	3.86	0.05	0.048		
		2	2	-1	8	995.20	2.01	4.25	0.06			
		700.700		- 6	8	0000.24	0,55	6.11	0.57		0.732	0.317
					7							EREES.
		-	-	-b	3 3	1940.00	2 58	1 12	0.06	0.577		
	2 1	2	3	-1	8	6668.24	0.85	2.77	0.57		0.667	0.310
					5					100000000000000000000000000000000000000	PRODUCE	RESERVE
					5 8					0.702		
	***										***	
	2 1				8						0.200	
	====	100 M		wenn)	*********	****		******	PAKERDEY			nnears
					3							
					8							
d		2	5	×1	8	1891.32	1.85	4.08	0.13		0.128	0.352
-					*********						******	FRENKE
	2 1	-6	0		3							
	month	nei ann	er der No. der		8							
			7	- 9	3	2040.00	3.92	1.39	0.41	0,408		
			7	-1	8	622 .32	2.73	4.96	0.35		0.348	0,372
					***********			DESENSES	EDUNDENS	eveces	or in the series	EFFER
	2 1	2	8		3				0.28			
					8				0.11			
					***********						NESERBE	-
					3							*****
					8							
					3							
				-b	8	2825.00	5.31	6.91	0.11			
	2 1	2	11	- 8	5	740.00	6.76	2.60	0.08	0.079		
					В							
					3							
	21	3	1	-3	8	10000.41	0.90	2.85	0.98		0.976	0.313
CORP.				SERBI	*******	*********		*******	******	MERCER	RESERVE	ENEBES
-	Alteria	3	2	- 8	3	920.00	15.22	2.73	0.09	0.093		
	2 1	3	2	-1	8	7512.96	1.50	3.79	0.55		0.550	0.345
	BRR	10.00	1回 10 10	MERKI	CERCRESCRESS	BESSERATORS	BARRERE	1887 TES	SECRETE	REFERE	*****	BELEST

