



TRAIL MOUNTAIN COAL CO.
P.O. BOX 356
ORANGEVILLE, UTAH 84537

Aug. 11, 1977

Ronald W. Daniels
State of Utah
Dept. of Natural Resources
Division of Oil, Gas, and mining
1588 West North Temple
Salt Lake City, Utah 84116

Dear Mr. Daniels:

This letter is to inform you that I am in complete agreement with the four conditions and timetable as outlined in your letter of Aug. 1, 1977, and I will comply with these conditions.

Also, you will be receiving an augmented map of our surface facilities as soon as our engineers have completed it.

I trust your recommended approval to the governor will be forthcoming in the near future.

Sincerely yours,

John L. Bell, Pres.

Trail Mountain Coal Co.

Date 6/17/77



STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
1588 West North Temple
Salt Lake City, Utah 84116

NOTICE OF INTENTION TO COMMENCE MINING OPERATIONS
(See Rule M of General Rules and Regulations)

1. Name of Applicant or Company Trail Mountain Coal Company
Corporation () Partnership () Individual ()

2. Address P.O. Box 356, Orangeville, Utah
Permanent Temporary

3. Name and title of person representing company John L. Bell, President

4. Address Same as above Office Phone 748-2140

5. Location of Operation Emery Sec. 25 T. 17 S R. 6 E
County

6. Name of Mine Trail Mountain Mine

7. Mineral to be mined:		Mining method:
(<input checked="" type="checkbox"/>) Coal	() Flagstone	<u>Continuous Mining</u>
() Copper	() Gravel	
() Manganese	() Shale	<u>Conventional Mining</u>
() Iron Ore	() Uranium	
() Phosphate	() Gilsonite	
() Potash	() Bituminous Sandstone	
() Fluorspar	() Tungsten	
() Other (specify) _____		

8. Have you or any person, partnership or corporation associated with you received an approved Notice of Intention to Commence Mining Operations by the State of Utah for operations other than described herein?
() Yes () No
If yes, list all approval numbers now under surety:

9. Owner/Owners of record of the surface area within the land to be affected:
John L. Bell Address P.O. Box 356, Orangeville, Utah
Address _____
Address _____
Address _____

10. Owner/Owners of record of minerals to be mined:

<u>Trail Mountain Coal Company</u>	Address <u>Orangeville, Utah</u>
<u>Leases from John L. Bell</u>	
_____	Address _____
<u>60 AC. Fee Land</u>	Address _____
<u>40 AC. Federal Leased Land</u>	
<u>No. U-082996</u>	Address _____

11. Owner/Owners of record of all other minerals within any part of the land affected:

<u>N/A</u>	Address _____
_____	Address _____
_____	Address _____

11a. Have the above owners been notified in writing?
(X) Yes () No

12. Source of Operator's legal right to enter and conduct operations on land to be covered by the Notice Leases From John L. Bell

13. Approximate acreage to be disturbed:

A) Mining Operation Area -	<u>7</u>	acres
(include operations, storage, & disposal area)		
B) Access Road or Haulageway -	_____	acres
C) Drainage System -	_____	acres

TOTAL ACRES: 7

14. Give the names and post office addresses of every principal Executive, Officer, Partner, (or person performing a similar function) of Applicant:

Name:	Title:	Address:
a. <u>Rupert Willis</u>	<u>Secretary</u>	<u>Orangeville, Utah</u>
b. <u>Carson Rhealy</u>	<u>Office Mgr. & Tres.</u>	<u>Orangeville, Utah</u>
c. _____		
d. _____		

15. Has Applicant, any subsidiary or affiliate or any person, partnership, association, trust, or corporation controlled by or under common control with Applicant, or any person required to be identified by Item 14, ever had an approval of a Notice of Intention withdrawn or has surety relating thereto ever been forfeited? () Yes (X) No

If yes, explain:

STATE OF Utah

COUNTY OF Salt Lake

I, John L. Bell, having been duly sworn
depose and attest that all of the representations contained in the foregoing
application are true to the best of my knowledge; that I am authorized to
complete and file this application on behalf of the Applicant and this
application has been executed as required by law

Signed: John L. Bell

Taken, subscribed and sworn to before me the undersigned authority
in my said county, this 17th day of June, 19 77.

