Mine file
Pam
PFO

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

RECEIVED
DEC 13 1993
DIVISION OF
OIL, GAS & MINING

December 6, 1993

Mr. Lowell Braxton, Administrator
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Re: Notification of Application for Partial Bond Release
Huntington Canyon No. 4 Mine
INA/015/004, UT-004
Emery County, Utah

Dear Mr. Braxton:

Mountain Coal Company has completed Phase II of its approved reclamation plan for the Huntington Canyon No. 4 Mine. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the Utah Coal Mining Reclamation Act, this letter will serve as notification that Mountain Coal Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond.

The original bond posted for this property was $360,104.00, of which $216,062.40 (60%) was released on November 10, 1986 upon approval of Phase I Bond Release. The present bond posted for this site is $144,041.60. Mountain Coal Company is seeking release of an additional 30% of the original bond, or $108,031.20.

If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

MOUNTAIN COAL COMPANY

APPLICATION
FOR
PHASE II BOND RELEASE

GORDON CREEK NO. 3/6 MINES

INA/007/017

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Mr. Lowell Braxton, Administrator
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Re: Application for Partial Bond Release
Gordon Creek No. 3 & 6 Mines
INA/007/017
Carbon County, Utah

Dear Mr. Braxton,

Mountain Coal Company has completed Phase II of the approved reclamation plan for the Gordon Creek No. 3 & 6 Mines. This is based upon the establishment of revegetation and sediment control in accordance with the approved reclamation plan, as verified in the attached 1993 Vegetation Monitoring Report and Sediment Production Evaluation.

In accordance with the provisions of R645-301-880, Mountain Coal Company is hereby applying for partial release of the performance bond. The original bond posted for this property was $346,000.00, of which $207,600.00 (60%) was released on June 26, 1987 upon approval of Phase I Bond Release. The present bond posted for this site is $138,400.00. Mountain Coal Company is hereby applying for release of an additional 30% of the original bond, or $103,800.00. This will leave an amount of $34,600.00 to be held until final bond release. The disturbed area for this site was 7.98 acres, with an affected area of approximately 28 acres. The remaining bond would provide for approximately $4,335.84/acre of disturbed area or $1235.71/acre of affected area, which is considered more than adequate for possible third party revegetation as noted in R645-301-880.320.

Copies of letters for notification to land owners, agencies, and water companies in the area are enclosed. A copy of the newspaper advertisement placed prior to submittal of this application is enclosed. This advertisement ran for four consecutive weeks in the local area papers. Proof of publication is also enclosed.

It is our hope this application will meet with your approval. If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

Encl.

cc: Scot Anderson
Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Calvin K. Jacob & Sons
734 South Cherry Drive
Orem, Utah 84507

Re: Application for Partial Bond Release
Gordon Creek No. 3 & 6 Mines
INA/007/017
Carbon County, Utah

Gentlemen:

Mountain Coal Company has completed Phase II of the approved reclamation plan for the Gordon Creek No. 3 & 6 Mines. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the Utah Coal Mining Reclamation Act, this letter will serve as notification that Mountain Coal Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond.

The original bond posted for this property was $346,000.00, of which $207,600.00 (60%) was released on June 26, 1987 upon approval of Phase I Bond Release. The present bond posted for this site is $138,400.00. Mountain Coal Company is hereby applying for release of an additional 30% of the original bond, or $103,800.00.

Since you are a surface owner of record, you are invited to participate in a bond release inspection, if you so desire. The Division of Oil, Gas and Mining is available to participate in this inspection at your request. Please contact me or the Division if you wish to arrange for such an inspection.

If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

CC: Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

State of Utah
Division of State Lands and Forestry
355 West North Temple
3 Triad Center, Suite 400
Salt Lake City, Utah 84180-1204

Re: Application for Partial Bond Release
Gordon Creek No. 3 & 6 Mines
INA/007/017
Carbon County, Utah

Gentlemen:

Mountain Coal Company has completed Phase II of the approved reclamation plan for the Gordon Creek No. 3 & 6 Mines. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the Utah Coal Mining Reclamation Act, this letter will serve as notification that Mountain Coal Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond.

The original bond posted for this property was $346,000.00, of which $207,600.00 (60%) was released on June 26, 1987 upon approval of Phase I Bond Release. The present bond posted for this site is $138,400.00. Mountain Coal Company is hereby applying for release of an additional 30% of the original bond, or $103,800.00.

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If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Utah Power & Light Company
P.O. Box 899
Salt Lake City, Utah 84110

Re: Application for Partial Bond Release
Gordon Creek No. 3 & 6 Mines
INA/007/017
Carbon County, Utah

Gentlemen:

Mountain Coal Company has completed Phase II of the approved reclamation plan for the Gordon Creek No. 3 & 6 Mines. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the Utah Coal Mining Reclamation Act, this letter will serve as notification that Mountain Coal Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond.

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If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Mr. Lowell Braxton, Administrator
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Re: Application for Partial Bond Release
Gordon Creek No. 3 & 6 Mines
INA/007/017
Carbon County, Utah

Dear Mr. Braxton:

Mountain Coal Company has completed Phase II of the approved reclamation plan for the Gordon Creek No. 3 & 6 Mines. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the Utah Coal Mining Reclamation Act, this letter will serve as notification that Mountain Coal Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond.

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If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Carbon County Commission
Courthouse Building
Price, Utah 84501

Re: Application for Partial Bond Release
Gordon Creek No. 3 & 6 Mines
INA/007/017
Carbon County, Utah

Gentlemen:

Mountain Coal Company has completed Phase II of the approved reclamation plan for the Gordon Creek No. 3 & 6 Mines. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the Utah Coal Mining Reclamation Act, this letter will serve as notification that Mountain Coal Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond.

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If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Division of Wildlife Resources
455 West Railroad Avenue
Price, Utah 84501

Re: Application for Partial Bond Release
Gordon Creek No. 3 & 6 Mines
INA/007/017
Carbon County, Utah

Gentlemen:

Mountain Coal Company has completed Phase II of the approved reclamation plan for the Gordon Creek No. 3 & 6 Mines. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the Utah Coal Mining Reclamation Act, this letter will serve as notification that Mountain Coal Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond.

The original bond posted for this property was $346,000.00, of which $207,600.00 (60%) was released on June 26, 1987 upon approval of Phase I Bond Release. The present bond posted for this site is $138,400.00. Mountain Coal Company is hereby applying for release of an additional 30% of the original bond, or $103,800.00.

If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Mr. Robert Davis
Price River Distribution System
45 West 500 South
Price, Utah 84501

Re: Application for Partial Bond Release
Gordon Creek No. 3 & 6 Mines
INA/007/017
Carbon County, Utah

Gentlemen:

Mountain Coal Company has completed Phase II of the approved reclamation plan for the Gordon Creek No. 3 & 6 Mines. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the Utah Coal Mining Reclamation Act, this letter will serve as notification that Mountain Coal Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond.