	3	14/2 00	4 00	2 24	0.00			
2133-8		1442.00						
- b	8	100000000000000000000000000000000000000	3.00			0.324		
<b>拉索拉拉数型电流频型电影发电池</b>			EDNAMBAR	*******	manuan		*******	ERRESE
213 4 -a	3	1020.00	3.92	1.39	0.20			
-b	8	7674.00	2.87	5.08	0.42	0.624		
MARRIES SANTURES		*******				PRESERVE	*****	NAMES OF STREET
221 1 -a	3	1085.00	A 76	2 07	0.15			
-5		1035.00		4.37		0.244		
	9					0.211		
***********								*****
2 2 1 1 -1	8	6268.04	2.55	4.79	0.36		0.363	0.369
****************	NATES STATES S	*********	MERKERE		SEREEME		*****	SERVER
2212 -a	3	904.00	5.53	1.65	0.15			
-b	. 8	741.00	8.10	8.54	0.02	0.176		
					****			
2212-1	8	2957.32	4.74	6.53	0.13			
-2	8	6268.04					0 / 00	0.770
************						RESERVED	BELLEVE	RENDUC
		668.00						
-b	8	502.00	49.80	21,17	0.01	0.050		
**********	referencies e						****	
2213-1	. 8	1769.81	4.52	6.38	0.08			
		6268.04					0.440	0.375
************								
								MARKET
		520.00						
- 6	8	3250.00	2.46	4.71	0.19	0.273		
***********								$(a_1,a_2,a_3,a_4,a_5,a_6)$
2214-1	8	6268-04	2.55	4,79	0.36		0.363	0.369
***********						******		SERVIN
2 2 1 5 -a	5	632.00	15.03	7.88	0.05			
		599.00				0.076		
AND THE REAL PROPERTY.		prr.00						
46000							*****	*****
2 2 1 5 -1								
-2	8	6268.04	2.55	4.79	0.36		0.482	0.765
**********	CHRISTIAN			REPRESE	******	ERRKEUS	*****	SEASES.
221 6 -a	- 5	1500.00	12.67	2.49	0.17			
-b	8	396.00	13.89	11.18	0.01	0.177		
**********	أأر والمحاودة							
								*****
2 2 1 6 -1	8	2835.99	2.65	4.88	0.16			
2 2 1 6 -1 -2	8 8	2835.99 6268.04	2.65 2.55	4.88 4.79	0.16		0.524	0.369
2 2 1 6 -1 -2	8 8 ***********	2835.99 6268.04	2.65 2.55	4.88 4.79	0.16 0.36		0.524	0.369
2 2 1 6 -1 -2	8 8 **********************************	2835.99 6268.04 995.00	2.65 2.55 8.04	4.88 4.79	0.16 0.36 causes 0.14		0.524	0.369
2 2 1 6 -1 -2 2 2 1 7 -8	8 8 **********************************	2835.99 6268.04	2.65 2.55 8.04	4.88 4.79	0.16 0.36 causes 0.14		0.524	0.369
2 2 1 6 -1 -2 2 2 1 7 -8	8 8 8 8 8	2835.99 6268.04 995.00 6735.00	2.65 2.55 2.55 8.04 2.38	4.88 4.79 1.98 4.62	0.16 0.36 0.14 0.40	0.543	0.524	0.369
2 2 1 6 -1 -2 	8 8 5 3 6	2835.99 6268.04 995.00 6735.00	2.45 2.55 5.04 8.04 2.38	4.88 4.79 ************************************	0.16 0.36 0.14 0.40	0.543	0.524	0.369
2 2 1 6 -1 -2 **********************************	8 8 3 8 8	2835.99 6268.04 995.00 6735.00	2.45 2.55 8.04 2.38	4.88 4.79 1.98 4.62	0.16 0.36 0.14 0.40	0.543	0.524	0.369
2 2 1 6 -1 -2 	8 8 3 6	2835.99 6268.04 995.00 6735.00 1124.00 4238.00	2.45 2.55 8.04 2.38 ************************************	4.88 4.79 1.98 4.62 88888888 1.32 4.61	0.16 0.36 0.14 0.40	0.543	0.524	0.369
2 2 1 6 -1 -2	8 8 8 3 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00	2.65 2.55 8.04 2.38 2.38 3.56 2.36	4.88 4.79 ************************************	0.16 0.36 0.14 0.40	0.543	0.524	0.369
2 2 1 6 -1 -2 -2	8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00	2.65 2.55 8.04 2.38 3.56 2.36	4.88 4.79 1.98 4.62 1.32 4.61	0.16 0.36 0.14 0.40 0.24 0.26	0.543	0.524	0.369
2 2 1 6 -1 -2 -2	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 20000000000000000000000000000000000	2.65 2.55 8.04 2.38 3.56 2.36	4.88 4.79 1.98 4.62 1.32 4.61	0.16 0.36 0.14 0.40 0.24 0.26	0.543	0.524	0.369
2 2 1 6 -1 -2 -2	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 20000000000000000000000000000000000	2.65 2.55 8.04 2.38 3.56 2.36	4.88 4.79 1.98 4.62 1.32 4.61	0.16 0.36 0.14 0.40 0.24 0.26	0.543	0.524	0.369
2 2 1 6 -1 -2 -2	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00 4238.00	2.45 2.55 8.04 2.38 3.56 2.36 2.06	4.88 4.79 1.98 4.62 8.61 8.61 1.00 1.59	0.16 0.36 0.14 0.40 0.24 0.26	0.543	0.524 ************************************	0.369
2 2 1 6 -1 -2 **********************************	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 5268.04 995.00 6735.00 1124.00 4238.00 8756.00	2.65 2.55 8.04 2.38 3.56 2.36 2.06	4.88 4.79 1.98 4.62 1.32 4.61	0.16 0.36 0.14 0.40 0.24 0.26	0.543	0.524	0.369
2 2 1 6 -1 -2 **********************************	8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00 8756.00 970.00	2.45 2.55 8.04 2.38 3.56 2.36 2.06	4.88 4.79 1.98 4.62 4.61 1.32 4.61 1.00	0.16 0.36 0.14 0.40 0.24 0.26 2.42 0.17	0.543	0.524	0.369 ************************************
2 2 1 6 -1 -2	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00 8756.00 970.00	2.45 2.55 8.04 2.38 3.56 2.36 2.06 5.15	4.88 4.79 1.98 4.62 4.61 1.32 4.61	0.16 0.36 0.14 0.40 0.24 0.26 2.42 0.17	0.543	0.524	0.369 ************************************
2 2 1 6 -1 -2 **********************************	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 288888888888888888888888888888888888	2.65 2.55 8.04 2.38 3.56 2.36 2.36 2.15 1.89	4.88 4.79 1.98 4.62 ************************************	0.16 0.36 0.14 0.40 0.24 0.26 0.26 0.17	0.543	0.524	0.369 ************************************
2 2 1 6 -1 -2 **********************************	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00 20022222222222222222222222222222222	2.65 2.55 8.04 2.38 3.56 2.36 2.06 5.15 1.89	4.88 4.79 1.98 4.62 8.61 8.61 1.00 1.59 4.12 8.12 4.99	0.16 0.36 0.14 0.40 0.24 0.26 0.17 0.17	0.543	0.524 ************************************	0.369 ************************************
2 2 1 6 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -3 -2 -3 -2 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 5268.04 995.00 6735.00 1124.00 4238.00 238.00 2756.00 270.00 7414.32 2212222222 1900.00 1990.00	2.65 2.55 8.04 2.38 3.56 2.36 2.06 5.15 1.89	4.88 4.79 1.98 4.62 1.32 4.61 1.00 1.59 4.12	0.16 0.36 0.14 0.40 0.24 0.26 2.42 0.17 0.50	0.543	0.524 ************************************	0.369 ************************************
2 2 1 6 -1 -2 **********************************	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00 20022222222222222222222222222222222	2.65 2.55 8.04 2.38 3.56 2.36 2.06 5.15 1.89	4.88 4.79 1.98 4.62 1.32 4.61 1.00 1.59 4.12	0.16 0.36 0.14 0.40 0.24 0.26 2.42 0.17 0.50	0.543	0.524 ************************************	0.369 ************************************
2 2 1 6 -1 -2 **********************************	8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00 970.00 7414.32	2.65 2.55 8.04 2.38 3.56 2.36 2.06 5.15 1.89 4.50 2.76	4.88 4.79 1.98 4.62 1.32 4.61 1.00 1.59 4.12 2.12 4.99	0.16 0.36 0.14 0.40 0.24 0.26 2.42 0.17 0.50	0.543	0.524 ************************************	0.369 ************************************
2 2 1 6 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -3 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00 8756.00 970.00 7414.32	2.45 2.55 8.04 2.38 3.56 2.36 2.06 5.15 1.89 4.50 2.76	4.88 4.79 1.98 4.62 4.61 1.32 4.61 1.00 1.59 4.12 4.99 4.35	0.16 0.36 0.14 0.40 0.24 0.26 2.42 0.17 0.50	0.543	0.524 ************************************	0.369 ************************************
2 2 1 6 -1 -2 -2	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00 8756.00 970.00 7414.32	2.45 2.55 8.04 2.38 3.56 2.36 2.06 5.15 1.89 4.50 2.76	4.88 4.79 1.98 4.62 ************************************	0.16 0.36 0.14 0.40 0.24 0.26 0.17 0.17 0.50 0.13 0.11	0.543	0.524 ************************************	0.369 ************************************
2 2 1 6 -1 -2	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2835.99 6268.04 995.00 6735.00 1124.00 4238.00 238.00 238.00 2414.32 228.00 2414.32 228.00 2414.32 228.00 2414.32 228.00 2414.32	2.65 2.55 8.04 2.38 3.56 2.36 2.06 5.15 1.89 4.50 2.76 2.10	4.88 4.79 1.98 4.62 1.32 4.61 2.61 2.12 4.99 4.12 4.35	0.16 0.36 0.14 0.40 0.24 0.26 0.17 0.17 0.50 0.13 0.11	0.543 0.491 2.423 0.169 0.241	0.524 ********** ********* 0.499 ********* 0.486	0.369 ************************************