Notary Public: Andrew Anderson

My Commission Expires: March 8, 1980

PLEASE NOTE:

Section 40-8-13(2) of the Mined Land Reclamation Act provides as follows:

"Information relating to the location, size, or nature of the deposit and marked confidential by the operator, shall be protected as confidential information by the Board and the Division and not be a matter of public record in the absence of a written release from the operator, or until the mining operation has been terminated as provided in subsection (2) of section 40-8-21."

Is confidential information contained herein?

YES _____ (Initial)

NO _____ (Initial)

Sections desired to be maintained as confidential information -



STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
1588 West North Temple
Salt Lake City, Utah 84116

MINING AND RECLAMATION PLAN

(Other forms may be used in lieu of MR 2, provided they contain the same information)

1. Name of Applicant or Company Trail Mountain Coal Company
2. Proposed type of operation Coal Mining
3. (a) Prior Land Use(s) Wildlife Habitat
(b) Current Land Use(s) Mining
(c) Possible or Prospective Future Land Use(s) Recreation
4. What vegetation exists on the land proposed to be affected None,
area is disturbed and no vegetation exists
(a) Types and Estimated Percent cover or density: No vegetation left on
disturbed area
5. What is the pH range of soil before mining? N/A pH
Name of Person or Agency and method of determining pH Pad site to be reclaimed
is a cut/fill structure
6. Site elevation above sea level 7,200'
7. In case of coal, oil shale, and bituminous sandstone:
Principal seam(s) and thickness(es) Hiawatha 7-8'
8. Estimated duration of mining operations 3
9. Has overburden, waste or rejected materials been classified as acid or alkali producing? () Yes (X) No
Does the above material being moved have any other characteristics affecting revegetation? No
10. Will any underground workings or aquifers be encountered? (X) Yes () No
Describe minor amount from Blackhawk Formation
Is there an active discharge of water from abandoned-deep mines on or crossing the land affected? (X) Yes () No If yes, describe the quality of water being discharged. unknown, to be determined by Division

11. Describe specifically a detailed procedure for: See Federal Mining & Reclamation Plan
- (a) The mining sequence
 - (b) The procedure for constructing and maintaining access roads, to include a typical cross-section and a profile of the proposed road grades.
 - (c) The procedure for site preparation including removing trees and brush.
 - (d) The method for removing and stockpiling topsoil or disturbed materials.
 - (e) The method for the placement or containment of all disturbed materials, to include the method for handling of all acid or alkali-producing and toxic materials.
 - (f) A procedure for final stabilization of disturbed materials.

GRADING AND REGRADING

Specifically describe: See Federal Mining & Reclamation Plan

- (a) Typical cross-section of regrading.
- (b) The method of spreading topsoil or upper horizon material on the regraded area and indicate the approximate thickness of the final surfacing material.
- (c) What type of soil treatment will be utilized.
- (d) The method of drainage control for the final regraded area.
- (e) Maximum grading slope. less 45°

TESTING

1. Describe method for testing stability of reclamation fill material.

Pad surface is compacted and stable

Describe method for the testing of soil that is intended to support vegetation

Soil will be tested by a lab prior to seeding, a small test plot will be installed.

2. Describe any soil treatment employed as an aid to revegetation As per

lab report and recommendations and test plot experience

3. Describe surface preparation of areas intended to support vegetation:

Possibly mulching, fertilization, scarification

REVEGETATION

1. Revegetation to be completed by:

- | | |
|---|---|
| <input checked="" type="checkbox"/> Operator | <input type="checkbox"/> Hydroseeding |
| <input type="checkbox"/> Soil Conservation District | <input type="checkbox"/> Aerial Seeding |
| <input type="checkbox"/> Private Contractor | <input type="checkbox"/> Conventional or Rangeland Drilling |
| <input type="checkbox"/> Other (specify) _____ | <input checked="" type="checkbox"/> Broadcast and Drag |
| | <input type="checkbox"/> Other _____ |

2. Will Mulch be used? Yes No
 Type: _____ Rate/Acre _____ lbs.

3. Revegetation Plan and Schedule -

Species	Rate/Acre	Planting Location	Facing N-S-E-W	Season to be replanted
Smooth Brome	3	Pad & Slope	All aspects	Fall
Crested Wheat	2	" "		
Orchard Grass	2	" "		
Russian, wildrye	1	" "		
Fourwing Saltbrush	1	" "		

