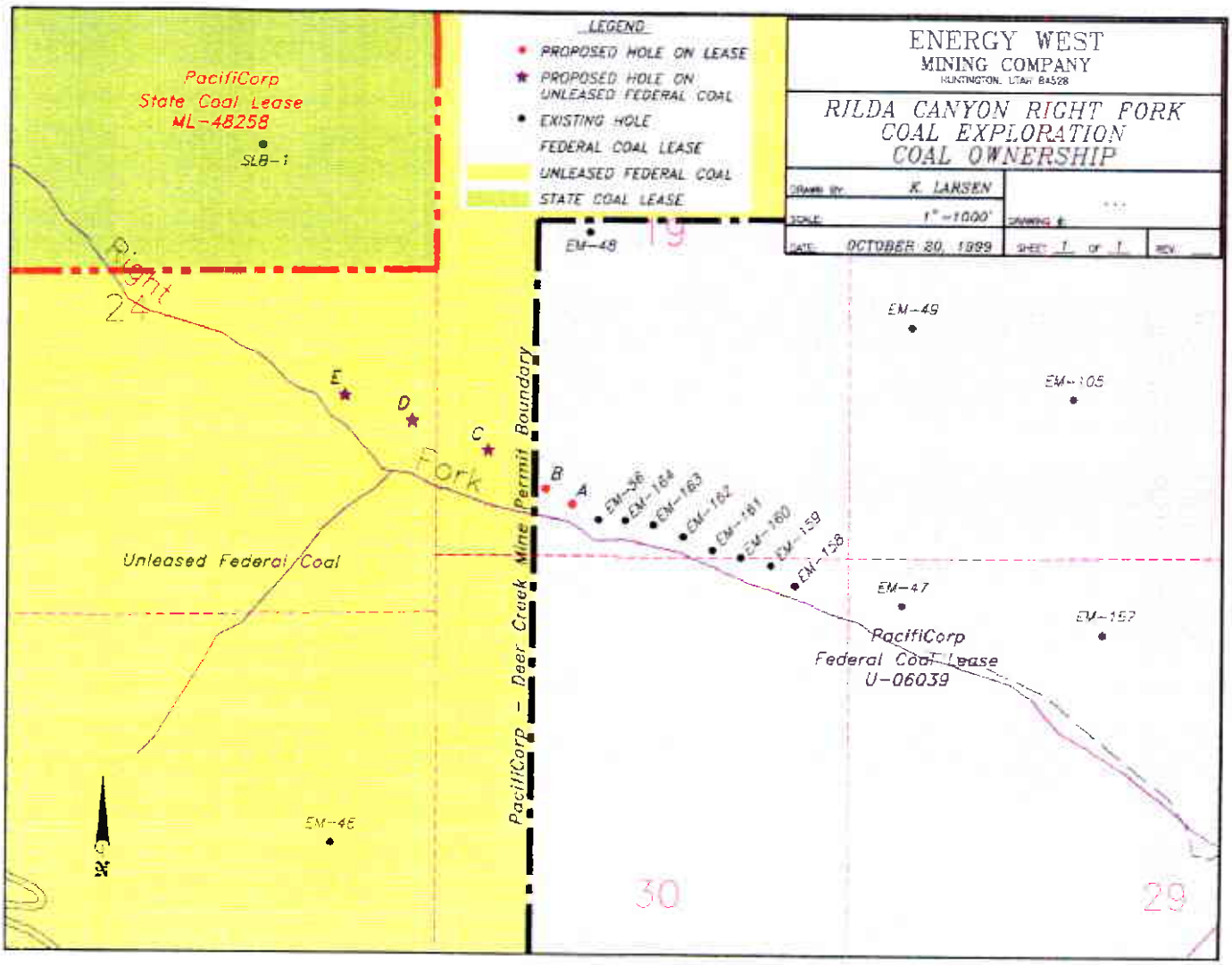
RILDA CANYON - RIGHT FORK
HELICOPTER DRILLING APPLICATION
FEDERAL COAL LEASE U-06039
and
UNLEASED FEDERAL COAL
EXPLORATION LICENCE APPLICATION
DECEMBER 1999

PACIFICORP

C/O InterWest Mining Co.
(Managing Agent)

ENERGY WEST MINING Co.

Energy West Mining Co.
(Mine Operator)



RILDA CANYON - RIGHT FORK
HELICOPTER DRILLING APPLICATION

FEDERAL COAL LEASE U-06039
and
UNLEASED FEDERAL COAL
EXPLORATION LICENCE APPLICATION
DECEMBER 1999

PACIFICORP
InterWest Mining Co.
Managing Agent

ENERGY WEST MINING Co.
Energy West Mining Co.
Mine Operator

1995 North Rilda Ridge Helicopter Assisted Drilling

FEDERAL COAL EXPLORATION LICENCE APPLICATION and EXPLORATION PLAN

DECEMBER 1999

C/O Interwest Mining Company
(Managing Agent)

PACIFICORP

ENERGY WEST Mining Co.

Energy West Mining Company
(Mine Operator)

FEDERAL COAL
EXPLORATION LICENCE APPLICATION

INTRODUCTION

This Exploration Licence Application has been prepared by PacifiCorp-Energy West Mining Company in accordance with requirements of the Code of Federal Regulations, Title 43, Chapter II, Subpart 3410. The proposed exploration area covers land in Emery County, Utah, within which Energy West Mining Company plans to conduct a helicopter assisted drilling program to evaluate potential access routes from existing Federal Coal Lease U-06039 and State Coal Lease ML-48258.

The exploration plan outlined within this Exploration Licence Application complies with the requirements of 43 CFR, Chapter II, Subpart 3482, as required by Section 3410.2-1(a)(3). The exploration plan format designated by the Bureau of Land Management has been followed in this Exploration Licence Application.

The information contained in this Exploration Licence Application demonstrates that environmental protection and reclamation are integral components of the proposed exploration program. In recent years, PacifiCorp has successfully completed similar exploration programs utilizing environmentally sensitive exploration technics in similar terrain.

OUTLINED (43 CFR, CHAPTER II, SUBPART 3410)

3410.2 PRE-LICENCE PROCEDURES

3410.2-1 "APPLICATION FOR AN EXPLORATION LICENCE"

3410.2-1(a) "EXPLORATION LICENCE APPLICATIONS SHALL BE SUBMITTED AT THE BUREAU OF LAND MANAGEMENT STATE OFFICE HAVING JURISDICTION OVER THE LANDS COVERED IN THE APPLICATION (43 CFR SUBPART 1821)

This Exploration Licence Application is submitted to the Bureau of Land Management District Office in Salt Lake City, Utah which has jurisdiction over the lands covered in this application.

"THE APPLICATIONS SHALL BE SUBJECT TO THE FOLLOWING REQUIREMENTS"

3410.2-1(a)(1) "NO SPECIFIED FORM OF APPLICATION IS REQUIRED"

3410.2-1(a)(2) AN AREA IN A PUBLIC LAND SURVEY STATE FOR WHICH AN APPLICATION IS FILED SHALL BE DESCRIBED BY LEGAL DESCRIPTION OR, IF ON UNSURVEYED LANDS, BY METES AND BOUNDS, IN ACCORDANCE WITH 3471.1-1(D)(1) OF THIS TITLE.

The following table lists the legal description of the lands outlined in this application, according to coal plat records maintained by the Bureau of Land Management.

LEGAL DESCRIPTION
RILDA CANYON - RIGHT FORK
EXPLORATION LICENCE APPLICATION

Township 16 South, Range 7 East, Salt Lake Meridian, Emery County Utah

Section 19, SW 1/4

Containing 102.2 acres, more or less

Township 17 South, Range 7 East, Salt Lake Meridian, Emery County Utah

Section 24, SE 1/4

Containing 157.8 acres, more or less

TOTAL ACERAGE - 260

3410.2-1(a)(3) "EACH APPLICATION SHALL CONTAIN THREE COPIES OF AN EXPLORATION PLAN WHICH COMPLIES WITH THE REQUIREMENTS OF 3482.1(a) OF THIS TITLE."

Three copies of the Exploration Licence Application and Exploration Plan are enclosed.

3410.2-1(a)(4) "EACH APPLICATION AND ITS SUPPORTING DOCUMENTS SHALL BE FILED WITH A NON-REFUNDABLE FILING FEE (43 CFR 3472.3)."

Enclosed is a check for $250.00.

3410.2(a)(5) "EXPLORATION LICENCE APPLICATIONS SHALL NORMALLY COVER NO MORE THAN 25,000 ACRES IN A REASONABLY COMPACT AREA AND ENTIRELY WITHIN ONE STATE."

The total number acres in the proposed exploration area is approximately 260 acres (exploration licence application is within the 25,000 acre size limitation).

3410.2-1(b) "NOTHING IN THIS SUBPART SHALL PRECLUDE THE AUTHORIZED OFFICER FROM ISSUING A CALL FOR EXPRESSIONS OF LEASING INTEREST IN A AREA CONTAINING EXPLORATION LICENCES OR APPLICATIONS FOR EXPLORATION LICENCES."

3410.2.1(c) "APPLICANTS FOR EXPLORATION LICENCES SHALL BE REQUIRED TO PROVIDE AN OPPORTUNITY FOR OTHER PARTIES TO PARTICIPATE IN EXPLORATION UNDER THE LICENCE ON A PRO COST SHARING BASIS."

3410.2-1(c)(1) "IMMEDIATELY UPON THE FILING OF AN APPLICATION FOR AN EXPLORATION LICENCE THE APPLICANT SHALL PUBLISH A "NOTICE OF INVITATION," APPROVED BY THE AUTHORIZED OFFICER, ONCE EVERY WEEK FOR TWO CONSECUTIVE WEEKS IN AT LEAST ONE NEWSPAPER OF GENERAL CIRCULATION IN THE AREA WHERE THE LANDS COVERED BY THE LICENCE APPLICATION ARE SITUATED. THIS NOTICE SHALL CONTAIN AN INVITATION TO THE PUBLIC TO PARTICIPATE IN THE INVITATION IN THE EXPLORATION UNDER THE LICENCE AND SHALL CONTAIN THE LOCATION OF THE BUREAU OF LAND MANAGEMENT OFFICE IN WHICH THE APPLICATION SHALL BE AVAILABLE FOR INSPECTION. COPIES OF THE NOTICE OF INVITATION SHALL BE FILED WITH THE AUTHORIZED OFFICER AT THE TIME OF PUBLICATION BY THE APPLICANT, FOR POSTING IN THE PROPER BUREAU OF LAND MANAGEMENT OFFICE AND FOR BUREAU OF LAND MANAGEMENT'S PUBLICATION OF INVITATION IN THE FEDERAL REGISTER.

Upon approval the following notice will published in the Emery County Progress for two consecutive weeks:

NOTICE OF INVITATION TO PARTICIPATE
IN COAL EXPLORATION PROGRAM
PACIFICORP - ENERGY WEST MINING COMPANY

Energy West Mining Company is inviting all qualified parties to participate in its proposed exploration of certain Federal coal deposits in the following described lands in Emery County, Utah:

Township 16 South, Range 7 East, Salt Lake Meridian, Emery County Utah

Section 19, SW 1/4

Containing 102.2 acres, more or less

Township 16 South, Range 7 East, Salt Lake Meridian, Emery County Utah

Section 24, SE 1/4

Containing 157.8 acres, more or less

Any party electing to participate in this exploration program must send a written notice of such election to the Bureau of Land Management, Utah State Office, 324 South Street, Suite 301, Salt Lake City, Utah 84111, and to Energy West Mining Company, P.O. Box 310, Huntington, Utah 84528. Such written notice must be received within thirty days after publication of this notice in the Federal Register.

3410.2-1(c)(2) "ANY PERSON WHO SEEKS TO PARTICIPATE IN THE EXPLORATION PROGRAM CONTAINED IN THE APPLICATION SHALL NOTIFY THE AUTHORIZED OFFICER AND THE APPLICANT IN WRITING WITHIN 30 DAYS AFTER THE PUBLICATION IN THE FEDERAL REGISTER. THE AUTHORIZED OFFICER MAY REQUIRE MODIFICATION OF THE ORIGINAL EXPLORATION PLAN TO ACCOMMODATE THE LEGITIMATE EXPLORATION NEEDS OF PERSONS SEEKING TO PARTICIPATE, AND TO AVOID THE DUPLICATION OF EXPLORATION ACTIVITIES IN THE SAME AREA, OR MAY NOTIFY THE PERSON

SEEKING TO PARTICIPATE THAT THE PERSON SHOULD FILE A SEPARATE APPLICATION FOR AN EXPLORATION LICENCE."

3410.2-1(d) "AN APPLICATION TO CONDUCT EXPLORATION WHICH COULD HAVE BEEN CONDUCTED AS A PART OF EXPLORATION UNDER AN EXISTING OR RECENT COAL EXPLORATION LICENCE MAY BE REJECTED."

RILDA CANYON - RIGHT FORK HELICOPTER DRILLING APPLICATION FEDERAL COAL LEASE U-06039
and
UNLEASED FEDERAL COAL EXPLORATION LICENCE APPLICATION

DECEMBER 1999

C/O Interwest Mining Company
(Managing Agent)

PACIFICORP

Energy West Mining Company
(Mine Operator)

NORTH RILDA RIDGE
HELICOPTER DRILLING APPLICATION
FEDERAL COAL LEASE U-06039
and
UNLEASED FEDERAL COAL
EXPLORATION LICENCE APPLICATION

DECEMBER 1999

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PACIFICORP

RILDA CANYON
1999 HELICOPTER DRILLING PLAN

INTRODUCTION:

PacifiCorp proposes to drill up to five (5) coal exploration holes in the Right Fork of Rilda Canyon. The purpose for drilling is to explore potential access routes from the existing Deer Creek Mine workings to the Mill Fork State Coal Lease ML 48258. All holes will be drilled using a helicopter transported drill rig in accordance with the following plan. Less than 250 tons of coal will be removed.

LOCATION AND DEPTH OF PROPOSED DRILL HOLES:

Five (5) potential drill sites are indicated on the accompanying drawings. The approximate locations, depths and elevations of the holes are as follows:

HOLE NUMBER	LOCATION	ELEVATION	DEPTH	SURFACE OWNERSHIP	COAL OWNERSHIP
A	420' North, 1100' East of the SW Corner of Sec. 19, T. 16S, R. 7E.	8405	635	USFS	BLM LEASE U-06039
B	540' North, 900' East of the SW Corner of Sec. 19, T. 16S, R. 7E.	8480	700	USFS	BLM LEASE U-06039
C	830' North, 420' East of the SW Corner of Sec. 19, T. 16S, R. 7E.	8640	835	USFS	UNLEASED FEDERAL COAL
D	1500' North, 210' West of the SE Corner of Sec. 24, T. 16S, R. 6E.	8805	955	USFS	UNLEASED FEDERAL COAL
E	1700' North, 750' West of the SE Corner of Sec. 24, T. 16S, R. 6E.	8820	930	USFS	UNLEASED FEDERAL COAL

In accordance with Federal Regulations 43 CFR 3482.1 (a), 30 CFR 772.11 and State of Utah R645 Coal Mining Rules, the following is submitted:

APPLICANT:

PacifiCorp
One Utah Center
201 South Main, Suite 2100
Salt Lake City, Utah 84140-0021
(801)220-2000

OPERATOR:

Energy West Mining Company
15 North Main Street
Huntington, Utah 84528
(435)687-9821

RESPONSIBLE REPRESENTATIVE:

Charles Semborski or Ken Fleck
Energy West Mining Company
15 North Main Street
Huntington, Utah 84528
(435)687-4720

PROJECT STARTUP DATE: June 30, 2000

PROJECT COMPLETION DATE: September 15, 2000

PROPOSED EXPLORATION AREA:

The proposed drilling is located within the current Deer Creek Mine permit boundary. Drill Holes A and B are located in Section 19, Township 16 South, Range 7 East, Salt Lake Base and Meridian, within Federal Coal Lease U-06039, and Drill Holes C, D and E are located in Sections 19, Township 16 South, Range 7 East and 24, Township 16 South, Range 6 East, Salt Lake Base and Meridian, in unleased Federal Coal. The drilling will occur on Federal land with the surface administered the United States Forest Service (USFS) and the subsurface by the Bureau of Land Management (BLM) [The reviewer is referred to the accompanying maps entitled Rilda Canyon - Right Fork 1999 Helicopter Exploration Drilling, Surface Ownership Map, Coal Ownership Map].

The proposed holes will be drilled in the Right Fork of Rilda Canyon, a tributary to Huntington Canyon in Emery County, Utah. The proposed sites are situated below the Castle Gate escarpment in very steep terrain with side slopes of approximately 45 percent (2h:1v). The holes are located in the upper Blackhawk Formation at elevations ranging from 8400 to 8800'.

VEGETATION and WILDLIFE:

The vegetation in the area consists of a Cottonwood/Aspen/Fir/Dogwood community in the bottom of the canyon and Spruce-Fir Coniferous Forest inter-mixed with Salina Wildrye/Mountain Mahogany on the south side slope and Salina Wildrye/Mountain Mahogany/Pinyon-Juniper on the north slope. The primary land uses associated with the area are wildlife habitat and and recreation. The area is presently classified for the following wildlife uses by the Utah Division of Wildlife Resources (DWR):

Mule Deer	High Priority Summer Range
Elk	Critical Winter Range and High Priority Summer Range

The proposed drilling is not expected to have a detrimental impact on any of these species, their habitat or other land uses associated with the area.

Surveys for Threatened, Endangered and Sensitive (TES) plant and animal species have been conducted in connection with various projects in this area of Rilda Canyon (Surface Facilities, Permit Extension and Power Line). Results of these surveys have been provided to the various regulatory agencies in the applications for the projects. No TES plants and animals have been found in the areas of the proposed drill holes. Based upon the 1999 raptor survey completed with DWR, all of the proposed activity is outside the ½ mile buffer zones of the nests located in Mill Fork Canyon.

ARCHAEOLOGICAL INFORMATION:

The United States Forest Service - Manti-LaSal National Forest was contacted regarding the need for a cultural resource survey associated with the drilling project. A cultural resource survey is not recommended by that agency due to the low potential.

EXPLORATION METHODS:

Pre-Work Meeting:
A pre-work meeting including the responsible company representatives, contractors, Bureau of Land Management, and the Forest Service will be conducted at the project location prior to commencement of operations.

Road Use Permit:
The Forest Service will be notified 48 hours in advance that heavy equipment will be moved onto National Forest System lands and that surface disturbing activities will commence.

Rilda Canyon Road (Emery County Road #306): Prior to drilling, Energy West will obtain a permit from the Emery County Road Department for the helicopter staging area.

Fire Suppression Equipment:
All gasoline and diesel powered equipment will be equipped with effective mufflers or spark arresters which meet applicable Forest Service specifications. Fire suppression equipment will be available to all personnel working at the project site. Equipment will include at least one hand tool per crew member consisting of shovels and polaskis and one properly rated fire extinguisher per vehicle and/or combustion engine.

Drill Hole Access and Pad Construction:
No access road or pad construction will be necessary for the proposed project. Drilling equipment and materials will be transported to the drill sites by helicopter. Personnel will access the sites by vehicle via existing roads and on foot. The drill sites are relatively level (20 percent or less slope); therefore, minimal site preparation will be necessary. Vegetation, in the form of trees, grasses, forbes and sparse, low shrubs, will not be removed. However, it may be necessary to remove dead-fall and some "taller" shrubs (mahogany, etc.). This will be minimized and accomplished using hand tools. The dead-fall will be replaced upon completion of drilling. An area no larger than approximately 40' by 40' will be occupied at each drill site. Leveling of drilling equipment will be accomplished using hand tools and supports (wood blocks, etc.) transported to the site by helicopter. All materials, tools and equipment will be removed upon completion of drilling and reclamation activities.

Water Requirements & Rights:

Water will pumped directly from Rilda Canyon Creek. A gasoline/diesel powered water pump will be stationed near the creek and water will be pumped to water tanks located at the drill sites (see map for location of pump station).

The amount of water required for the project is estimated at 20,000 gallons per hole. Therefore, the maximum total quantity of water to be used is estimated at approximately 100,000 gallons (0.22 acre feet). A *Temporary Exchange Application* will be filed and approved with the State of Utah, Division of Water Rights prior to commencement of operations.

Drill Methods & Procedures:

Three inch maximum diameter holes will be core or rotary drilled the entire length to the approximate depths stated previously. Drilling depths will be sufficient to accomplish penetration through both the Blind Canyon and Hiawatha coal seams. The drilling will be done by a drilling contractor experienced in helicopter supported drilling. The drill is a diesel powered rotary drill rig mounted on 4' x 8' skids. Drilling will utilize water and, as necessary, a biodegradable polymer drilling "mud" such as MINEX 1330 (see attached MSDS). The water will be obtained from Rilda Canyon Creek

The following support equipment will be required:

3 pickup trucks
1 Gas/ Diesel powered water pump

The drill rig components and associated materials, tools and equipment will be transported by truck to the helicopter staging area indicated on the accompanying map. The tools and materials necessary for site preparation will be transported to the drill sites by helicopter. Site preparation will include removal of dead-fall and brush as necessary and installation of silt fence material on the down-slope sides of the site. Minor digging, using hand tools, may be necessary at some locations to achieve effective installation of the silt fence and placement of the leveling support materials (wood blocks, etc.). Brattice or other similar material will be placed on the ground beneath the drill rig which will be transported to the site by helicopter in several "lifts". The drill rig components will be assembled at the drill site, the rig will be leveled and other necessary materials will be flown to the site.

A 1" diameter high-pressure hose will be installed from the pump stations to the drill sites. The hose will be placed on the ground as indicated on the accompanying map. This will be accomplished by hand and/or helicopter. No clearing of vegetation will be necessary for placement of the water hose. Existing openings among the trees will be utilized. Additionally, no vegetation clearing will occur at the water tank/pump sites or the helicopter staging areas. Activities will be confined to the existing road in Rilda Canyon. The necessary approvals will be obtained from the Emery County for activities associated with the respective road.

During the drilling operation, water and drilling fluids will be recirculated to the extent possible. Any returned cuttings and other materials will be captured in a container at the drill site. The cuttings will be transported from the drill site to the staging area by helicopter and then by vehicle to the Deer Creek Waste Rock Site for disposal. Containment of possible fluid spills will be achieved through the use of brattice ground cover, silt fence, and if necessary, dirt berms. If spills occur, all affected materials will be removed from the site and disposed of at an approved location. If soil is removed during spill containment and clean-up, the site of removal will be recontoured and seeded with the approved seed mixture.

Fuel and/or lubricating oil containers not stored on a truck will be placed on brattice or other acceptable ground cover at a site located away from drainage channels and surrounded by silt fence, dirt berm or other acceptable containment structure. If spills occur, clean-up will be conducted as stated above.

Access by personnel associated with the drilling projects will be via vehicle to Rilda Canyon and by foot to the drill sites. Therefore, no additional access facilities will be constructed.

As previously discussed, 3" maximum diameter holes will be core or rotary drilled for the entire depth of the holes. The holes will penetrate through both the Blind Canyon and Hiawatha coal seams. This will result in approximately a maximum of 100 pounds of coal being removed per hole. The core and/or cuttings will be examined to determine coal seam characteristics. Drilling is proposed to be completed first at site A (see the accompanying map). The need for, and location of, subsequent drilling will be determined following completion of each hole; however, no more than five (5) holes will be drilled. The drill rig and all associated equipment and materials will be moved to the next drill site by helicopter.

Hole Abandonment:

Groundwater is not anticipated to be encountered in any of the drill holes; therefore, they are not proposed to be retained as water monitoring wells. However, if groundwater is present in any of the holes, this will be reported to the appropriate agencies (BLM, USFS, DOGM) and a determination will be made regarding the transfer and modification of the drill holes to monitoring wells.

Upon completion of down-hole procedures, all drill holes will be properly sealed by emplacing cement from the bottom of the hole to ground level. The cement slurry mixture used to plug and seal the holes will be mixed in compliance with standard cement mixing tables (e.g. Halliburton). Any variance from this procedure will be approved in advance by the Chief of the Price Office.

Drill Site and Pump Station Reclamation:

Following completion of drilling and plugging activities and removal of all materials and equipment from the drill site, the site will be reclaimed. If soil disturbance has occurred, the areas will be repaired and recontoured using hand tools.

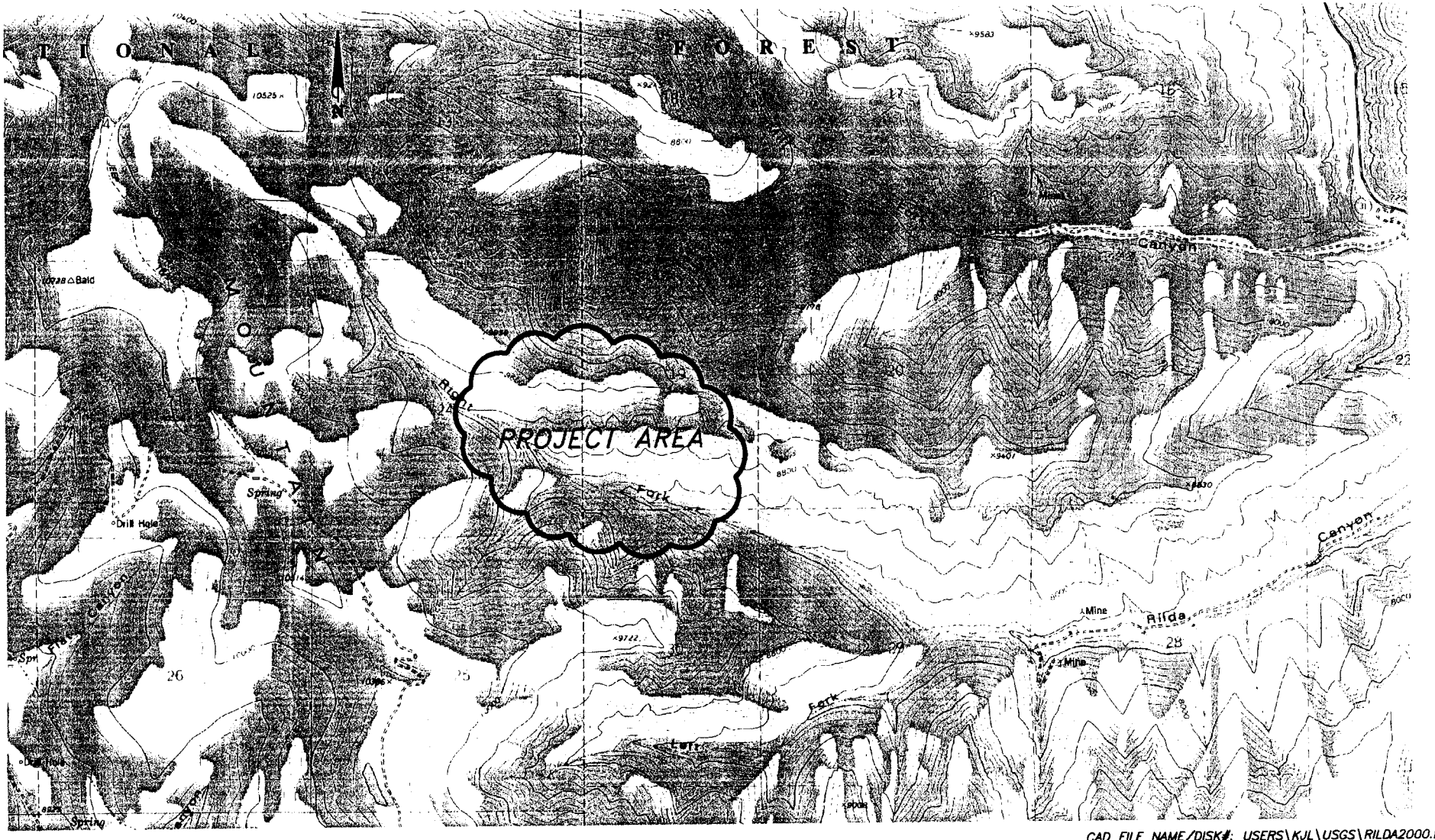
The areas will then be reseeded using the following certified seed mixture or a mixture stipulated by the Forest Service.

Species	lbs/acre (PLS)
Intermediate Wheatgrass - *Agropyron intermedium*	3
Slender Wheatgrass - *A. trachycaulum*	3
Orchard Grass - *Dactylis glomerata*	2
Western Wheat Grass - *A. smithii*	2
Smooth Brome - *Bromus inermus*	3
Ladak Alfalfa - *Medicago sativa ladak*	1
Yellow Sweet Clover - *Meliotus officinalis*	1
Small Burnett - *Sanguisorba minor*	1
Perennial Ryegrass - *Lolium perenne*	1

The seed mixture will be hand broadcast using a hurricane spreader and the area will be hand raked following seeding to cover the seed. Following seeding, any dead-fall that was removed from the drill site will be replaced.

Following completion of drilling of the final hole, the drill rig and all associated equipment and materials will be removed by helicopter to the helicopter staging area and transported from the area by vehicle. The water hose, tanks and pumping station and all associated materials and equipment will be removed. All trash and extraneous materials will be removed from the US Forest Service property and disposed of at an approved location.

It is anticipated that all drilling and reclamation activities associated with this project will be completed within 45 days following the date of implementation.