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	422	1	- 5	3	2299.00	0.87	0.65	0.98				
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d	Marie .	min mi	nene:	encannon.			RPRESER	******		*****	PARKER	
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H	CHURCH	er erine a	2242		***********	STREETS	******		2000000	-		
	4 2 3				2637.00	18.47		0.24				
			- b		12736.00			0.65	0.000			
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			+b	. 8	16716.00	2.15	4.40	1.05	1.400			
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					ALTE OF				WHERE'S		REELES	
	462	4	- 8	3	1636.00	2.44	1.09	0.42	w le			
					7572.00	3.70	5.77	0.36				
					*****							
	423	4	-1	8	13283.06	0.30	1.65	2.24		2.241	0.245	
	REDERI	1011			*********	*****	PRESCRE	*******	*****		ARESTS	
	423	5	- 8	3	1393.00	8.61	2.05	0.19				
			-6	8	4577.00	4.81	6.58	0.19	0.381			
	****				PRESENTATION							
	7 50 10		-		1767.00	1.13	0.74	0.00				
d	Mb.		-0	6	6479.00	4.03	0.40	0.28	0.937			
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1					13283.06							
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	424	1			1124.00							
			- b	8	15151,00	2.18	4,43	0.95	1.117			

4 2	6	2	- 8	3	597.00	4.19	1.43	0.12			
			~ b	8	15273.00	2.62	4.85	0.87	0.989		
		***	****		***********				******	*****	****
	AL MINISTER	4	-1	8	8159.19		2.46	0.92		0.920	0.29
-	-		NC 20 10 NC 20 10 10 10		**********	Mr. 400 CAV CAS 400-005-00: 3	DESCRIPTION		- ANDRESS	PERTIES	NETER
4 2	4	3	~ 8	- 3	1294.00	4.54	1.51	0.24			
			-b	8	5871.00	2.04	4,29	0.38	0.618		

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APPENDIX D
LABORATORY TEST RESULTS
AND SAMPLING INFORMATION

### INBERG-MILLER ENGINEERS

124 EAST MAIN STREET

RIVERTON, WYOMING 82501-4397

307-856-8136

November 13, 1992

5930-RX

Energy Fuels Nuclear, Inc. One Tabor Center, Suite 2500 Denver, Colorado 80202

ATTENTION: MR. BILL ALMAS

RE: DAY LOMA MINE

Gentlemen:

The following is a report of the following services which we have provided for the above-referenced project:

- 1. Drilling and sampling (including test boring logs).
- Laboratory testing of selected soil samples.
- 3. Surveying and drafting test boring locations.

These services have been completed per our September 29, 1992 Service Agreement which was executed by Energy Fuels Nuclear, Inc. on October 1, 1992.

### FIELD EXPLORATION

The field work was performed using a Mobile 3-57 truck-mounted drilling rig at the site on October 12 and 13. 1992. Seven (7) test borings were advanced to depths ranging from 14.0 to 21.5 feet. Drilling was performed using 8.5" diameter hollow-shaft augers. The augers act as continuously advancing steel casing. The method prevents test holes from caving in above the levels to be tested. Sampling tools are lowered inside the hollow stem for testing into undisturbed soils.

Drilling and field sampling were performed according to the following standard specifications:

- 1. "Soil Investigation and Sampling by Auger Borings," ASTM D1452.
- Sampling with \_ two-inch O.D. split-barrel (split-spoon) per ASTM D1586. "Penetration Test and Split-Barrel Sampling of Soils." Forty-eight (48) such tests were performed.
- Sampling with a 2.5-inch I.D., thick-wall sampler driven with procedure and effort of ASTM D1586. Four (4) such samples were obtained.

Energy Fuels Nuclear, Inc. November 13, 1992 Page Two

The soil samples were field classified by the Field Engineer, sealed in containers to prevent loss of moisture and returned to our laboratory. They were then inspected by the Geotechnical Engineer prior to the preparation of this report, and reclassified visually in accordance with ASTM D2487.

A field log was prepared for each boring during exploration. After the retrieved samples were checked in the laboratory, a Final Log for each boring was prepared which contained the work method, samples recovered and the indication of the presence of various soil types. The Final Logs are enclosed as YELLOW SHEETS.

The Final Logs contain both factual and interpretive information. On the Final Logs, horizontal lines designating the interface between differing materials encountered represent approximate boundaries. The transition between soil layers is typically gradual.

#### LABORATORY TESTING PROGRAM

As specifically requested by Mr. Bill Almas (Energy Fuels Nuclear, Inc.) and Mr. Barry Carlson (Shepherd Miller, Inc.), the following laboratory soil tests were performed:

1.	Moisture Content (ASTM D2216)	TESTS
2.	Unit Weight Determination (ASTM D2937)	3
3.	Sleve Analysis - #200 (ASTM D1140)	9

The results of the above-listed soil tests are as follows:

Sample No. HL-1-]B	Sample Depth (Ft.) 3.3 to 5.3	Passing No. 200 Sieve (percent) 80.2	Dry Unit Weight (PCF)	Water Content (percent)
			100.0	
HL-2-2A	2.5 to 3.0	34.7	109.2	13.6
HL-2-4	7.5 to 9.0	14.5		
HL-3-6B	13.0 to 14.0	42.6		
HL-8-3	5.0 tr 1.5	24.7		
HL-8-4B	8.0 co 8.5	35.9	104.0	18.9
HL-8-5	10.0 to 11.5	92.4		
HL-8-6C	13.5 to 14.0	15.8	110.8	10.4
HL-9-2	2.5 to 4.0	36.5		

Energy Fuels Nuclear, Inc. November 13, 1992 Page Three

### SURVEYING AND DRAFTING

On October 24, 1992, our survey crew was present on the site to survey the test boring locations. The control point used in the survey for the basis of location and elevation was the section corner common to Sections 13, 14, 23 and 24, T.32 N., R.91 W. 6 P.M., Fremont County, Wyoming. Following the completion of the field survey, the test borings were plotted on the "Reclaimed Areas" map you provided to us. We have enclosed this map for your use as requested.