Utah Serviceberry 1 " "
 Alfalfa 1 " "

4. Will affected area be subject to livestock or wildlife grazing? yes
 Yes No Will vegetation protection be needed? No, livestock grazing, possibly wildlife grazing, low intensity

5. Will irrigation be used: Yes No Type _____

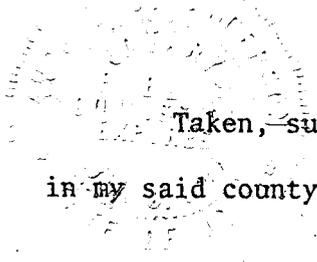
6. Describe maintenance procedures for revegetation if needed, until surety release is granted. Reseeding if necessary

STATE OF Utah

COUNTY OF Salt Lake

I, John L. Bell, having been duly sworn
depose and attest that all of the representations contained in the foregoing
application are true to the best of my knowledge; that I am authorized to
complete and file this application on behalf of the Applicant and this
application has been executed as required by law.

Signed: John L. Bell



Taken, subscribed and sworn to before me the undersigned authority
in my said county, this 17th day of June, 1977.

Notary Public: Andrew J. Anderson

My Commission Expires: March 8, 1980

PLEASE NOTE:

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"Information relating to the location, size, or nature of the deposit and marked confidential by the operator, shall be protected as confidential information by the Board and the Division and not be a matter of public record in the absence of a written release from the operator, or until the mining operation has been terminated as provided in subsection (2) of section 40-8-21."

Is confidential information contained herein?

YES _____ (Initial)

NO _____ (Initial)

Sections desired to be maintained as confidential information -

Corrected original
CALVIN L. RAMPTON
Governor



OIL, GAS, AND MINING BOARD

GORDON E. HARMSTON
Executive Director,
NATURAL RESOURCES

STATE OF UTAH

DEPARTMENT OF NATURAL RESOURCES

GUY N. CARDON
Chairman

CLEON B. FEIGHT
Director

DIVISION OF OIL, GAS, AND MINING

1588 West North Temple
Salt Lake City, Utah 84116
(801) 533-5771

CHARLES R. HENDERSON
ROBERT R. NORMAN
I. DANIEL STEWART
HYRUM L. LEE

March 11, 1977

Mr. John L. Bell
Trail Mountain Coal Company
P.O. Box 356
Orangeville, Utah 84537

Re: Trail Mountain Coal Mine
Sec. 25, T. 17S, R6E.
Emery County, Utah
ACT/015/009

Dear Mr. Bell:

On 8 March this Division, in conjunction with the Manti LaSal National Forest, inspected the Trail Mountain Mine in Cottonwood Canyon. The purposes of this inspection were to (1) discuss the hydrologic analysis of Cottonwood Creek which was previously prepared by the Forest Service, and (2) to listen to the Forest's concerns on the protection of Cottonwood Creek caused by runoff from the surface facilities of this mine.

You will recall, in the copy of my letter to Mr. Blumer of 2/17/77, I stated that we did not have enough data on the stream drainage's hydrologic and climatologic parameters to determine if the present culverts in the access ramps to the mine were adequate for normal flow. The forest's latest communication has provided this information to the Division.

In short, the information which we have received indicates that the present culverts under the mine access ramps have the capacity to withstand the two (2) year flood in Cottonwood Canyon. This would be unacceptable to the Division and in our opinion, is not in concert with the objective of the Mined Land Reclamation Act as set forth in 40-8-12 (1)(b).

Downstream values in Cottonwood Creek also must receive consideration. The water use of Cottonwood Creek as culinary and irrigation water, as well as other structures proposed on the stream, should be afforded some degree of protection from flooding. Coal fines, oil and grease, and mere siltation from the surface pad in the event of flooding over the pad should be considered in any design of stream crossings.