The original bond posted for this property was $346,000.00, of which $207,600.00 (60%) was released on June 26, 1987 upon approval of Phase I Bond Release. The present bond posted for this site is $138,400.00. Mountain Coal Company is hereby applying for release of an additional 30% of the original bond, or $103,800.00.

If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

PUBLIC NOTICE

Gordon Creek No. 3 & 6 Mines
Permit #INA/007/017

Mountain Coal Company
P.O. Box 591
Somerset, Colorado 81434

Application for Partial Release of Performance Bond

Mountain Coal Company completed reclamation Phase I at its Gordon Creek No. 3 & 6 Mines during the period of September 15, 1985 through November 30, 1986. Phase I Bond Release was granted on June 26, 1987. The company has now completed reclamation Phase II, which is based on establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the Utah Coal Mining Rules, notice is hereby given to the general public that Mountain Coal Company is applying for partial release of the performance bond posted for this operation.

The original bond posted for this property was $346,000.00, of which $207,600.00 (60%) was release on June 26, 1987 upon approval of Phase I Bond Release. The present bond posted for this site is $135,400.00. Mountain Coal Company is seeking release of an additional 30% of the original bond, or $103,800.00.

The Gordon Creek No. 3 & 6 Mines are located in Coal Canyon, approximately 20 road miles northwest of Price, Utah. The following are the legal descriptions of the permit area:

Township 13 South, Range 8 East, SLBM, Utah
Sec. 8: SE 1/4 SE 1/4
Sec. 9: S 1/2 SW 1/4, SE 1/4 NE 1/4, NE 1/4 SE 1/4
Sec. 17: NE 1/4 NE 1/4, SE 1/4 NE 1/4, NE 1/4 SE 1/4
Sec. 16: W 1/2, SW 1/4 NE 1/4
15 acres in the W 1/2 W 1/2 SE 1/4
75' Roadway R/W in the
SW 1/4 SE 1/4 Sec. 16 and in the
W 1/2 NE 1/4 and SE 1/4 NW 1/4
Sec. 21, T. 13S., R. 8E., SLBM, Utah

The permit area is located on the Jump Creek Utah, U.S. Geological Survey 15 minute quadrangle map.

There are no Federal Coal Leases associated with this property.

The reclamation work was performed on approximately 28 acres of disturbed and affected area located on the following described lands:

Township 13 South, Range 8 East, SLBM, Utah
Sec. 16: SE 1/4 NW 1/4
Sec. 16: SW 1/4 NE 1/4
Sec. 16: E 1/2 SW 1/4
Sec. 16: W 1/2 SE 1/4

The Division will now evaluate the proposal to determine whether it meets all the criteria of the Permanent Program Performance Standards according to the requirements of the Utah Coal Mining Rules.

Upon completion of the evaluation for said reclamation, a decision will be made as to approval or disapproval of the application. The reclamation plan is available for public review at: Division of Oil, Gas and Mining, 355 West North Temple, 3 Triad Center, Suite 350, Salt Lake City, Utah 84180-1203, and at the Carbon County Courthouse, Price, Utah 84501.

Written comments, objections, and requests for public hearing or informal conference on this proposal may be addressed to the Director of the Division: Mr. Jim Carter, Director, Division of Oil, Gas and Mining, 355 West North Temple, 3 Triad Center, Suite 350, Salt Lake City, Utah 84180-1203, Attention: Mr. Lowell Braxton.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)
ss.
County of Carbon,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Sun Advocate, a twice-weekly newspaper of general circulation, published at Price, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for Four (4) .....consecutive issues, and that the first publication was on the

21st .....day of September .....,19 93

and that the last publication of such notice was in the issue of such newspaper dated the

12th .....day of October .....,1993.

Kevin Ashby

Subscribed and sworn to before me this

12th .....day of October .....,19 93

Linda Thayn
Notary Public

My Commission expires January 10, 1995

Residing at Price, Utah

Publication fee, $ 195.20

NOTARY PUBLIC
LINDA THAYN
611 NORTH 10TH EAST
PRICE, UT 84501
My Commission Expires Jan. 10, 1995
State of Utah

PUBLIC NOTICE
Gordon Creek No. 3 & 6 Mines
Permit #INA/007/017
Mountain Coal Company
P.O. Box 591
Somerset, Colorado 81434

Application for Partial Release of Performance Bond

Mountain Coal Company completed reclamation Phase I at its Gordon Creek No. 3 & 6 Mines during the period of September 15, 1985 through November 30, 1986. Phase I Bond Release was granted on June 26, 1987. The company has now completed reclamation Phase II, which is based on establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the Utah Coal Mining Rules, notice is hereby given to the general public that Mountain Coal Company is applying for partial release of the performance bond posted for this operation.

The original bond posted for this property was $346,000.00, of which $207,600.00 (60%) was released on June 26, 1987 upon approval of Phase I Bond Release. The present bond posted for this site is $135,400.00. Mountain Coal Company is seeking release of an additional 30% of the original bond, or $103,800.00.

The Gordon Creek No. 3 & 6 Mines are located in Coal Canyon, approximately 20 road miles northwest of Price, Utah. The following are the legal descriptions of the permit area:

Township 13 South, Range 8 East, SLBM, Utah
Sec. 8: SE ¼, SE ¼
Sec. 9: S ½ SW ¼, SE ¼ NE ¼, NE ¼ SE ¼
Sec. 17: NE ¼ NE ¼, SE ¼ NE ¼, NE ¼ SE ¼
Sec. 16: W ½, SW ¼ NE ¼
15 acres in the W ½ W ½ SE ¼
75' Roadway R/W in the
SW ¼ SE ¼ Sec. 16 and in the
W ½ NE ¼ and SE ¼ NW ¼
Sec. 21, T. 13S., R. 8E., SLBM, Utah

The permit area is located on the Jump Creek Utah, U.S. Geological Survey 15 minute quadrangle map.

There are no Federal Coal Leases associated with this property.

The reclamation work was performed on approximately 28 acres of disturbed and affected area located on the following described lands:

Township 13 South, Range 8 East, SLBM, Utah
Sec. 16: SE ¼ NW ¼
Sec. 16: SW ¼ NE ¼
Sec. 16: E ½ SW ¼
Sec. 16: W ½ SE ¼

The Division will now evaluate the proposal to determine whether it meets all the criteria of the Permanent Program Performance Standards according to the requirements of the Utah Coal Mining Rules.

Upon completion of the evaluation for said reclamation, a decision will be made as to approval or disapproval of the application. The reclamation plan is available for public review at: Division of Oil, Gas and Mining, 355 West North Temple, 3 Triad Center, Suite 350, Salt Lake City, Utah 84180-1203, and at the Carbon County Courthouse, Price, Utah 84501.