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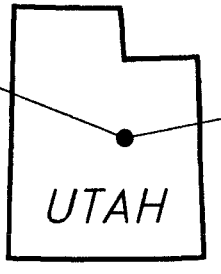

Modified from Rilda Quadrangle 7.5 Minute Series

ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

RILDA CANYON RIGHT FORK COAL EXPLORATION GENERAL LOCATION MAP

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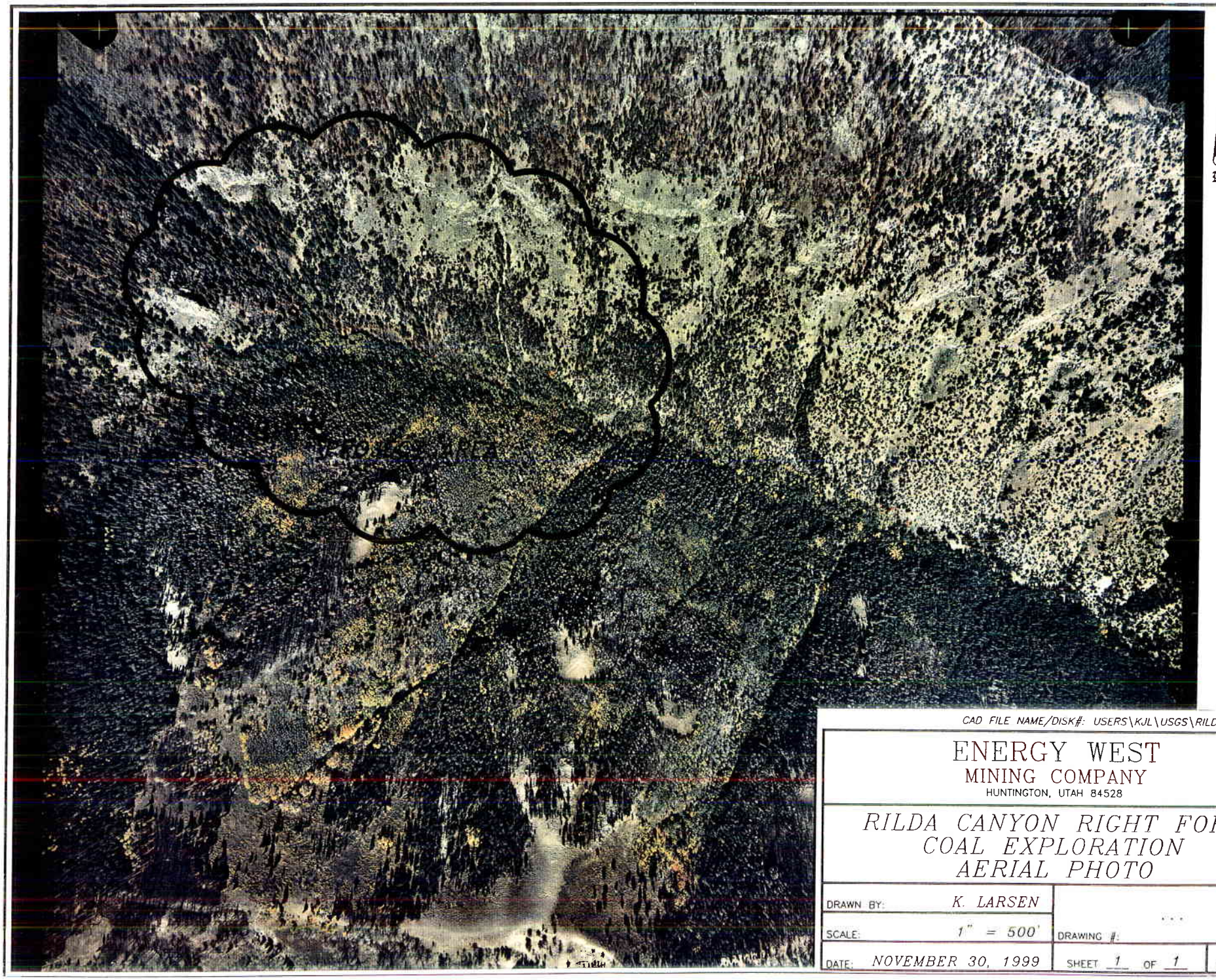
DATE:	OCTOBER 20, 1999	SHEET 1 OF 1	REV. ___



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MINING COMPANY
HUNTINGTON, UTAH 84528

RILDA CANYON RIGHT FORK COAL EXPLORATION AERIAL PHOTO

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SCALE:	1" = 500'	DRAWING #:	
DATE:	NOVEMBER 30, 1999	SHEET 1 OF 1	REV.

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HUNTINGTON, UTAH 84528

RILDA CANYON RIGHT FORK COAL EXPLORATION TOPOGRAPHY MAP

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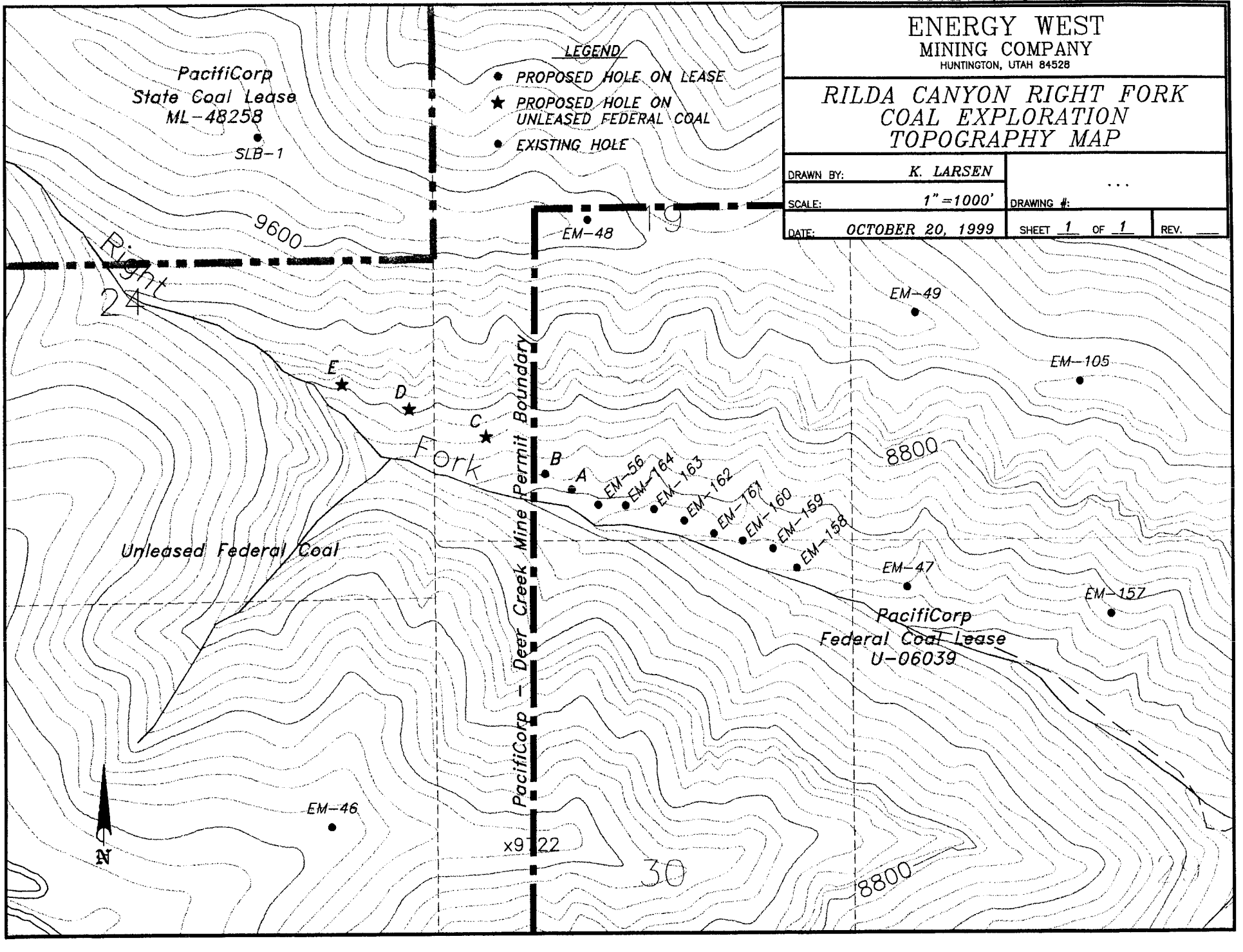
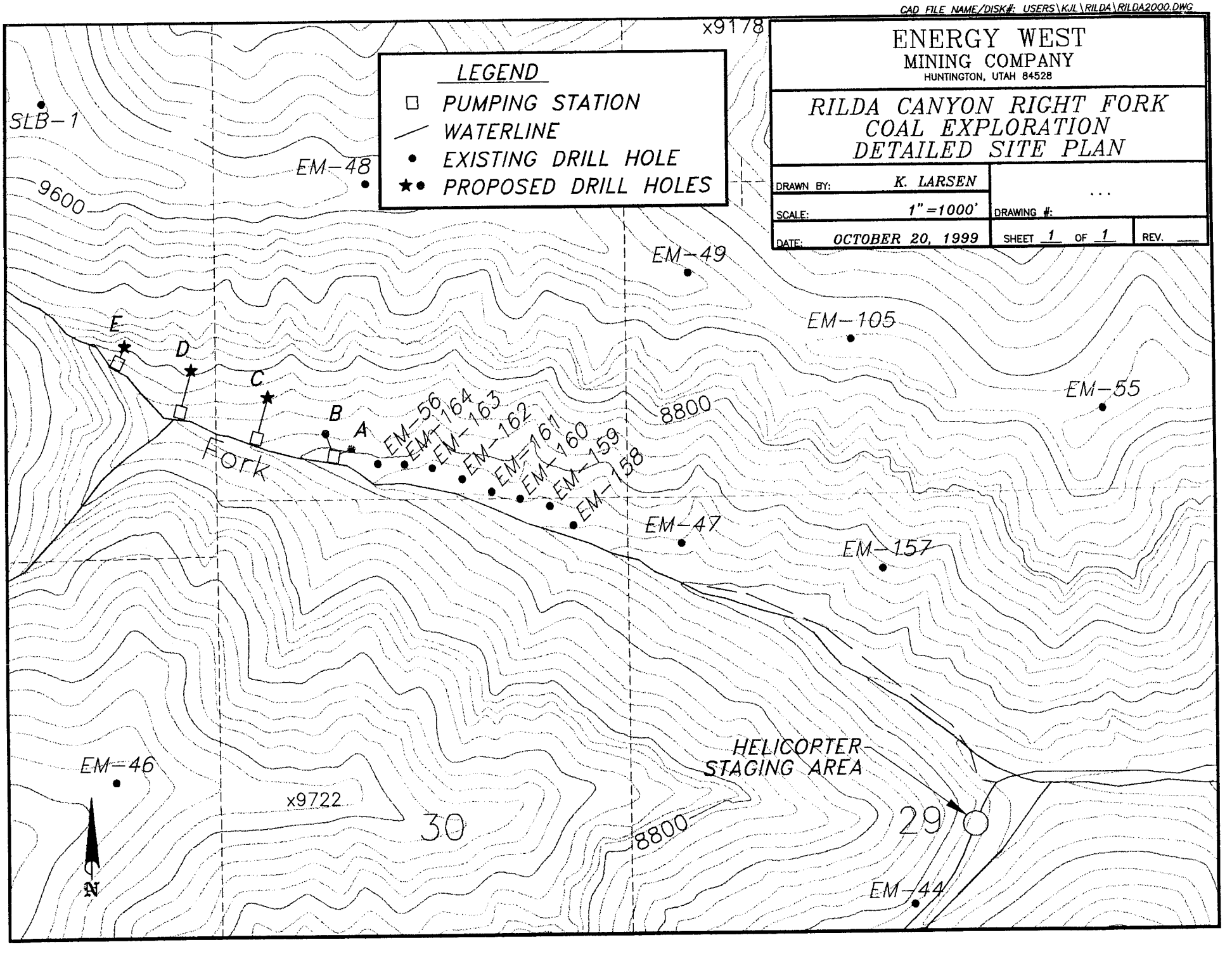
DATE:	OCTOBER 20, 1999	SHEET 1 OF 1	REV. ___

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ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528
RILDA CANYON RIGHT FORK
COAL EXPLORATION
DETAILED SITE PLAN
DRAWN BY: K. LARSEN
SCALE: 1" =1000'
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DATE: OCTOBER 20, 1999
SHEET 1 OF 1
REV.
LEGEND
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WATERLINE
EXISTING DRILL HOLE
PROPOSED DRILL HOLES
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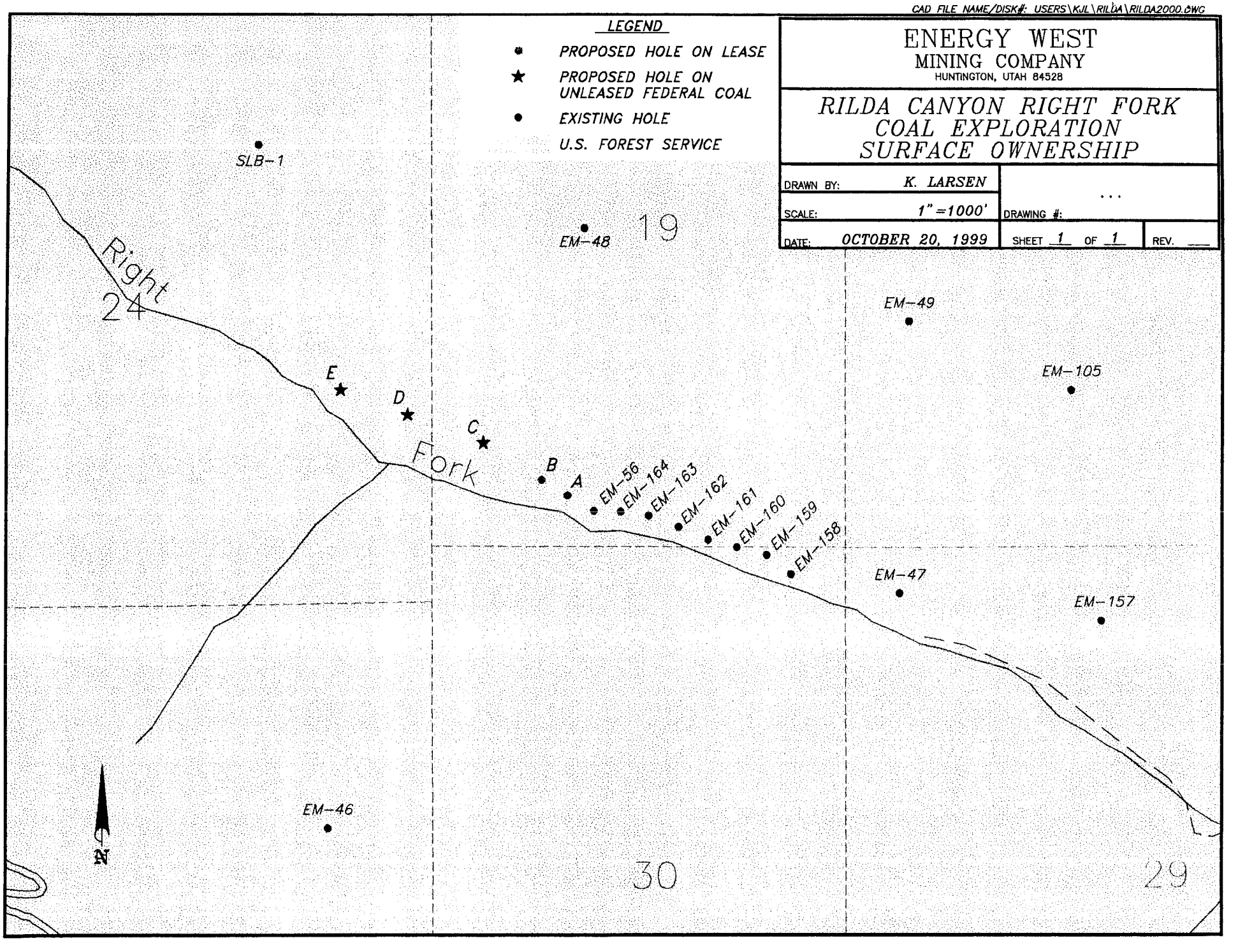

ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

RILDA CANYON RIGHT FORK COAL EXPLORATION SURFACE OWNERSHIP

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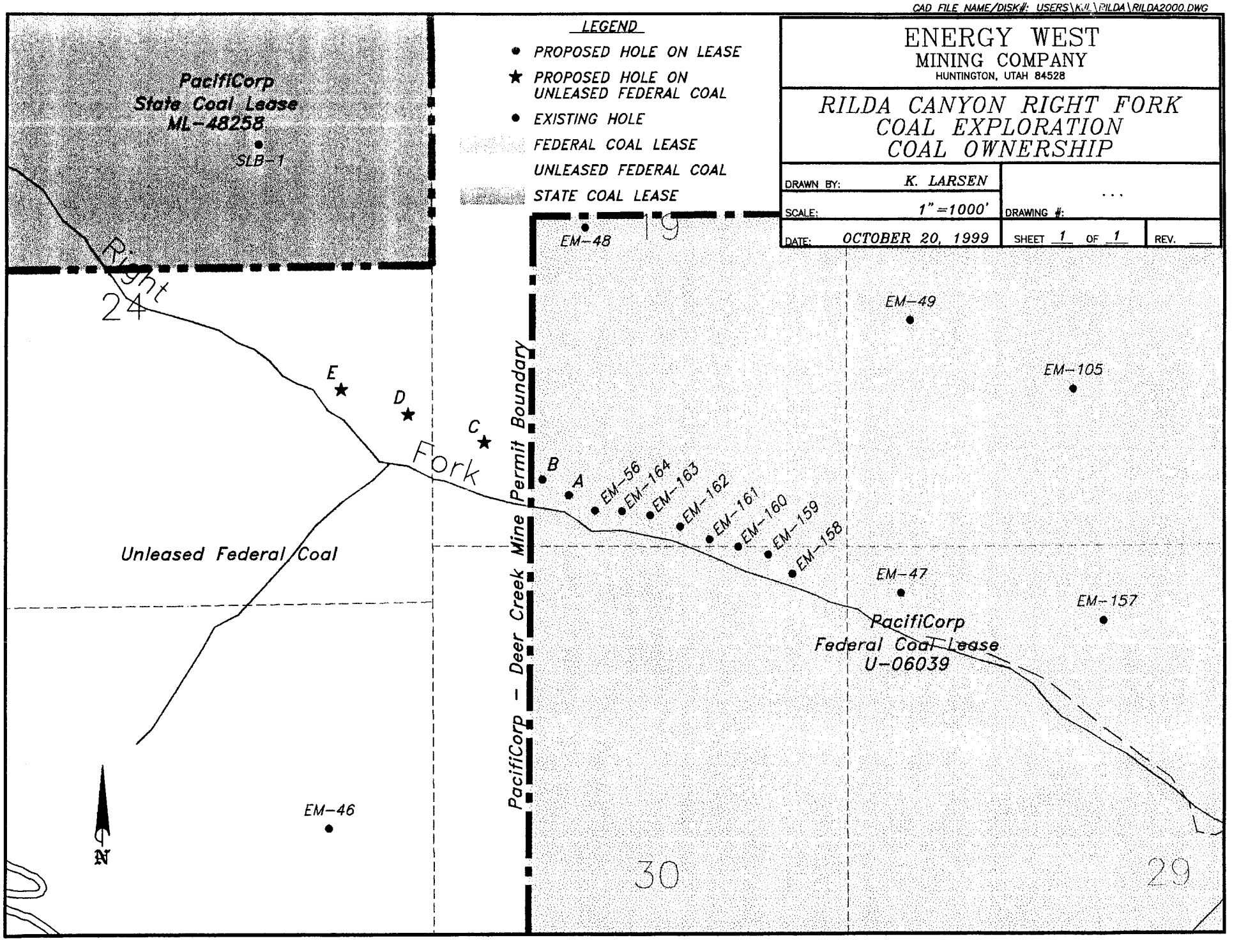
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PROPOSED HOLE ON UNLEASED FEDERAL COAL
EXISTING HOLE
FEDERAL COAL LEASE
UNLEASED FEDERAL COAL
STATE COAL LEASE
ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528
RILDA CANYON RIGHT FORK
COAL EXPLORATION
COAL OWNERSHIP
DRAWN BY: K. LARSEN
SCALE: 1" =1000'
DRAWING #:
DATE: OCTOBER 20, 1999
SHEET 1 OF 1
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SLB-1
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EM-47
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EM-46
EM-56
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EM-162
EM-161
EM-160
EM-159
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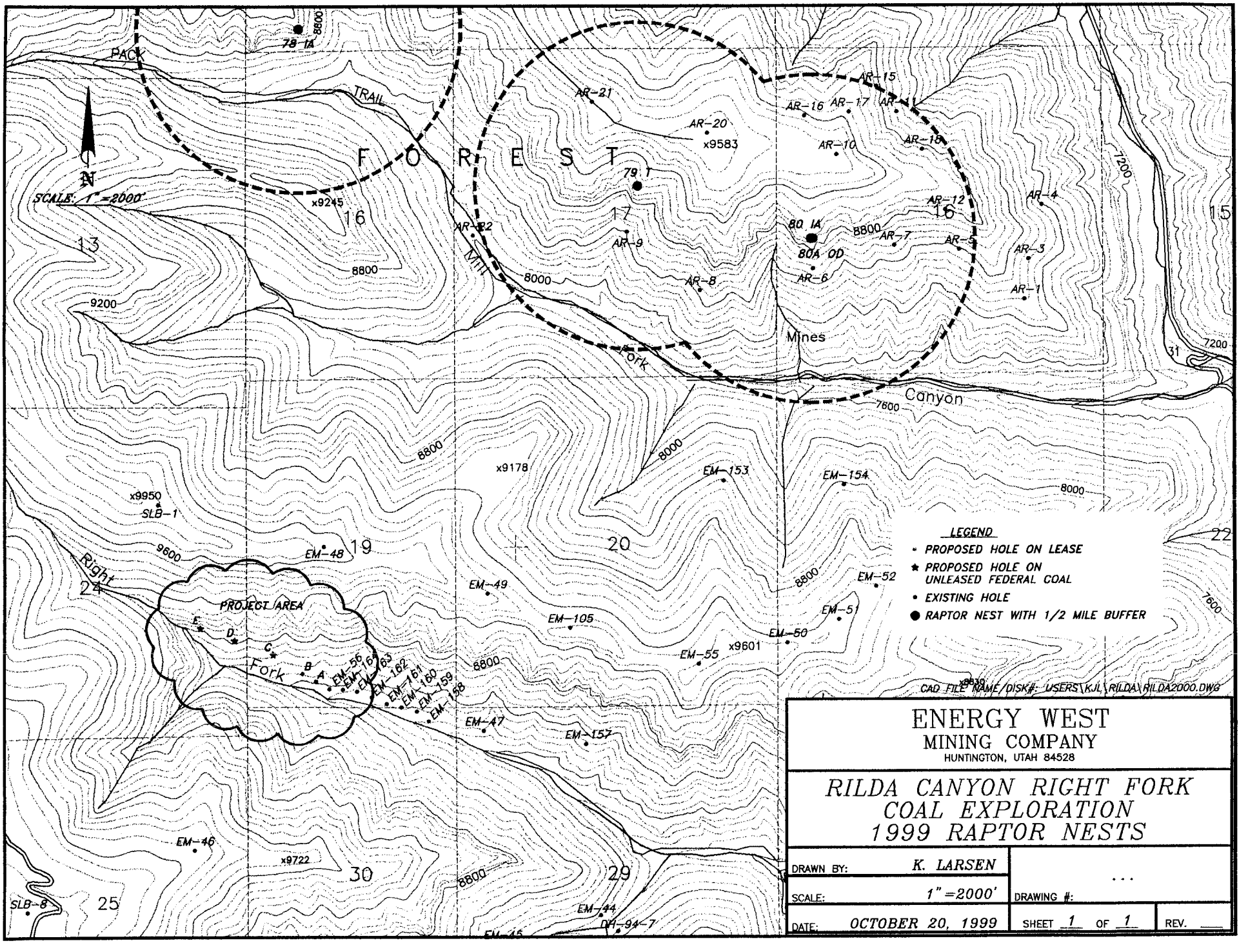
Unleased Federal Coal
PacifiCorp - Deer Creek Mine Permit Boundary
PacifiCorp
Federal Coal Lease
U-06039
N



ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

RILDA CANYON RIGHT FORK COAL EXPLORATION 1999 RAPTOR NESTS

DRAWN BY:	K. LARSEN		
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DATE:	OCTOBER 20, 1999	SHEET 1 OF 1	REV.

PFO

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

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Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

November 27, 2001

Chuck Semborski, Environmental Supervisor
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Re: Exploration of lease ML-48258, PacifiCorp, Deer Creek Mine, C/015/018-EX01J, Outgoing File

Dear Mr. Semborski:

The Division received an application to drill eight holes within lease ML-48258 on November 21, 2001. We anticipate completing this review by December 21, 2001. Steve Demczak has been assigned as the Lead on this project. A copy is being forwarded to the U.S. Forest Service for their review and concurrence.

If you have any question, please call Steve at (435)-613-5242 or me at (801) 538-5268.

Sincerely,

Pamela Grubaugh-Littig
Permit Supervisor

sm
cc: Joe Wilcox, OSM w/o
Richard Manus, BLM w/o
Elaine Zieroth, USFS w/application
Steve Boyden, SITLA wo
Mark Page, Water Rights w/o
Dave Ariotti, DEQ w/o
Derris Jones, DWR w/o
Price Field Office w/o
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Outgoing
015/018

MILL FORK CANYON
HELICOPTER DRILLING APPLICATION
UTAH STATE COAL LEASE ML-48258

APRIL 2000

C/O Interwest Mining Company
(Managing Agent)

PACIFICORP

Energy West Mining Company
(Mine Operator)

ENERGY WEST Mining Co.

MILL FORK CANYON
HELICOPTER DRILLING APPLICATION
UTAH STATE COAL LEASE ML-482589

APRIL 2000

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LIST OF MAPS

PACIFICORP
MILL FORK CANYON
2000 HELICOPTER DRILLING PLAN

INTRODUCTION:

PacifiCorp proposes to drill one (1) coal exploration hole in the Mill Fork Canyon. The purpose for drilling is to assess coal characteristics and seam thickness. The hole will be drilled using a helicopter transported drill rig in accordance with the following plan. Less than 250 tons of coal will be removed.

LOCATION AND DEPTH OF PROPOSED DRILL HOLE:

One (1) potential drill site is indicated on the accompanying drawings. The approximate location, depth and elevation of the hole is as follows:

HOLE NUMBER	LOCATION	ELEVATION (Feet)	DEPTH	SURFACE OWNERSHIP	COAL OWNERSHIP
MLF-1	100' North, 1305' West of the SE Corner of Sec. 12, T. 16S, R. 6E.	8640	850	USFS	State Coal Lease ML-48258

In accordance with Federal Regulations 43 CFR 3482.1 (a), 30 CFR 772.11 and State of Utah R645 Coal Mining Rules, the following is submitted:

APPLICANT:

PacifiCorp
One Utah Center
201 South Main, Suite 2100
Salt Lake City, Utah 84140-0021
(801)220-2000

OPERATOR:

Energy West Mining Company
15 North Main Street
Huntington, Utah 84528
(801)687-9821

PACIFICORP
MILL FORK CANYON
2000 HELICOPTER DRILLING PLAN

RESPONSIBLE REPRESENTATIVE:

Charles Semborski or Ken Fleck
Energy West Mining Company
15 North Main Street
Huntington, Utah 84528
(801)687-9821

PROJECT STARTUP DATE: July 15, 2000

PROJECT COMPLETION DATE: September 15, 2000

PROPOSED EXPLORATION AREA:

The proposed drill hole is located within the current Utah State Coal Lease ML-48258, in Section 12, Township 16 South, Range 6 East, Salt Lake Base and Meridian. The drilling will occur on lands in which the surface is administered by the United States Forest Service (USFS) and the subsurface by the State of Utah [The reviewer is referred to the accompanying maps titled Mill Fork Canyon - 2000 Helicopter Exploration Drilling, Surface Ownership Map, Coal Ownership Map].

The proposed hole will be drilled in Mill Fork Canyon, a tributary to Huntington Canyon, in Emery County, Utah. The proposed site is situated on the existing trail (U.S. Forest Service 171 391) located in the canyon bottom of Mill Fork. The drill site is located in the upper Blackhawk Formation with an estimated elevation of 8640 feet.

VEGETATION and WILDLIFE:

The vegetation in the area consists of a Cottonwood/Aspen/Fir/Dogwood community in the bottom of the canyon and Spruce-Fir Coniferous Forest inter-mixed with Salina Wildrye/Mountain Mahogany on the south side slope and Salina Wildrye/Mountain Mahogany/Pinyon-Juniper on the north slope. The primary land uses associated with the area are wildlife habitat and livestock grazing and recreation. The area is presently classified for the following wildlife uses by the Utah Division of Wildlife Resources (DWR):

Mule Deer	High Priority Summer Range
Elk	Critical Winter Range and High Priority Summer Range

The proposed drilling is not expected to have a detrimental impact on any of these species, their habitat or other land uses associated with the area.