Mr. John L. Bell
March 11, 1977
Page Two

The Division feels that the suggestions provided by the Forest Service for design of stream crossings on Cottonwood Creek are reasonable and that they should be incorporated into the Mining and Reclamation Plan which you will be submitting to us. In the way of review, those suggestions are that structures on Cottonwood Creek should be capable of passing a 50 year flood, in this case 450 cfs. Under certain conditions, this flow can be handled with a 96" culvert, but possibly a bridge or box culvert would be more economical, depending on culvert length.

Overland flow of water and suspended particles from the mine working pad, reject pile, and coal surge pile into Cottonwood Creek is also of concern to this Division. You will recall that my letter of 2/17/77 to Mr. Blumer outlined our ideas on the containment of mine yard runoff. The observations of the coal pile made during our inspection on 8/4/76 have led us to modify those ideas somewhat. A rock/earth berm would still be called for along the Cottonwood Creek side of the operation, except for the general area adjacent to the coal surge pile. Where coal will be piled we now feel that at the very least, a concrete or block wall should be constructed to prevent coal from entering the creek through spillage or through moving equipment on, and around, the pile.

The water discharge from the mine observed on the day of the inspection was one additional item upon which I must comment. A discharge of water was taking place on the day of the inspection and was being allowed to flow down the hillside into Cottonwood Creek, causing a visible turbidity in the stream. In our opinion, a continued discharge of this nature is not in line with the best conservation practices. We trust that this discharge is a temporary condition and would like your return comments on same.

I hope that this letter clarifies our position on the information we would like included in your Mining and Reclamation Plan. We will be glad to set up a meeting to discuss the reasons for taking this position.

Very truly yours,

DIVISION OF OIL, GAS, AND MINING



RONALD W. DANIELS, COORDINATOR
OF MINED LAND DEVELOPMENT

/lc

cc: William H. Boley, Forest Engineer
U.S. Dept. of Agriculture
Forest Service
Manti-LaSal National Forest
350 East Main Street
Price, Utah 84501

Ralph Blumer, Mining Engineer
U.S.G.S. Office of Area Mining
Supervisor
Conservation Division
8426 Federal Building
Salt Lake City, Utah

DEPARTMENT OF THE INTERIOR

Geological Survey

COAL MINING PLAN - UTAH

Notice of Availability of Proposed Decision
for Mine Plan Submitted for Approval

In accordance with the requirements of 30 CFR 211.5 (c)(2), notice is hereby given that Trail Mountain Coal Company, P.O. Box 356, Orangeville, Emery County, Utah 84537, has submitted a mine plan to mine the 40 acre Federal lease U-082996 by underground mining method. The Trail Mountain mine is located in Emery County, Utah in T. 17 S., R. 6 E., SW $\frac{1}{4}$ SE $\frac{1}{4}$, Sec. 25. The Trail Mountain mine plan was initially received for review by the Mining Supervisor on September 10, 1976.

The Trail Mountain mine is an ongoing mining operation on fee land. The Federal lease, containing approximately 28 acres of coal, will be mined through entries located on the fee land. It is estimated that a year will be required to mine out the Federal lease.

The purpose of this notice is to inform the public that the Mining Supervisor proposes to approve the mining plan. Any person having an interest, which is or may be adversely affected, may request a public meeting in writing. Requests for a public meeting should include the name and addresses of the requestor and should be submitted to the Area Mining Supervisor, Conservation Division, U.S. Geological Survey, 8426 Federal Building, 125 South State Street, Salt Lake City, Utah 84138. All requests should be made within 20 days from the date of publication of this notice. No decision on the mine plan will be made prior to 20 days from the date of publication of this notice.

A preliminary public meeting on the proposed mine was held at the Emery County Court House on October 5, 1976, to solicit public comments and suggestions on related environmental and resource aspects of the proposed mine.

James J. Travis
FOR
Jackson W. Moffitt
Area Mining Supervisor

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Manti-LaSal N.F.

Ron Daniels

*Route to Bureau
Laguerre Jack
Pat I
\$ held in*

REPLY TO: 2800 Minerals

March 28, 1977

SUBJECT: Trail Mountain Mine (John Bell Mine)
Located in Cottonwood Canyon



TO: District Ranger, Ferron Ranger District

Attached is a report and minutes of our 3/8/77 meeting in Cottonwood Canyon at the Trail Mountain Mine.