Written comments, objections, and requests for public hearing or informal conference on this proposal may be addressed to the Director of the Division: Mr. Jim Carter, Director, Division of Oil, Gas and Mining, 355 West North Temple, 3 Triad Center, Suite 350, Salt Lake City, Utah 84180-1203, Attention: Mr. Lowell Braxton.

Published in the Sun Advocate September 21, 28, October 5 and 12, 1993.

AFFIDAVIT OF PUBLICATION

TATE OF UTAH)
ss.
County of Emery,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for Four (4) consecutive issues, and that the first publication was on the

21st day of September, 19 93

and that the last publication of such notice was in the issue of ch newspaper dated the

12th day of October, 19 93

Kevin Ashby

Subscribed and sworn to before me this

12th day of October, 19 93

Linda Thayn
Notary Public

My Commission expires January 10, 1995

Residing at Price, Utah

Publication fee, $ 195.20

NOTARY PUBLIC
LINDA THAYN
811 NORTH 100 EAST
PRICE, UT 84501
My Commission Expires Jan. 10, 1995
State of Utah

PUBLIC NOTICE
Gordon Creek No. 3 & 6 Mines
Permit #INA/007/017
Mountain Coal Company
P.O. Box 591
Somerset, Colorado 81434

Application for Partial Release of Performance Bond

Mountain Coal Company completed reclamation Phase I at its Gordon Creek No. 3 & 6 Mines during the period of September 15, 1985 through November 30, 1986. Phase I Bond Release was granted on June 26, 1987. The company has now completed reclamation Phase II, which is based on establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the Utah Coal Mining Rules, notice is hereby given to the general public that Mountain Coal Company is applying for partial release of the performance bond posted for this operation.

The original bond posted for this property was $346,000.00, of which $207,600.00 (60%) was released on June 26, 1987 upon approval of Phase I Bond Release. The present bond posted for this site is $135,400.00. Mountain Coal Company is seeking release of an additional 30% of the original bond, or $103,800.00.

The Gordon Creek No. 3 & 6 Mines are located in Coal Canyon, approximately 20 road miles northwest of Price, Utah. The following are the legal descriptions of the permit area:

Township 13 South, Range 8 East, SLBM, Utah
Sec. 8: SE ¼, SE ¼
Sec. 9: S ½ SW ¼, SE ¼ NE ¼, NE ¼ SE ¼
Sec. 17: NE ¼ NE ¼, SE ¼ NE ¼, NE ¼ SE ¼
Sec. 16: W ½, SW ¼ NE ¼
15 acres in the W ½ W ½ SE ¼
75' Roadway R/W in the
SW ¼ SE ¼ Sec. 16 and in the
W ½ NE ¼ and SE ¼ NW ¼
Sec. 21, T. 13S., R. 8E., SLBM, Utah

The permit area is located on the Jump Creek Utah, U.S. Geological Survey 15 minute quadrangle map.

There are no Federal Coal Leases associated with this property

The reclamation work was performed on approximately 28 acres o disturbed and affected area located on the following described lands

Township 13 South, Range 8 East, SLBM, Utah
Sec. 16: SE ¼ NW ¼
Sec. 16: SW ¼ NE ¼
Sec. 16: E ½ SW ¼
Sec. 16: W ½ SE ¼

The Division will now evaluate the proposal to determine whether it meets all the criteria of the Permanent Program Performance Standards according to the requirements of the Utah Coal Mining Rules.

Upon completion of the evaluation for said reclamation, a decision wi be made as to approval or disapproval of the application. The reclama tion plan is available for public review at: Division of Oil, Gas and Min ing, 355 West North Temple, 3 Triad Center, Suite 350, Salt Lake City Utah 84180-1203, and at the Carbon County Courthouse, Price, Uta 84501.

Written comments, objections, and requests for public hearing o informal conference on this proposal may be addressed to the Director the Division: Mr. Jim Carter, Director, Division of Oil, Gas and Minin 355 West North Temple, 3 Triad Center, Suite 350, Salt Lake City, Uta 84180-1203, Attention: Mr. Lowell Braxton.

Published in the Emery County Progress September 21, 28, October and 12, 1993.

VEGETATION SAMPLING: RECLAIMED AREAS OF THE GORDON CREEK NO. 3 & 6 MINES

1993

Prepared by

MT. NEBO SCIENTIFIC, INC.
330 East 400 South, Suite 6
P.O. Box 337
Springville, Utah 84663
(801) 489-6937

for

BLACKHAWK ENGINEERING
Route 1, Box 146-H5
Helper, Utah 84526

November 1993

TABLE OF CONTENTS

SCOPE 1

INTRODUCTION 1

General Site Description 1

METHODS 2

Transect & Quadrat Placement 3
Cover and Composition 3
Woody Plant Species Density 4
Production 4
Sample Adequacy & Statistical Comparisons. 5
Photographs 5
Raw Data 6

RESULTS 6

Reclaimed Areas (A-H, separately). 6
Reclaimed Areas (A-H, combined). 7
Summary Tables 9-49

COLOR PHOTOGRAPHS . . . . . Appendix A

RAW DATA . . . . . Appendix B

VEGETATION SAMPLING:

RECLAIMED AREAS OF THE GORDON CREEK NO. 3 & 6 MINES

1993

SCOPE

The following report has been prepared to assess the current condition of the vegetation of the reclaimed areas at the Gordon Creek No. 3 & 6 Mines. The reclaimed areas were compared with an undisturbed reference area that was used as a standard for revegetation success.

INTRODUCTION

General Site Description

The Gordon Creek No. 3 & 6 Mines are located in the Gordon Creek area of Carbon County, Utah. The elevation of the area lies between 7,550 ft and 7,850 ft above sea level. Vegetation types adjacent to the mine area were oak-shrubland and sagebrush-grassland communities. The reclaimed areas of the mine

site lie on a variety of slopes and exposures which are discussed further in the METHODS section of this report.

MT. NEBO SCIENTIFIC has been involved with sampling the area in recent years. In 1989 qualitative and quantitative sampling was conducted on the reclaimed areas of the mine sites. Also surveyed in 1989 was species survival of containerized transplants. Woody plant species density sampling was conducted in 1991, whereas, no vegetation sampling was done in 1992.

METHODS

Methodologies used herein were performed in accordance with the guidelines supplied by the State of Utah, Division of Oil, Gas and Mining (DOGM).

Quantitative and qualitative data were taken on the vegetation of the reclaimed and reference areas. Sampling was conducted August 19-20, 1993. The reclaimed areas were divided into sample areas (see Sample Map). Each of those areas consisted of several disturbance types (i.e. roads, pads, portals, regraded slopes, etc.).