### CLOSURE

We appreciate the opportunity to be of service to you on this phase of the project. If you have any questions regarding the information contained herein, or if we may be of further assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Jon C. Howell, P.E. Sectechnical Engineer

JCH:der:soil80

printer ( )						
	LOG OF TEST B	ORII	NG N	O. HI	-L	
Project: Dav	Loma Mine			Job	No.:	5930-RX
Cocacion: Gas	Hills, Wyoming Client: Ener ) Benchmark(Ft)	gy Fu	iels :	Nuclear	. Inc.	
	Denember (LC)	en terminal mensels an	THE REAL PROPERTY.	A STATE OF THE PARTY NAMED IN		A D' CONTRACTOR OF THE PARTY OF
		133				
DEPTH SAMPLIN		/	1 200 A	0 1189	A POR	Tm LL OTHER TESTS
0.0-1.5	Medium dense, dry, light	1	18			
17.	brown, sandy SILT 0.5'		10			
	Medium dense, damp, light olive gray, clayey, fine to					
ss-2	medium SAND		1.1			
2.5-4.0	3.5'		17			
16	Sciff, damp, light olive	1	1.		10.00	
	gray and grayish blue, silty		1 - 1		1-12	
05 55-3	CLAY with some fine sand					
5.0-6.5			13		1-1-1	-4200-80.27
16			1 1			
Name and			1 . 1.			E STATE OF THE STA
ss-4	Some reddish brown below 8.0'					
7.5-9.0			15			
17	9.0'	13.00				
	Medium dense, damp, gray and black, clayey, fine to			e in the		
10 55-5	medium SAND with occassional					
10.0-11.5	fine to coarse gravel (tail-		16			
17	ings)			13811		
microsoper c						Property of
T TS\$-5 T T						
12.5-14.0			25			
16	14.0					
15						
			1			
and other land				YIJ TA	1 / 1	
NO 100 may						<b>进</b> 。
200 Miles						

WATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES				
Initial Occurrence While Drilling Dry Time After Drilling O hrs Depth to Water dry Depth to Cave-In 10.4	Date Begun 10-12-92 Comp. 10-12-92 Crew JCH/ELL Rig Mobile 8-37 Method 8.5" Diameter H.S.A. Termination Depth: 14.0'				

## LOG OF TEST BORING NO. HL-2

Project: Day Loma Mine			
Location: Gas Hills, Wyoming Client: Energy fuels No	100	No.:	5930-RX
Surface El. (Fc) Benchmark(Fc)	nerear	, Inc	2

			, , , , , ,	
DEPTH SAMPLIN TYPE NO. DEPTH IFTH RECOVERY (IM)	SOIL DESCRIPTION	2 8 1 N	S TE YO	PL OTHER TESTS
SS-1 0.0-1.5 17 DC-2 2.5-4.0 16	Medium dense. dry, light brown. sandv SILT 0.5 Medium dense. damp, light reddish tan and olive gray, silty, fine to medium SAND with some clav 3.0 Stiff, damp, olive gray, silty CLAY with fine to medium sand and gravel seams	24	13.6 124.8 109.9	-#200=34.7%
05ss-3 5.0-6.5 - 17	and gravel seams	24		
	Interbedded medium dense, damp, light oliver gray, clayey, fine to medium SAND	24		-#200=14.52
10ss-5 10.0-11.5 - 17	and stiff, damp, light olive gray sandy CLAY	28		
15 = =		24		
15.0-16.5	Medium dense to loose, damp,	34		
55-8	olive gray, clayey, fine to medium SAND (tailings)	24		
	(Log Continued on Next Page)			

Project: Day Loma Mine Location: Gas Bills, Wyoming Client: Ene Surface El.(Ft) Benchmark(Ft)	Job No.: 5930-RX rgy Fuels Nuclear. Inc.
AMERICAN AND AMERI	
DEPTH SAMPLING TYPE - NO. DEPTH IST RECOVERY IIM  DEPTH IST RECOVERY IIM	TESTS
SS-9 20.0-21.5 Loose, damp, olive gray, clayey, fine to medium SAND	, 10
25	
30	
35	
WATER LEVEL OBSERVATIONS	001111100110011001100110011001100110011001110001100011000110001100011000110001100011000110000
Initial Occurrence While Drilling Dry Time After Drilling O hrs Depth to Water dry Depth to Cave-In 16.8	DRILLING AND SAMPLING NOTES  Date Begun 10-12-92 Comp. 10-12-92 Crew JCH/ELL Rig Mobile B-57 Method 8.5" Diameter H.S.A. Termination Depth: 21.5'

Project: Dav	LOG OF TEST BO	ORING N			
Location: Gas Surface El. (Ft	Hills, Wyoming Client: Ener ) Benchmark(Ft)	zy Fuels	Job Nuclear,	No.: Inc.	5930-RX
				· · · · · · · · · · · · · · · · · · ·	
DEPTH SAMPLIN	SOIL DESCRIPTION	33/4	( 18 ) a / ( 18 )	A You	Ym LL OTHER TESTS
SS-1 0.0-1.5 - 17	Medium dense, dry, light brown, sandy SILT 0.5" Sciff to firm, damp, light clive gray, sandy CLAY with intermittent silty, fine to	15			
SS-2 2.5-4.0 18	medium sand seams	18			
05 - ss-3 5.0-6.5 - 18 - pc-4 6.5-8.0 - 18		21			
10 SS-5 10.0-11.5 18	Possible tailings(?) from 10.0' to 12.0'	ó			
	More sand and moist from 13.0' to 15.0'	5			-#200=42.6X
15 - s\$-7 15.0-16.5 - 17		24			
INVESTMENT THE					