One possibility not discussed in Evan Hansen's report is the piping of the complete creek between the two pipes. If any appreciable mining operation is to take place at this site, additional storage room will be a necessity. A pipe design of this magnitude would and should be done, considering this length, by a firm that has expertise in this area.

W. H. Boley

WILLIAM H. BOLEY
Forest Engineer

Enclosure

cc: Ron Daniels



Manti-LaSal N.F.

REPLY TO: 2800 Minerals

March 23, 1977

SUBJECT: Trail Mountain Mine (John Bell Mine)
Located in Cottonwood Canyon

TO: Forest Engineer



On March 8, 1977, the following people met in Cottonwood Canyon at the Trail Mountain Mine: John Niebergall - District Ranger, William Boley - Forest Engineer, Fred Thompson and Bob Wilson - Geologists, Evan Hansen - Engineer representing the Forest Service, Ron Daniels and Brian Buck - representing Utah State Division of Oil, Gas, and Mining, and Rupert Willis - representing Trail Mountain Mining Company. Following is a summary of various subjects which were discussed and observed by the group.

Presently the mine is producing a minimal amount of coal, approximately 60 to 80 tons per day. This coal is being stockpiled outside of the coal mine between the tipple operations and Cottonwood Creek. The coal is being loaded and hauled out daily. At these small rates of production coal is migrating from the stockpile and spilling over the creek bank into the creek channel. Future production rates for the mine are estimated in the range of 2000 to 2500 tons of coal per day. When these larger rates of production start, the area for stockpiling coal and space for surface facilities will not be adequate to accommodate the amount mined. Some arrangement to accommodate these facilities should be required in the mining plans.

The present efforts to reopen the mine entail pumping water out of the old mine portals. This water is discharging at an elevation of approximately 100 feet above the creek channel, running down the slope and into a small dozer-made pond adjacent to the stream. The water in Cottonwood Creek downstream is very riley and muddy; upstream it is clear. The possibility of contaminating the stream by discharging this type of water into it is very high.

Talking with Rupert Willis about where the property line is located between John Bell and the L.D.S. Church in Section 25, T17S, R6S, he indicated the stream is the boundary line. If a property survey was made showing where the correct property line is, this may or may not give the mine more operating room. If indeed the creek is the property line, an agreement might be made with the L.D.S. Church where additional land could be used for operating area, if the creek could be enclosed in a large culvert.

On March 11, the Emery County Courthouse records were checked and the recorded deeds indicate the centerline of Cottonwood Creek is the true property line between John Bell and the L.D.S. Church.

The Trail Mountain Mine is presently using diesel-powered generators for electrical power. They are negotiating with Utah Power and Light to furnish power at the mine site. Coming up Cottonwood Canyon stakes and lath were observed which supposedly is the location of the proposed powerline. Before final acceptance of the powerline location is made, consideration should be made to improving the road alignment so the powerline will not have to be moved in the future. A powerline corridor should be selected which will be compatible with the road and other uses to be made of the canyon.

The mining company is expanding its operations and are building up for the future production rates. They have recently had an underground telephone line installed to the mine. They are currently constructing a large cinderblock building which will be used as a maintenance shop and for showerhouse facilities. They have purchased and are installing a continuous miner in the mining area. Before large production rates can begin, and continue on a long time basis, additional Federal coal lease will have to be obtained.

There are two existing 24-inch culverts installed in Cottonwood Creek at the mine location. The upper culvert has approximately 12 feet of fill over it and the lower culvert has approximately 7 feet of cover. The fill over these culverts is composed of large rocks (1 to 3 cubic yards). These culverts are not large enough to carry the flood flows when they occur.

There are two criteria identified in Forest Service Manuals for the design of culverts. First, the culvert should be sized to pass the 10-year flood without head pressure. In the case of the Cottonwood Drainage, a 10-year flood is 260 cubic feet of water per second (cfs). This would require a 78-inch culvert. Second, it should be sized so with head pressure the 50-year flood will pass. A 50-year flood in Cottonwood Creek is 450 cfs. An 84-inch culvert with an end section will take care of the 50-year flood at the upper location. At the lower crossing, a 96-inch culvert with end sections would be required if the fill was raised two to four feet. A 112"x75" steel pipe arch with an end section could possibly be used without any additional fill.