Transect and Quadrat Placement

Transect lines for sampling were placed randomly throughout the reclaimed areas resulting in several sample sites (see Sample Map).

Random/regular placement of sampling quadrats were designed to provide unbiased accuracy of the data compiled. Once the transect lines were placed, regular points were then marked on them. From these marks, a random number dictated the direction and distance to place the quadrats at right angles from the transect lines.

All reclaimed areas were seeded with the same seed mix on a variety of slopes, exposures, soil conditions, and water relationships, etc. Data summaries are presented separately and combined due to heterogeneity of this area. Reporting the data in this manner was an attempt to provide information of small, localized areas, yet also provide the average success of the entire mine site. The reference area was also sampled using the same methods, but simply reports the combined data.

Cover and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies

were also assessed from the quadrats. Additional information recorded on the raw data sheets were: estimated precipitation, slope, exposure, grazing use, animal disturbance and other appropriate notes. Plant nomenclature follows Welsh et al. (1987).

Woody Plant Species Density

Density of woody plant species of the reclaimed areas were made using belt transects. These 6 ft by 50 ft belts were placed randomly throughout the study areas. Total number of individuals by species were counted in each of the belt transects. The average number was then calculated followed by the number of individuals per acre.

Density of woody plant species of the *Reference Area* were recorded using the point quarter distance method (Cottom and Curtis 1956). In this method, random points were placed on the sample sites and measured into four quarters. The distance to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

Production

Total annual biomass production was estimated by clipping,

drying and weighing current annual growth. "Double sampling" using four quadrats estimated around the clipped and weighed plot was implemented.

Sample Adequacy & Statistical Comparisons

Sampling adequacy was achieved using formulas from Snedocor and Cochran (1980), insuring that 80% of the samples were within 10% of the true mean for the shrub communities of the area. The formula used is given below.

$$nmin = \left[\frac{1.28\ (s)}{x\ (.1)}\right]^2$$

where,

nmin = minimum adequate sample
s = standard deviation
x = sample mean
.1 = confidence interval

Student's t-tests were also employed to compare the reclaimed and reference areas of all sites for cover and productivity. All sample means, standard deviations, and sample sizes were included in this report to enable the reviewers to apply further statistical tests if desired.

Photographs

Color photographs of the sample areas were taken at the time

of sampling and have been submitted with this report in Appendix A.

Raw Data

The raw data have been summarized on a spreadsheet and are included in this report in Appendix B.

RESULTS

Reclaimed Areas (Areas A-H, separately)

Vegetation sample areas A-H (see Sample Map) were first summarized separately. Tables 1-32 summarize the results of the sampling for these areas. The tables include total cover, lifeform composition, cover by species, species frequency, sample sizes, woody plant species density, and productivity.

Cover of each of the reclaimed areas (A-H) ranged from 34.00% to 56.50%, each statistically greater than or equal to the cover of the Reference Area.

Woody plant species *density* of each of the areas when summarized separately, ranged from 687.70 to 3,212.55 individuals per acre. The standard for the reclaimed areas that was

determined previously for woody plant species density was 1,000 individuals per acre. Two of the eight areas fell somewhat below this standard, but as will be shown later, the average was well above that.

Production of each area sampled in the reclaimed areas ranged between 705.82 to 2,298.30 lbs. per acre. All of these values were significantly greater than the reference area.

Reclaimed Areas (Areas A-H, combined)

When the data of the reclaimed areas were combined to show the success of the revegetation as a whole, the following patterns existed.

Cover of the combined areas was estimated as 44.96% (Table 33). Cover for the Reference Area was 35.00% (Table 37). The differences were significantly different (Table 41) in favor of the reclaimed areas. Lifeform composition of the reclaimed and reference area can be compared on Tables 34 and 38.

Density of the woody plant species of the combined reclaimed areas was 1,455.82 (Table 335 individuals per acre. This value is also greater than the standard of 1,000 individuals per acre previously determined by DOGM and the operator.

Productivity of the combined areas and the Reference Area was estimated at 1,585.41 (Table 36) and 452.40 lbs. per acre (Table 40), respectively. These differences were also significant (Table 41).

The results and conclusions of this report suggest that the Gordon Creek reclaimed mine site area met or exceeded standards predetermined for revegetation success.

TABLE 1: Total cover and composition summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "A", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	39.67	12.91	30
Litter	10.50	5.22	30
Bareground	28.83	15.09	30
Rock	21.00	9.70	30
COMPOSITION			
Shrubs	8.80	16.34	30
Forbs	14.70	28.47	30
Grasses	76.50	31.90	30

TABLE 2: Species cover and frequency summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "A", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Abies concolor	0.33	1.80	30	3.33
Artemisia tridentata	0.33	1.25	30	6.67
Chrysothamnus nauseosus	0.33	1.25	30	6.67
Quercus gambelii	0.67	2.81	30	6.67
Rosa woodsii	0.67	3.59	30	3.33
Symphoricarpos oreophilus	1.50	4.31	30	13.33
FORBS				
Aster foliaceus	1.83	5.24	30	13.33
Eriogonum sp.	1.50	5.50	30	13.33
Machaeranthera canescens	1.50	4.86	30	13.33
Salsola iberica	0.17	0.90	30	3.33
GRASSES				
Elymus spicatus	6.50	9.59	30	43.33
Elymus cinereus	8.67	14.72	30	50.00
Elymus lanceolatus	14.00	11.72	30	70.00
Poa pratensis	1.50	2.93	30	23.33
Stipa hymenoides	0.17	0.90	30	3.33

TABLE 3: Woody species densities of the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "A", see Sample Map).

*(no density recorded in this area)

TABLE 4: Dry weight annual production for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "A", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	*(no production recorded in this area)		
Woody Spp.			
TOTAL PRODUCTION			

TABLE 5: Total cover and composition summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "B", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	34.00	4.36	10
Litter	7.00	2.45	10
Bareground	38.50	12.46	10
Rock	20.50	11.28	10
COMPOSITION			
Shrubs	4.29	9.15	10
Forbs	33.74	29.62	10
Grasses	61.98	28.90	10

TABLE 6: Species cover and frequency summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "B", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Artemisia tridentata	0.50	1.50	10	10.00
Quercus gambelii	1.00	3.00	10	10.00
FORBS				
Circium sp.	1.50	4.50	10	10.00
Epilobium brachycarpum	2.50	3.35	10	40.00
Eriogonum sp.	1.00	2.00	10	20.00
Machaeranthera canscens	3.00	3.32	10	50.00
Melilotus officinalis	2.50	6.02	10	20.00
GRASSES				
Elymus spicatus	9.00	8.00	10	70.00
Elymus cinereus	10.50	12.13	10	50.00
Elymus lanceolatus	2.00	2.45	10	40.00
Poa pratensis	0.50	1.50	10	10.00

TABLE 7: Woody species densities of the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "B", see Sample Map).