Surveys for Threatened, Endangered and Sensitive (TES) plant and animal species have been conducted in connection with various projects in this area of Rilda Canyon (Surface Facilities, Permit Extension and Powerline) and the Mill Fork coal leasing process. Results of these surveys have been provided to the various regulatory agencies in the applications for the projects. No TES plants and animals have been found in the area of the proposed drill hole. Based upon the 1999 raptor survey completed with DWR, the proposed activity is located within the ½ mile buffer zone of the nest 78 located in Mill Fork Canyon. As documented in the 1999 survey, nest 78 was inactive. Raptor activity in Mill Fork Canyon will be evaluated during the 2000 survey scheduled for May 2000. PacifiCorp proposes to commence drilling operations after the July 15 raptor nesting season deadline.

ARCHEOLOGICAL INFORMATION:

The proposed location is along the existing trail (U.S. Forest Service 171 391) located in Mill Fork Canyon. No construction or excavation is necessary utilizing helicopter supported drilling techniques.

EXPLORATION METHODS:

Pre-Work Meeting:
A pre-work meeting including the responsible company representatives, contractors, State of Utah Institutional Trust Lands Administration, and the Forest Service will be conducted at the project location prior to commencement of operations.

Road Use Permit:
The Forest Service will be notified 48 hours in advance that heavy equipment will be moved onto National Forest System lands and that surface disturbing activities will commence.

Mill Fork Canyon (U.S. Forest Development Road #245): Prior to drilling, Energy West will obtain a permit from the U.S. Forest Service for the helicopter staging area located at the end of U.S. Forest Service Road #245 in Section 17, Township 16 South, Range 7 East.

PACIFICORP
MILL FORK CANYON
2000 HELICOPTER DRILLING PLAN

Fire Suppression Equipment:
All gasoline and diesel powered equipment will be equipped with effective mufflers or spark arresters which meet applicable Forest Service specifications. Fire suppression equipment will be available to all personnel working at the project site. Equipment will include at least one hand tool per crew member consisting of shovels and pulaskis and one properly rated fire extinguisher per vehicle and/or combustion engine.

Drill Hole Access and Pad Construction:
No access road or pad construction will be necessary for the proposed project. Drilling equipment and materials will be transported to the drill site by helicopter. Personnel will access the site by vehicle via existing roads and on foot. The drill site is relatively level (10 percent or less slope); therefore, minimal site preparation will be necessary. Vegetation, in the form of trees, grasses, forbes and sparse, low shrubs, will not be removed. However, it may be necessary to remove dead-fall and some "taller" shrubs (mahogany, etc.). This will be minimized and accomplished using hand tools. The dead-fall will be replaced upon completion of drilling. An area no larger than approximately 40' by 40' will be occupied at the drill site. Leveling of drilling equipment will be accomplished using hand tools and supports (wood blocks, etc.) transported to the site by helicopter. All materials, tools and equipment will be removed upon completion of drilling and reclamation activities.

Water Requirements & Rights:
Water will be pumped directly from Mill Fork Creek. A gasoline/diesel powered water pump will be stationed near the creek and water will be pumped to water tanks located at the drill site.

The amount of water required for the project is estimated at 20,000 gallons per hole. Therefore, the maximum total quantity of water to be used is estimated at approximately 20,000 gallons (0.06 acre feet). A *Temporary Exchange Application* will be filed and approved with the State of Utah, Division of Water Rights prior to commencement of operations.

Drill Methods & Procedures:
A three inch maximum diameter hole will be core or rotary drilled the entire length to the approximate depth stated previously. Drilling depth will be sufficient to accomplish penetration through both the Blind Canyon and Hiawatha coal seams. The drilling will be done by a drilling contractor experienced in helicopter supported drilling. The drill is a diesel powered rotary drill rig mounted on 4' x 8' skids. Drilling will utilize water and, as necessary, a biodegradable polymer drilling "mud" such as MINEX 1330 (see attached MSDS). The water will be obtained from Mill Fork Creek.

PACIFICORP
MILL FORK CANYON
2000 HELICOPTER DRILLING PLAN

The following support equipment will be required:

3 pickup trucks - stationed at the staging area

The drill rig components and associated materials, tools and equipment will be transported by truck to the helicopter staging area indicated on the accompanying map. The tools and materials necessary for site preparation will be transported to the drill site by helicopter. Site preparation will include removal of dead-fall and brush as necessary and installation of silt fence material on the down-slope sides of the site. Minor digging, using hand tools, may be necessary at some locations to achieve effective installation of the silt fence and placement of the leveling support materials (wood blocks, etc.). Brattice or other similar material will be placed on the ground beneath the drill rig which will be transported to the site by helicopter in several "lifts". The drill rig components will be assembled at the drill site, the rig will be leveled and other necessary materials will be flown to the site.

A 1" diameter high-pressure hose will be laid overland from the pump stations to the drill site. This will be accomplished by hand and/or helicopter. No clearing of vegetation will be necessary for placement of the water hose. Existing openings among the trees will be utilized. Additionally, no vegetation clearing will occur at the water tank/pump sites or the helicopter staging areas. Activities will be confined to the existing road in Mill Fork Canyon. The necessary approvals will be obtained from the U.S. Forest Service for activities associated with the respective roads.

During the drilling operation, water and drilling fluids will be recirculated to the extent possible. Any returned cuttings and other materials will be captured in a container at the drill site. The cuttings will be transported from the drill site to the staging area by helicopter and then by vehicle to the Deer Creek Waste Rock Site for disposal. Containment of possible fluid spills will be achieved through the use of brattice ground cover, silt fence, and if necessary, earthen berms. If spills occur, all affected materials will be removed from the site and disposed of at an approved location. If soil is removed during spill containment and clean-up, the site of removal will be recontoured and seeded with the approved seed mixture.

Fuel and/or lubricating oil containers not stored in a truck will be placed on brattice or other acceptable ground cover at a site located away from drainage channels and surrounded by silt fence, earthen berm or other acceptable containment structure. If spills occur, clean-up will be conducted as stated above.

Access by personnel associated with the drilling project will be via vehicle to Mill Fork Canyon and by foot to the drill site. Therefore, no additional access facilities will be constructed.

PACIFICORP
MILL FORK CANYON
2000 HELICOPTER DRILLING PLAN

As previously discussed, a 3" maximum diameter hole will be core or rotary drilled for the entire depth of the hole. The hole will penetrate through both the Blind Canyon and Hiawatha coal seams. This will result in approximately a maximum of 100 pounds of coal being removed. The core and/or cuttings will be examined to determine coal seam characteristics. The drill rig and all associated equipment and materials will be removed by helicopter.

Hole Abandonment:
Groundwater is not anticipated to be encountered; therefore, the proposed hole will not be retained as water monitoring well. However, if groundwater is present, it will be reported to the appropriate agencies (SITLA, USFS) and a determination will be made regarding the transfer and modification of the drill hole to a monitoring well.

Upon completion of down-hole procedures, the drill hole will be completely sealed with cement from the bottom of the hole to ground level. The cement slurry mixture used to plug and seal the hole will be mixed in compliance with standard cement mixing tables (e.g. Halliburton). Any variance from this procedure will be approved in advance by the SITLA.

Drill Site and Pump Station Reclamation:
Following completion of drilling and plugging activities and removal of all materials and equipment from the drill site, the site will be reclaimed. If soil disturbance has occurred, the areas will be repaired and recontoured using hand tools.

The areas will then be reseeded using the following certified seed mixture or a mixture stipulated by the Forest Service.

Species	lbs/acre (PLS)
Intermediate Wheatgrass - *Agropyron intermedium*	3
Slender Wheatgrass - *A. trachycaulum*	3
Orchard Grass - *Dactylis glomerata*	2
Western Wheat Grass - *A. smithii*	2
Smooth Brome - *Bromus inermus*	3
Ladak Alfalfa - *Medicago sativa ladak*	1
Yellow Sweet Clover - *Meliotus officinalis*	1
Small Burnett - *Sanguisorba minor*	1
Perennial Ryegrass - *Lolium perenne*	1

The seed mixture will be hand broadcast using a hurricane spreader and the area will be hand raked following seeding to cover the seed. Following seeding, any dead-fall that was removed from the drill site will be replaced.

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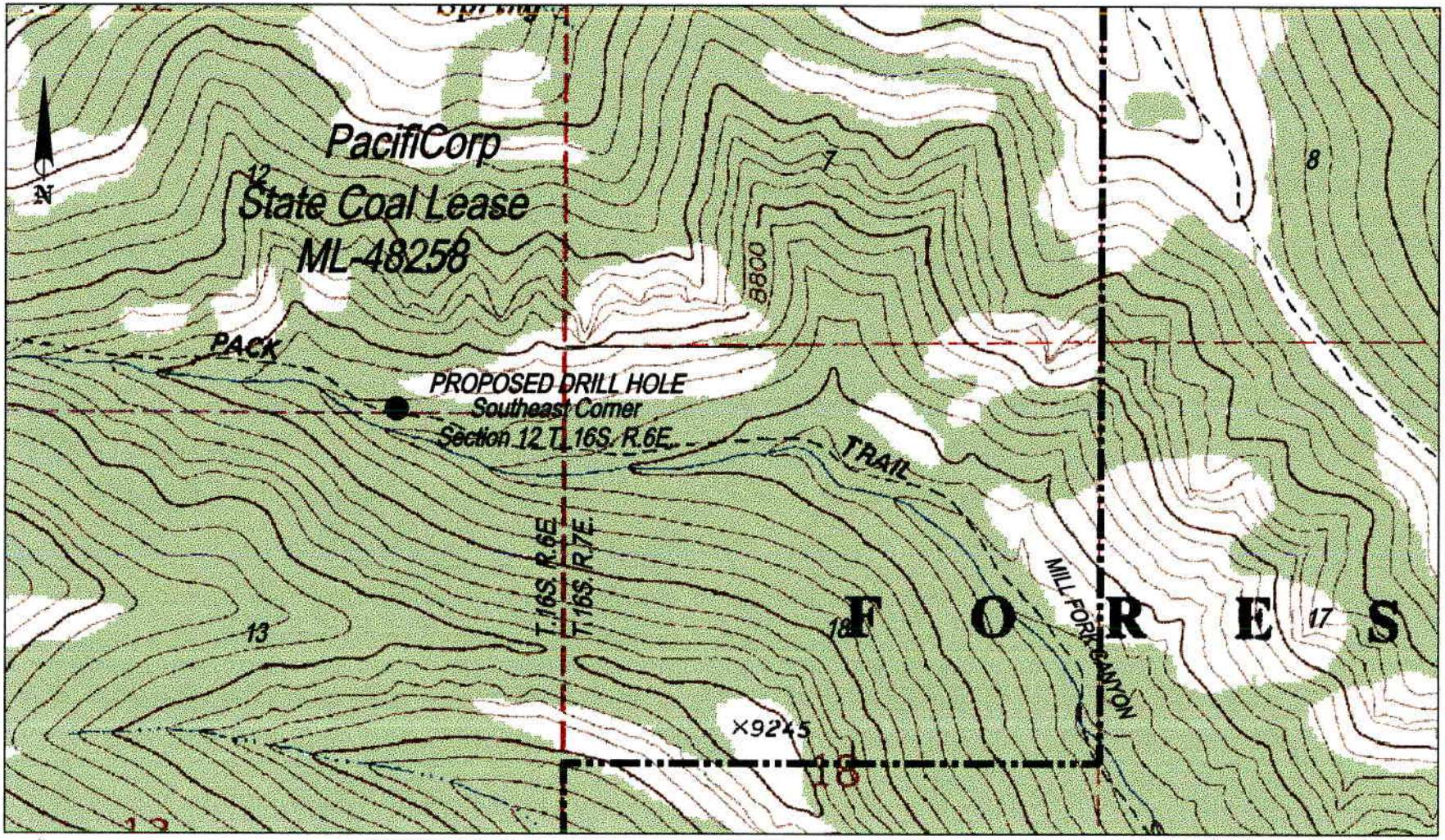
MILL FORK CANYON
2000 HELICOPTER DRILLING PLAN

Following completion of drilling, the drill rig and all associated equipment and materials will be removed by helicopter to the helicopter staging area and transported from the area by vehicle. The water hose, tanks and pumping station and all associated materials and equipment will be removed. All trash and extraneous materials will be removed from the US Forest Service property and disposed of at an approved location.

It is anticipated that all drilling and reclamation activities associated with this project will be completed within 15 days following the date of implementation.



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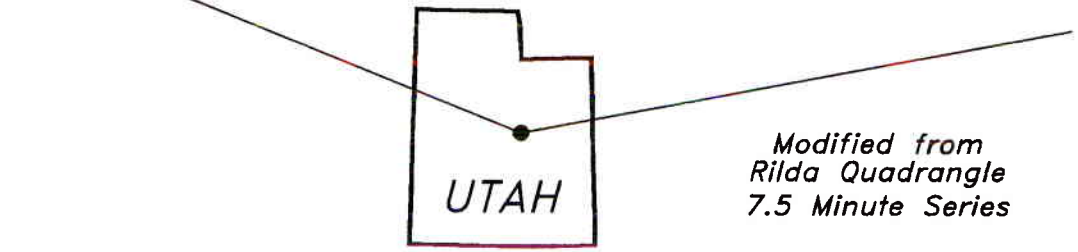
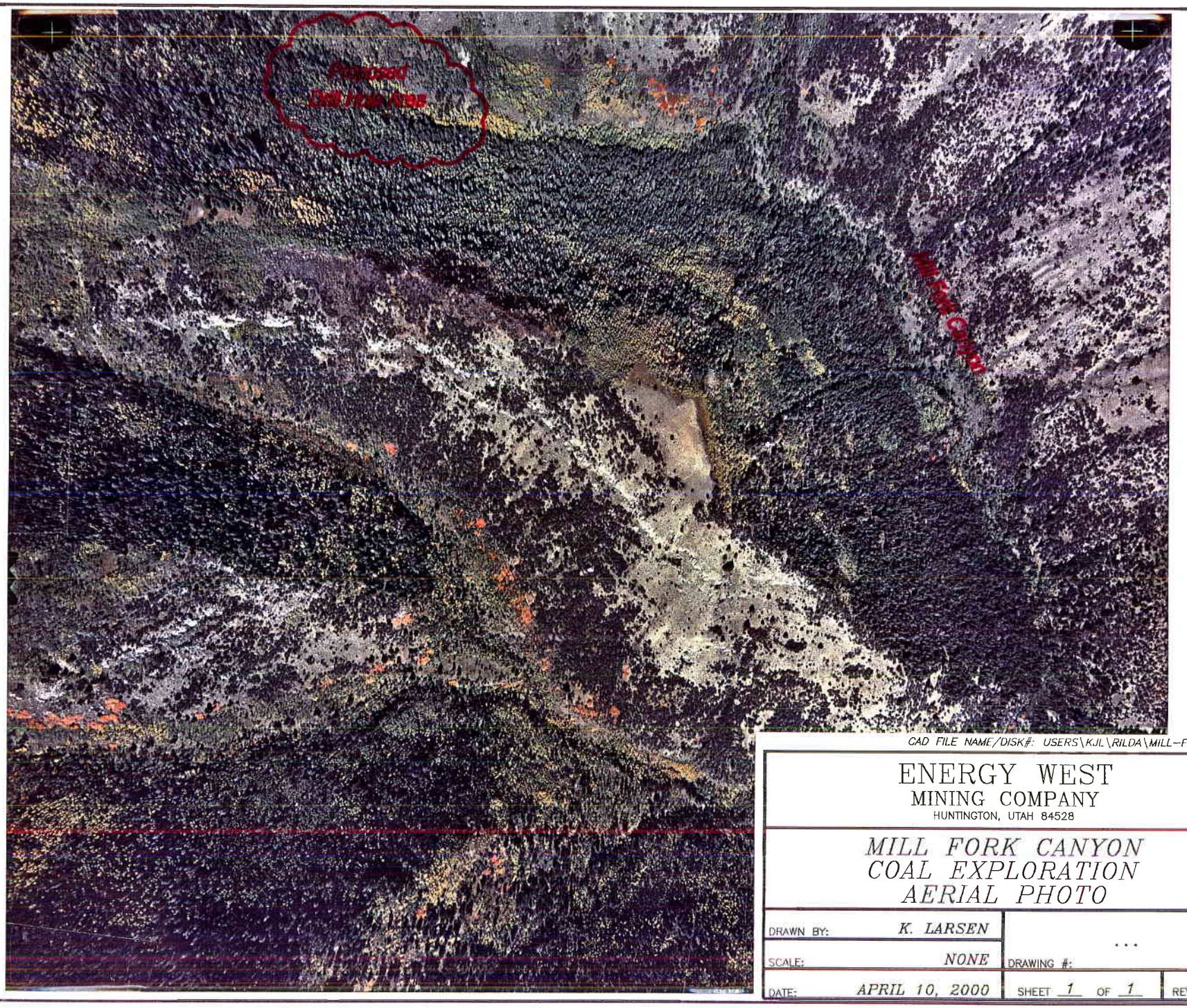


Modified from
Rilda Quadrangle
7.5 Minute Series

ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

MILL FORK CANYON
COAL EXPLORATION
GENERAL LOCATION MAP

DRAWN BY:	K. LARSEN		
SCALE:	NONE	DRAWING #:	...
DATE:	APRIL 12, 2000	SHEET 1 OF 1	REV. ___



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ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

MILL FORK CANYON
COAL EXPLORATION
AERIAL PHOTO

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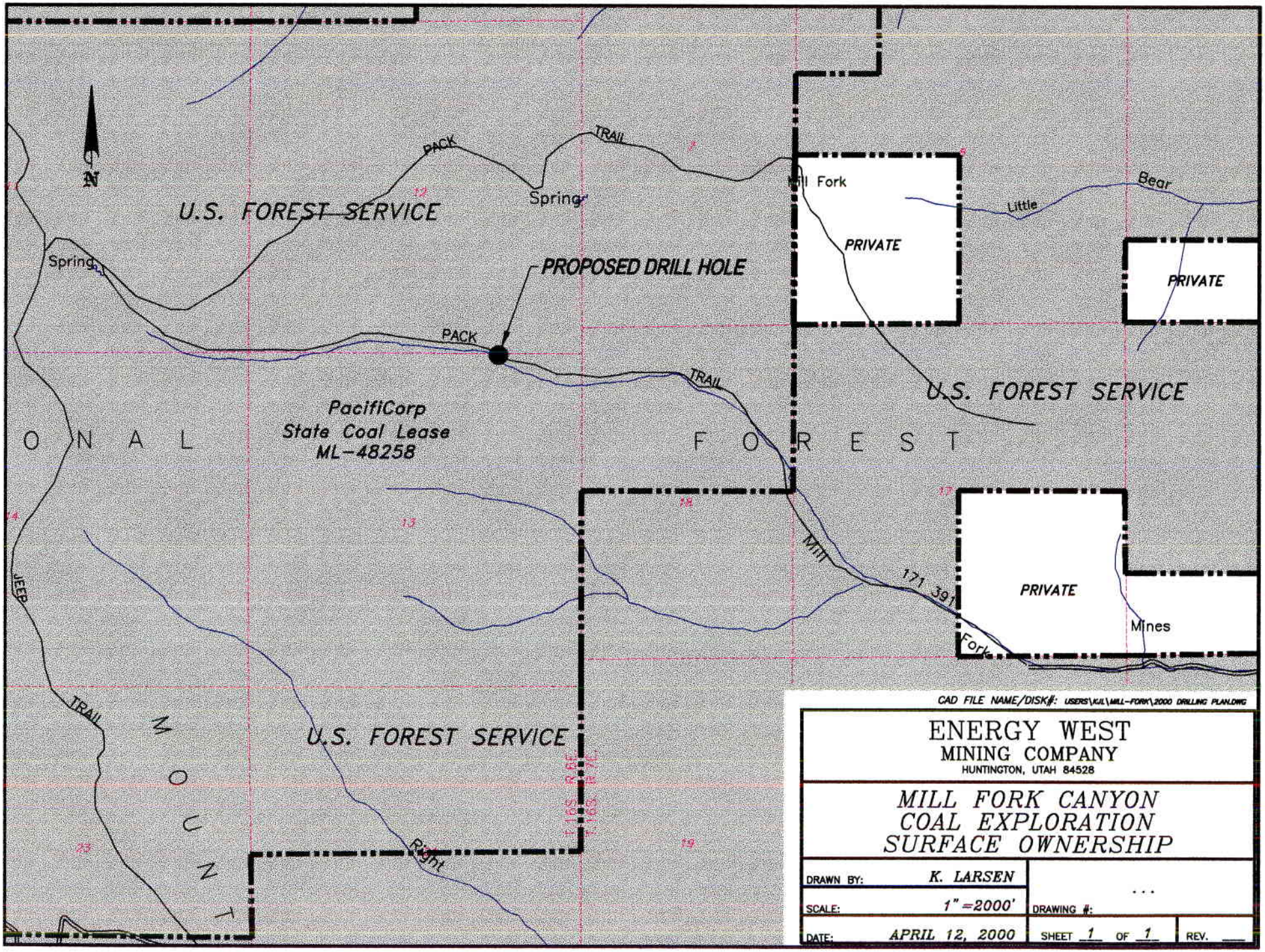
DATE:	APRIL 10, 2000	SHEET 1 OF 1	REV. ___



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ENERGY WEST MINING COMPANY

HUNTINGTON, UTAH 84528

MILL FORK CANYON COAL EXPLORATION SURFACE OWNERSHIP

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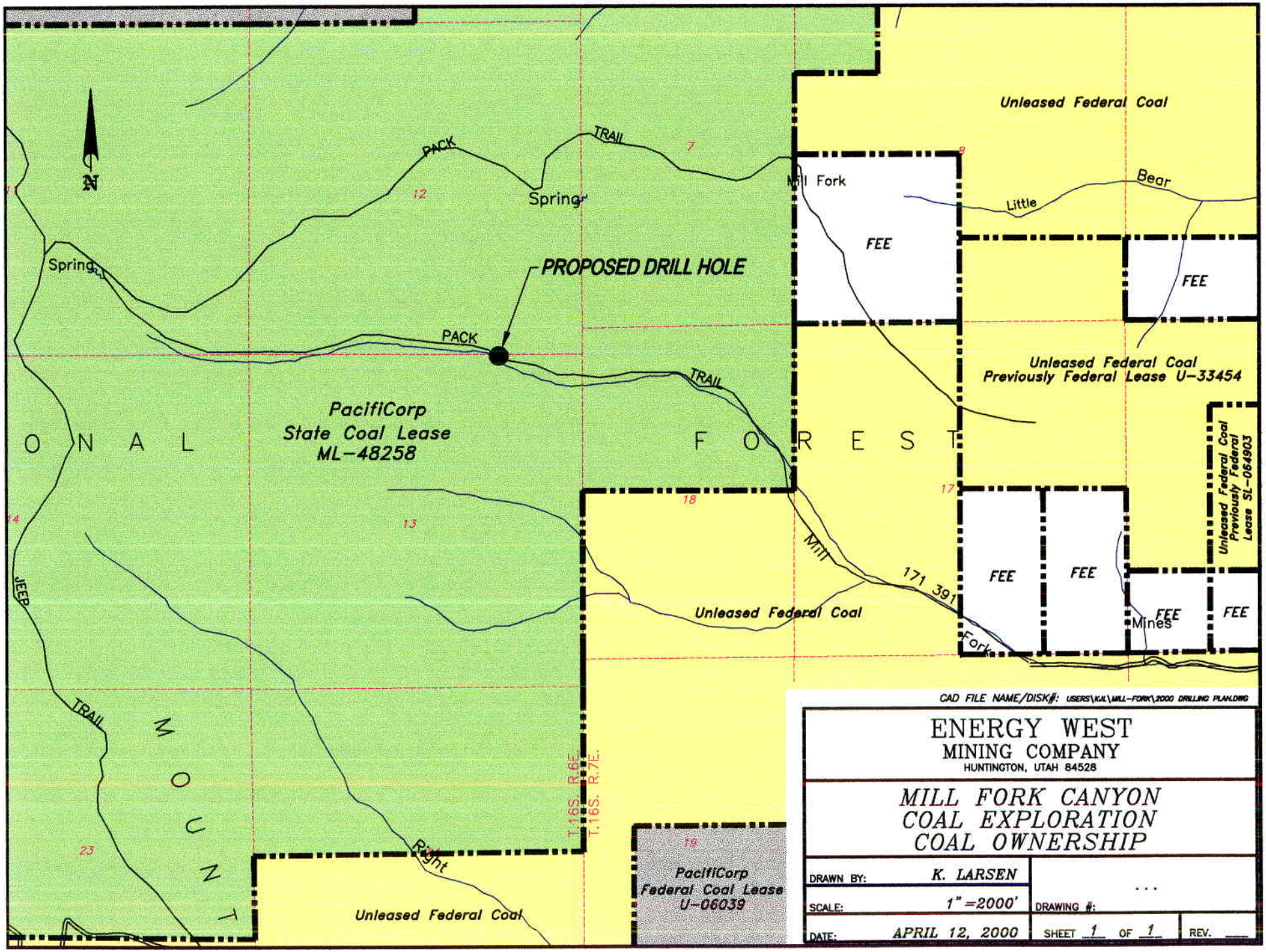

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MINING COMPANY
HUNTINGTON, UTAH 84528

MILL FORK CANYON
COAL EXPLORATION
COAL OWNERSHIP

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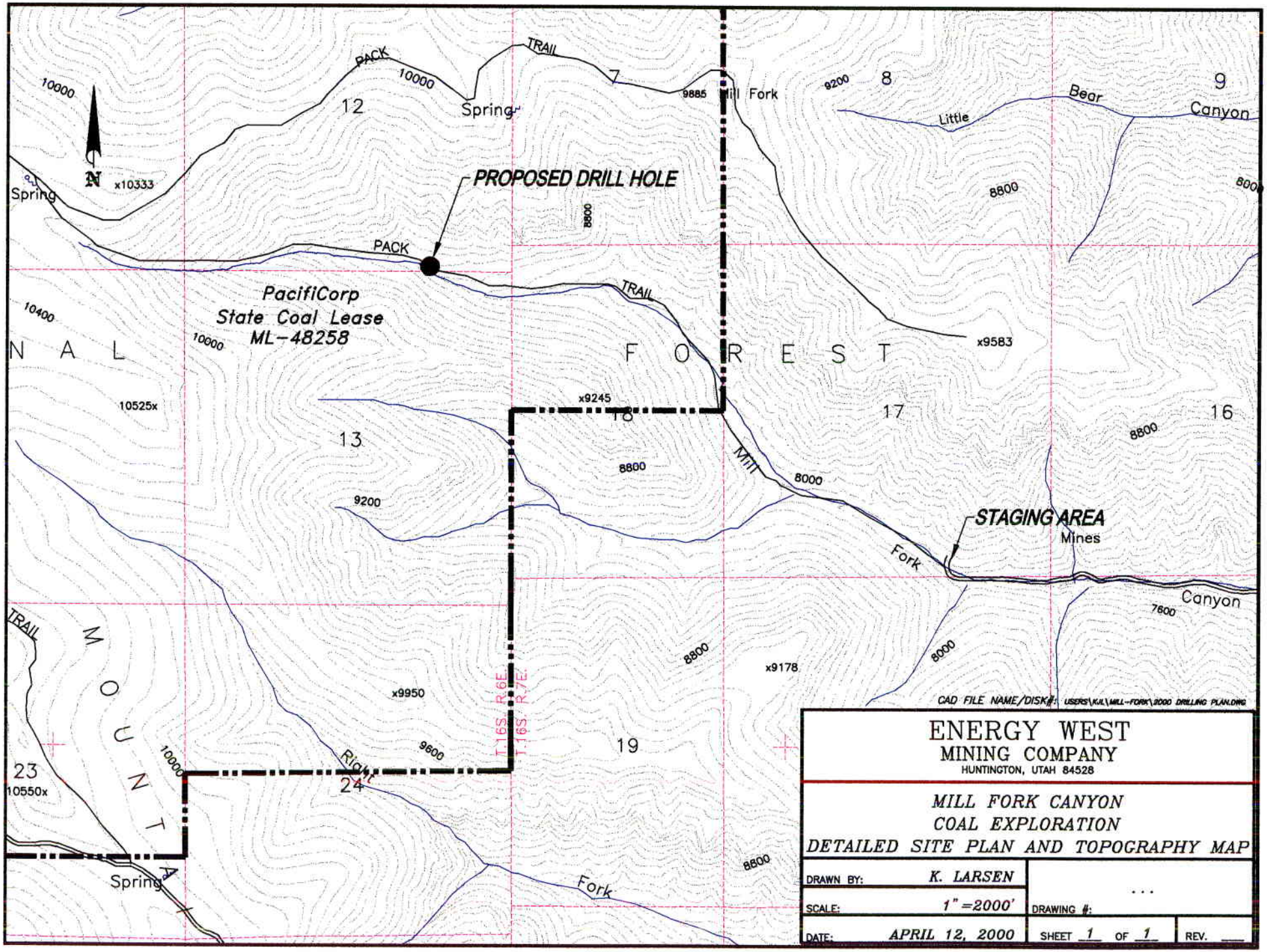
PROPOSED DRILL HOLE
PacifiCorp
State Coal Lease
ML-48258
STAGING AREA
Mines
Mill Fork
Little Bear Canyon
Fork Canyon
Right Fork
Spring
TRAIL
PACK
NATIONAL FOREST
MOUNTAIN
T.16S. R.6E.
T.16S. R.7E.
12
7
8
9
13
18
17
16
19
23
24
10000
10400
10525x
10550x
9885
9200
8800
8000
7600
9600
x10333
x9583
x9245
x9178
x9950
CAD FILE NAME/DISK#: USERS\KJL\MILL-FORK\2000 DRILLING PLAN.DWG
ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528
MILL FORK CANYON
COAL EXPLORATION
DETAILED SITE PLAN AND TOPOGRAPHY MAP
DRAWN BY: K. LARSEN
SCALE: 1" =2000'
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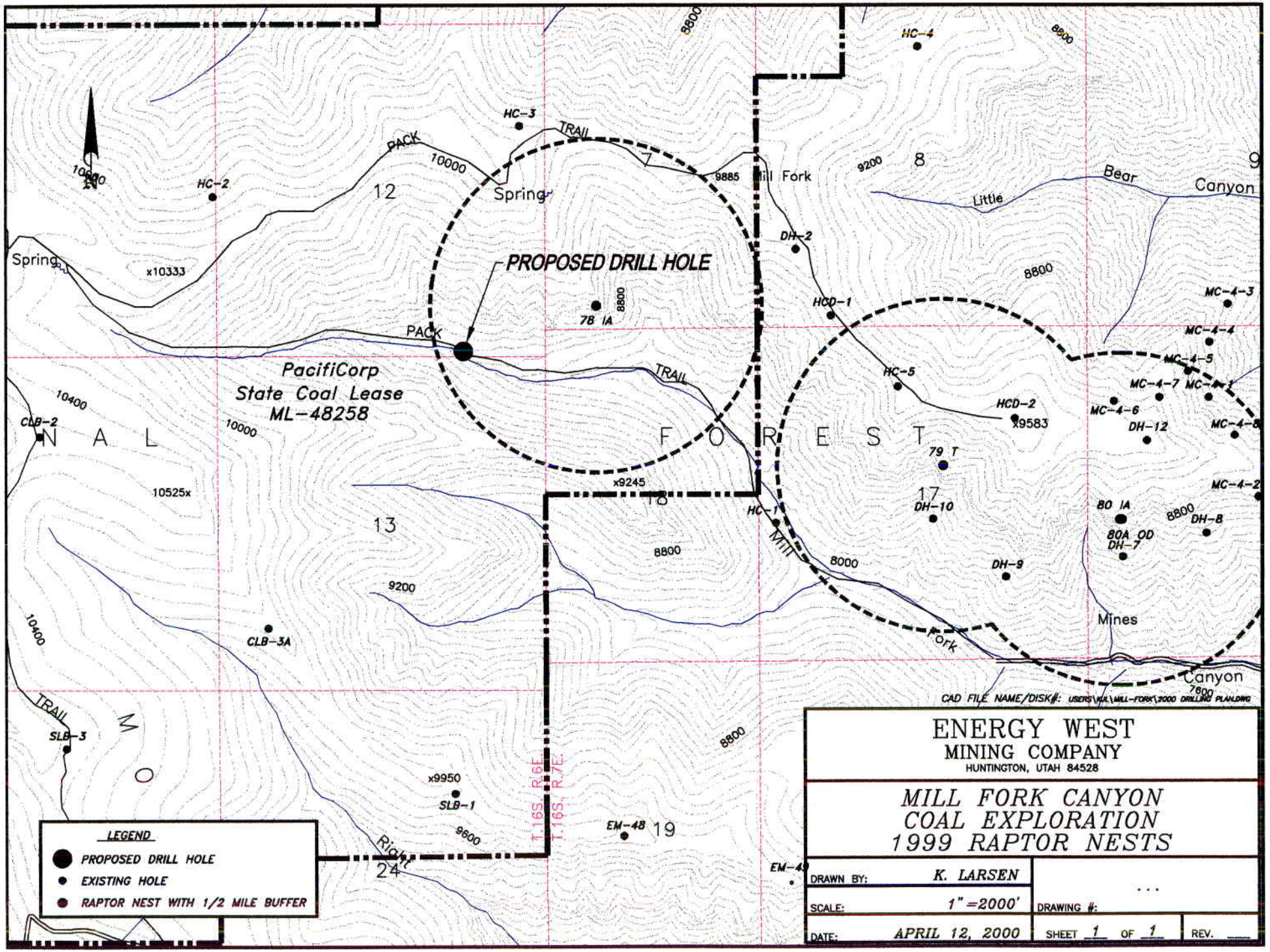
DATE: APRIL 12, 2000
SHEET 1 OF 1
REV.