The Forest Service Manual also states that any culverts with end areas greater than 35 square feet should be designed for a 20-year flood and checked for a 50-year flood. The 20-year flood in Cottonwood is 320 cfs. This would require an 84-inch culvert.

If Forest Service requirements were met at the upper crossing an 84-inch corrugated metal pipe (cmp) would be required, and at the lower crossing a 96-inch cmp or 112"x75" steel pipe arch could be installed. When these large sizes of pipe are being considered, a small bridge soon becomes a viable alternative when economics are considered.

Presently, the upper culvert is 80 feet long and the lower culvert is 60 feet long. A rough estimate in the cost of the pipe would be as follows:

84" x 80 ft. is \$5124.00 plus \$1956.00 for two end sections
96" x 60 ft. is \$4200.00 plus \$1956.00 for end sections.

As an alternative, the

112" x 75" x 60 ft. arch is \$3660.00 plus the cost of a
headwall and wingwalls.

The above costs do not include installation costs. Installation costs would run approximately 50 percent of the cost of the pipe.

The Trail Mountain Mine owns the surface land in the area of their portal entries and tippie operations. Because of this ownership, they have the attitude that good housekeeping policies do not apply to them. The State Division of Oil, Gas, and Mining will have jurisdiction to police the mine's surface activities. The Forest Service regulations and the State Division of Oil, Gas, and Mining regulations should be compatible with each other. Therefore, just because a mining company owns the surface land, instead of the Federal government, this should not make any difference in their surface operations.

There are other potential mining sites up and down stream from the Trail Mountain Mine which, if ever open, would have to meet Federal and E.P.A. standards. The Trail Mountain Mining Company should have to live up to all E.P.A. and Federal standards. If Trail Mountain Mining Company contaminates and pollutes the Cottonwood stream, this may have an affect on other potential mining operations downstream.

It was recognized that there are problems which exist in Cottonwood Canyon. There are enough violations that the E.P.A., if made aware of them, would have the power to close the Trail Mining Company operations down until compliances are met.

One recommendation we all agreed on is that the mining company should be encouraged to install a 6- to 8-foot high retaining wall around the stockpile area. This retaining wall should enclose a large enough area for future production rates.

Evan E. Hansen

EVAN HANSEN, P.E.
Civil Engineer

Felt Trail Mtn Coal Co



United States Department of the Interior

U-082996

GEOLOGICAL SURVEY

Office of the Area Mining Supervisor
Conservation Division
8426 Federal Building
125 South State Street
Salt Lake City, Utah 84138

ACT/015/009

April 20, 1977

Oil Gas & Mining Division
1588 West North Temple
Salt Lake City, Utah 84104

Dear Sir:

Attached is a Notice of Availability of Proposed Decision for your information. This notice is required in 30 CFR 211.

Sincerely yours,

Ralph J. Blumer

Ralph J. Blumer
Mining Engineer

Attachment



TRAIL MOUNTAIN COAL CO.
P.O. BOX 356
ORANGEVILLE, UTAH 84537

Mr. Charles R. Henderson
Dept. of Natural Resources
1588 West North Temple
Salt Lake City, Utah 84116

Dear Mr. Henderson:

In reply to your letter of March 11, 1977, I would like to clarify certain points and suggestions that you made in regards to the Trail Mountain Mine at Orangeville, Utah.

At the present time an additional study is being made of the normal flow and possible flooding of Cottonwood creek. We would like to hold off on our decision as to whether we will install another larger culvert or build a bridge or box culvert pending the findings of this study. We feel the culverts that we now have with an overflow design should be adequate but we will comply with any decision that is mutually agreed upon when all of the information is in.

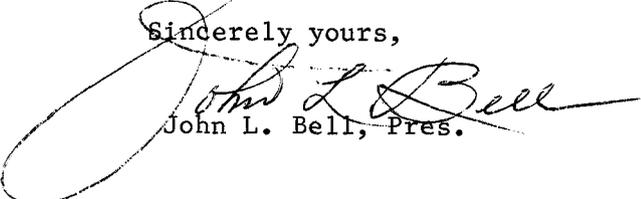
We have built a rock/earth berm or settling pond along the Cottonwood Creek side of our operation to catch any overland flow of water and settle out any suspended particles from the mine working pad. We feel this pond is adequate in size to hold any runoff problem that might arise in the future.