*(no density recorded in this area)

TABLE 8: Dry weight annual production for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "B", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	*(no production recorded in this area)		
Woody Spp.			
TOTAL PRODUCTION			

TABLE 9: Total cover and composition summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "C", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	45.00	8.37	20
Litter	7.00	2.92	20
Bareground	24.00	10.07	20
Rock	24.00	9.82	20
COMPOSITION			
Shrubs	19.66	24.53	20
Forbs	15.56	14.08	20
Grasses	64.78	27.94	20

TABLE 10: Species cover and frequency summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "C", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Artemisia tridentata	7.50	10.55	20	40.00
Chrysothamnus nauseosus	1.50	3.91	20	15.00
Gutierrezia sarothrae	0.50	2.18	20	5.00
FORBS				
Aster foliaceus	3.50	6.54	20	30.00
Circium sp.	0.50	2.18	20	5.00
Machaeranthera canescens	2.00	2.92	20	35.00
Medicago sativa	0.25	1.09	20	5.00
Melilotus officinalis	0.75	2.38	20	10.00
GRASSES				
Elymus spicatus	8.25	7.46	20	70.00
Elymus cinereus	7.75	10.30	20	60.00
Elymus lanceolatus	1.25	3.49	20	15.00
Poa pratensis	11.25	12.44	20	65.00

TABLE 11: Woody species densities of the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "C", see Sample Map).

	NUMBER/ACRE
Artemisia tridentata	526.35
Artemisia nova	18.15
Chrysothamnus nauseosus	127.05
Chrysothamnus viscidiflorus	18.15
TOTAL	689.70

TABLE 12: Dry weight annual production for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "C", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	543.86	424.21	8
Woody Spp.	161.96	184.52	8
TOTAL PRODUCTION	705.82	399.85	8

TABLE 13: Total cover and composition summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "D", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	45.25	9.15	20
Litter	12.00	6.60	20
Bareground	19.75	9.55	20
Rock	23.00	6.40	20
COMPOSITION			
Shrubs	20.56	25.77	20
Forbs	17.72	19.40	20
Grasses	61.72	25.86	20

TABLE 14: Species cover and frequency summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "D", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Artemisia tridentata	1.50	3.20	20	20.00
Ceratoides lanata	0.25	1.09	20	5.00
Chrysothamnus nauseosus	8.50	15.90	20	40.00
Suaeda torreyana	0.25	1.09	20	5.00
FORBS				
Aster foliaceus	2.75	6.98	20	15.00
Hedysarum boreale	1.00	2.00	20	20.00
Machaeranthera canescens	2.75	3.34	20	45.00
Medicago sativa	0.75	1.79	20	15.00
Melilotus officinalis	0.50	2.18	20	5.00
Tragopogon dubius	0.25	1.09	20	5.00
GRASSES				
Elymus spicatus	12.25	12.09	20	65.00
Elymus cinerus	6.25	9.20	20	60.00
Elymus lanceolatus	7.00	7.14	20	65.00
Poa pratensis	1.25	3.83	20	10.00

TABLE 15: Woody species densities for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "D", see Sample Map).

	NUMBER/ACRE
Artemisia tridentata	308.55
Ceratoides lanata	72.60
Chrysothamnus nauseosus	1742.40
Kochia prostrata	108.90
TOTAL	2232.45

TABLE 16: Dry weight annual production for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "D", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	2136.07	3645.54	6
Woody Spp.	162.22	93.34	6
TOTAL PRODUCTION	2298.30	3649.52	6

TABLE 17: Total cover and composition summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "E", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	56.50	10.97	10
Litter	14.50	7.89	10
Bareground	21.00	9.17	10
Rock	8.00	2.45	10
COMPOSITION			
Shrubs	22.63	23.64	10
Forbs	0.00	0.00	10
Grasses	77.37	23.64	10

TABLE 18: Species cover and frequency summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "E", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Ceratoides lanata	1.00	3.00	10	10.00
Chrysothamnus nauseosus	4.50	9.07	10	20.00
Kochia prostrata	7.50	10.06	10	50.00
FORBS				
GRASSES				
Agropyron cristatum	1.00	3.00	10	10.00
Elymus cinereus	29.00	13.38	10	100.00
Poa pratensis	13.50	12.46	10	70.00

TABLE 19: Woody species densities of the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "E", see Sample Map).

	NUMBER/ACRE
Artemisia tridentata	163.35
Artemisia nova	36.30
Ceratoides lanata	72.60
Chrysothamnus nauseosus	308.55
Eriogonum corymbosum	18.15
Kochia prostrata	2613.60
TOTAL	3212.55

TABLE 20: Dry weight annual production for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "E", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	2181.58	650.34	4
Woody Spp.	45.72	60.89	4
TOTAL PRODUCTION	2227.25	693.75	4

TABLE 21: Total cover and composition summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "F", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	53.50	12.46	10
Litter	10.50	7.23	10
Bareground	21.00	7.68	10
Rock	15.00	7.75	10
COMPOSITION			
Shrubs	5.89	11.46	10
Forbs	3.65	7.51	10
Grasses	90.46	13.63	10

TABLE 22: Species cover and frequency summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "F", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Artemisia tridentata	1.50	4.50	10	10.00
Ceratoides lanata	0.50	1.50	10	10.00
Kochia prostrata	0.50	1.50	10	10.00
FORBS				
Hedysarum boreale	1.00	3.00	10	10.00
Melilotus officinalis	0.50	1.50	10	10.00
GRASSES				
Agropyron cristatum	1.00	3.00	10	10.00
Elymusspicatus	14.50	13.12	10	70.00
Elymus cinereus	17.50	13.83	10	80.00
Elymus lanceolatus	8.50	9.23	10	50.00
Poa pratensis	8.00	7.48	10	60.00

TABLE 23: Woody species densities of the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "F", see Sample Map).

	NUMBER/ACRE
Artemisia tridentata	1052.70
Ceratoides lanata	117.98
Chrysothamnus nauseosus	145.20
Eriogonum corymbosum	18.15
Kochia prostrata	117.98
TOTAL	1452.00

TABLE 24: Dry weight annual production for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "F", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	1613.54	1266.60	4
Woody Spp.	5.71	9.89	4
TOTAL PRODUCTION	1619.25	1260.82	4

TABLE 25: Total cover and composition summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "G", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	55.00	11.18	10
Litter	11.50	7.43	10
Bareground	22.00	9.54	10
Rock	11.50	5.94	10
COMPOSITION			
Shrubs	3.64	10.91	10
Forbs	8.66	15.29	10
Grasses	87.70	18.87	10

TABLE 26: Species cover and frequency summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "G", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Artemisia tridentata	2.00	6.00	10	10.00
FORBS				
Hedysarum boreale	4.00	7.00	10	30.00
GRASSES				
Dactylis glomeratus	4.00	9.17	10	20.00
Elymus spicatus	8.00	9.80	10	40.00
Elymus cinereus	26.00	26.53	10	90.00
Elymus lanceolatus	2.50	7.50	10	10.00
Poa pratensis	8.50	9.23	10	50.00

TABLE 27: Woody species densities for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "G", see Sample Map).