PROPOSED DRILL HOLE
PacifiCorp
State Coal Lease
ML-48258
HC-1
HC-2
HC-3
HC-4
HC-5
HCD-1
HCD-2
DH-2
DH-7
DH-8
DH-9
DH-10
DH-12
MC-4-1
MC-4-2
MC-4-3
MC-4-4
MC-4-5
MC-4-6
MC-4-7
MC-4-8
CLB-2
CLB-3A
SLB-1
SLB-3
EM-48
EM-49
78 IA
79 T
80 IA
80A OD
9885
x10333
x9583
x9245
x9950
10525x
TRAIL
PACK
Spring
Mill Fork
Little
Bear
Canyon
Fork
Mines
FOREST
NAL
MO
T.16S., R.6E.
T.16S., R.7E.
12
13
17
18
19
24
LEGEND
PROPOSED DRILL HOLE
EXISTING HOLE
RAPTOR NEST WITH 1/2 MILE BUFFER
CAD FILE NAME/DISK#: USERS\KL\MILL-FORK\2000 DRILLING PLAN.DWG
ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528
MILL FORK CANYON
COAL EXPLORATION
1999 RAPTOR NESTS
DRAWN BY: K. LARSEN
SCALE: 1" =2000'
DRAWING #: ...
DATE: APRIL 12, 2000
SHEET 1 OF 1
REV. ___

APPENDIX III

GROUNDWATER HYDROLOGY SECTION

HYDROLOGY

Since 1979 UP&L has been collecting data regarding the hydrology of the permit area and surrounding vicinity including quantity and quality of both ground and surface water (see Map HM-1). This data collection program is part of a hydrologic monitoring program which has been approved by the Utah State Division of Oil, Gas and Mining and the Office of Surface Mining.

All data collected has been and will continue to be submitted to the Office of Surface Mining; the Utah State Division of Oil, Gas and Mining; the U.S. Forest Service; and the Bureau of Land Management each year in the Annual Hydrologic Monitoring reports. Described below in the order of the following outline are the conditions observed and the ongoing monitoring of the hydrology.

HYDROLOGIC OUTLINE

I. Groundwater
   - A. Groundwater Recharge
   - B. Aquifer Description by Formation
   - C. Structural Hydrologic Features
   - D. Alluvial Aquifers
   - E. East Mountain Springs
   - F. In-Mine Quality
   - G. Mine Discharge

II. Surface
   - A. Huntington Creek Drainage
     1. Huntington Creek
     2. Deer Creek

I. GROUNDWATER

A. GROUNDWATER RECHARGE

The majority of the groundwater recharge on East Mountain comes from the winter snowpack which melts and infiltrates the surface of East Mountain. The water flows down vertical fractures which intersect sandstone channel systems in the North Horn and Blackhawk formations. The majority of the groundwater reaching this point intersects the surface in springs located in the North Horn Formation. Very little recharge intersects the Price River Formation and Castlegate Sandstones; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it

intersects the northeast trending Roans Canyon Fault Graben. In-mine long-hole drilling completed to test the hydrology of this fault system has shown that the system acts as an imperfect aquiclude to further southeast migration of water. The system acts as an aquiclude because swelling bentonitic clays along the fault prohibit most of the water from penetrating across the fault. Most of the recharge south of the Roans Canyon Fault System comes from the snow melt directly above. The same mode of water migration occurs there as to the north; but, when the water intersects the sandstone channels, it migrates toward the canyohs which surround and disect the permit area.

B. AQUIFER DESCRIPTION BY FORMATION

Data has been collected from numerous coal exploration drill holes, from within the mine workings, from surface drainages, and from the springs in the area. The data have not identified any laterally continuous aquifers present throughout the area but have identified localized perched water tables in the North Horn and Blackhawk formations. Stratigraphy is the main controlling factor restricting groundwater movement and development of regional and perched aquifer systems within the East Mountain property. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow (see Figure HF-1).

FLAGSTAFF LIMESTONE

An erosional remnant of Flagstaff Limestone 150 feet in thickness caps the upper portions of East Mountain. This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation.

NORTH HORN FORMATION

The North Horn Formation is a lacustrine sequence 750 feet in thickness. This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper portion of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified, and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two-thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Price River Formation or Castlegate Sandstone below. The mudstones present appear to swell when they come in contact

with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives UP&L the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the water-bearing strata in the North Horn Formation.

PRICE RIVER FORMATION

The Price River Formation is a braided stream deposit 300 feet in thickness. It is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally void of water because it lacks adequate recharge.

CASTLEGATE SANDSTONE

The Castlegate Sandstone is 350 feet in thickness and consists of successive sequences of point bar deposits. Generally the sandstone is medium- to fine-grained, but occasionally pebble conglomerates are present near the base of some sequences. The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water-saturated. It is oftentimes dry or slightly damp in some zones. It is void of significant water because it lacks adequate recharge.

BLACKHAWK FORMATION

The Blackhawk Formation contains the economic coal deposits within East Mountain. The formation is 750 feet in thickness and consists of mudstones, sandstones, interbedded mudstone and sandstone, and coal. The coal deposits are located in the lower 120 feet of the Formation. The Blind Canyon Seam, which is the upper coal seam, is situated seventy (70) feet above the base of the Blackhawk Formation. The lowest coal seam present on the property is the Hiawatha Seam, which immediately overlies the Starpoint Sandstone.

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata (refer to maps HM-2 and HM-3). The locations of the channels shown on maps HM-2 and HM-3, are based on data collected from in-mine mapping and numerous

drill holes, both in-mine and surface, that have been completed on the property. These channel systems were part of a deltaic depositional setting active during and after the coal-forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine- to medium-grained sand with similar characteristics to the Starpoint Sandstone. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., mudstone, carbonaceous mudstone, and interbedded material) generally act as aquicludes which impede water flow unless fracturing or faulting of the units has induced secondary permeability.

The majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes (see Figure HF-2). Since 1978, the water flowing into the mine workings has been measured. The measurement locations in the Deer Creek Mine are shown on Map HM-2, Wilberg/ Cottonwood Mine locations on Map HM-3. Many locations within the mines have been monitored in the past, but a limited number of accessible long-term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines such as retreated longwall panels water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past. UP&L commits to measuring long-term area specific changes in discharge where possible. If a situation develops where post-mining dewatering can be accurately measured over a long period of time, UP&L will collect data regarding aquifer dewatering rates to further understand mining effects on the groundwater system. One possible location which is applicable to both the Deer Creek and Cottonwood mines is shown on Map HM-2.

The most accurate measurement of water flowing into the mine workings is achieved by measuring the total water leaving the mine, which is done and reported annually in the Hydrologic Monitoring Report. The total amount of water leaving the mine includes metered discharge water as well as estimated water which evaporates from the mine workings.

Based on current data, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an

effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. Of the water-producing areas, those closest to the active mining face exhibit the greatest flows. As mining advances the area adjacent to the active face continues to be excessively wet, and previously mined wet areas experience a decrease in flow. It appears that the water source is being dewatered since excavated areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. Very few springs are found within the Blackhawk along the extensive faults in the Wasatch Plateau. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine -- along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. Apparently, fractures seal readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

The coal seams in the Blackhawk Formation are impermeable and are not water-saturated.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant (see Figure HF-2) and include (1) structural rolls with overlying fluvial channels, (2) Pleasant Valley and Roans Canyon Fault systems, (3) fractures and joints (lineaments), and (4) surface and in-mine drill holes.

STARPOINT SANDSTONE

The Starpoint Sandstone overlies and intertongues with the Masuk Shale. The formation is approximately 150 to 200 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Starpoint Sandstone due to the interfingering nature of the contact between the two units.

The Starpoint Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicated that the Starpoint Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Starpoint is where it has been intersected by the major canyons in the plateau. Drill holes completed in the Deer Creek Mine defined the piezometric gradient in the lower Blackhawk Starpoint

System and confirmed the groundwater flow to conform with the topographic relief (see Figure HF-3). This, plus the fact that the Starpoint is only slightly to moderately permeable, allows only limited flow of groundwater through the formation.

C. STRUCTURAL HYDROLOGIC FEATURES

Three important structural hydrologic features have been identified within the East Mountain permit area. They are the Roans Canyon Fault Graben, Straight Canyon Syncline, and the Deer Creek Fault (see Map HM-1).

The Roans Canyon Fault Graben separates reserves currently being mined from future reserves. In order to access coal reserves from the northern third of the property, the Deer Creek Mine Plan includes a fault crossing to be completed during 1989-90.

A hydrogeologic investigation of the Roans Canyon Fault Graben was completed during 1988 in order to develop plans for management of groundwater inflow during and after the construction of three parallel rock tunnels. The fault crossing is located in the Third North section of the Deer Creek Mine (see Map HM-4). In order to conduct the investigation five (5) test wells were developed. Selected intervals in the boreholes were tested for hydraulic properties with straddle packers. In addition, three (3) short-term and one long-term constant rate flow tests were performed to measure aquifer parameters. The packer test and flow and recovery test data were analyzed to determine static pressures and

gradients through the fault system and to determine transmissivity, hydraulic conductivity, and storage coefficient for each zone tested.

The investigation defined two major hydrogeologic units which are fractured, well-sorted, medium-grained, friable, oxidized channel sandstones. The first sandstone unit is located approximately 350 feet, the second about 650 feet, horizontally from the southern bounding fault (see Map HM-4). The sandstone units are likely of limited vertical thickness but may have more extensive lateral continuity. The two sandstones are heavily oxidized and iron-stained along fractures, and in places the sandstone is totally oxidized for several feet adjacent to the fracture. The oxidation, at a depth of 2000 feet below land surface, indicates that oxygenated water is infiltrating rapidly from the surface through the fractures, suggesting that there is good hydraulic connection between the channel sandstones at the depth of the rock tunnels and the recharge at the surface primarily through fractures.

Aquifer test results indicated the horizontal flow component is the result of flow in the graben from the west toward the east where the graben intercepts the canyon walls and, presumably, the groundwater system discharges. The vertical flow component is controlled by the Starpoint Sandstone which underlies the entire graben.

The groundwater flow in the graben occurs primarily in the fractures of the two major water-producing zones with

lesser flow quantities in the fractured siltstone units. Virtually no flow occurs in the mudstone between the siltstone and sandstone. The south boundary fault of the graben creates a hydrologic barrier to flow into the mine area south of the graben, whereas the north boundary fault does not have a thick fault gouge zone like the one associated with the southern fault; but, from drilling observations, it is also suspected to be a barrier to groundwater flow.

The data collected during the investigation and subsequent modeling prove the initial flow rates and total quantity produced from one of the water-producing zones in the first month to be substantial. It was therefore recommended that a dewatering and grouting program be instituted to reduce the amount of water encountered during slope development and the increase in effective stress in the rock mass related to a decrease in fluid pressure before the working face reaches the dewatered area. Predicted tunnel inflow rates, without grouting and the dewatering employed, are given in the following table.

Predicted Tunnel Inflow Rates

Time (days)	With Dewatering (gpd)	(gpm)
0.01	342,000	238
0.05	286,660	199
0.10	272,540	189
0.37	267,160	186
0.50	267,140	179
0.75	250,610	174
1.00	247,940	172
5.00	240,560	167
10.00	239,880	167
16.00	239,880	167
23.00	238,810	166
31.00	239,800	167
100.00	239,800	167

It is UP&L's intent to utilize a pressure grout program to minimize the long-term groundwater inflow from the water-producing zones encountered during slope development. The grouting program will consist of drilling a series of boreholes prior to water-producing zone interception and forcing fast-setting grout material into the fractures. In zones other than the two major water-producing areas grouting will be done if the groundwater inflow exceeds 50 gpm. Past experience with pressure grouting indicates that as much as seventy-five to ninety-five percent (75-95%) of the groundwater inflow can be effectively stopped. The table below compares the predicted tunnel inflow rates with dewatering and pressure grouting.

PREDICTED TUNNEL INFLOW RATES
PRESSURE GROUT EFFECTIVENESS

Time	With Dewatering		50%		75%		95%	
Days	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)
0.01	342,000	238	171,000	119	85,500	60	17,100	12
0.05	286,660	199	143,330	100	71,665	50	14,333	10
0.10	272,540	189	136,270	95	68,135	47	13,627	9
0.37	267,140	186	133,570	93	66,785	47	13,357	9
0.50	250,610	179	125,305	90	62,653	45	12,531	9
0.75	247,940	174	123,970	87	61,985	44	12,397	9
1.00	240,560	172	120,280	86	60,140	43	12,028	9
5.00	239,880	167	119,940	84	59,970	42	11,994	8
10.00	238,880	167	119,440	84	59,720	42	11,944	8
16.00	238,810	167	119,405	84	59,703	42	11,941	8
23.00	238,810	166	119,405	83	59,703	42	11,941	8
31.00	238,810	167	119,405	84	59,703	42	11,941	8
100.00	238,810	167	119,405	84	59,703	42	11,941	8

One factor addressed during the dewatering and grouting evaluation was the influence of the tunnels and prior dewatering on the flow in the surface springs located in the vicinity of the Roans Canyon Fault Graben. A maximum

drawdown of approximately ten (10) feet at the surface of the graben was calculated using the groundwater model. Given the preexisting dominant vertical flow direction and the fact that the springs do not appear to be associated with aquifers of concern to this investigation, it is unlikely that the tunnels or the recommended dewatering systems would exert a measurable influence on the springs.

The Straight Canyon Syncline is the second structurally related hydrologic feature within the permit boundary. It parallels and lies adjacent to the Roans Canyon Fault Graben (see Map HM-1). Because the syncline forms a stratigraphic depression, groundwater is funneled into it and migrates to the southeast. Wet conditions have been experienced where mining has taken place in the base of the syncline. The significance of the Straight Canyon Syncline hydrologically is much less than that of the Roans Canyon Graben.

The third feature is the Deer Creek Fault. Mining in the Deer Creek and Wilberg mines to the west of the Deer Creek Fault had intersected wet strata while the Des-Bee-Dove Mine to the east had dry strata, indicating that the fault forms an aquiclude to water migration to the east.

D. ALLUVIAL AQUIFERS

No alluvial aquifers have been defined within the permit area; however, hydrologic investigation of Rilda Canyon will be conducted during 1989 and reported in the Annual Hydrologic Report. Alluvial aquifers are known to exist outside

the permitted area and include Huntington Canyon to the northeast and along Cottonwood Creek to the south.

E. EAST MOUNTAIN SPRINGS

A number of springs and seeps contribute to the surface water bodies on and adjacent to UP&L's East Mountain property. The majority of the springs on East Mountain occur in the North Horn Formation with the major flowing springs restricted to this formation (see Table HT-1 and Map HM-5). The North Horn Formation is composed of a sedimentary sequence of variegated shales, sandstone, conglomerates, and freshwater limestone. The variability of composition of this formation causes a variation in permeability as well.

The fractured nature of the Flagstaff allows for good vertical transport of water with little lateral movement resulting in the occurrence of few springs in that formation. The majority of water percolates through the Flagstaff to the North Horn Formation. When an impermeable zone is intersected during the water's vertical movement there, a lateral migration is promoted. If the ground surface is intersected by these waters, a spring is formed. This often is the case in the North Horn Formation where a large number of springs is to be found. Some portion of the water will make its way down to the Price River Formation where a few springs are present.

Between the time UP&L began monitoring springs on East Mountain and 1986 the number of springs measured increased from less than fifty (50) to nearly seventy (70). Because we

felt that more benefit could be realized by concentrating our monitoring on selective springs in the area that will be undermined within the next five years (see Map HM-5), a meeting was held on March 25, 1987 with the U.S. Forest Service and the Utah State Division of Oil, Gas and Mining to determine the most effective plan for UP&L's monitoring. A subsequent meeting was held on April 15, 1987 with the State Division of Oil, Gas and Mining to finalize the monitoring plan revisions.

During the meeting it was resolved that the following springs will be monitored (underlined in Table HT-1).

Alpine Spring	79-32
+*Burnt Tree Springs	79-34
+*Elk Springs	+*79-35
+*Sheba Springs	79-38
Ted's Tub	79-40
79-2	80-41
+*79-10	80-43
79-12	+*80-44
79-15	+*80-46
+*79-23	80-47
79-24	82-51
+*79-26	+*82-52
79-28	+*84-56
+*79-29	

+ Baseline analysis performed in 1986 and will be repeted every five years.

Of these springs twelve will be monitored on a monthly basis, weather permitting, and have been denoted on the above list with asterisks (*). The applicant agrees that each year a map showing the area to be mined within the next five years will be supplied in the Annual Hydrologic Monitoring report. A field verification meeting will be held each year to determine if changes in the springs monitored is required.

FLOW

The flow and sampling schedule is as follows. All springs listed above are measured during the months of July and October. In addition, a minimum of twelve (12) springs are monitored to establish a discharge recession curve. Generally, measurements are made on a monthly basis during the months of July through October if weather and reasonable access permit. But, when historical data indicate that a spring is short-lived, all efforts are made to measure discharge from that spring at least three times, equally spaced, within its flow period. Each year in the Annual Hydrologic Report spring flow rates are compared to East Mountain climatology as to how closely spring discharge follows local annual precipitation. This comparison is vital in determining mining effects on spring discharge versus general changes in annual precipitation.

QUALITY SAMPLES

All springs listed above are sampled for water quality characteristics during the months of July and October. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Operational Quality (see Hydrologic Monitoring Schedule included herein). Baseline analysis was conducted in 1986 on the recession study springs and will be repeted every five years. In addition, the twelve discharge recession springs denoted by asterisks in the above list will

be monitored monthly, access permitting, each year between July and October for the following parameters: (1) discharge quantity, (2) specific conductivity [field], (3) temperature [field], (4) pH [field], (5) total hardness, (6) carbonate, and (7) total manganese.

QUALITY

To more closely identify springs which are related one with another, water samples were analyzed to determine the percentage of cations and anions in solution. The percentages have been graphically represented as cation-anion diagrams (see Hydrologic Monitoring Report). The purpose of the cation-anion diagrams is to identify groups of related springs by water chemistry. The diagrams clearly show the similarity of water quality of springs originating in the same geologic formation. To better visualize the concept, the cation-anion diagrams are presented by the geologic formation in which they originate (see Hydrologic Monitoring Report).

A historical summary of the water quality analysis for a representative group of East Mountain Springs is presented in Table HT-2.

IN-MINE QUALITY

Due to the increased total dissolved solids (TDS) concentration, the quality of groundwater entering the East Mountain property generally decreases from the north to the south. Increased TDS concentration is mainly due to increased levels of calcium, bicarbonate, magnesium, and sul-

fate. The trend of increased TDS concentration from north to south has also been detected in springs which are located above the coal horizon. Changes in the dissolved solid concentrations from north to south could possibly indicate the direction to groundwater movement as indicated in the Probable Hydrologic Consequences section of the permit.

Average quality by location has remained relatively constant for each individual location (refer to 1988 Hydrologic Monitoring Report). Quality of all samples collected since 1977 is presented in Table HT-3. The samples reveal that the predominant dissolved chemical constituents are bicarbonate, calcium, magnesium, and sulfate, with minor amounts of chloride and sodium. These findings are similar to other studies conducted on the Wasatch Plateau Coal Field.

Collection procedures for groundwater quality consist of two grab samples collected and analyzed per quarter at each of the mines which produces measurable quantities of water. Sampling according to this established plan began in the first quarter of 1982. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Operational Quality except when new sites are established, in which case baseline information will be collected for two (2) years.

MINE DISCHARGE - DEER CREEK

Excess water not utilized in the mining operation or for domestic use was either pumped to storage areas or discharged from the mine. The locations of the main sump areas within the mine are shown in Figure HF-4. The largest

volume of water is stored in the western part of Main West, which has not been actively mined for several years.

In-line water meters are utilized to record the amount of water discharged from the mine, after which the water passes through an oil skimmer before being piped to UP&L's Huntington Power Plant. None of the discharge water leaving the mine enters any of the natural streams in the region but instead is used in the cooling towers at the power plant.

MINE DISCHARGE - WILBERG/COTTONWOOD

Water produced in the Wilberg Mine gravity flows to the northern area of 1st North. At that point a vertical turbine located in the Deer Creek Mine picks up the water and pumps it back to the south and down to the Wilberg Mine main sump (see Figure HF-5). This process is utilized to circumvent the area sealed due to the fire in 1984. The sump, which functions as a settling basin, effectively removes settleable solids from the water. A portion of the water is redistributed to various areas of the mine to be utilized in the mining operation. Excess water is discharged into the Left Fork of Grimes Wash after passing through an oil skimmer in accordance with stipulations of the Wilberg Mine Discharge Permit UT-0022896-01. Intermittent small quantity discharges have occurred at the Miller Canyon break-outs, developed for ventilation purposes but sealed in 1987. Discharge usually occurs during the months of June through November with a flow rate ranging from 5 to 25 GPM. Discharge from Miller Canyon is monitored in accordance with stipulations of the Wilberg Mine Discharge Permit UT-0022896-04. Unplanned discharge after mining will be monitored for compliance with all applicable state and federal water ~~quantity~~ quality regulations.

II. SURFACE WATERS

The surface drainage system on East Mountain is divided into two major drainages; the southwest portion forms part of the Cottonwood Creek drainage, and the northeast portion of East Mountain contributes to the Huntington Creek drainage (see Map HM-1). These drainage boundaries, including minor subdivisions to Cottonwood and Huntington creeks, are designated on Map . Both Huntington and Cottonwood creeks flow out of the Wasatch Plateau in a southeasterly direction. The creeks merge with Ferron Creek to form the San Rafael River, a tributary of the Green River.

A. HUNTINGTON CREEK DRAINAGE SYSTEM

1. HUNTINGTON CREEK

Huntington Creek is comprised of many smaller tributary streams that feed the main stream. Deer Creek and Meetinghouse Canyon creeks are the only tributaries to Huntington Creek that emanate from within UP&L's coal mine portal areas.

Huntington Creek flow data are recorded on a continuous basis by UP&L at two locations; one station is located near the Huntington Power Plant, the other below Electric Lake which is about twenty-two miles upstream from the Huntington Plant. Flow records are maintained by UP&L in order to determine water entitlements and reservoir storage allocation for the various users on the river.

The UP&L station near the plant was established in the fall of 1973. Prior flow records were obtained from the USGS station located about one mile downstream from UP&L's existing station. The USGS station was established in 1909 and was discontinued in 1970 after determination of available water supply for the Electric Lake Dam. The dam was completed in December 1973, and water storage commenced shortly afterward.

The calculated natural flow rates, which consider actual flow recorded at the plant, plant diversions, Electric Lake storage, and lake evaporation along with yearly comparisons, are reported annually in the Hydrologic Monitoring Report.

Huntington Creek water quality information is compiled on a monthly basis for stations above and below the Huntington Plant, while samples for Huntington Creek below Electric Lake and the Right Fork are taken quarterly. The location of water quality sampling stations on Huntington Creek that were considered for this report are listed below (refer to Map HM-1).

a. Below Electric Lake*

b. Above the Forks*

c. Below the Power Plant Diversion

d. Below the Power Plant

* Not listed on map due to scale

Specific water quality data as well as yearly comparisons are reported annually in the Hydrologic

Monitoring Report. This practice will continue throughout the life of the permit.

In general, the water shows a gradual increase in concentration of dissolved minerals as the flow proceeds down Huntington Canyon.

The values at the station below Electric Lake do not express the actual natural drainage water quality characteristics because of the lake effect, but it appears that the surface flow in Huntington Canyon is of very high quality in the upper reaches with some natural degradation occurring as the flow proceeds to the canyon mouth.

2. DEER CREEK

Deer Creek is a tributary of Huntington Creek and flows from the same canyon in which the Deer Creek Mine is located. The permittee shall monitor the characteristics of Deer Creek according to the following flow and sampling schedule (see Hydrologic Monitoring Schedule included herein).

a. Locations:

   1). Above the Mine

   2). Below the Mine (see Map HM-1)

b. Flow information is collected during the first or second week of each month.

c. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed

in the DOGM Guidelines for Surface Water Operational Quality. The program was initiated in March 1988. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed monthly in conjunction with quantity measurements.

As stated above, flow information is collected monthly throughout the year with the use of three Parshall flumes (see Map HM-1). Hydrographs comparing yearly flows are reported in the Hydrologic Monitoring Report.

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. Quality samples collected from Deer Creek at the sites above the Deer Creek Mine and below the Mine are summarized in Table HT-4. It is apparent from the table that the quality of the Deer Creek run-off degradates slightly from the upper to the lower sampling point. The quality of the lower sampling point is thought to be affected by the Mancos Shale which causes the increase in TDS.

3. MEETINGHOUSE CANYON CREEK

Meetinghouse Canyon Creek is a tributary of Huntington Creek and is monitored according to the following schedule (see Hydrologic Monitoring Schedule included herein).

a. Location: South Fork of Meetinghouse Canyon (see Map HM-1)

b. Flow information is collected during the first or second week of each month.

c. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. The program was initiated in March 1988. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed monthly in conjunction with quantity measurements.

Data regarding flow in Meetinghouse Canyon Creek is presented in the annual Hydrologic Monitoring Report.

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. Quality sampling was initiated in 1986; results of the samples collected are presented in Table HT-5 and in the Hydrologic Monitoring Report.