(Log Continued on Next Page)

LOG OF TEST BORING NO. HL-3, Cont.							
Project: Dav Loma Mine  Location: Gas Hills, Wooming Client: Energy Fuels Nuclear, Inc.  Surface El.(Ft) Benchmark(Ft)							
DEPTH SAMPLING TYPE NO. SOIL DESCRIPTION DEPTH PT RECOVERY (IN)	TESTS						
SS-8 20.0-21.5 Very stiff, damp, light olive gray, sandy CLAY	39						
SIT SIMAGE							
25							
40 100 mc							
30							
-tonesa							
35							
minut an							
WATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES						
Initial Occurrence While Drilling Dry Time After Drilling O hrs Depth to Water dry Depth to Cave-In 18.8	Date Begun 10-12-92 Comp. 10-12-92 Crew JCH/ELL Rig Mobile 3-57 Method 8.5" Diameter H.S.A. Termination Depth: 21.5						

	Dav Loma Mine Gas Hills, Wvoming Client: Ener (Ft) Benchmark(Ft)	Job No.: 5930-RX
IFM / TY	MPLING PE - NO. SOIL DESCRIPTION TH (FT) (RY (IN)	THER TESTS
53-1 0.0-1 16- 16- 17- 05 - 55-3	sandy SILT 0.5'  Medium dense, damp, light reddish can and light olive gray, silty, fine to medium SAND  Some sand and gravel below 4.0'	
5.0-6 17 	.0 8.5' - Stiff, moist, brown, sandy CLAY (possible tailings?) 10.0' Loose, moist, light reddish	14
TSS-6 12.5-14 17		,
posterioria.	ATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES
Initial Occ	Drilling O hrs	Date Begun 10-12-92 Comp. 10-12-92 Crew JCH/ELL Rig Mobile B-57 Method 8.5" Diameter H.S.A. Termination Depth: 14.0"

### LOG OF TEST BORING NO. HL-8

Location: Ga Surface El. (F	s Hills, Wooming Client: Energet)  t) Benchmark(Ft)	zy Fu	els N	uclear	No.:		3430-47
DEPTH SAMPA	SOIL DESCRIPTION	/:	2000	(64.79)	12/0	Yo Yo	PL OTHER TESTS
55-1 0.0-1.5 16	-Medium dense, dry, light brown, sandv STLT 0.5" - Medium dense, damp, light reddish tan and light olive		14				
	- gray, clayey, fine to medium SAND		21				
05 - SS-3 - 5.0-6.5 - 17 -	7.0*		12				-#200~24.7%
7.5-9.0 15	Very stiff to stiff, damp, reddish tan and olive gray, sandy and silty CLAY		33	18	.9 12:	3.7	-#200×95.9%
10.0-11.5	Dense to medium dense, black,		19				-#200=92.4%
DC-6 12.5-14.0	gray and dark olive gray, clayey, fine to medium SAND (tailings)		35	10	.4 12:		-#200=15.8%
15 - ss-7 - 15.0-16.5 - 16 -	16.5'		20				
WAT	ER LEVEL OBSERVATIONS		DRIL	LING A	NO SAM	MPLIN	G NOTES
	SECURIO ASSESSED ASSESSED ASSESSED SECURIOR SECU	Cres Meti	w JC	un 10 B/ELL 8.5" ion De	Diamet	Ris	mp. 10-13-92 g Mobile 3-57 .S.A. 16.5'

### LOG OF TEST BORING NO. HL-9

Project: Day		Job	No.:	5930-RX
Location: Gas	Hills, Wvoming Client: Energy Fuels Nu	uclear	. Inc.	STATE OF THE PARTY
Surface El. (Ft	) Benchmark(Ft)	TAXABLE DISCOURSE CONTRACT	Market Street,	

DEPTH SAMPLING	SOIL DESCRIPTION	/3	30/2	(String) of	A Y	PL OTHER TESTS
SS-1 0.0-1.5 - 17	Medium dense, dry, light, p brown, sandy SILT 0.5' Stiff, damp, light reddish can and light olive gray		21			
2.5-4.0 18	Medium dense to loose, damp. light reddish tan and light olive gray, silty, fine to		20			-#200=36.5
05 - SS-3 5.0-6.5 - 18	medium SAND		19			
7.5-9.0 18	Stiff, moist, olive gray, sandy CLAY		7			
10ss-3 10.0-11.5			19			
755-6 12.5-14.0 17	Stiff, damp, gray and black, sandy CLAY with some gravel (tailings)		33			
5 - ss-7 - 15.0-16.5 - 18 -			16			
Manager (Manager )						
	20.01					
	(Log Continued on Next Page)					

LOG OF TEST BORING NO. HL-9, Cont.  Project: Dav Loma Mine Job No.: 5930-RX Location: Gas Hills, Wyoming Client: Energy Fuels Nuclear, Inc.  Surface El.(Ft) Benchmark(Ft)						
DEPTH SAMPLING IFT TYPE - NO. SOIL DESCRIPTION DEPTH IFT RECOVERY IM	THE TESTS					
SS-8 20.0-21.5 Very stiff, damp, olive gr sandy CLAY						
2.5						
30						
35						
WATER LEVEL OBSERVATIONS	DRILLING AND SAMPLING NOTES					
Initial Occurrence While Drilling Dry Time After Drilling O hrs Depth to Water dry Depth to Cave-In 17.7	Date Begun 10-13-92 Comp. 10-13-92 Crew JCH/ELL Rig Mobile 8-57 Method 8.5" Diameter B.S.A. Termination Depth: 21.5'					