	NUMBER/ACRE
Artemisia nova	9.08
Artemisia tridentata	363.00
Atriplex canescens	9.08
Ceratoides lanata	299.48
Chrysothamnus nauseosus	36.30
Eriogonum corymbosum	27.23
Gutierrezia sarothae	9.05
Kochia prostrata	54.45
Rosa woodsii	9.08
TOTAL	816.75

TABLE 28: Dry weight annual production for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "G", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	1076.43	801.65	4
Woody Spp.	0	0	4
TOTAL PRODUCTION	1076.43	801.65	4

TABLE 29: Total cover and composition summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "H", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	41.00	6.63	10
Litter	10.00	5.92	10
Bareground	28.50	12.46	10
Rock	20.50	6.10	10
COMPOSITION			
Shrubs	18.81	23.66	10
Forbs	11.53	18.98	10
Grasses	69.66	27.79	10

TABLE 30: Species cover and frequency summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "H", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Artemisia tridentata	4.50	8.20	10	30.00
Chrysothamnus nauseosus	3.00	6.40	10	20.00
FORBS				
Kochia scoparia	1.00	3.00	10	10.00
Machaeranthera canescens	1.00	3.00	10	10.00
Medicago sativa	1.00	2.00	10	20.00
Salsola iberica	1.50	4.50	10	10.00
GRASSES				
Bromus tectorum	1.00	2.00	10	20.00
Elymus spicatus	1.00	2.00	10	20.00
Elymus cinereus	9.00	10.44	10	60.00
Elymus lancelatus	7.00	9.27	10	40.00
Poa pratensis	11.00	11.58	10	50.00

TABLE 31: Woody species densities of the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "H", see Sample Map).

	NUMBER/ACRE
Artemisia tridentata	392.04
Atriplex canescens	14.52
Ceratoides lanata	58.08
Chrysothamnus nauseosus	718.74
Eriogonum corymbosum	58.08
Kochia prostrata	21.78
TOTAL	1263.24

TABLE 32: Dry weight annual production for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Area "H", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	*(No production recorded in this area)		
Woody Spp.			
TOTAL PRODUCTION			

TABLE 33: Total cover and composition summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Combined Areas A-H, see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	44.96	12.24	120
Litter	10.25	6.15	120
Bareground	25.42	12.74	120
Rock	19.38	9.63	120
COMPOSITION			
Shrubs	13.51	21.17	120
Forbs	14.02	22.12	120
Grasses	72.47	28.51	120

TABLE 34: Species cover and frequency summary for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Combined Areas A-H, see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Abies concolor	0.08	0.91	120	0.83
Artemisia tridentata	2.29	6.15	120	18.33
Ceratoides lanata	0.17	1.11	120	2.50
Chrysothamnus nauseosus	2.38	8.04	120	15.00
Gutierrezia sarothae	0.18	0.91	120	0.83
Quercus gambellii	0.25	1.69	120	3.33
Kochia prostrata	0.67	3.59	120	5.00
Rosa woodsii	0.17	1.82	120	0.83
Suaeda torreyana	0.04	0.45	120	0.83
Symphoricarpos oreophilus	0.23	2.25	120	3.33
FORBS				
Aster foliaceus	1.50	4.90	120	10.83
Circium sp.	0.21	1.63	120	1.67
Epilobium brachycarpum	0.21	1.19	120	3.33
Eriogonum sp.	0.46	2.89	120	5.00
Hedysarum boreale	0.58	2.60	120	3.33
Kochia scoparia	0.08	0.91	120	1.67
Machaeranthera canescens	1.50	3.45	120	22.50
Medicago sativa	0.25	1.09	120	5.00
Melilotus officinalis	0.46	2.33	120	5.00
Salsola iberica	0.17	1.43	120	1.67
Tragopogon dubius	0.04	0.45	120	4.16
GRASSES				
Agropyron cristatum	0.17	1.28	120	1.67
Bromus tectorum	0.08	0.64	120	2.50
Dactylis glomeratus	0.33	2.87	120	3.33
Elymus cinereus	12.17	15.87	120	70.00
Elymus lanceolatus	6.54	9.48	120	43.33
Elymus spicatus	7.75	10.06	120	51.67
Poa pratensis	5.92	9.49	120	45.00
Stipa hymenoides	0.04	0.45	120	0.83

TABLE 35: Woody species densities of the reclaimed areas of the Gordon Creek 3 & 6 Mines (Combined Areas A-H, see Sample Map).

	NUMBER/ACRE
Artemisia frigida	7.64
Artemisia tridentata	508.20
Atriplex canescens	5.73
Ceratoides lanata	120.36
Chrysothamnus nauseosus	452.79
Chrysothamnus viscidiflorus	1.91
Eriogonum corymbosum	26.75
Gutierrezia sarothrae	1.91
Kochia prostrata	328.61
Rosa woodsii	1.91
TOTAL	1455.82

TABLE 36: Dry weight annual production for the reclaimed areas of the Gordon Creek 3 & 6 Mines (Combined Areas A-H, see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	1510.29	685.50	26
Woody Spp.	75.12	72.74	26
TOTAL PRODUCTION	1585.41	625.15	26

TABLE 37: Total cover and composition summary for the Reference Area of the Gordon Creek 3 & 6 Mines (see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	35.00	9.31	30
Litter	12.00	6.00	30
Bareground	23.67	9.12	30
Rock	29.33	10.93	30
COMPOSITION			
Shrubs	46.03	18.16	30
Forbs	15.74	15.36	30
Grasses	38.23	13.91	30

TABLE 38: Species cover and frequency summary for the Reference Area of the Gordon Creek 3 & 6 Mines (see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Artemisia frigida	13.17	8.71	30	90.00
Cercocarpos montanus	2.43	6.66	30	16.67
Eriogonum corymbosum	0.17	0.90	30	3.33
Gutierrezia sarothrae	0.83	2.27	30	13.33
FORBS				
Haplopappus richardsonii	0.40	1.28	30	10.00
Hedysarum boreale	4.00	6.24	30	46.67
Machaeranthera grindelioides	0.83	1.86	30	16.67
Penstemon sp.	0.17	0.90	30	3.33
GRASSES				
Elymus salinus	12.83	5.27	30	100.00
Stipa hymenoides	0.17	0.90	30	3.33

TABLE 39: Woody species densities of the Reference Area of the Gordon Creek 3 & 6 Mines (see Sample Map).