B. COTTONWOOD CREEK DRAINAGE SYSTEM

The southern portion of East Mountain is intersected by Cottonwood Creek and its associated tributaries, including Cottonwood Canyon Creek and Grimes Wash. The Cottonwood

Creek drainage is about equal in size to the Huntington drainage, with total discharge from each drainage about 70,000 acre feet per year. The major cultural feature on Cottonwood Creek is the Joe's Valley Reservoir, located about twelve miles west of the town of Orangeville. The 63,000 acre foot reservoir was constructed by the U.S. Bureau of Reclamation and provides storage water for irrigation, industrial, and municipal needs in the Emery County area.

1. COTTONWOOD CANYON CREEK

An extensive baseline study conducted on Cottonwood Canyon Creek to determine water characteristics prior to mining at the proposed Cottonwood Mine began in 1979. A property acquisition in 1981 resulted in mine plan changes; therefore, the baseline study was terminated as of January 1, 1984. As agreed upon with DOGM, UP&L will continue to monitor the flow and water quality field measurements at the USGS flume location on a monthly basis.

2. GRIMES WASH

Grimes Wash is a tributary of Cottonwood Creek and flows in the same canyon in which the Wilberg/Cottonwood Mine is located. Three permanent runoff sampling sites were established in 1980 and are sampled as listed below (see Hydrologic Monitoring Schedule included herein).

a. Locations

1.) Right Fork

2.) Left Fork

3.) Below the Mine (see Map HM-1)

b. Flow information is collected during the first or second week of each month.

c. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. The program was initiated in March 1988. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed monthly in conjunction with quantity measurements.

As stated above, flow information is collected monthly throughout the year with the use of two Parshall flumes (see Map HM-1 for flume locations). Hydrographs comparing yearly flows are shown in the Hydrologic Monitoring Report.

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. Quality samples collected in Grimes Wash are shown in Table HT-6. Specific data is shown in the Hydrologic Monitoring Report.

Grimes Wash drainage quality is greatly affected by the influx of the Right Fork. The Right Fork originates

in the North Horn Formation (interbedded shales, siltstones, and sandstones) which is abundant in calcareous material. As a result, the Right Fork contributes a relatively high amount of suspended solids to the Grimes Wash drainage, particularly during high runoff periods.

C. USES OF SURFACE WATERS

Nine springs have been developed in Huntington Canyon to provide for domestic, industrial, and commercial water needs. Currently Huntington City utilizes two springs in Huntington Canyon, Big Bear Canyon Springs and Little Bear Canyon Springs. The North Emery Water Users Association also utilizes springs in Huntington Canyon to provide for domestic and industrial water needs in areas outside of Huntington City. The Association is currently utilizing water from three springs in Rilda Canyon as well as from four other springs in the general area (see Map HM-1).

Some of the springs on East Mountain have been developed for watering livestock by installing troughs, and Elk Springs has limited use as a culinary water source for cabins in the area. A summary of the springs within the permit area, their location and any claims placed on the water they produce is made in table HT-7.

D. ALTERNATIVE WATER SUPPLY INFORMATION

The mining completed in the Deer Creek Mine may alter or disrupt the flow of water on the surface of East Mountain.

Currently these waters are put to limited use for livestock and wildlife or, in a few cases, for culinary water for cabins.

If the mining activities affect the surface waters, water from adjacent springs may be diverted to flow into the areas where other springs may have stopped flowing. Many springs which could be diverted are present in the area.

III. CLIMATOLOGICAL INFORMATION

A. PRECIPITATION

The climate of the permit area has been described by the U.S. Geological Survey, which states that it is semi-arid to subhumid and precipitation generally increases with altitude. The average annual precipitation ranges from about ten (10) inches in the lowest parts of the permit area (southeast) to more than twenty-five (25) inches in the highest parts (northwest). UP&L's weather station, located adjacent to the permit area, has provided data which shows that the summer precipitation in the form of thundershowers averages about the same as the winter precipitation in the form of snowfall. Because much of the summer precipitation runs off without infiltration, the winter precipitation has the greatest impact on groundwater.

Precipitation amounts have been and will continue to be recorded at the Hunter and Huntington power plants, at Electric Lake Dam, and on East Mountain. Precipitation data can be found in the annual Hydrologic Monitoring Report (see table HT-8 for East Mountain data).

B. TEMPERATURES

Air temperatures vary considerably both diurnally and annually throughout the permit area. Midsummer daytime temperatures in lower areas commonly exceed 100 degrees Fahrenheit, and midwinter nighttime temperatures throughout the area commonly are well below zero degrees Fahrenheit. The summer temperatures are accompanied by large evaporation rates. Although not recorded, there probably also is significant sublimation of the winter snowpack, particularly in the higher plateaus which are unprotected from dry winds common to the region. Temperature information is collected at the UP&L weather stations at each power plant, at Electric Lake, and on East Mountain. These data will continue to be included in the annual Hydrologic Monitoring Report (see table HT-8 for East Mountain data).

IV. HYDROLOGIC MONITORING PLAN

Utah Power & Light Company has collected a great deal of data which has broadened our understanding of the hydrologic conditions of East Mountain. UP&L has made a commitment to collect the data needed to bring about a complete understanding of the hydrologic conditions of East Mountain, including an understanding of the effects mining has on the hydrology and the potential consequences of mining. The following is a schedule for our Hydrologic Monitoring Program which will be followed throughout the permit life.

UTAH POWER & LIGHT COMPANY
MINING DIVISION - TECHNICAL SERVICES
HYDROLOGIC MONITORING PROGRAM
DEER CREEK, WILBERG/COTTONWOOD AND DES BEE DOVES MINES

I. Monitoring Locations

A. Surface Water Hydrology (see attached Map HM-1 for locations listed below)

1. Cottonwood Creek Drainage System

a. Cottonwood Canyon Creek - USGS Flume:
700 feet North, 200 feet East of the Southwest corner of Section 31, Township 17 South, Range 7 East.

Reclamation monitroing at the Cottonwood Fan Portal will occur at points above and below the two sediment basins (see Map 3-14).

b. Grimes Wash

(1) Right Fork: (Approximately 1500 feet upstream from the inlet culvert for the disturbed area.) 500 feet North, 1500 feet West of the Southwest corner of Section 22, Township 17 South, Range 7 East.

(2) Left Fork: (Approximately 50 feet upstream from the inlet culvert for the disturbed area.) 200 feet South, 2350 feet East of the Northwest corner of Section 27, Township 17 South, Range 7 East.

(3) Below the mine: (Approximately 500 feet downstream from the outlet culvert below the disturbed area.) 1770 feet South, 1820 feet West of the Northeast corner of Section 27, Township 17 South, Range 7 East.

(4) Reclamation Monitoring: In addition to location (3) above, monitoring will occur at a point immediately above the sediment ponds (see Map 4-1).

2. Huntington Creek Drainage System

a. Huntington Creek: UP&L's Environmental Department monitors the following four site along Huntington Creek:

(1) Below Electric Lake*
(2) Above the Forks*
(3) Above the power plant diversion
(4) Below the power plant
* Not listed on map due to scale

b. Deer Creek

(1) Above the Mine: (Approximately 600 feet upstream from the mine facility.) 200 feet north, 800 feet West of the Southeast corner of Section 10, Township 17 South, Range 7 East.

(2) At Permit: (Approximately 5,000 feet downstream from the mine facility.) 480 feet North, 3360 feet East of the Northwest corner of Section 1, Township 17 South, Range 7 East.

(3) Below the Mine: (Approximately 12,000 feet downstream from the mine facility.) 480 feet South, 3360 feet East of the Northwest corner of Section 1, Township 17 South, Range 7 East.

Deer Creek c. Meetinghouse Canyon - South Fork: (Approximately 200 feet upstream from the north and south convergence.) 800 feet North, 1500 feet East of the Southwest corner of Section 35, Township 16 South, Range 7 East

3. Reclamation Monitoring

a. Following stage 1 final reclamation backfilling and grading monitoring will be conducted at points immediately above and below the last sediment pond(s).

B. Groundwater Hydrology

? 1. East Mountain Springs (see attached Map HM-5 for spring locations) HM-5 in Hydrology Section of permit.

Burnt Tree *+
Elk Spring *+
Sheba Springs *+
Ted's Tub
79-2
79-10*+
79-15
79-23*+
79-24
79-26*+
79-28 (Flag Lake)
79-29*+
79-34
79-35*+
80-41
80-43
80-44*+
80-46*+
80-47
82-51
82-52*+
84-56*+
89-60 (Alpine Spring)

*Recession Study Spring
+Baseline analysis performed in 1986 and will be repeated every five years.

2. Piezometric Data

a. Surface

(1) Rilda Canyon (see attached Map HM-1 for locations)

P1
P2
P3
P4
P5
EM-47

(2) Cottonwood Canyon Creek
EM-31

b. Underground (Deer Creek): Program was terminated due to access and mine construction projects. New locations will be added when prospective sites meet long-term monitoring criteria.

3. In-Mine
   a. Deer Creek Mine (see attached Map HM-2 for locations)
      (a) 3rd South "B" xc-21
      (b) 3rd North xc-41
   b. Wilberg/Cottonwood Mines (see attached Map HM-3 for locations)
      (a) 2nd South xc-11
      (b) 4th East xc-24

II. Monitoring Schedule

A. Field Measurement: Listed below are the sites which will be monitored by UP&L Mining Division in accordance with the guidelines established by DOGM; i.e.,
   - Date and Time
   - Flow
   - pH
   - Temperature
   - Dissolved oxygen

1. Cottonwood Canyon Creek
   a. Cottonwood Canyon Creek - USGS Flume
   b. Grimes Wash
      (1) Right Fork
      (2) Left Fork
      (3) Below the mine

2. Huntington Canyon Drainage
   a. Deer Creek
      (1) Above the mine
      (2) At Permit Boundary
      (3) Below the mine
   b. Meetinghouse Canyon - South Fork

3. East Mountain Springs

4. In-Mine
   a. Deer Creek
   b. Wilberg/Cottonwood

All sites will be monitored monthly except for East Mountain Springs and in-mine locations. East Mountain Springs will be field tested during the months of July and October. In addition, the Recession Study Springs (denoted by asterisks in the Monitoring Location section) will be field tested from July through October. In-Mine locations will be field tested quarterly.

B. Quality Sampling (Laboratory Measurements)

1. Surface Water Hydrology: Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Quality (see Table #1). Quarterly sampling was initiated during March 1988 and will continue throughout the year; i.e., June, September, and December. Baseline analysis was performed in 1986 and will be repeated every five years thereafter.
   a. Cottonwood Creek Drainage, Grimes Wash
      (1) Right Fork
      (2) Left Fork
      (3) Below the mine
   b. Huntington Creek Drainage
      (1) Deer Creek
         (a) Above the mine
         (b) Below the mine
      (2) Meetinghouse Canyon - South Fork

2. Groundwater Hydrology
   a. East Mountain Springs: Water samples will be collected and analyzed during the months of July and October. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Water Quality (see Table #2). In addition, the Recession Study Springs (denoted by asterisks in the Monitoring Location section) will be sampled monthly for the following parameters:
      (1) Total Hardness
      (2) Carbonate
      (3) Total Manganese
   b. In-Mine: Two water samples will be collected and anlyzed per mine quarterly. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Water Quality (see Table #2).

III. Annual Reports

All data collected regarding the hydrology of East Mountain will be summarized by the applicant in an annual Hydrologic Monitoring Report. Copies of the report will be submitted to the OSM; U.S. Forest Service; and the Utah State Division of Oil, Gas and Mining. In addition, any raw data collected will be submitted to the Utah State Division of Oil, Gas and Mining on a quarterly basis.

TABLE 1

SURFACE WATER BASELINE, OPERATIONAL, AND POSTMINING WATER QUALITY PARAMETER LIST

FIELD MEASUREMENTS:

*	-	Water Levels or Flow
*	-	pH
*	-	Specific Conductivity (umhos/cm)
*	-	Temperature (degrees Centigrade)
*	-	Dissolved Oxygen (ppm) [perennial streams only]

LABORATORY MEASUREMENTS: (mg/l) [Major, minor ions and trace elements are to be analyzed in total and dissolved forms.]

#	*	-	Total Settleable Solids
#	*	-	Total Suspended Solids
	*	-	Total Dissolved Solids
	*	-	Total Hardness (as $CaCO_3$)
	*		Acidity ($CaCO_3$)
		-	Aluminum (Al)
		-	Arsenic (As)
		-	Barium (Ba)
		-	Boron (B)
	*	-	Carbonate (CO_3^{-2})
	*	-	Bicarbonate (HCO_3^-)
		-	Cadmium (Cd)
	*	-	Calcium (Ca)
	*	-	Chloride (Cl^-)
		-	Chromium (Cr)
		-	Copper (Cu)
		-	Fluoride (F^-)
	*	-	Iron (Fe)
		-	Lead (Pb)
	*	-	Magnesium (Mg)
	*	-	Total Manganese (Mn)
		-	Mercury (Hg)
		-	Molybdenum (Mo)
		-	Nickel (Ni)
		-	Nitrogen: Ammonia (HN_3)
		-	Nitrate (NO_2)
		-	Nitrate (NO_3)
	*	-	Potassium (K)
		-	Phosphate (PO_4^{-3})
		-	Selenium (Se)
	*	-	Sodium (Na)
	*	-	Sulfate (SO_4^{-2})
		-	Sulfide (S^-)
		-	Zinc (Zn)
	*	-	Oil and Grease
	*	-	Cation-Anion Balance

Sampling Period:

- \- Baseline
- * Operational, Postmining
- # Construction

TABLE 2

GROUNDWATER BASELINE, OPERATIONAL, AND POSTMINING WATER QUALITY PARAMETER LIST

FIELD MEASUREMENTS:

* - Water Levels or Flow
* - pH
* - Specific Conductivity (umhos/cm)
* - Temperature (degrees Centigrade)

LABORATORY MEASUREMENTS: (mg/l) [Major, minor ions and trace elements are to be analyzed in dissolved form only.)

* - Total Dissolved Solids
* - Total Hardness (as $CaCO_3$)
- Aluminum (Al)
- Arsenic (As)
- Barium (Ba)
- Boron (B)
* - Carbonate (CO_3^{-2})
* - Bicarbonate (HCO_3)
- Cadmium (Cd)
* - Calcium (Ca)
* - Chloride (Cl^-)
- Chromium (Cr)
- Copper (Cu)
- Fluoride (F^-)
* - Iron (Fe)
- Lead (Pb)
* - Magnesium (Mg)
* - Manganese (Mn)
- Mercury (Hg)
- Molybdenum (Mo)
- Nickel (Ni)
- Nitrogen: Ammonia (NH_3)
- Nitrate (NO_2)
- Nitrate (NO_3)
* - Potassium (K)
- Phosphate (PO_4^{-3})
- Selenium (Se)
* - Sodium (Na)
* - Sulfate (SO_4^{-2})
- Sulfide (S^-)
- Zinc (Zn)

Sampling Period:

- Baseline
* Operational, Postmining

YEAR -- 1989-1990

	LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
COTTONWOOD CANYON CREEK	COTTONWOOD CANYON CREEK	field	field	field	field	field	field	field	field	field	field	field	field
SURFACE HYDROLOGY	GRIMES WASH												
	RIGHT FORK	field	field	operational	field	field	operational	field	field	operational	field	field	operational
	LEFT FORK	field	field	operational	field	field	operational	field	field	operational	field	field	operational
	BELOW MINE	field	field	operational	field	field	operational	field	field	operational	field	field	operational
	DEER CREEK												
	ABOVE MINE	field	field	operational	field	field	operational	field	field	operational	field	field	operational
	@ PERMIT	field	field	field	field	field	field	field	field	field	field	field	field
	BELOW MINE	field	field	operational	field	field	operational	field	field	operational	field	field	operational
COTTONWOOD CANYON CREEK	MEETINGHOUSE CANYON	field	field	operational	field	field	operational	field	field	operational	field	field	operational
GROUNDWATER HYDROLOGY	EAST MOUNTAIN SPRINGS							operational *			operational *		
	RECESSION STUDY SPRINGS								modified operational	modified operational			
	IN-MINE												
	DEER CREEK			operational			operational			operational			operational
	WILBERG/ COTTONWOOD			operational			operational			operational			operational

* includes recession study springs

YEAR -- 1991

(Baseline monitoring preceding repermitting)

	LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SURFACE HYDROLOGY	COTTONWOOD CANYON CREEK	field	field	field	field	field	field	field	field	field	field	field	field
	GRIMES WASH												
	RIGHT FORK	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
	LEFT FORK	field	field	operational	field	field	baseline	field	field	operational	field	field	base
	BELOW MINE	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
	DEER CREEK												
	ABOVE MINE	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
	@ PERMIT	field	field	field	field	field	field	field	field	field	field	field	field
	BELOW MINE	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
	MEETINGHOUSE CANYON	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
GROUNDWATER HYDROLOGY	EAST MOUNTAIN SPRINGS							operational *		operational *			
	RECESSION STUDY SPRINGS								modified operational	modified operational			
	IN-MINE												
	DEER CREEK			operational			baseline			operational			operational
	WILBERG/ COTTONWOOD			operational			baseline			operational			operational

* includes recession study springs

EAST MOUNTAIN PERMIT AREA

PROBABLE HYDROLOGIC CONSEQUENCES

DESCRIPTION OF THE MINING OPERATION:

The Utah Power & Light Co. mine permit areas are located in the central portion of the Wasatch Plateau Coal Field in Emery County, Utah. Generally, this area is a flat-topped mesa surrounded by heavily vegetated slopes which extend to precipitous cliffs leading to the valley below. Much data has been collected regarding the geology and the hydrology of the East Mountain property. In all, over 120 drill holes have been completed from the surface, over 500 from within the mines; and a comprehensive hydrologic data collection program is ongoing, all of which have provided data used in this PHC. The most applicable data have been included in this document. For a review of additional data it is suggested that the reader refer to the annual Hydrologic Monitoring Report.

Two mineable coal seams exist and will be mined using underground longwall methods. The longwall panels will be oriented with their length in either an east-west or northeast-southwest direction. The chemical and physical properties of the overburden have been identified and described in the permit but, because this is an underground operation, will have little effect on the hydrologic consequences.

DESCRIPTION OF THE SURFACE WATER SYSTEM:

The surface drainage system on East Mountain is divided into two major drainages; the southwest portion forms part of the Cottonwood Creek drainage, and the northeast portion contributes to the

Huntington Creek drainage. The Huntington Creek drainage covers seventy-three percent (73%) of the East Mountain leases held by UP&L. Both of these perennial streams are located adjacent to but not within the permit boundaries. UP&L has observed that all of the streams emanating from within the permit boundary cease flowing in the fall or winter, suggesting that they are not perennial but ephemeral. Most of the streams are spring fed. UP&L has monitored all of the surface waters since 1979 and will continue to monitor them in the future. The data collected is included in each annual Hydrologic Monitoring Report.

The locations of the major springs and ponds on East Mountain are shown on the attached spring map. The springs have been monitored for several years, providing the baseline data, and operational data is currently being collected. The data is included in the Hydrologic Monitoring reports. The water is used for power generation, irrigation in Castle Valley, livestock, and wildlife. The quantity and quality of surface waters measured are shown in Tables HT-4 through HT-6 and Figures HF-6 through HF-13.

DESCRIPTION OF THE GROUNDWATER SYSTEM:

Seven wells are located within the vicinity of the East Mountain (see Map HM-1). All were constructed for potentiometric surface studies, and none of the wells flow at the surface or are pumped for domestic water supplies.

The majority of all natural groundwater discharge points located on the East Mountain property are in the form of seeps and springs. UP&L has mapped approximately seventy-five (75) springs ranging in discharge from less than one GPM to as high as 450 GPM (see Map HM-5).

UP&L has collected an extensive database of information pertaining to the groundwater quality and quantities of the East Mountain region and adjacent areas. Included in the database is long-term quality and flow information both for springs and for groundwater intercepted by mining.

The USGS has conducted extensive studies to determine the regional groundwater system for the central Wasatch Plateau Coal Field. The studies indicate a regional aquifer exists in the coal-bearing sequence of the Blackhawk and the underlying Starpoint Sandstone formations. The studies have also concluded that several isolated or perched aquifers existed above the Blackhawk-Starpoint aquifer. UP&L agrees with conclusions of the USGS studies concerning the perched aquifers above the coal-bearing sequence of the Blackhawk Formation but has some reservations about the significance of the Blackhawk-Starpoint aquifer which will be discussed below. The majority of the groundwater is discharged from the perched aquifers which occur along the base of the North Horn Formation in the form of seeps and springs (see Map HM-5 and Table HT-1). Several other perched aquifers exist mainly along the formational contacts with the North Horn Formation, including the upper contact with Flagstaff Limestone and the lower contact with the Price River Formation.

The majority of the groundwater recharge on East Mountain comes from the winter snowpack which melts and infiltrates into the surface of East Mountain. The water flows down vertical fractures which intersect sandstone channel systems in the North Horn and Blackhawk formations. The majority of the groundwater reaching this point intersects the surface in springs located in the North Horn Formation. Very little recharge intersects the Price River Formation and Castlegate

Sandstones; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it intersects the northeast trending Roans Canyon Fault Graben. In-mine long-hole drilling completed to test the hydrology of this fault system has shown that the system acts as an imperfect aquiclude to further southeast migration of water. Figure HF-14 shows the hydrologic gradient measured by the drill holes completed across the fault system. The system acts as an aquiclude because swelling clays along the fault prohibit most of the water from penetrating across the fault. Most of the recharge south of the Roans Canyon Fault System comes from the snow melt directly above. The same mode of water migration occurs there as to the north; but, when the water intersects the sandstone channels, it migrates toward canyons which surround and disect the permit area.

Several vertical drill holes completed in the Deer Creek Mine were developed into water monitoring holes to test the piezometric gradient of the Starpoint-Blackhawk aquifer. Data collected from the holes was included in the annual Hydrologic Monitoring Report and identifies the hydrologic gradient.

CLIMATIC CONDITIONS:

The climate of the permit area has been described by the U. S. Geological Survey, which states that it is semiarid to subhumid, and precipitation generally increases with altitude. As shown on Figure HF-15, average annual precipitation ranges from about ten (10) inches

in the lowest parts of the permit area (southeast) to more than twenty-five (25) inches in the highest parts (northwest). UP&L's weather station, located adjacent to the permit area, has provided data which shows that the summer precipitation, in the form of thundershowers, averages about the same as the winter precipitation, in the form of snowfall. The winter precipitation has the greatest impact on groundwater, however, because much of the summer precipitation runs off without infiltration. The data collected at UP&L's East Mountain weather station is included in the annual Hydrologic Monitoring reports.

Throughout the permit area air temperatures vary considerably both diurnally and annually. Midsummer daytime temperatures in lower areas commonly exceed 100° F and midwinter nighttime temperatures throughout the area commonly are well below 0° F. The summer temperatures are accompanied by large evaporation rates. Although not recorded, there probably also is significant sublimation of the winter snowpack, particularly in the higher plateaus which are unprotected from dry winds common in the region. The volume of water flowing into the major streams within and adjacent to the permit area has been characterized by monitoring. Discharge recession curves for these streams are included herein as Figures HF-6 through HF-13.

GEOMORPHIC DESCRIPTION OF THE MINE PLAN AND ADJACENT AREA:

Sediment load concentrations in the area of the permit vary dramatically depending on the percentage of disturbed areas, ruggedness of the terrain, geologic formations present, the amount of precipitation the areas receive, and stream flow volume. In work conducted after the Deer Creek Mine began production, the USGS identified the

sediment yield in Deer Creek Canyon to be 3.1 tons/day. Huntington Creek was measured at 1.8 to 66 tons/day. Other creeks adjacent to the permit area were tested and found to have similar sediment loads.

UP&L has collected samples on a quarterly basis from the streams within and adjacent to the permit area. Samples taken at periods of both high and low flow have been tested for total suspended solids (TSS) to identify stream stability and are reported annually in the Hydrologic Monitoring Report. Tables HT-4 through HT-6 show the TSS values reported in the 1987 monitoring report.

Several conditions present within the permit area contribute to the sediment yield of the streams or stream instability. Several of the canyons in the area are very steep with very limited vegetative cover. During periods of high precipitation the amount of sediment introduced into the streams from these areas is significant. Samples taken in Deer Creek Canyon above the disturbed area during high run-off demonstrate how much sediment can be introduced from the undisturbed areas. The areas of the Deer Creek Mine Portal and access road are also prone to producing sediment yield in the stream; however, these surface waters flow through a sediment pond prior to discharge which effectively removes settleable solids from the water.

OVERBURDEN:

UP&L has collected data which identified the nature and chemical composition of the overburden. Because the mine is an underground mine, the overburden chemical composition will affect the hydrologic consequences at the portal site. The nature and chemical composition

of the material is shown in the PAP in section 2-65 and will not be presented here.

When the disturbed areas are reclaimed as proposed in the PAP, it is not anticipated that the chemical composition of the material removed at the portal site and then moved back into place will impact the surface hydrology.

SURFACE WATER:

UP&L has conducted baseline monitoring of surface waters within and adjacent to the permit area. Additional sampling sites will be included in the future prior to disturbance in that area which may potentially impact the surface hydrology. Water samples are and will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the "DOGM Guidelines for Surface Water Quality." All of the long-term monitoring sites have been equipped with Parshall style flumes to facilitate monitoring. Water quality data collected from the surface water systems is shown in Tables HT-4 through HT-6.

GROUNDWATER:

UP&L has conducted baseline and operational monitoring of springs and in-mine water sources in and adjacent to the permit area. The springs located within or immediately adjacent to areas overlying coal to be mined in the next five (5) years or areas overlying previously mined areas will be monitored (except that the discharge recession curve springs will be monitored in the future regardless of their position relative to mining). The data collected has provided information useful

in the understanding of potential hydrologic consequences of mining. The quality discharge data collected is shown in Table HT-2.

The water intersected in the mine is monitored to facilitate understanding of the groundwater hydrology of the area. UP&L has installed measuring devices on water lines which transport water from long-term water producing areas. Both quality and quantity data have been and will continue to be collected from these locations. Additional long-term water monitoring sites will be added when the conditions of the water intersected meet the criteria for long-term water monitoring sites. The data has identified the amount of water captured by the mine workings. It does not identify how the discharge will change in the future during mining and in the post-mining period. In order to better understand these issues, UP&L will continue to monitor, where possible, the discharge in previously mined areas to establish the discharge recession from a given area, making it possible to more accurately project mine discharge volumes into future mining and post-mining periods.

No domestic water wells are located within the permit area. UP&L intends to conduct pump tests on water monitoring wells drilled by West Appa Coal Co. in Rilda Canyon to the north of the permit boundary. The data collected should be useful in determining the hydrologic setting of the springs in that area. Seven (7) water monitoring wells located around the perimeter of the permit area have been monitored for several years for the piezometric water level. The data has been included in our interpretations of the possible hydrologic consequences of mining. The data regarding the quality of water intersected in the mine is summarized in Tables HT-3.

SOIL LOSS AND SEDIMENT YIELD:

As described above (soil loss and sediment yield) several areas outside of the disturbed area of the mine portals are susceptible to erosion and were identified by water quality samples taken at both high and low flows in the streams within and adjacent to the permit area. The susceptibility to erosion is a condition typical of the Wasatch Plateau and the arid western states.

The locations of all of the streams within and adjacent to the permit area are shown on the Hydrologic Data Map (see Map HM-1). The sediment load in samples collected is summarized in the annual Hydrologic Monitoring Report. Riparian zones are usually adjacent to the streams and springs which emanate from the permit area. The Riparian zones are located adjacent to the springs and streams shown on the Spring Map (see Map HM-5).

No alluvial valley floors are present within or immediately adjacent to the permit area.

The soil types within the permit area have been identified by the U.S. Department of Agriculture (Soil Survey Carbon-Emery Area, Utah 1970). The study was used in conjunction with in-house studies to understand the soils present in the permit area. The data has been presented in section 2-131 of the PAP.

The stability of the reclaimed soil slopes is always a concern in a disturbed area. Soil studies have identified the type of material available for reclamation, and reclamation procedures and methods of sediment control have been geared around the available soil data.

The suspended solid content of surface water samples taken at medium and high flow have been presented in the Surface Water section of this document.

The field measurements of the channel gradients, bank materials, and channel cross-sections have been presented in the PAP.

PREDICTION OF MINING IMPACTS (SURFACE WATER):

Data collected by UP&L indicates mining has had only minor impact on surface water quality and quantity. During periods of high runoff changes in quality are insignificant; however, in low flow conditions some degradation is likely due to the fact that the mine discharge waters are higher in total dissolved solids (TDS) than the surface waters. It is difficult to assess the degradation because it is not known from where or how much of the water discharged from the mine would naturally have been discharged into the receiving stream by springs and seeps. The water discharged from the Deer Creek Mine will not affect the quality of Deer Creek throughout the life of the mine due to the fact that the water is transferred directly to the power plant through a pipeline. Post-mining conditions will likely cause water to be discharged from portals in Deer Creek Canyon, Grimes Wash, North Fork of Meetinghouse Canyon, Miller Canyon, and Rilda Canyon. The quantity of discharge will be discussed in the Groundwater section of this document. The cumulative effect of discharge waters on post mine use is thought to be insignificant because the volume of water to be discharged is negligible in comparison to the volume which flows in Cottonwood and Huntington creeks.

The most significant impact on the discharge of the receiving stream quality will take place when the stream is at its lowest flow (about 15-30 CFS), at which time the total discharge into either Cottonwood or Huntington Creek will be small in proportion to the volume of water flowing in the creeks. The TDS levels of either Huntington or Cottonwood Creek are about 300 to 350 mg/l while the discharge water TDS levels are 500 to 1000 mg/l. Even with the differential in quality, the effect the discharge waters will have on the stream water quality will be minimal due to the difference in flow volume.