The water discharge from the mine observed on the day of inspection was a temporary emergency condition and should not occur again in the foreseeable future. Any discharge from the mine will now be directed into the berm of settling pond and not into the Cottonwood Creek.

In regards to the suggestion that a concrete or block wall be built along the creek bank in the area adjacent to the coal stock pile, we feel that the present construction should be adequate. Along the bank of Cottonwood Creek we have constructed an earth/rock embankment over three feet in height. Beyond this is 12-15 foot roadway that must be kept open and clear at all times to allow trucks access to the coal pile for loading purposes. Signs will be placed warning truckiers and loaders to keep well away from the stream and embankment. The coal that was observed on the stream bank was deliberately dumped there over a year ago by one of the men running the loading machine. Loaders and truckers have been instructed not to dump over the bank and we are certain this condition will not reoccur.

We trust this information is what you require. We appreciate all of your help and cooperation in the past.

Sincerely yours,


John L. Bell, Pres.

JLBch

Manti-LaSal N.F.

REPLY TO: 2530 Hydrologic Surveys, Prescriptions, and Plans

March 3, 1977

SUBJECT: Flood Flows for Design of Cottonwood Creek Crossing
at the Bell Mine

TO: William H. Boley, Forest Engineer



The Bell Mine is being developed in the Cottonwood Creek drainage on the Ferron Ranger District. This has generated a need to anticipate the flood flows for the design of a stream crossing at the mine site.

A field survey was performed in 1975 to assess the hydrologic condition of the Cottonwood watershed. The analysis utilized the SCS runoff curve number method to generate runoff hydrographs for 2 year, 10 year, and 50 year storms. The storm synthesized hydrographs accompany this memorandum. The flood peaks from the design hydrographs were plotted on log normal probability paper and the 100 year flood peak was extrapolated by extension of the line through the 2, 10, and 50 year events to the 100 year event.

The analysis showed that the existing culverts are inadequate with respect to Forest Service criteria for passage of flood flows. The two current stream crossings consist of 18 foot fills over 24 inch culverts. The maximum flow that could be passed through such a system with 18 feet of head pressure is approximately 50 cfs. This flow is slightly exceeded by the peak from the 2 year storm. Field observation since the initial investigation suggests that the fill may have been over-topped by water since 1975. Greater magnitude storms may cause a failure of the fill by eroding it. Significant damage to the mine yarding area and downstream resources would result from this cutting. Adequately sized culverts or bridges could alleviate this risk. Table 1 presents the estimated flood peak and the minimum size of culvert required to pass the runoff from large magnitude events.

Table 1

<u>Storm Return Period (Years)</u>	<u>Flood Flow Estimate (cfs)</u>
2	57
10	260
20	320
50	450
100	640

As can be seen from Table 1, Cottonwood Creek can generate large magnitude floods. This is due to the relatively large portion of the drainage that consists of exposed bedrock.

There is an inherent risk in designing stream crossings to pass a design size flood. That risk is that a flood of a larger than design magnitude could occur within the design life. To determine the risk of the design exceedence in any single year, the following expression is employed:

$$J = 1 - \left(1 - \frac{1}{T}\right)$$

J = Risk of exceedence expressed as a decimal

T = Recurrence Interval

The risk of exceedence during a period of concurrent years may be calculated by the expression:

$$J = 1 - \left(1 - \frac{1}{T}\right)^n$$

n = Number of concurrent years in the design life being considered.
J and T are as previously defined.

The use of the above equations generates an exceedence risk, the potential that design criteria will be exceeded. Application of these principals in design of structures is useful in arriving at the most cost effective structure that will last for an acceptable period of time.