LOG OF TEST B	BORING NO. HL-10
Project: Day Loma Mine	Job No.: 5930-RX
Location: Gas Hills. Wvoming Client: Ener Surface El.(Fc) Benchmark(Ft)	Try Fuels Nuclear, Inc.
agrace arvitel penemarkitel	
and the same of th	y y y
DEPTH SAMPLING IFT TYPE NO. DEPTH IFT PECOVERY (IN)  SOIL DESCRIPTION	THESTS
SS-1 0.0-1.5   Sandy SILT	20
05 - SS-3 Medium dense, damp, olive 5.0-6.5 gray and black clayey, fine to medium SAND (possible tailings?)	38
7.5-9.0 17. 10 - SS-5 Firm to very stiff, moist. 10.0-11.5 olive gray and bluish gray,	23
18 sandy CLAY  SS-5 Very moist at 13.0'	6
15 - SS-7 15.0-16.5	40
18	
(I am Constituted as News County	

Project: Day Loma Mine  Location: Gas Bills, Wyoming Client: Energy Fuels Nuclear, Inc.  Surface El.(Ft) Benchmark(Ft)								
Self-mark(rt)								
	and the same of th							
DEPTH SAMPLING SOIL DESCRIPTION DEPTH IFT RECOVERY IIM	TESTS							
SS-8 20.0-21.5 Stiff, moist. olive gray sandy CLAY	24							
25								
management :								
an-college -								
30								
MARIO								
enablese i								
35								
WATER LEVEL OBSERVATIONS	ORILLING AND SAMPLING NOTES							
Initial Occurrence While Drilling Dry Time After Drilling O hrs Depth to Water dry Depth to Cave-In 18.3	Date Begun 10-13-92 Comp. 10-13-92 Crew JCH/ELL Rig Mobile B-57 Method 8.5" Diameter H.S.A. Termination Depth: 21.5'							

WENT ENERGY FUELS NUC	LEAR, IK.	DATE 11-11-92	or Jeff
MCACT GRAG HILLS - DAY		SHECKED	<b>8</b> Y
SAMPLE NO/ DEPTH (FT)	PASSING NO. 200 SIGNE (%)		
HL-2-2A	34.7		
HL-8-43	95.9 *		
			00.1
H4-8-6C	15.8 *	Grain Size	ME THE DE
			In court of 2
	*		
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LABORATORIES

ENERGY LABORATORIES, INC.

P.O. BOX 3258 . CABPER. WY 62601 . PHONE (307) 235-0515 254 NORTH CENTER, SUITE 100 . CABPER. WY 82601 . FAX (307) 234-1639

### EMERGY FUELS SOIL ANALYSIS REPORT

Data Submitted: 10-16-92 Data Received: 10-19-92 Report Date: 11-04-92

Analyst: DB

LAB I.D.	Sample I.D.	Sample Date	Sample Time	U-nat pCi/gm	Ra226 pCi/gm	Ra226 Prec. +/-
92-41336 92-41338 92-41339 92-41340 92-41341 92-41342 92-41344	HL-1 HL-2 HL-2.1 HL-8.1 HL-8.2 HL-8.3 HL-8.4 HL-8.5	10-12-92 10-12-92 10-12-92 10-13-92 10-13-92 10-13-92 10-13-92 10-13-92	09:55 11:00 13:30 13:40 14:30 14:30	71.8 3.5 151 2.7 1.9 4.1 2.6 28.4 579	86.9 2.5 86.8 1.5 1.2 2.3 15.7	1.0 0.1 0.1 0.1 0.1 0.4 2.1
	HL-10.4				37.0	

REPORT APPROVED BY: A.Q. Lean buy

tdc



### ENERGY LABORATORIES, INC.

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SOIL ANALYSIS REPORT - ENERGY FUELS

303 595 0930

Project: Gas Hills

Report Date: 08/11/93

LAB I.D.	SAMPLE I.D.	Date Sampled	Ra226 (Chemical) pCi/g	Net CPM 1	Net CPM 2	(A A*)/A- 3
93-28610	HL-1-6, HL-1-5 Composite	10-12-93	58.9 ± 0.7	262.5	275.3	0.0465
93-28611	HL-9-7, HL-9-6 Composite	10-12-93	34.4 ± 0.6	95.0	110.2	0.1379

Report Approved By: AS Ro

<sup>1</sup> A° - Net CPM after de-emanation

<sup>&</sup>lt;sup>2</sup>  $A \infty$  - Net CPM after full ingrowth <sup>3</sup>  $(A \infty - A^{\circ})/A \infty$  Radon Emanation Coefficient



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SOIL ANALYSIS REPORT - ENERGY FUELS

Project: Day Loma

Report Date: 08/11/93

LAB I.D.	SAMPLE I.D.	Date Sampled	Time Sampled	Ra226 (Chemical)	Net CPM 1	Net CPM 2	(Am - A*)/Am
93-24420 93-24421 93-24422 93-24423 93-24424 93-24425 93-24426	BG-4 BG-6 BG-12 BG-15 B6-20 HL-8 HL-10A	07-07-93 07-07-93 07-07-93 07-07-93 07-07-93 07-07-93	15:00 15:00 15:00 15:00 15:00 15:00	6.1 ± 0.2 4.1 ± 0.2 186 ± 1.3 3.8 ± 0.2 105 ± 1.2 1.9 ± 0.1 5.0 ± 0.2	25.3 7.1 544 12.7 511 8.8 27.7	31.4 13.6 562 19.0 549 15.3 34.0	0.1943 0.4779 0.0338 0.3316 0.0692 0.4248 0.1853

Report Approved By: AB Rea MmH #324420.ef

<sup>1</sup> A\* - Net CPM after de-emanation 2 A = - Net CPM after full ingrowth 2 (A = - A\*)/A= Radon Emanation Coefficient

### ENERGY LABORATORIES, INC.

LABORATORIES

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Large Area Activated Charcoel Canister (LAACC) Radon Flux Report

Project:

ENERGY FUELS

Date Set:

July 7, 1993

Site: Locations

Day Lome Project Heap Leach Pile/Nine Spoils Pile Westher:

Dete Remove: July 8, 1993

Report Date: July 14, 1993

Clear, min. 60.0 F+/-

Date Counted: July 9, 1993

BEC.D JAT 50 1883

Method:

Energy fuels and ELI's representatives placed and retrieved LAACC units

EPA Method 115 per 40 CFR 61 (NESHAPS) Radon Flux measurements have been corrected

for instrument & charcost background counts

07/07/93 07/08/93 Redon Flux Field Gamme Lab I.D. LAACC # Canister # Location\* Time Set Time Resove pC1/a2s Reading, UR/hr HEAP LEACH PILE 93-24218 14 3 HL-8 09:33 13:29 8.0 36 15 93-24219 HL-1 09:38 13:24 6.7 64 DUPLICATE 5.7 5 18 13:18 93-24220 NL-1A 09:42 6.6 64 93-24221 19 á HL+1B 09:47 13:22 5.2 40 93-26222 30 HL-5 09:52 13:31 11.1 35 7 13:40 93-24223 8 HL-2 10:09 5.4 33 93-26224 9 φ 14.5 14:21 14:03 4.7 35 14:06 93-24225 12 13 NL - 10 10:26 33 6.5 14 HL-10A 93-24226 16 10:31 14:08 18.7 42 93-24227 17 HL-P 10:42 13:37 8.3 45 DUPLICATE 7.0 MIME SPOILS PILE 24 93-24228 BG-6 11:38 14:16 90 6.7 93-24229 12 BG-5 11:45 14:17 8.0 93-24230 13 19 65-1 11:27 14:14 4.8 43 86.6 93-24231 8 16 11:49 14:19 6.7 45 20 8G-7 93-24232 11:55 14:23 5.7 48 11 93-24233 18 BC-10 13:15 11:33 69.5 110 P3-24234 3 21 BG-9 12:00 14:23 5.4 93-24239 4 22 88-16 14:23 12:13 282.5 350 39 23 93-24236 BG-3 11:35 14:15 40.3 290 93-26237 40 24 BG-2 11:30 14:15 2.1 100 93-24238 29 29 BG-17 14:26 12:15 285.5 420 30 93-24239 30 80-18 14:30 12:15 103.8 BG-13 93-24240 14:04 12:01 33.6 135 DUPLICATE 30.2 31 31 12:08 93-24241 在日-14 14:10 524.9 1800 93-24242 36 36 BG-20 14:35 12:22 80.6 320 25 93-24243 3.6 BG-15 14:16 12:11 23.4 260 93-24244 37 28 BG-12 13:24 12:04 63.1 93-24245 35 35 80-19 14:32 12:20 78.8 0.45 32 93-24248 34 BG-11 13:19 11:60 149.7 700

<sup>\*</sup> See attached Chain of Custody/Field Notes for further description of LAACE location.



### Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: ENERGY FUELS Site: Day Loma Project

Location: Beap Leach Pile/Mine Spoils Pile

Report Date: July 14, 1993

REC'D JUL 20 1993

### Quality Assurance/Quality Control Data

Date Counted	Standard No. 1 cpm			
07/09/93 Sample N	2275 2397 o. Cannister	4280 4453	Radon Flux* pC1/m2s	
1 2 3 4 5 1 2 49 50 91 92	Field Can Field Can Field Can Field Can	nk nk nk nister Back. nister Back. nister Back. nister Back. nister Back. nister Back.	<0.5 <0.5 <0.5	

Ö Total Number of Field Duplicates: 5 Total Number of Field Blank Cannisters Reported: Total Number of Measurements On Heap Leach Pile 10 8.10 pC1/m2s Average Radon Flux For Heap Leach Pile: Minimum: 4.7 pC1/m2s 18.7 pC1/m2s 19 Total Number of Measurements On Mine Spoils Pile Average Radon Flux For Mine Spoils Pile: 92.37 pC1/m2s Minimum: 2.1 pC1/m2s Maximum: 524.9 pC1/m2s

REPORT APPROVED BY: R. a. Garling, by KK.

Total Number of Laboratory Duplicates:

APPENDIX E COST ESTIMATE

### JOB SIZING

The duration of the heap leach project should be completed in one season; in the Gas Hills this is about six months. A recap of estimated costs follows in the next section.

Allowing for two weeks of inclement weather, one week for mobilization and demobilization and one week for miscellaneous delays, the work period is about five months or 105 days.

Reshaping the outslope will require 132,400 compacted cubic yards of material. Of this, 97,850 cubic yards will be obtained from the spoil pile with the remainder coming from job site excavation. Scrapers will move 130,250 cubic yards of material. Two 20 cubic yard push pull scrapers will load and haul about 400 bank cubic yards of material per hour, given the conditions and haul distance for the project. At 2800 cubic yards per day, the scrapers will operate 47 days. The plan calls for building the outslope from the bottom up so as to get good compation. Some bulldozer pushing will be required on the spoil pile initially, but the hauls generally will be flat. In addition to the scraper units, a 370 hp buildozer, a motor grader, a 5000 gallop water truck and a compactor will be required for reshapir the outslope. A minor amount of excavation will be accomplished with a bulldozer in areas such as the gullies and for short pushes.

As shown later on a materials handling exhibit, the range of rock to be emplaced varies from sand to 72 inch pieces. Handling this range of material calls for a 2 1/2 cubic yard loader and a 25 ton hydraulic excavator or crane. For the majority, the material can be spotted where it is to be emplaced. The production rate of emplacement varies from 500 cubic yards per day to 175 cubic yards per day. For estimating purposes, each unit is rated at 300 cubic yards per day. Four laborers have been included in the estimate for rock emplacement. With 64,250 cubic yards of material to be emplaced, the job duration is 107 days.