PREDICTION OF MINING IMPACTS (GROUNDWATER):

The water discharge rates from the mines are variable and dependent on several factors. One of the most significant is that when the mine enters virgin country a significant amount of water is liberated. In virtually all cases the amount of water which flows into the mine exceeds the recharge and, in time, the water inflow decreases in volume. If new areas are not mined, the discharge from the mine will decrease accordingly.

Water discharged from the Deer Creek Mine is currently transported directly to the Huntington Power Plant by way of an underground pipeline. The volume of water discharged from the mine has increased at a significant rate over the past several years. The increased discharge is due to at least five factors. First, in previous years water discharged was measured with a Stevens Recorder installed in a Parshall Flume. Calibration of the recorder was difficult to maintain, and in 1985 in-line flow meters (totalizer and instantaneous flow) were

installed, allowing for a more accurate measurement of discharge. Second, mining has progressed into areas largely dominated by sandstone roof. The inflow from these areas is greater per acre of exposed area than areas of mudstone top. Third, mining has progressed into the bottom of the Straight Canyon Syncline, the lowest part of the mine where a significant amount of water has been intersected. Fourth, mining has intersected the Roans Canyon Fault, releasing additional water into the mine workings. Last, prior to 1985 water used in mining was pumped directly from the in-mine sumps. Since 1985 all water is pumped from the mine through the metering system. Mining water is then pumped back into the mine through a high-pressure steel line to the mining faces where it is utilized.

Since January 1985 water discharges from the Cottonwood Mine have been limited to a minor amount, less than 15 GPM, from the Miller Canyon Breakout. Water discharged from that point comes from sealed portions of the Wilberg Mine and a limited amount intersected in the active Cottonwood Mine workings which is transmitted by pipeline to the sealed workings.

The monitoring of in-mine water sources has shown that the long-term water flow from a given area is much less than ten percent (10%) of the initial flow from the area. Most of the current inflow into the mine workings is from areas where the water storage has not been depleted. After the storage has been depleted, the flow will reduce to roughly equal the recharge rate which is expected to be less than ten percent (10%) (historical data) of the current discharge rate. The current discharge rate from all UP&L mines combined is approximately 1400 to 1600 GPM; therefore, the post-mining discharge rate is expected to be approximately 140 to 160 GPM. For verification purposes UP&L

will, where possible, monitor select areas of the mine to formulate discharge recession curves over time, enabling a better understanding of the ratio of initial discharge rates and long-term post mining discharge values. There is no reason to assume that the post-mining discharge water quality will differ from that currently being discharged (see Groundwater Monitoring section).

Because the permit area is divided between the Huntington Creek Drainage Basin and the Cottonwood Creek Drainage Basin, 73% and 27% respectively, the amount of inter-basin water transfer that occurs must be considered. The average annual flows of Huntington and Cottonwood creeks are 96.3 and 97.6 CFS, respectively. The current discharge rate from UP&L's total permit areas ranges from 1400 to 1600 GPM, less than 3.5% of either of the creeks' average flows. Because a limited portion of the Deer Creek mine workings (less than 27%) intersects water that would normally migrate toward the Cottonwood Basin but is discharged out Deer Creek Canyon, the interbasin water transfer from the Cottonwood drainage to Huntington Creek will probably never exceed 0.8% of the average annual discharge of either system.

Water intersected by the Cottonwood/Wilberg Mine workings currently comes from areas underlying the Cottonwood Creek drainage. Future mining, however, will undermine areas of the Huntington Creek drainage and previously mined areas of the Deer Creek Mine. It is expected that water normally intercepted by the Deer Creek workings will migrate down into the Cottonwood workings, thus reducing the post-mining discharge of the Deer Creek Mine. Of all the portals in UP&L's permit areas, the Miller Canyon portal of the Cottonwood Mine is

at the lowest elevation and will probably experience the greatest post-mining discharge of all of the portals in the southern portion of the permit areas.

Previous investigation by UP&L has suggested that the Roans Canyon Fault System contains significant amounts of water. In 1988 a comprehensive drilling and hydrologic testing program was conducted on the fault system. From the data collected it was determined that most of the water present in the two zones identified can be effectively dewatered by utilizing horizontal wells from in the mine. If additional sustained inflows are encountered during the graben crossing, an attempt will be made to seal the water-producing zones with pressure grouting seals. If the grouting is effective, it is not expected that significant quantities of water will flow into the mine workings for long term periods. Given the preexisting dominant vertical flow direction and the fact that the springs do not appear to be associated with aquifers of concern, it is unlikely that the tunnels or the recommended dewatering system will exert a measurable influence on the springs.

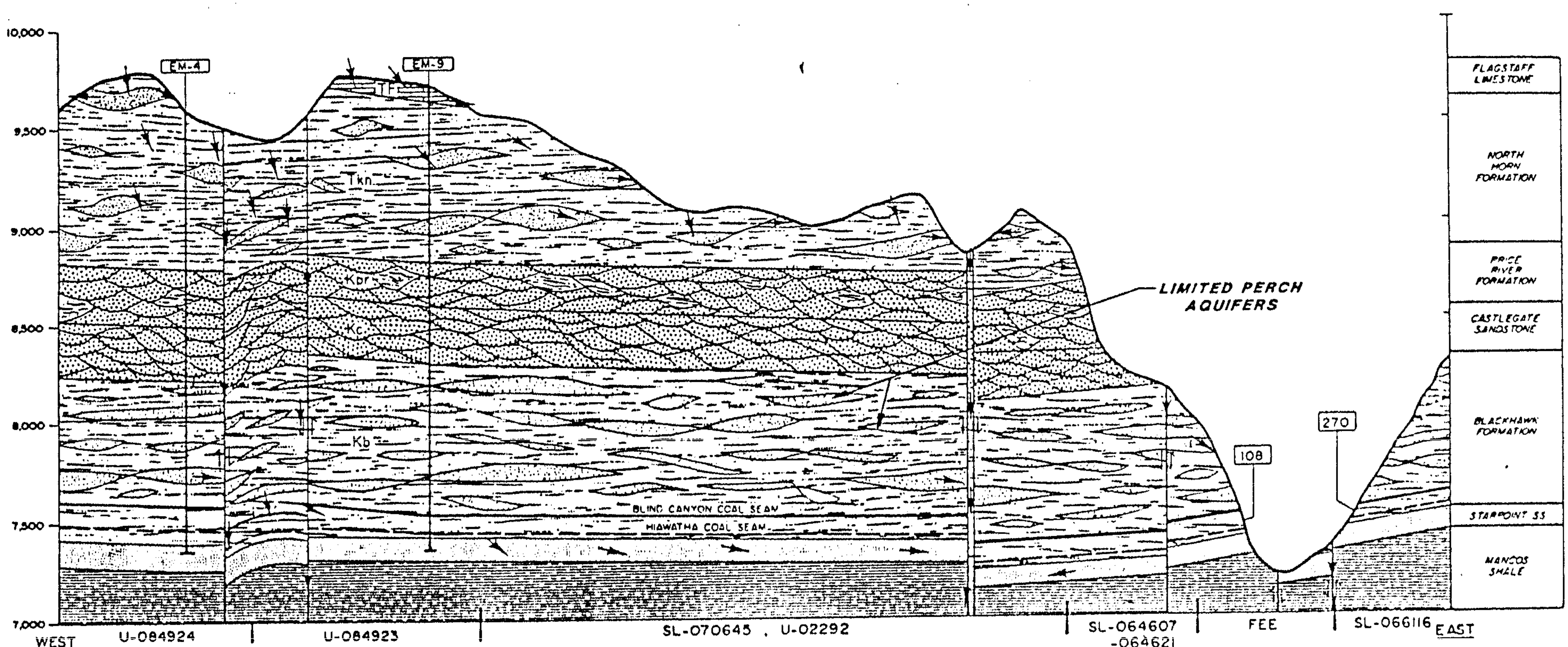
The hydrologic monitoring on East Mountain has provided data to support a hydrologic model. The data supports the fact that the majority of the groundwater is transported through fracture systems. As previously discussed, snow melt from the higher reaches of East Mountain to the north percolates into the subsurface along vertical fractures, allowing the water to intersect sandstone channels which form perched aquifers in the North Horn formation. The water continues its southeast migration until the flow is stopped at the Roans Canyon Fault. Water then flows downward as well as laterally along the fault.

The groundwater on the southern two-thirds of East Mountain finds its recharge in the highest portions of the plateau to the south of the Roans Canyon Fault. The groundwater model is best depicted as shown in Map HM-1.

The spring monitoring has failed to identify any mining related impacts. Most of the springs are located in the North Horn formation which is known to contain clays that heal when fractured. Mining impacts to the springs located in the North Horn Formation will probably not be experienced either during mining or post-mining.

SUMMARY:

Based on the data currently available, the hydrologic consequences of mining will probably be very slight in comparison to the magnitude of the entire hydrologic system. Hydrologic monitoring has identified the quality and quantity of surface and groundwater present within the permit area and has identified where slight impacts of mining may occur in the hydrologic regime. Monitoring has also identified areas requiring further data collection in order to fully understand and qualify/quantify the mining related impacts both in mining and post-mining time frames. UP&L recognizes the importance of fully understanding the hydrologic setting of the area and commits to collecting addition data which will support or justify model modifications. Only after additional data is collected can a precise calculation of the hydrologic impacts be made.



GEOLOGIC CROSS SECTION FROM EM-4 TO EM-9, AND THROUGH MEASURED SECTIONS 108 - 270 IN DEER CREEK CANYON

DATE	REVISIONS	MARK

UTAH POWER AND LIGHT CO.
MINING DIVISION
HUNTINGTON, UTAH 84528

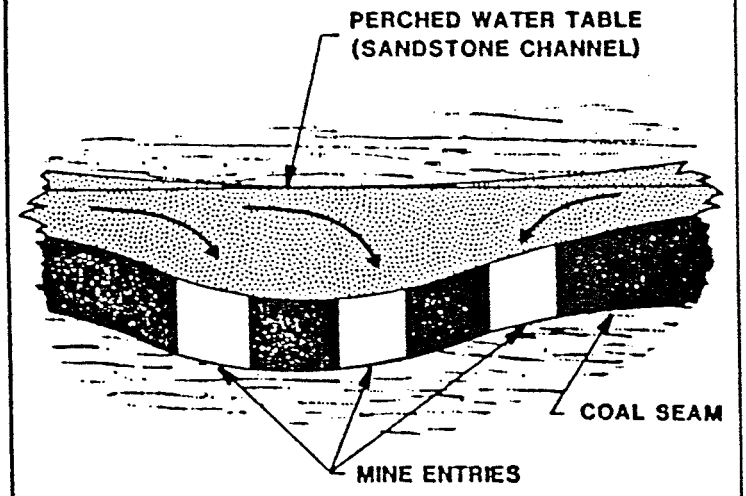
TYPICAL GROUNDWATER MOVEMENT
EAST MOUNTAIN PERMIT AREA

DRAWN BY: K. LARSEN	APPROVED BY:	HF-1
SCALE:	DATE: JAN. 23, 1989	

HF-2

LONG TERM WATER SOURCES

TYPE 1



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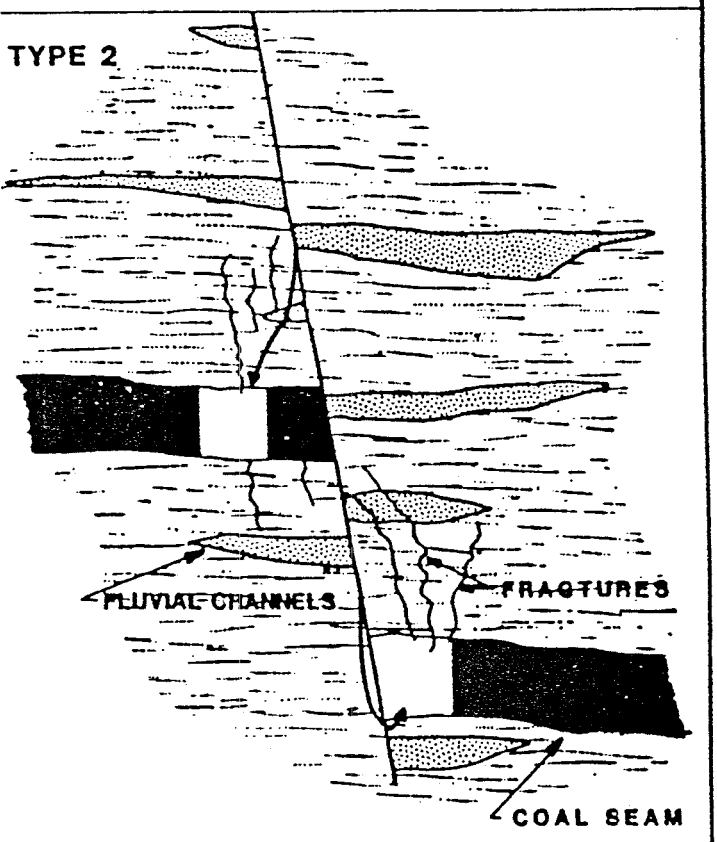

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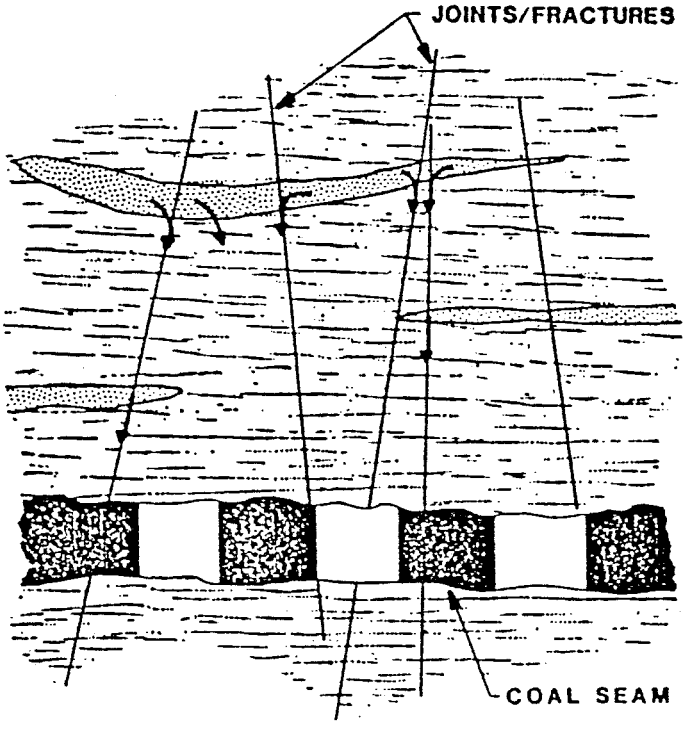

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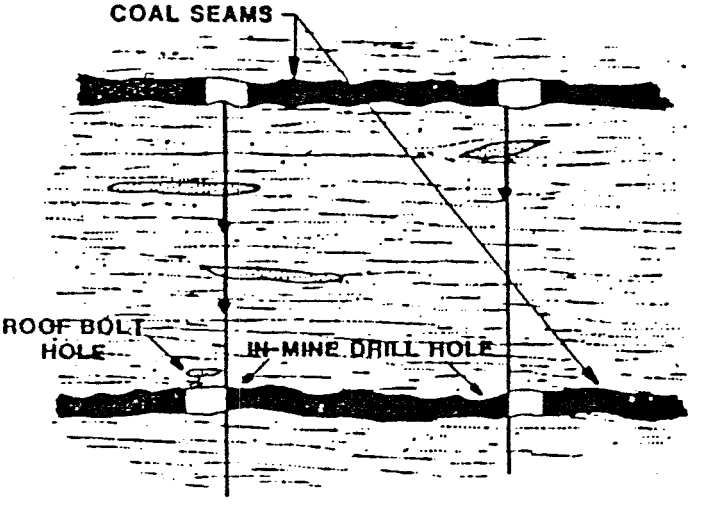
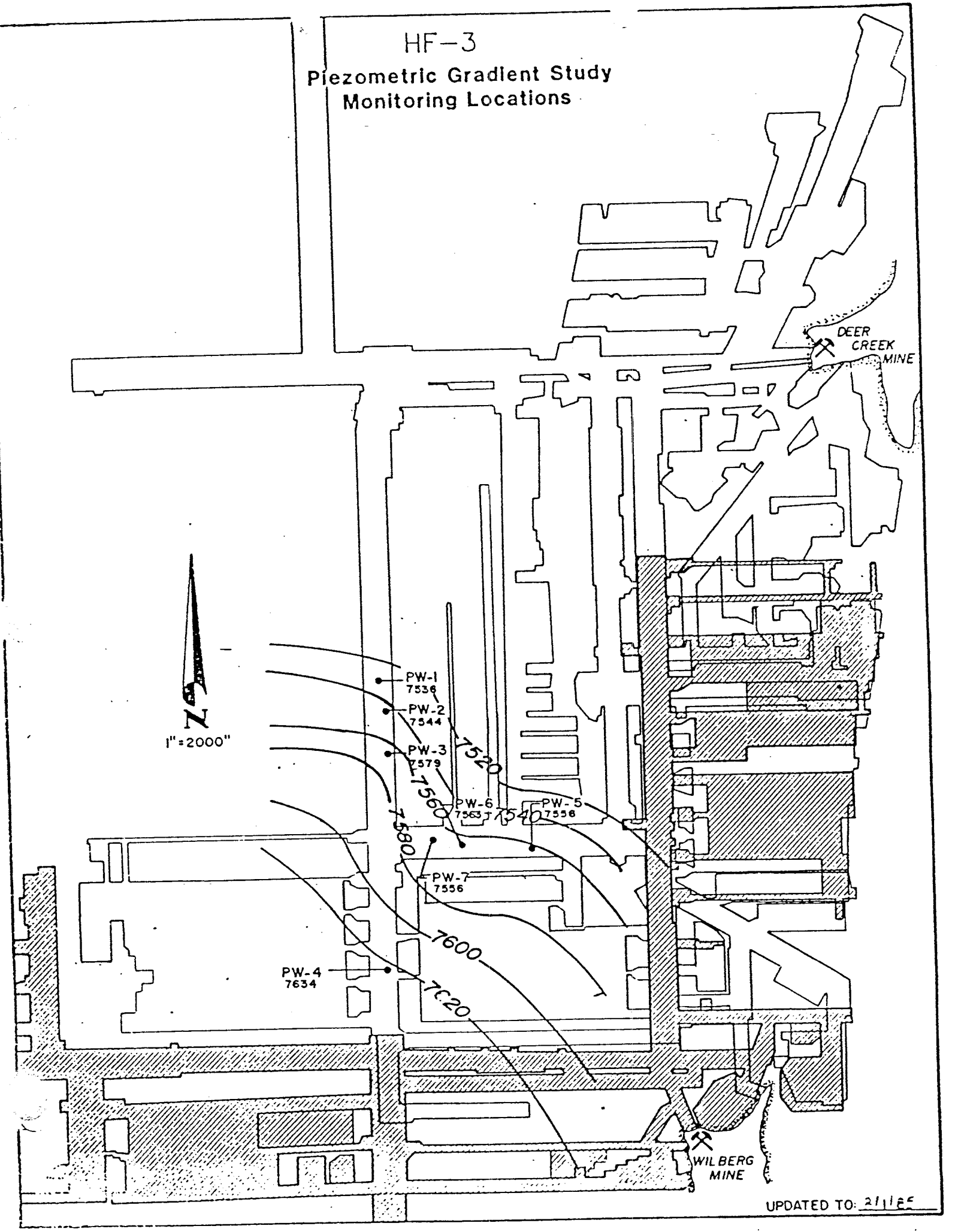


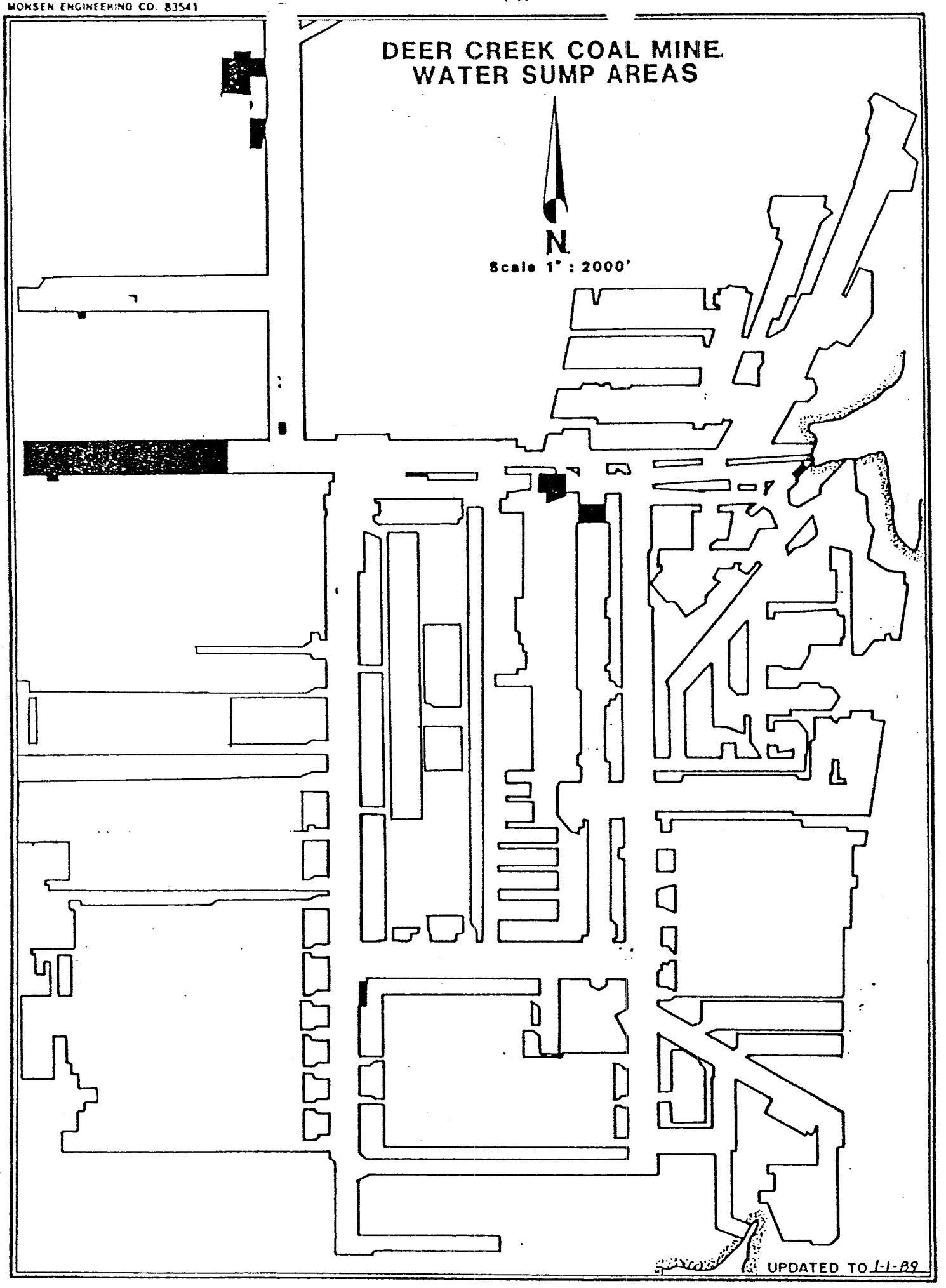
HF-3

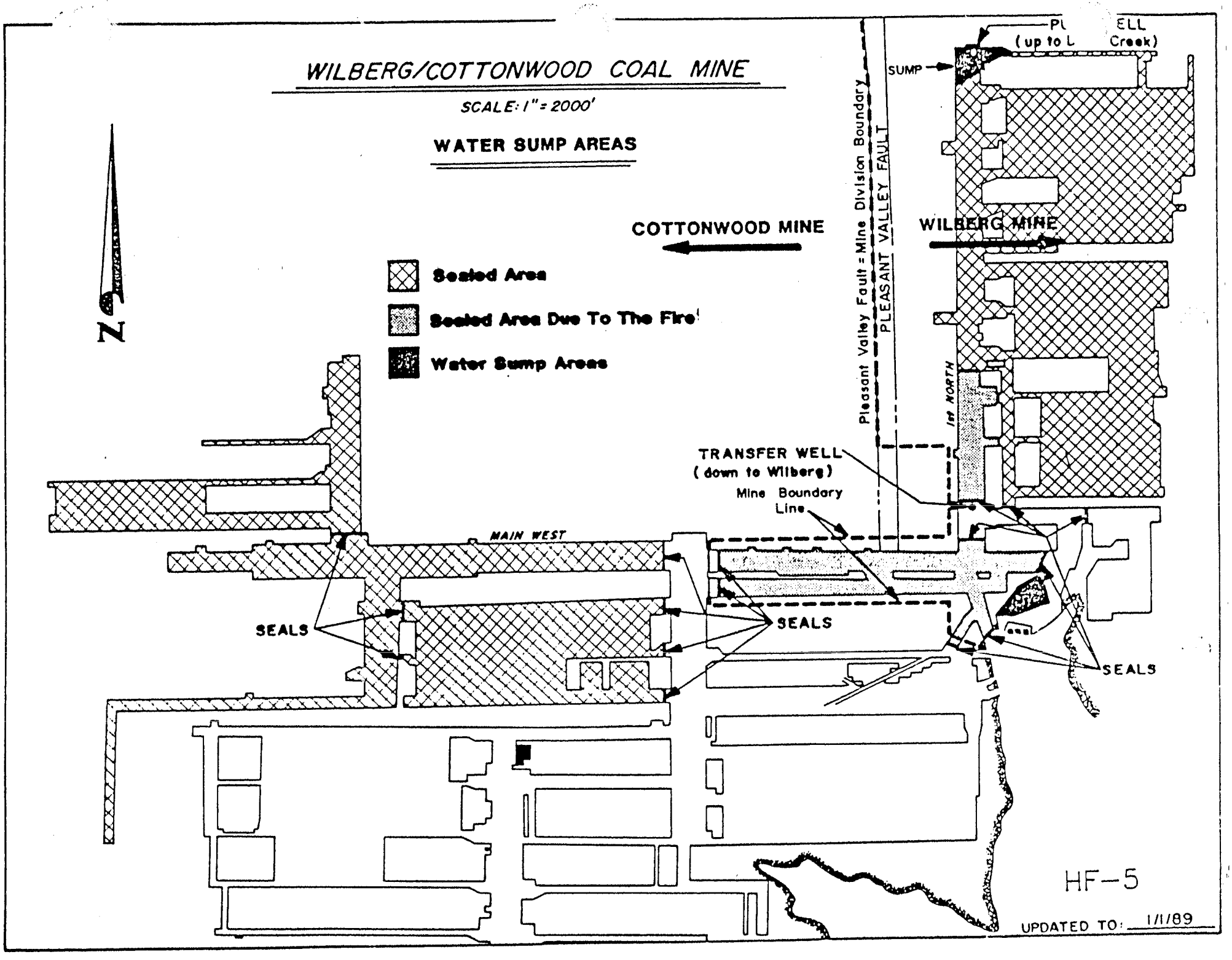
Piezometric Gradient Study
Monitoring Locations