	NUMBER/ACRE
Artemisia frigida	7041.97
Ceratoides lanata	265.73
Cercocarpus montanus	332.17
Chrysothamnus nauseosus	66.43
Eriogonum corymbosum	265.73
TOTAL	7972.04

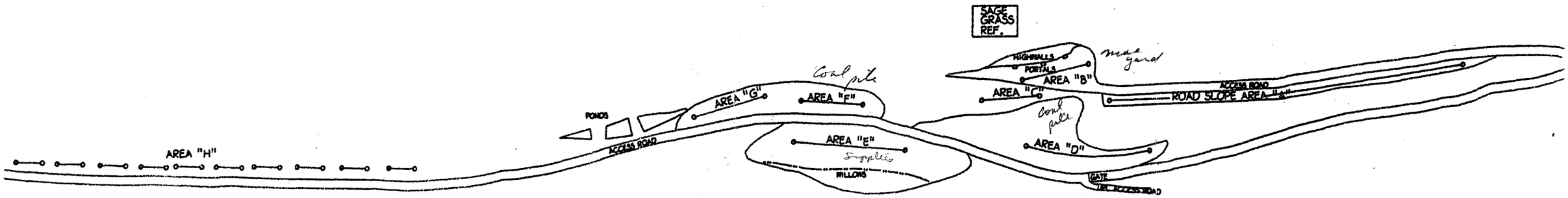
TABLE 40: Dry weight annual production for the Reference Area of the Gordon Creek 3 & 6 Mines (see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	295.99	437.92	15
Woody Spp.	156.41	81.80	15
TOTAL PRODUCTION	452.40	418.53	15

TABLE 41: Statistical summary sheet for the Reclaimed Areas and Reference Areas at Gordon Creek No. 3 & 6 Mines.

RECLAIMED AREAS (A-E Combined)			
Living Cover*	x=44.96	s=12.24	n=120
Density	x=1455.82	s= --	n=56
Production	x=1585.41	s=625.15	n=26
REFERENCE AREA			
Living Cover*	x=35.00	s=9.31	n=30
Density**	x=1000	s= --	n=--
Production	x=452.40	s=418.53	n=15
STATISTICAL ANALYSES			
Cover	t=4.162	df=148	SL=p<.005
Density**	t= --	df= --	SL= --
Production	t=6.242	df=39	SL=p<.005

x = sample mean, s = sample standard deviation,
n = sample size, NS = nonsignificant,
* represents understory and overstory cover combined.
** differences obvious, (predetermined standard)



Sample Area	Parameter	Sample No.	Sample Size(n)
A	Cover	1-30	(30)
B	Cover	31-40	(10)
C	Cover	41-60	(20)
	Density	1-8	(8)
	Production	1-8	(8)
D	Cover	61-80	(20)
	Density	9-16	(8)
	Production	9-14	(6)
E	Cover	81-90	(10)
	Density	17-24	(8)
	Production	15-18	(4)

Sample Area	Parameter	Sample No.	Sample Size(n)
F	Cover	91-100	(10)
	Density	25-40	(16)
	Production	19-22	(4)
G	Cover	101-110	(10)
	Density	41-56	(16)
	Production	23-26	(4)
H	Cover	111-120	(10)

Transect Lines

NORTH

GORDON CREEK NO.3&6
SAMPLE LOCATION MAP
1993

MT. NEBO SCIENTIFIC, INC.
RESEARCH AND CONSULTING

DRAWN	JON MAGENO
CHECKED	P. COLLINS
DATE	11-19-93
SCALE	not to scale

GC36.DWG

APPENDIX A:

COLOR PHOTOGRAPHS

REVEGETATION OF THE GORDON CREEK NO. 3 & 6 MINES

Reclaimed Area "A"

Reclaimed Area "B"

Reclaimed Area "C"

Reclaimed Area "D"

Reclaimed Area "E"

Reclaimed Area "F"

Reclaimed Area "G"

Reclaimed Area "H"

Reference Area

APPENDIX B:

RAW DATA

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "A" - Road Slope
Exposure: E
Slope: 39 deg.

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Rosa woodsii	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Symphoricarpos oreophilus	0.00	0.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00
Quercus gambelii	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Artemisia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Abies concolor	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
FORBS											
Aster foliaceus	10.00	0.00	0.00	0.00	0.00	20.00	5.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Salsola iberica	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum sp.	0.00	0.00	0.00	5.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00
GRASSES											
Poa pratensis	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	10.00	0.00	5.00
Elymus lanceolatus	15.00	20.00	10.00	25.00	30.00	20.00	10.00	5.00	25.00	0.00	0.00
Elymus cinereus	5.00	0.00	20.00	0.00	0.00	5.00	0.00	0.00	5.00	25.00	5.00
Elymus spicatus	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	35.00
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER											
Total Living Cover	40.00	50.00	35.00	40.00	35.00	60.00	35.00	35.00	40.00	50.00	55.00
Litter	5.00	5.00	15.00	5.00	5.00	10.00	5.00	5.00	15.00	20.00	10.00
Bareground	35.00	25.00	5.00	35.00	35.00	10.00	45.00	40.00	20.00	10.00	10.00
Rock	20.00	20.00	45.00	20.00	25.00	20.00	15.00	20.00	25.00	20.00	25.00
% COMPOSITION											
Shrubs	0.00	40.00	0.00	12.50	0.00	16.67	57.14	0.00	0.00	0.00	9.09
Forbs	25.00	0.00	14.29	25.00	0.00	33.33	14.29	85.71	0.00	0.00	9.09
Grasses	75.00	60.00	85.71	62.50	100.00	50.00	28.57	14.29	100.00	100.00	81.82

12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	20.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	25.00	0.00	0.00	15.00	0.00	30.00	15.00	5.00	20.00	20.00	10.00
30.00	0.00	0.00	50.00	15.00	5.00	5.00	0.00	0.00	60.00	0.00	0.00	15.00
25.00	10.00	0.00	5.00	15.00	10.00	25.00	5.00	15.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	35.00	25.00	70.00	45.00	30.00	50.00	35.00	30.00	65.00	20.00	20.00	35.00
10.00	15.00	10.00	10.00	10.00	10.00	15.00	10.00	10.00	5.00	10.00	10.00	30.00
15.00	30.00	45.00	10.00	25.00	30.00	15.00	10.00	35.00	5.00	45.00	55.00	25.00
15.00	20.00	20.00	10.00	20.00	30.00	20.00	45.00	25.00	25.00	25.00	15.00	10.00
0.00	57.14	0.00	7.14	33.33	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	14.29	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	28.57	100.00	92.86	66.67	100.00	60.00	100.00	100.00	100.00	100.00	100.00	100.00