The haulage fleet required to transport material to the site is sized at 600 loose cubic yards per day. The distance from the quarry to the heap leach area will be about 25 miles. For a two hour cycle time, six 35 ton off highway trucks, each hauling 25 loose cubic yards, will be required. In addition, a 5 1/2 cubic yard loader and a 370 hp bulldozer will be used for loading the trucks. The haul road will be maintained and dust will be allayed with a motor grader and water truck. The additional equipment is expected to be in the remaining time. Off highway trucks were chosen as much of the material is large and this type of truck can better cope with the job conditions.

On site testing of material will be required for gradation and durability. As estimated by Shepard Miller, one gradation test per 5000 cubic yards will be required at a

### DAY-LOMA HEAP LEACH REMEDIATION COST ESTIMATE

Based on data provided by Shepard Miller Inc. of Fort Collins, CO, the estimated cost for remediation of the Day Loma heap leach site is \$2,779,000. The SMI hydrological study of the site has resulted in plan whereby the steep outslope to the north of the heapleach area will be shaped to a 2.5:1 slope. The heap leach area as well as the outslope will be armored with rock mulch and riprap. In addition, there are three gullies that exist to the south of the heap leach area that are to be riprapped. And, a 2080 ft. drainage channel with apron and drop structure is to be constructed to cope with design runoff in Coyote Creek. This report only considers stabilization in place as proposed by Shepard Miller.

### ASSUMPTIONS

In deriving a cost estimate for remediating the heap leach site, certain assumptions were made which weigh heavily on the unit costs of materials and emplacement. These assumptions include the following:

Riprap and Filter Blacket Material. As Western Nuclear Inc. is planning to set u. a granite quarry for their upcoming riprap requirements, to is expected that the necessary rock materials can be obtained from that source at their estimated cost of \$9.00 per loose cubic yard plus an allowance of \$1.50 per cubic yard for additional screening or crushing. With an estimated cost of \$10.93 per loose cubic yard for loading, hauling and haul road maintenance, the total cost for riprap materials at \$21 ... .cy is less expensive than an alternate source - is Enterprises. That firm's charge for riprap to the Gas \*12.50 runs \$20.00/ton or about \$27.00/lcy.

Outslope Fill Material. It is expected that material for reshaping the outslope can be obtained from a spoils pile which lies adjacent and to the northwest of the heapleach site. The average haul distance is approximately 2000 ft. It is to be noted that this material has higher than background radiation.

Riprap Emplacement. It is assumed that the riprap can be machine placed, without much need for hand emplacement. Should hand emplacement be required, costs for emplacement are variously quoted between \$15 and \$18 per cubic yard. In addition, rock mulch emplacement on the heap leach cover is three inches thick. Should a six inch thickness be required because of NRC preferences, an additional 10,500 cubic yards of material will be required which will add \$308,000 to the estimated cost.

cost of \$1500 per test. One durability test per 10,000 cubic yards will be required at a cost of \$650 per test.

While the job duration is contained within a six month time frame, an additional month has been imputed for staff costs. On site staff will consist of a supervisor, quality control supervisor, two survey personnel and a clerk. On site engineering and inspection is included in a five percent allowance for engineering costs.

An allowance of five percent of project costs is included for engineering, pre-project tests and lab fees. This allowance accounts for studies, reports and on site clerk-of-the-works engineering activities.

It is expected that the spoils and traffic areas will have to be revegetated. In laying back the spoils bank to a 2.5 to 1 slope a four acre disturbance will be incurred.

Other cost items such as home office expenses and a reasonable contingency allowance are shown separately and below the line for identified costs.

### BARTELL & ASSOCIATES

390 Del Street LANDER, WYOMING 82520 (307) 332-4077

108 DAY-LOMA HE	DPLEACH
SHEET NO	OF
CALCULATED BY	DATE
CHECKED BY	DATE

E STIMATED . EQUIPMENT COSTS ON 19901 ZENTAL RATES BASED & UNFACTORED REFLECT DISCOUNTS, ESTIMATED OPERATING BASED ON 1988 BLUE BOOK BOTES (COST OF FUEL SUPPLIES NOT DIFFERENT! STANDSY RA TES @ 60% of RESTAL PATES. DO N.W. JSHAWE RIPPER 86,50 45.00 DO N. WO RIPPERL 80.85 AZ.40 CZZE (RP) 5000 GAL WATER TRUCK 35 TON OFRHIXAWAY TRUCK 55,40 23,70 BISB COMPASTOR 44.06 19,30 140 MOTOR GRADER 30.14 13.85 SEOC WHEEL LOADER 55,40 28.55 953 CZAWLE LOBOER 11:35 235 EXCAVATOR/CZANE 27,00 MANPOWEZ # 50,000/YE SUPERULSOR 90,000 25,000 \$170,000/va 51,000 221,000/4R = #18,420/MO

EQUIPMENT OPERATOR \$ 15.00 INC PAC LABORER \$ SERVICE PERS INCLUDED IN OPERATING COSTS

### BARTELL & ASSOCIATES

390 Del Street LANDER, WYOMING 82520 (307) 332-4077

PRODUCTION TO THE TANK

J08	
SHEET NO.	OF
CALCULATED BY	DATE
CHECKED BY	2140

## DAY LOWA HEAP LEACH REMEDIATION COST ESTIMATE PECAP

NRC Licence Amendment Reshape Outslope Gully Excavation	s 150,000 221,425 3,575
Riprap, Rock Hulch, Filter Bed Mining and Hauling Riprap, Rock Mulch, Filter Bed Emplacement Testing Supervision, Staff and Surveying	1,376,878 191,611 16,500 128,940
Indirect Costs Mobilization and Demobilization Revegetate 4 acre Spoil Area Subtotal \$2,170,794	31,225 49,040 1,600
Home Office Overhead 0 6% Subtotal \$2,301,042	130,248
Engineering, Test and Lab 8 5% Subtotal \$2,416,094	115,052
Contingency @ 15%	362,414
Total Estimated Cost	\$2,778,508 \$2,779,000