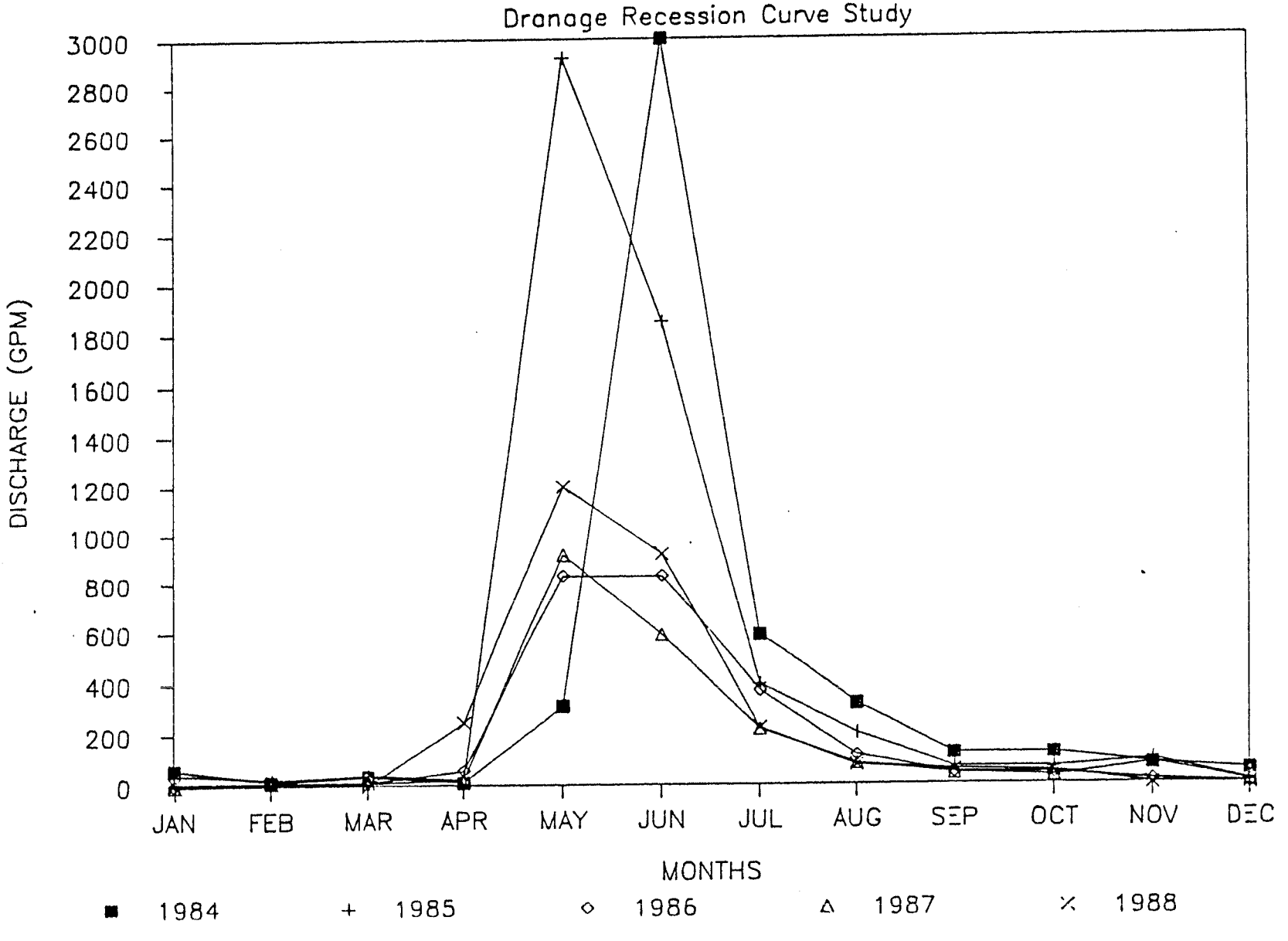
UPDATED TO: 2/1/88

MONSEN ENGINEERING CO. 83541

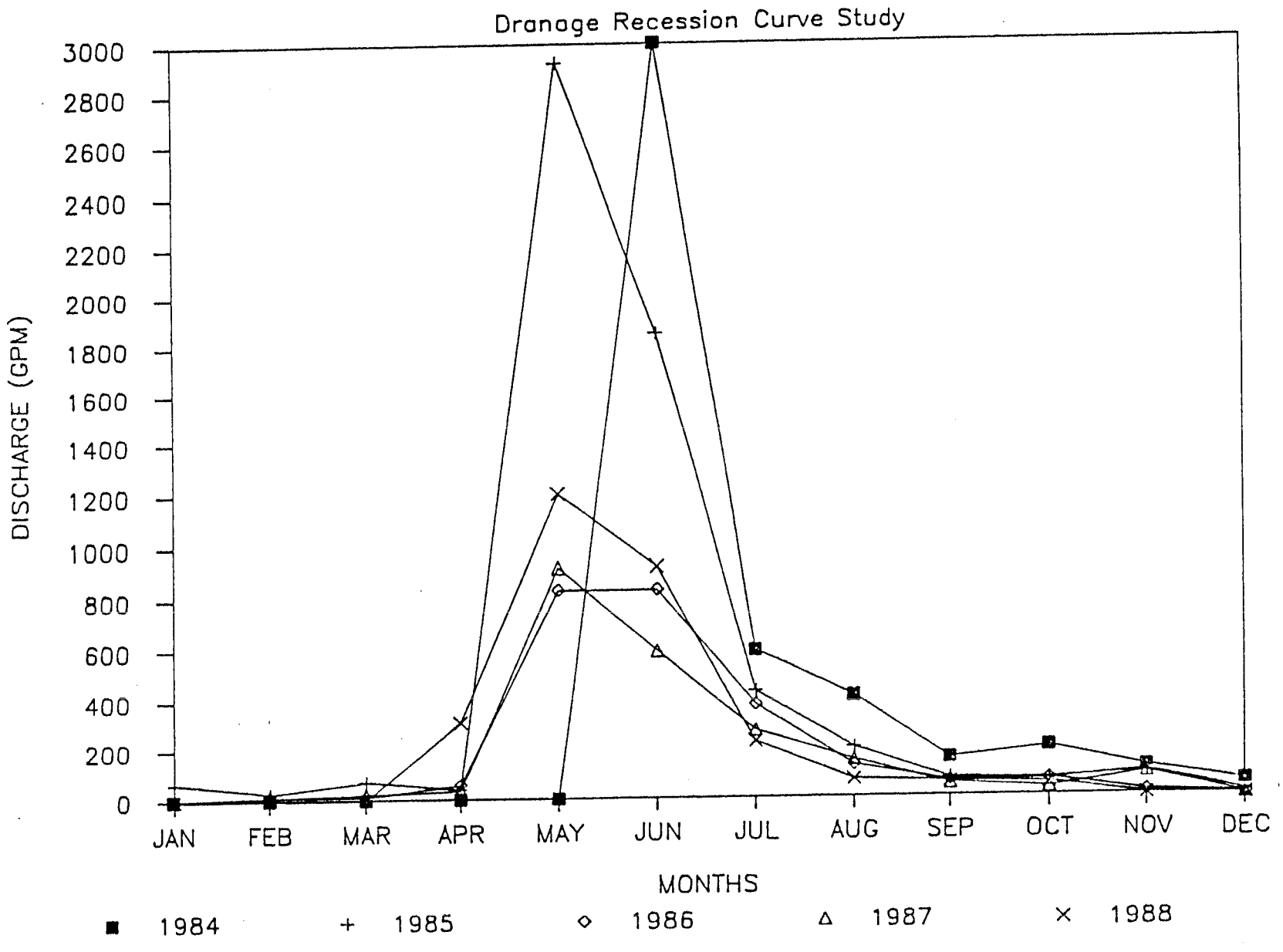


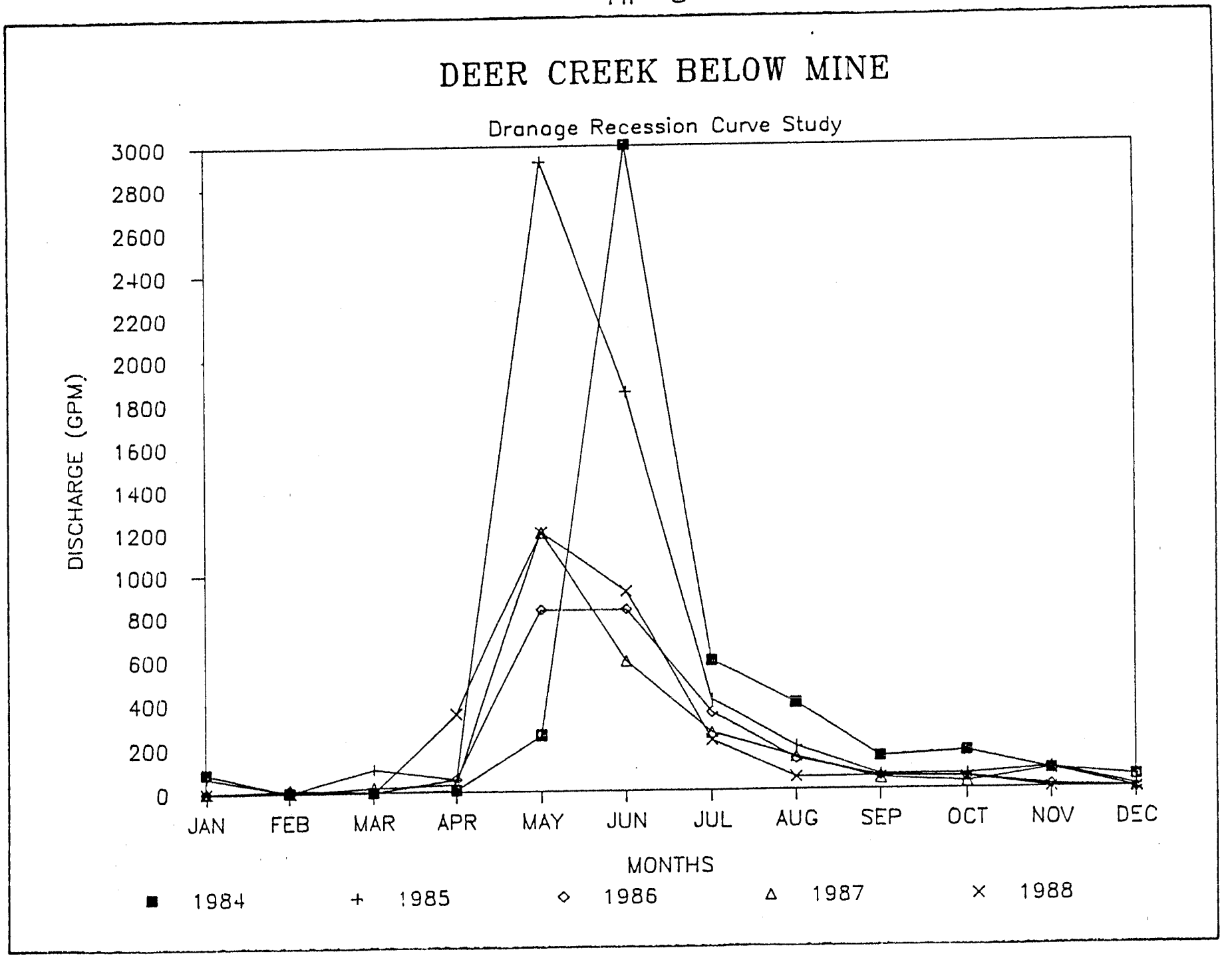

WILBERG/COTTONWOOD COAL MINE
SCALE: 1" = 2000'
WATER SUMP AREAS
N
COTTONWOOD MINE
WILBERG MINE
Sealed Area
Sealed Area Due To The Fire
Water Sump Areas
Pleasant Valley Fault = Mine Division Boundary
PLEASANT VALLEY FAULT
SUMP
(up to L
Creek)
1st NORTH
TRANSFER WELL
(down to Wilberg)
Mine Boundary
Line
MAIN WEST
SEALS
SEALS
SEALS
HF-5
UPDATED TO: 1/1/89

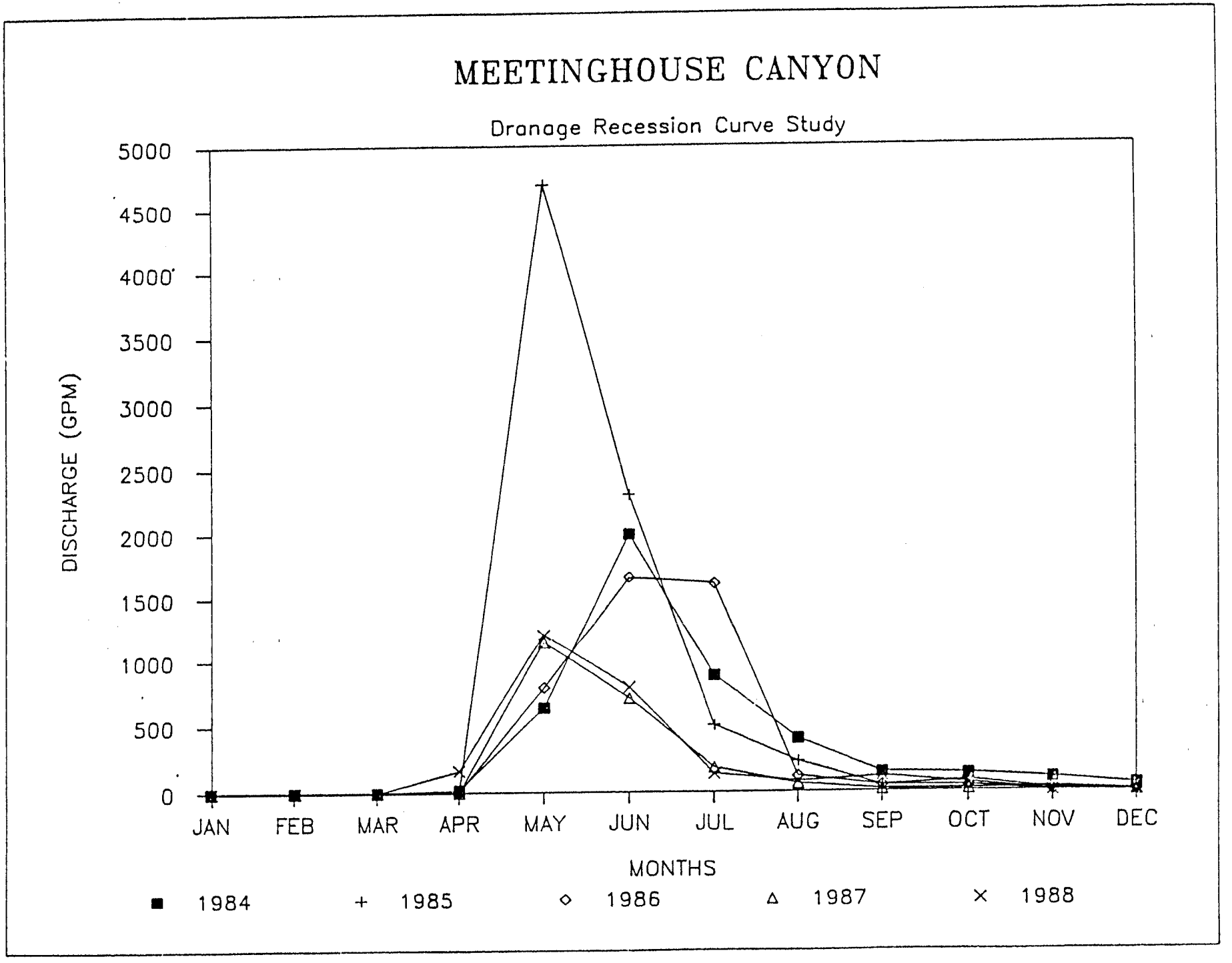
DEER CREEK ABOVE MINE

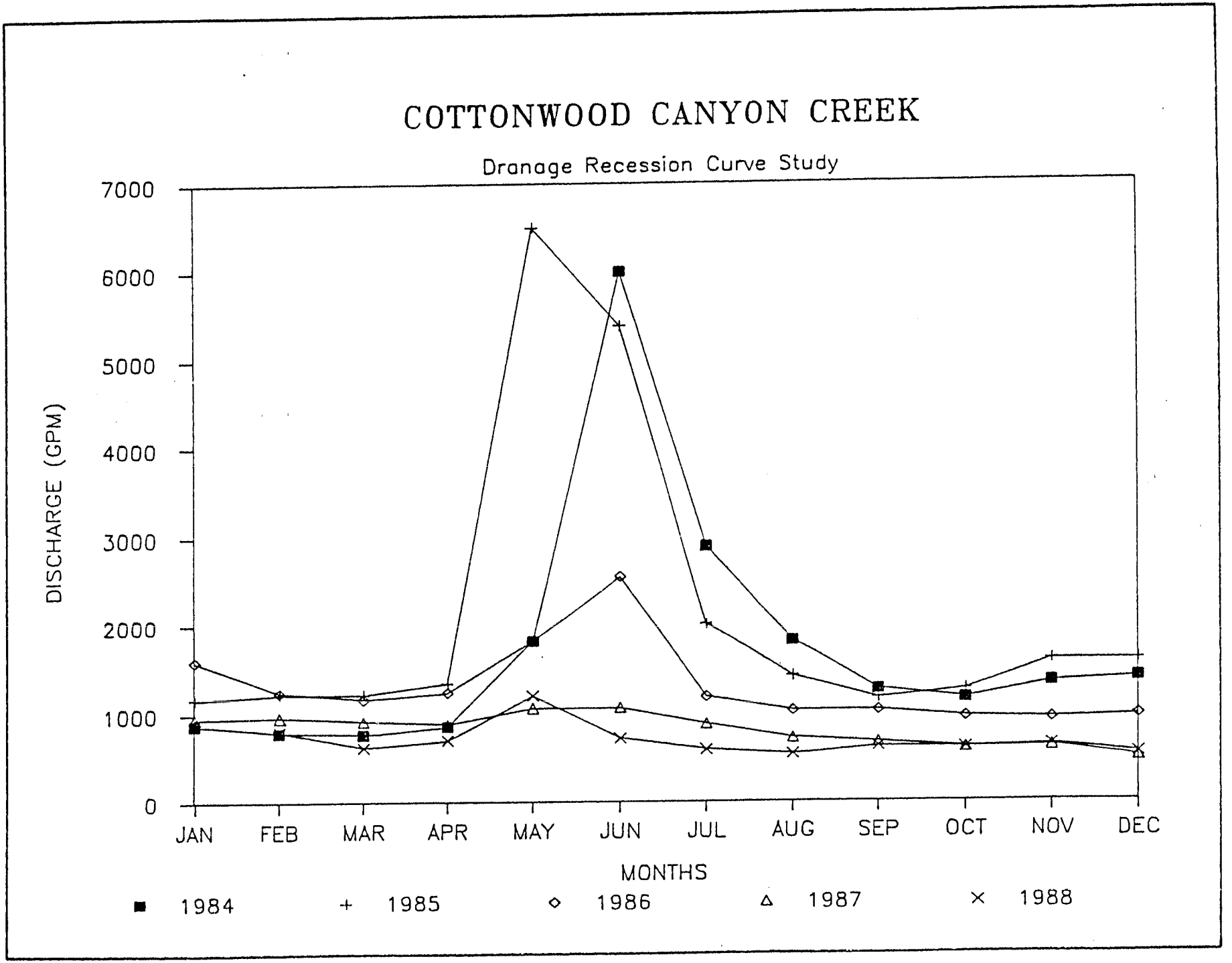


DEER CREEK @ PERMIT BOUNDARY

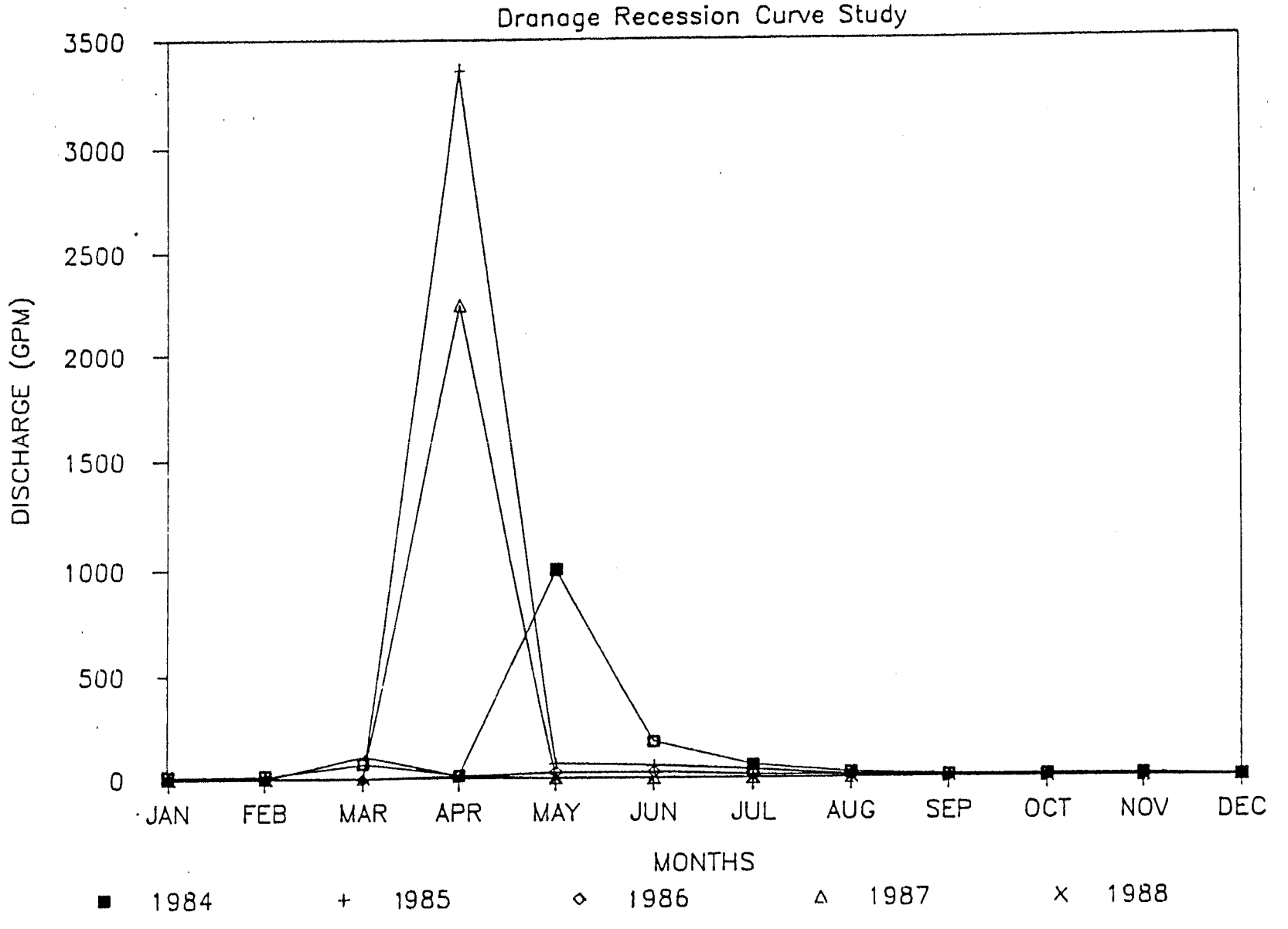



DEER CREEK BELOW MINE
Dranage Recession Curve Study
DISCHARGE (GPM)
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988

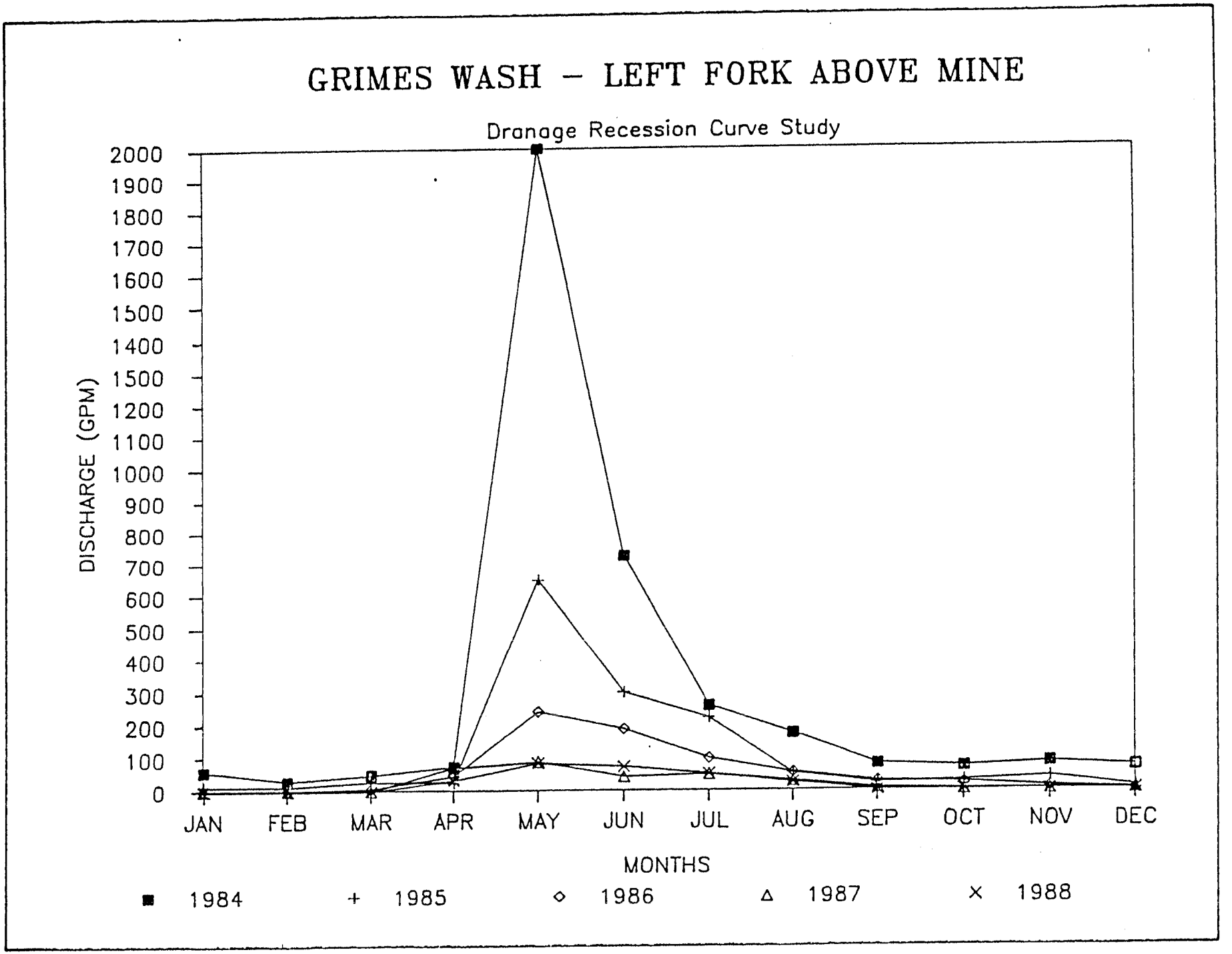

MEETINGHOUSE CANYON
Dranage Recession Curve Study
DISCHARGE (GPM)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988

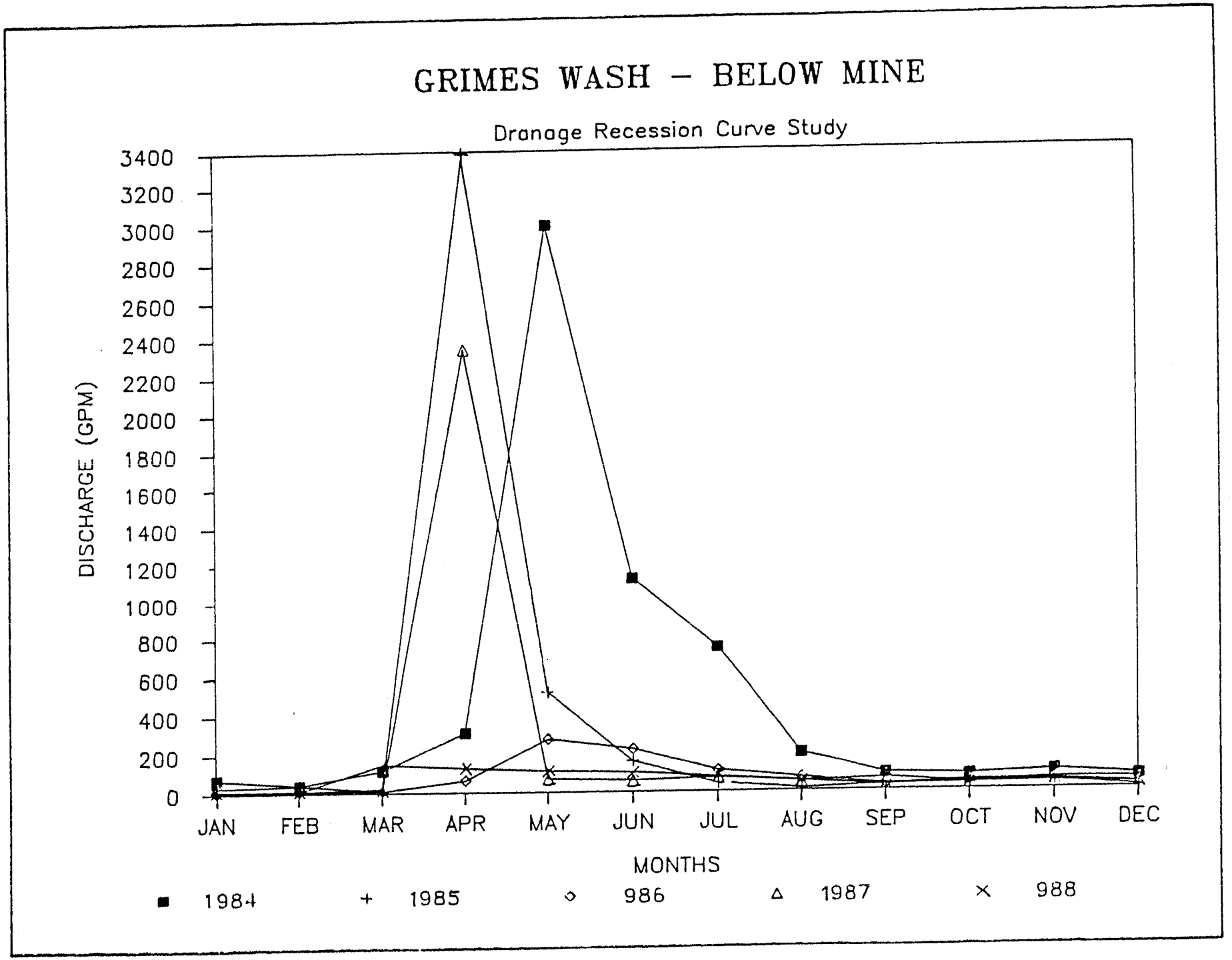

COTTONWOOD CANYON CREEK
Dranage Recession Curve Study
DISCHARGE (GPM)
7000
6000
5000
4000
3000
2000
1000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988