The following table presents the percent chance of risk being taken with the structure being in place for 10, 20, or 50 years:

<u>Life of the Structure in Years</u>	<u>Chance of Water Being Above the Structure Inlet (Chance of exceeding the 10-year flood)</u>	<u>Chance of Water Flowing Over the Fill (Chance of exceeding the 50-year flood)</u>
10	65%	18%
20	88%	33%
50	99%	64%

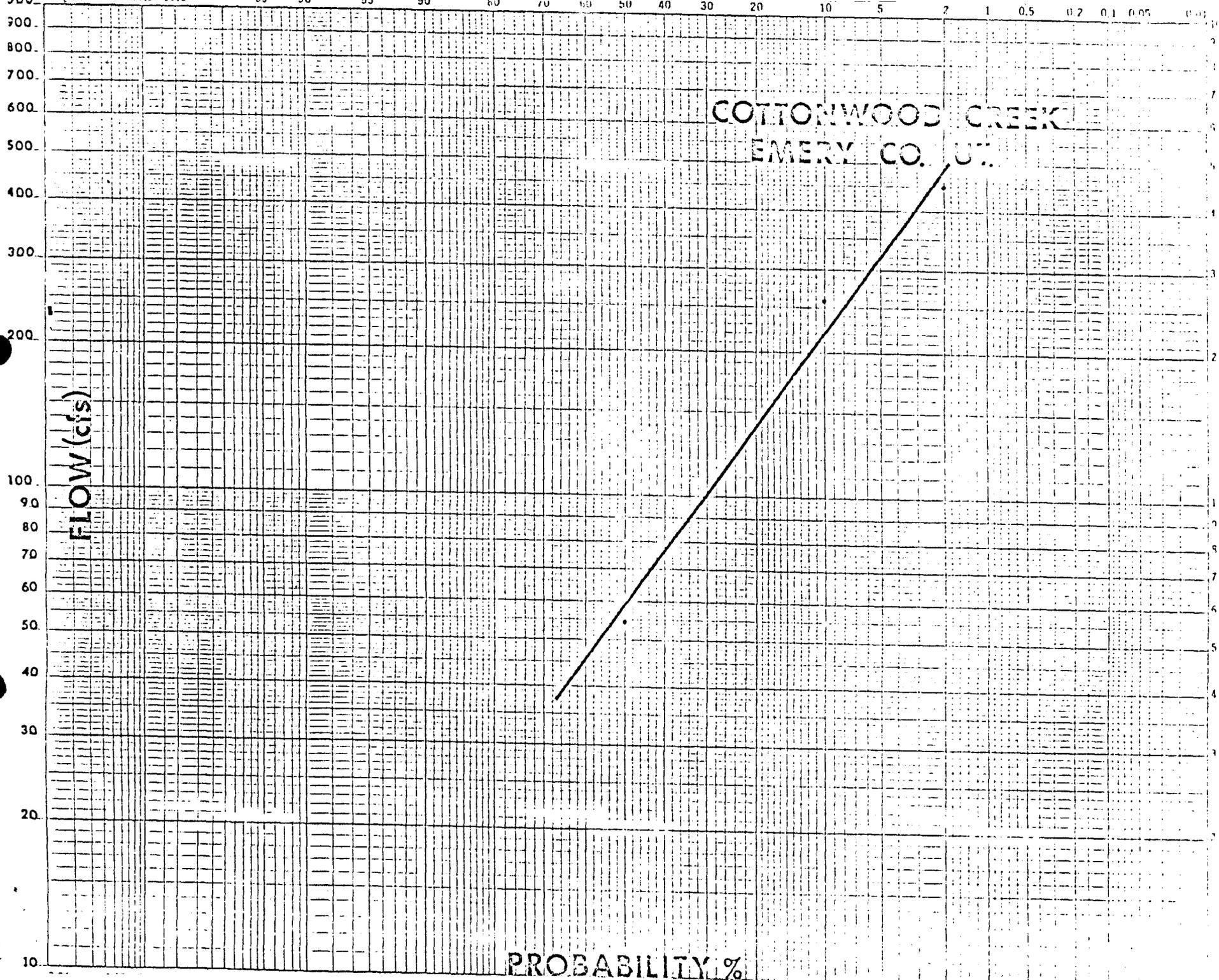
The flow data mentioned in this document do not provide for the passage of sediment and debris. Significant amounts of both could be generated by extreme runoff events. The rocks, trees, and brush common to the Cottonwood Creek channel have a high displacement probability. It should be kept in mind that this size culvert does not allow for sediment and debris constriction.

Robert J. Anderson

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Hydrologist

Enclosures

cc: Evan Hansen



2, 10, & 50 YEAR STORM
HYDROGRAPHS
COTTONWOOD CREEK