GRIMES WASH – RIGHT FORK ABOVE MINE

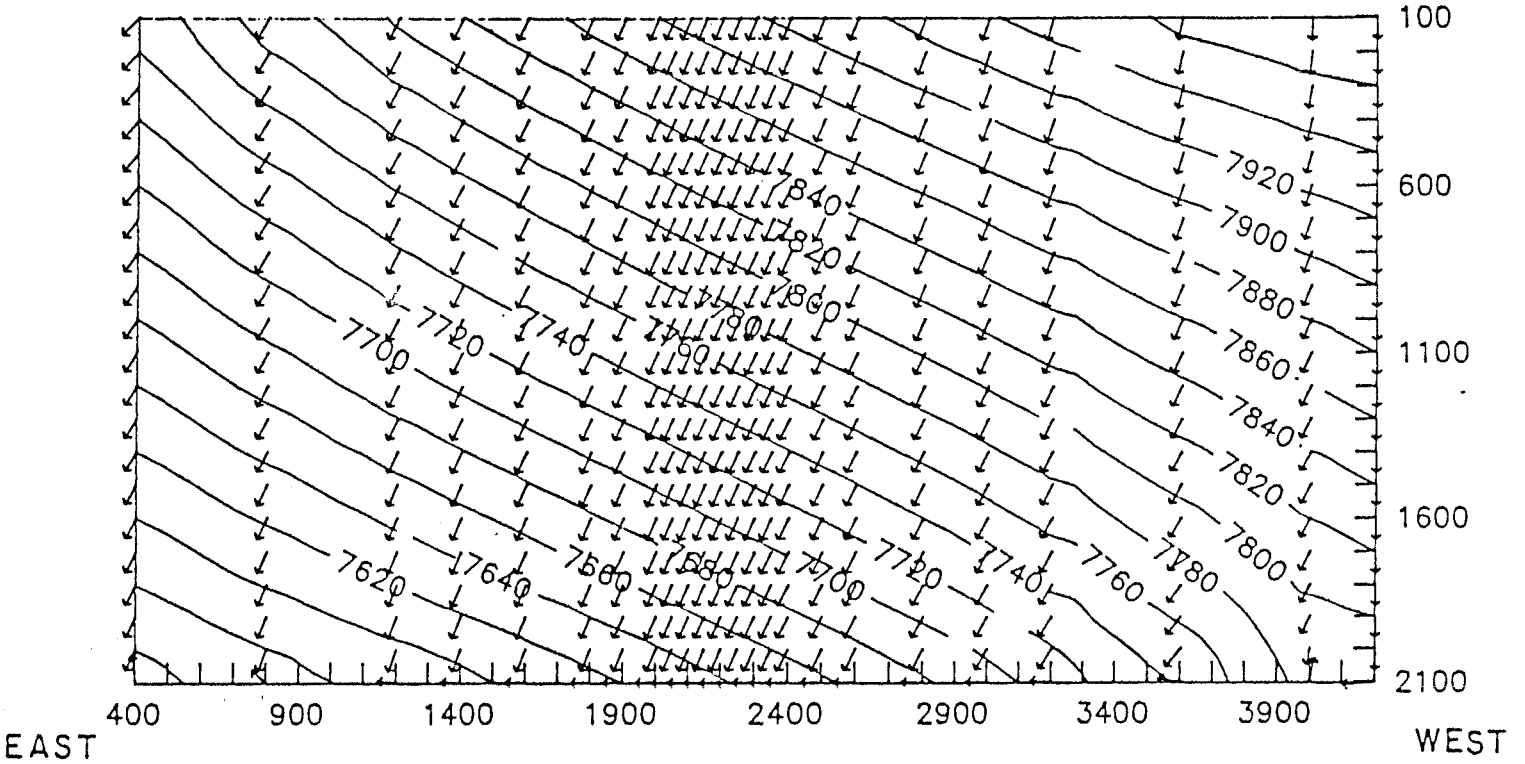


GRIMES WASH – LEFT FORK ABOVE MINE




GRIMES WASH – BELOW MINE
Dranage Recession Curve Study
DISCHARGE (GPM)
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
986
1987
988

TOP



BOTTOM

KEY:

Contours in feet

Contour Interval 20 feet

SCALE 1:600

PROJECT

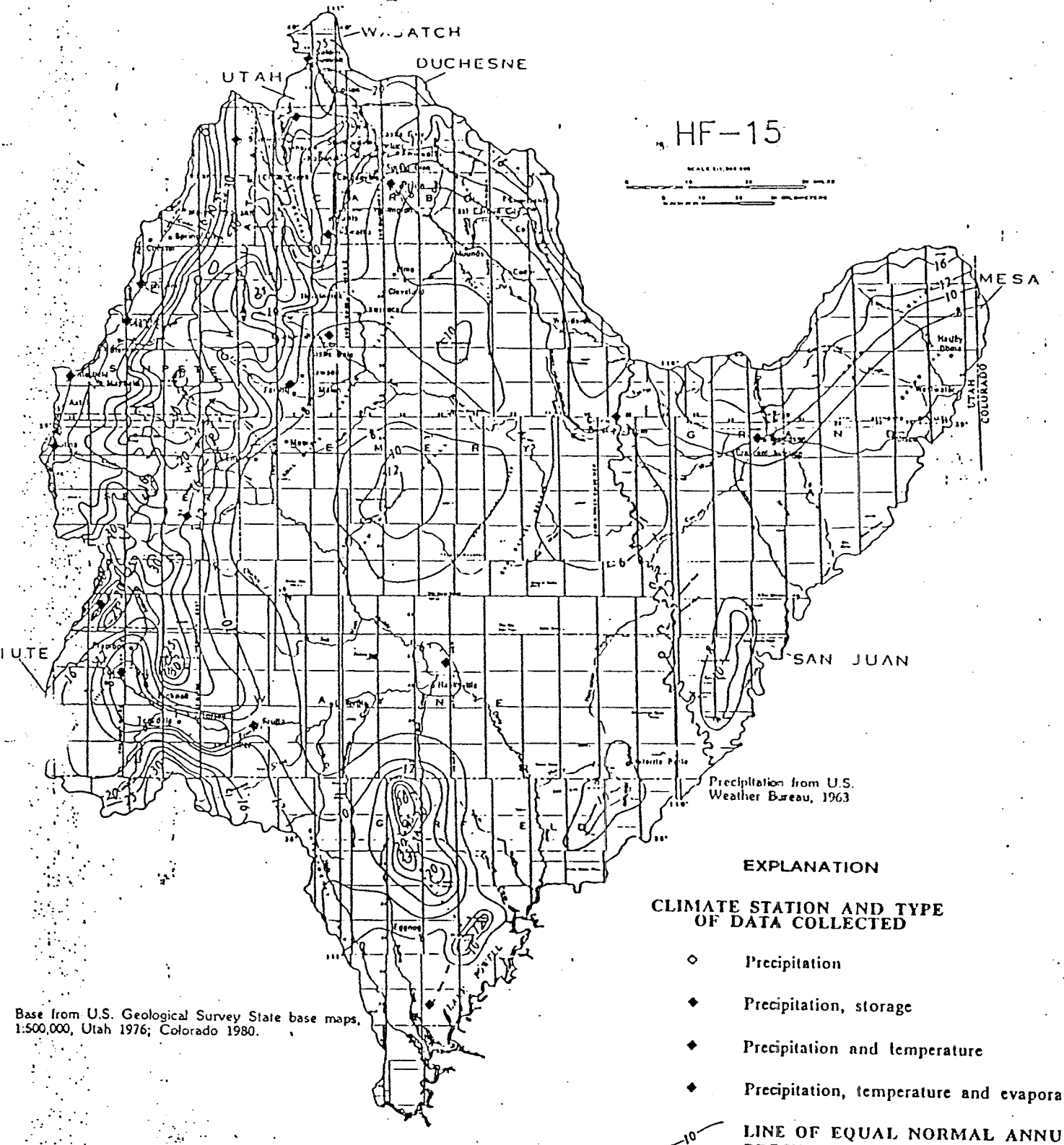
DATE

REVISIONS

Hydro-Search, Inc.
CONSULTING HYDROLOGISTS-GEOLOGISTS
Milwaukee • Denver • Reno

HF-14

Fault Graben Base Case



Normal annual (1931-60) precipitation and location of climate stations.

TABLE HT-1: MODES OF OCCURRENCE - EAST MOUNTAIN SPRINGS

Stratigraphic Location	Occurrences: Permeable fluvial channels that intersect the land surface	Flow along permeable strata underlain by impermeable mudstone which intersects the land surface	Contact of permeable beds and the Roans Canyon Fault zone	Mode of occurrence not identified
Base of Flagstaff Limestone		79-6, 79-7, 79-35, 86-58	Sheba Springs 79-1	
North Horn Formation	Teds Tub, Burnt Tree, 79-2, 79-3, 79-8, 79-9, 79-11, 79-12, 79-13, 79-14, 79-15, 79-16, 79-17, 79-21, 79-22, 79-26, 79-27, 79-28, 79-29, 79-34, 79-39, 80-42, 80-43, 80-46, 80-47, 80-48, 84-53, 84-56, 86-59		Elk Springs, 79-10, 79-18, 79-19, 79-20, 84-54	
Base of North Horn Formation		79-23, 79-25, 79-32, 79-36, 79-37, 79-38, 84-55	79-30, 79-31	
Other Stratigraphic Horizons	Blackhawk Formation 80-50, 84-57		80-49 (Price River) Bear Canyon Fault Zone 82-51 (Price River)	Flagstaff Limestone 79-4, 79-5, Pine Springs Trough, Price River Formation 79-24, 79-33, 79-40, 80-41, 80-44, 80-45, 82-52, Jerk Water, 89-60 (Alpine)

TABLE HT-2: EAST MOUNTAIN SPRINGS WATER QUALITY

HISTORICAL (1979-87)

Parameter	Burnt Tree	Elk Spring	Sheba Spring	79-10	79-23	79-26	79-29	79-35	80-44	80-46	82-52	84-56
Elevation	9260	9350	9740	9350	9035	9310	9410	9585	8980	9350	8995	9335
Geologic Formation	TKn	TKn	Tf	Kpr	TKn	TKn	TKn	Tf	Kpr	TKn	Kpr	TKn
Bicarbonate	334.00	296.00	290.00	314.00	413.00	336.00	327.00	306.00	455.00	344.00	411.00	344.00
Calcium	68.40	74.20	94.50	79.90	79.60	74.70	64.50	95.90	104.90	61.10	83.50	64.00
Carbonate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	4.80	3.70	3.20	5.00	11.30	7.80	18.70	3.50	11.30	4.80	9.50	9.00
Conductivity	504.00	443.00	447.00	481.00	691.00	485.00	552.00	453.00	904.00	556.00	672.00	563.00
Hardness	268.00	254.00	252.00	296.00		282.00	265.00	282.00		308.00	294.00	302.00
Iron	0.25	0.14	0.15	0.15	0.09	0.17	0.14	0.15	0.13	0.32	0.08	0.05
Magnesium	24.84	21.36	9.81	22.38	38.30	25.73	34.69	14.20	41.10	28.77	33.60	31.92
Manganese	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	<0.01	0.01	0.01	0.01
pH	7.46	7.65	7.53	7.55	7.72	7.84	7.69	7.55	7.75	7.38	7.38	7.45
Potassium	1.31	2.97	1.93	2.08	1.54	2.36	4.15	0.98	3.05	0.87	1.74	0.89
Sodium	14.11	11.16	6.49	6.66	14.90	17.12	29.83	9.73	34.30	10.07	23.22	17.60
Sulfate	32.00	42.70	40.90	31.70	27.20	47.60	75.80	51.70	145.70	19.40	52.10	28.00
TDS	290.00	254.00	269.00	270.00	364.00	280.00	339.00	275.00	523.00	309.00	381.00	318.00

TABLE HT-3: IN-MINE WATER QUALITY
HISTORICAL (1977-1987)

PARAMETER	MAXIMUM	MINIMUM	AVERAGE	NO. OF ANALYSES
DEER CREEK				
Bicarbonate	499	297	430	30
Calcium	245.0	10.0	106.3	61
Carbonate	1.0	1.0	1.0	23
Chloride	85.0	3.9	10.2	68
Conductivity	1700	470	873	67
Hardness	532	299	435	32
Iron, Dissolved	0.36	0.01	0.14	20
Magnesium	79.50	4.42	48.05	62
Manganese	0.06	0.01	0.02	38
pH	7.93	6.80	7.27	83
Potassium	10.00	1.00	3.55	61
Sodium	66.00	10.22	21.29	61
Sulfate	915.2	16.0	148.4	75
TDS	982	256	519	83
WILBERG/COTTONWOOD				
Bicarbonate	648	259	466	37
Calcium	416.9	11.2	186.7	67
Carbonate	1.0	1.0	1.0	21
Chloride	130.0	0.9	16.3	91
Conductivity	5000	620	1494	69
Hardness	2022	125	792	48
Iron, Dissolved	1.26	0.01	0.17	77
Magnesium	238.20	4.90	87.86	67
Manganese	0.06	0.01	0.02	45
pH	8.50	6.55	7.38	131
Potassium	21.00	1.00	6.63	67
Sodium	183.80	16.60	39.18	67
Sulfate	1450.0	78.0	367.4	120
TDS	2595	419	846	131

TABLE HT-5: MEETINGHOUSE CANYON WATER QUALITY - LEFT FORK SURFACE WATER QUALITY

HISTORICAL (1986-87)

	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	-------- SOLIDS -------- TDS	TSS	SETTLEABLE
MIN	<1.0	222	2.2	<1.0	3.0	300	5.4	195	<0.05	<0.05	22.6	<0.01	<0.5	7.25	0.60	3.8	20.0	190	<0.5	<0.1
MAX	49	307	55.6	8.0	47.5	500	8.1	350	0.30	0.90	36.5	0.04	10.9	8.55	1.62	13.1	85.0	292	74.0	<1.0
MEAN	6.3	249	39.6	2.0	9.2	412	10.3	241	0.10	0.18	29.5	0.02	1.6	7.78	1.16	8.9	37.5	242	22.2	0.2

TABLE HT-6: GRIMES WASH SURFACE WATER QUALITY

HISTORICAL (1979-1987)

	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	IRON DISSOLVED	IRON TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	SOLIDS TDS	SOLIDS TSS	SOLIDS SETTLEABLE
RIGHT FORK																				
MIN	0.1	104	30.0	<1.0	3.0	190	6.8	112	<0.05	0.01	6.3	<0.01	<0.5	7.2	1.60	2.0	20.0	125	0.5	<0.1
MAX	14.0	320	52.0	<1.0	16.0	750	9.8	320	3.31	20.60	46.2	0.30	5.2	8.7	7.64	20.44	161.7	700	7116.0	3.3
MEAN	2.2	254.0	40.7	<1.0	9.8	569	8.5	249.0	0.87	1.37	35.71	0.06	1.2	8.1	3.12	15.63	67.5	342	384.5	0.55
LEFT FORK																				
MIN	<1.0	188	2.3	<1.0	6.0	410	5.0	196	<0.05	0.04	23.8	<0.01	0.1	7.3	1.0	11.1	30.4	212	<0.5	<0.1
MAX	<1.0	482	71.1	15.0	156.0	790	9.6	460	0.12	0.81	68.5	0.15	3.5	8.7	3.0	34.0	115.0	570	253.0	<0.5
MEAN	<1.0	309	42.5	2.1	20.4	628	7.8	286	0.07	0.16	41.48	0.03	1.0	8.0	1.63	28.9	71.5	362	27.2	0.14
BELOW THE MINE																				
MIN	<0.1	117	5.1	<1.0	12.0	220	4.5	146	<0.05	0.01	10.7	<0.01	<0.5	7.10	2.60	9.0	46.0	152	<0.5	<0.1
MAX	127.0	400	191.5	<1.0	154.0	1,810	11.45	855	2.25	22.60	102.0	0.30	5.2	8.50	7.81	121.0	593.0	1224	9702.0	4.0
MEAN	9.8	338	99.1	<1.0	69.2	1,072	8.1	568	0.43	1.11	73.6	0.05	1.3	7.88	5.17	74.99	279.1	650	300.9	0.54

TABLE HT-7
UTAH POWER & LIGHT COMPANY
EAST MOUNTAIN SPRING OWNERSHIP

Spring	Location	Resource	Owner
Sheba Spring	T17S, R7E, S7	TROUGH	
		WR# 93-1617	FS
Elk Springs	T17S, R7E, S5	POND	PL
Burnt Tree Spring	T17S, R7E, S16	TROUGH & POND	FS
Jerk Water Spring	T17S, R7E, S16	TROUGH	FS
Pines Springs	T17S, R7E, S16	TROUGH & POND	FS
Pine Springs Trough	T17S, R6E, S1	TROUGH	FS
Ted's Tub	T17S, R7E, S17		PL
79-1	T17S, R7E, S7	TROUGH	FS
79-2 (Surging Spring)	T17S, R7E, S21		PL
79-3	T17S, R7E, S20		PL
79-4	T17S, R6E, S12		FS
79-5	T17S, R6E, S12		FS
79-6	T17S, R6E, S12	WR# 93-1622	FS
79-7	T17S, R6E, S12		FS
79-8	T17S, R6E, S12		FS
79-9	T17S, R6E, S12	TROUGH	
		WR# 93-1616	FS
79-10	T17S, R6E, S12		FS
79-11	T17S, R7E, S18		PL
79-12	T17S, R7E, S17	WILDLIFE	PL
79-13	T17S, R7E, S8		PL
79-14	T17S, R7E, S8		PL
79-15	T17S, R7E, S8		PL
79-16	T17S, R7E, S6	POND	PL
79-17	T17S, R7E, S6		PL
79-18	T17S, R7E, S5		PL
79-19	T17S, R7E, S5		PL
79-20	T17S, R7E, S5		PL
79-21	T17S, R7E, S20	POND	PL
79-22	T17S, R7E, S20	POND	PL
79-23	T17S, R7E, S15	LIVESTOCK USE	
		WR# 93-1421	FS
79-24	T17S, R7E, S22	TROUGH	
		WR# 93-1608	FS
79-25	T17S, R7E, S18	WR# 93-1615	FS
79-26	T17S, R7E, S18	POND	PL
79-27	T17S, R7E, S18	POND	PL
79-28 (Flag Lake)	T17S, R7E, S20	POND	PL
79-29	T17S, R7E, S18	POND	PL
79-30	T17S, R6E, S13		FS
79-31	T17S, R6E, S13		FS
79-32	T17S, R7E, S19	WILDLIFE	PL
79-33	T17S, R7E, S19		PL
79-34	T17S, R7E, S8		PL
79-35	T17S, R7E, S8		PL
79-36	T17S, R7E, S8		PL
79-37	T17S, R7E, S8		PL
79-38	T17S, R7E, S16	TROUGH	FS

TABLE HT-7
UTAH POWER & LIGHT COMPANY
EAST MOUNTAIN SPRING OWNERSHIP

Spring	Location	Resource	Owner
79-39	T17S, R7E, S20		PL
79-40	T17S, R7E, S21		PL
80-41	T17S, R7E, S21		PL
80-42	T17S, R7E, S21		PL
80-43	T17S, R7E, S20		PL
80-44	T17S, R7E, S21	WILDLIFE	PL
80-45	T17S, R7E, S21		PL
80-46	T17S, R7E, S21		PL
80-47	T17S, R7E, S21		PL
80-48	T16S, R7E, S33	TROUGH	FS
80-49	T16S, R7E, S33	TROUGH	FS
80-50	T16S, R7E, S29	LIVESTOCK	FS
82-51	T17S, R7E, S26	TROUGH WR# 93-1605	FS
82-52	T17S, R7E, S15		PL
84-53	T17S, R7E, S20		PL
84-54	T17S, R7E, S5		PL
84-55	T17S, R7E, S20		PL
84-56	T17S, R7E, S28		FS
84-57	T17S, R7E, S10	WILDLIFE	PL
86-58	T17S, R6E, S12		FS
86-59	T17S, R7E, S8		PL
89-60	T17S, R7E, S16		FS
North Springs	T16S, R7E, S28	DEVELOPED	FS
South Spring	T16S, R7E, S28	DEVELOPED	FS
Side Canyon Springs	T16S, R7E, S28	DEVELOPED	FS
East Mtn. Tank	T17S, R6E, S1	TROUGH	FS

FS = Forest Service
PL = Private Land

UTAH POWER & LIGHT MINING DIVISION
EAST MOUNTAIN PRECIPITATION
HISTORICAL COMPARISON

	1981	1982	1983	1984	1985	1986	1987	1988	MEAN	ST DEV
OCT	1.28	1.93	0.38	0.76	3.27	1.15	1.57	2.77	1.64	0.92
NOV	0.39	0.53	2.90	2.43	0.97	2.38	0.39	1.91	1.49	0.97
DEC	0.85	0.97	1.39	2.42	1.67	0.87	0.16	1.29	1.10	0.73
JAN	0.29	3.22	1.30	0.27	0.49	0.30	1.37	1.42	1.08	0.94
FEB	0.52	0.14	1.81	0.65	0.59	2.10	1.37	0.80	0.90	0.72
MAR	2.77	1.67	1.98	1.22	1.77	1.43	1.65	0.99	1.69	0.51
APR	0.64	0.00	0.92	0.58	1.35	1.05	1.16	2.08	0.96	0.58
MAY	0.87	0.45	0.71	0.22	1.73	0.38	1.77	1.03	0.90	0.55
JUN	0.11	0.09	0.61	1.18	0.28	0.53	0.58	0.81	0.52	0.34
JUL	0.57	1.86	1.27	1.90	2.47	0.87	2.49	0.45	1.49	0.76
AUG	0.85	1.10	4.83	2.33	0.12	2.24	1.16	0.96	1.70	1.37
SEP	2.55	2.61	1.62	0.64	2.31	1.63	0.06	0.91	1.54	0.88
TOTAL	10.98	14.57	19.71	14.53	17.82	14.92	13.73	14.61	15.00	2.38

EAST MOUNTAIN TEMPERATURES - HISTORICAL SUMMARY

OCTOBER SUMMARY

	HIGH	LOW
AVG.	45.2	29.3
MAX.	58.4	40.9
MIN.	22.3	9.5

FEBRUARY SUMMARY

	HIGH	LOW
AVG.	32.4	15.7
MAX.	55.5	39.2
MIN.	0.1	-14.1

JUNE SUMMARY

	HIGH	LOW
AVG.	66.4	44.3
MAX.	83.2	61.2
MIN.	27.7	13.1

NOVEMBER SUMMARY

	HIGH	LOW
AVG.	34.4	22.0
MAX.	48.5	35.6
MIN.	13.1	2.7

MARCH SUMMARY

	HIGH	LOW
AVG.	36.2	19.1
MAX.	58.7	39.8
MIN.	15.1	0.1

JULY SUMMARY

	HIGH	LOW
AVG.	72.2	51.2
MAX.	86.9	65.1
MIN.	48.5	20.4

DECEMBER SUMMARY

	HIGH	LOW
AVG.	29.5	13.2
MAX.	43.6	26.9
MIN.	2.7	-8.9

APRIL SUMMARY

	HIGH	LOW
AVG.	45.2	25.6
MAX.	68.1	45.2
MIN.	12.7	-0.3

AUGUST SUMMARY

	HIGH	LOW
AVG.	70.8	51.1
MAX.	85.0	63.8
MIN.	47.6	35.4

JANUARY SUMMARY

	HIGH	LOW
AVG.	30.0	14.9
MAX.	44.7	28.7
MIN.	2.9	-15.2

MAY SUMMARY

	HIGH	LOW
AVG.	51.5	32.2
MAX.	76.4	55.4
MIN.	15.8	3.4

SEPTEMBER SUMMARY

	HIGH	LOW
AVG.	59.7	41.5
MAX.	79.8	56.3
MIN.	31.6	20.0

HISTORICAL SUMMARY

PARAMETER	DATE	TEMP
AVERAGE HIGH		47.8
MAXIMUM HIGH	04-Jul-85	86.9
AVG. MAX. HIGH		77.8
MINIMUM HIGH	01-Feb-85	0.1
AVG. MIN. HIGH		7.7
AVERAGE LOW		30.2
MAXIMUM LOW	06-Jul-85	65.1
AVG. MAX. LOW		60.8
MINIMUM LOW	31-Jan-85	-15.2
AVG. MIN. LOW		-6.6

WILBERG COAL MINE PERMIT
PERMIT NUMBER UT-001
STATE PERMIT ACT/015/019

ATTACHMENT A
SPECIAL CONDITION 5

In accordance with these instructions Company submits maps of sufficient scale and accuracy to depict both primary grid control (Control Diagram) and coordinate address overlay maps 1" - 400' showing individual photogrammetrical survey points. Also, in accordance with the special instructions, Company submits computer listings of subsidence control points for years 1980, 1981, 1982 and 1983.

This information is in addition to Company's subsidence monitoring report which is appropriately submitted annually.

Special Condition 6

The Bureau of Mines entered into an agreement with Utah Power & Light Company in 1979, renewable on a yearly basis. This agreement is presently in force and field data is being generated. Utah Power states it plans to continue monitoring if, in the event the Government (Bureau) discontinues the subsidence monitoring surveys.

Methodology, frequency and accuracies will be compatible with past compiled data. Within six months of data collection owner will analyze the compiled information to determine if subsidence mitigation is warranted.

Owner will continue to publish reports on an annual basis summarizing the surface effects of undermining mining. Included will be comparisons between conventional and photogrammetrical surveys.

The total sediment yield per year is 3592 tons. For a density of 100 pounds per cubic foot, that relates to:

$$3592 \text{ tons} \times \frac{2000 \text{ lbs}}{\text{ton}} \times \frac{\text{ft}^3}{100 \text{ lbs}} \times \frac{\text{Acre foot}}{43560 \text{ ft}^3} = 1.65 \text{ Ac.ft.}$$

TABLE 4.2 SEDIMENT POND DESIGN

Precipitation from 10 Year 24 Hour Storm	2.2 inches
Weighted Average Curve Number	82.9
Direct Runoff	0.831 inches
Contributing Area	31.3 acres
Total Collected Runoff per Design Storm	2.17 Acre feet
Annual Sediment Production	3592 tons/year
Total Volume of Annual Sediment	1.65 Acre feet
Combined Total Required Pond Volume 2.17 = 1.65	3.82 Acre feet
Design Volume at Pond	4.47 Acre feet
Additional Sediment Volume Provided	0.65 Acre feet
60% of Sediment Volume 0.60 x (4.47 - 2.17) =	1.38 Acre feet

b. Ground cover is established for two (2) consecutive years at the end of the responsibility period, at 90 percent of reference area ground cover, with 90 percent statistical confidence. The stocking of live woody plants on the revegetated sites is equal to or greater than 90 percent of the stocking of live woody plants, of the same life form, on the reference areas with 80 percent statistical confidence. At least 80% of the shrubs and trees will have been in place at least 8 growing seasons. The tree or shrub is alive and healthy.

c. Productivity of the revegetated sites, for two (2) consecutive years at the end of the responsibility period, shall be considered successful if it is equivalent to 90 percent of the productivity of the reference areas with 90 percent statistical confidence.

d. A one-tail students "t" test of the sample means will be used for the statistical test.

7. Supplemental Shrub Stocking

If monitoring indicates adequate shrub density is not being achieved, supplemental shrub stocking will be initiated.

Containerized shrub species will be hand planted in the spring according to the following plan:

a. Species selection

Species will be selected from those listed on page 3-8.

Species selected will be those that have not established from seed.

b. Species grouping

Species will be intermixed to achieve three (3) layered clumps:

Low: (6"-12") Atriplex cuneata
A. confertifolia
Artemisia nova

APPENDIX XII

WILBERG MINE

BLASTING PLAN

BLASTING PLAN

The Wilberg Mine is a developed and producing underground coal mine and there is no foreseeable need for any blasting activities incident to the underground mining.

Should circumstances develop that require surface blasting activities a plan will be initiated in accordance with the Division's permanent regulations, parts UMC 817.61-68.

All surface blasting operations will be conducted by authorized, qualified persons. These individuals will be trained, examined and certified as provided by 30 CFR 850 and the State Industrial Commission, when the training, examination and certification becomes available through the responsible agencies. Handling and transportaton of explosives at the mine site will be done in accordance with 30 CFR 77-1302 and 77-1303 and all applicable state and federal laws that apply.

Records of each surface blast will be recorded as required by UMC 817.68. Exhibit 1 shows a typical report which will be compiled to satisfy these requirements.

BLASTING RECORD

A. Name of Operator Conducting Blast

_____
(Company Name)

_____
(Address)

_____
(City - State)

_____
(Telephone Number)

B. Location, Date and Time of Blast

_____
(Mine)

_____
(Location)

_____
(Date) (Time of Blast)

C. Name, Signature, and License Number of Blaster in Charge

_____
(Name)

_____
(Signature) (License No.)

D. Direction and Distance, in feet

_____
(Direction)

_____
(Distance)

E. Weather Conditions

_____
(Temperature)

_____
(Wind Direction & Approx. Velocity)

F. Type of Material Blasted

_____

G. Number of Holes, Burden, and Spacing

_____

H. Diameter and Depth of Holes

_____

I. Types of Explosives Used

_____

J. Total Weight of Explosives Used

_____
(Total Weight)

K. Maximum Weight Per Any 8 Millisecond Period

_____
(Maximum Weight)

L. Maximum Number of Holes Detonated Per 8 Millisecond Period

_____
(Maximum Number)

M. Initiation System

_____

N. Type and Length of Stemming

_____

O. Mats or Other Protection Used

_____

_____

P. Type of Delay Detonator and Delay Period

_____

_____

Q. Sketch of the Delay Pattern Attached

☐ Yes

R. Number of Persons in Blasting Crew

_____

S. Seismographic Records (Where Required)

_____
(Reading)

_____
(Location & Distance)

_____
(Name of Person Taking Reading)

_____
(Name of Person & Firm Analyzing Reading)

NOTE: This report is based on State Regulations UMC 817.68