BEAVERCREEK/BLACKHAWK
Gorgon Creek 3 & 6
Reclaimed Mine Site
Area "A" - Road Slope
Exposure: E
Slope: 39 deg.
Sample Date: 19 Aug 1993

25.00	26.00	27.00	28.00	29.00	30.00	Mean	SDev	Freq	
									TREES & SHRUBS
0.00	0.00	0.00	0.00	0.00	0.00	0.67	3.59	3.33	Rosa woodsii
5.00	0.00	0.00	0.00	0.00	0.00	0.33	1.25	6.67	Chrysothamnus nauseosus
0.00	0.00	0.00	0.00	0.00	0.00	1.50	4.31	13.33	Symphoricarpos oreophilus
0.00	0.00	0.00	0.00	0.00	0.00	0.67	2.81	6.67	Quercus gambelii
0.00	0.00	0.00	0.00	0.00	0.00	0.33	1.25	6.67	Artemisia tridentata
0.00	0.00	0.00	0.00	0.00	0.00	0.33	1.80	3.33	Abies concolor
									FORBS
0.00	0.00	20.00	0.00	0.00	0.00	1.83	5.24	13.33	Aster foliaceus
0.00	0.00	0.00	0.00	25.00	0.00	1.50	4.86	13.33	Machaeranthera canescens
0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.90	3.33	Salsola iberica
0.00	0.00	5.00	0.00	0.00	0.00	1.50	5.50	13.33	Eriogonum sp.
									GRASSES
0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.93	23.33	Poa pratensis
25.00	25.00	0.00	35.00	0.00	35.00	14.00	11.72	70.00	Elymus lanceolatus
10.00	0.00	0.00	0.00	0.00	5.00	8.67	14.72	50.00	Elymus cinereus
0.00	0.00	0.00	0.00	0.00	0.00	6.50	9.59	43.33	Elymus spicatus
5.00	0.00	0.00	0.00	0.00	0.00	0.17	0.90	3.33	Stipa hymenoides
									COVER
45.00	25.00	25.00	35.00	25.00	40.00	39.67	12.91		Total Living Cover
10.00	10.00	5.00	15.00	10.00	10.00	10.50	5.22		Litter
35.00	25.00	60.00	45.00	40.00	45.00	28.83	15.09		Bareground
10.00	40.00	10.00	5.00	25.00	5.00	21.00	9.70		Rock
									% COMPOSITION
11.11	0.00	0.00	0.00	0.00	0.00	8.80	16.34		Shrubs
0.00	0.00	100.00	0.00	100.00	0.00	14.70	28.47		Forbs
88.89	100.00	0.00	100.00	0.00	100.00	76.50	31.90		Grasses

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "B" - Pad Slope
Exposure: E
Slope: 39 deg.

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
TREES & SHRUBS										
Quercus gambelii	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
Artemisia tridentata	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS										
Circium sp.	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00
Melilotus officinalis	0.00	0.00	0.00	5.00	0.00	0.00	0.00	20.00	0.00	0.00
Machaeranthera canscens	10.00	0.00	5.00	5.00	0.00	5.00	5.00	0.00	0.00	0.00
Eriogonum sp.	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
Epilobium brachycarpum	0.00	5.00	0.00	5.00	10.00	0.00	0.00	5.00	0.00	0.00
GRASSES										
Poa pratensis	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus lanceolatus	0.00	0.00	0.00	0.00	5.00	0.00	5.00	5.00	0.00	5.00
Elymus cinereus	15.00	20.00	10.00	0.00	0.00	0.00	0.00	0.00	25.00	35.00
Elymus spicatus	10.00	10.00	5.00	10.00	25.00	20.00	0.00	0.00	10.00	0.00
COVER										
Total Living Cover	35.00	35.00	35.00	25.00	40.00	35.00	30.00	30.00	35.00	40.00
Litter	5.00	10.00	10.00	10.00	10.00	5.00	5.00	5.00	5.00	5.00
Bareground	40.00	35.00	45.00	45.00	25.00	35.00	55.00	50.00	10.00	45.00
Rock	20.00	20.00	10.00	20.00	25.00	25.00	10.00	15.00	50.00	10.00
% COMPOSITION										
Shrubs	0.00	0.00	14.29	0.00	0.00	28.57	0.00	0.00	0.00	0.00
Forbs	28.57	14.29	28.57	60.00	25.00	14.29	83.33	83.33	0.00	0.00
Grasses	71.43	85.71	57.14	40.00	75.00	57.14	16.67	16.67	100.00	100.00

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "B" - Pad Slope
Exposure: E
Slope: 39 deg.
Sample Date: 19 Aug 1993

Mean	SDev	Freq	
			TREES & SHRUBS
1.00	3.00	10.00	Quercus gambelii
0.50	1.50	10.00	Artemisia tridentata
			FORBS
1.50	4.50	10.00	Circium sp.
2.50	6.02	20.00	Melilotus officinalis
3.00	3.32	50.00	Machaeranthera canscens
1.00	2.00	20.00	Eriogonum sp.
2.50	3.35	40.00	Epilobium brachycarpum
			GRASSES
0.50	1.50	10.00	Poa pratensis
2.00	2.45	40.00	Elymus lanceolatus
10.50	12.13	50.00	Elymus cinereus
9.00	8.00	70.00	Elymus spicatus
			COVER
34.00	4.36		Total Living Cover
7.00	2.45		Litter
38.50	12.46		Bareground
20.50	11.28		Rock
			% COMPOSITION
4.29	9.15		Shrubs
33.74	29.62		Forbs
61.98	28.90		Grasses

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "C" - Portal Pad
Exposure: E
Slope: 2 deg.

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Chrysothamus nauseosus	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
Artemisia tridentata	15.00	25.00	10.00	10.00	0.00	0.00	20.00	0.00	0.00	30.00	30.00
Gutierrezia sarothae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS											
Medicago sativa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Circium sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Melilotus officinalis	10.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Aster foliaceus	0.00	10.00	0.00	0.00	0.00	0.00	10.00	15.00	5.00	0.00	0.00
Machaeranthera canescens	5.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00
GRASSES											
Poa pratensis	0.00	0.00	20.00	20.00	0.00	45.00	5.00	0.00	10.00	0.00	5.00
Elymus lanceolatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Elymus cinereus	0.00	0.00	5.00	5.00	30.00	5.00	0.00	0.00	25.00	5.00	5.00
Elymus spicatus	5.00	15.00	0.00	5.00	10.00	0.00	10.00	20.00	10.00	5.00	0.00
COVER											
Total Living Cover	35.00	65.00	40.00	40.00	45.00	50.00	45.00	40.00	50.00	55.00	45.00
Litter	5.00	5.00	5.00	5.00	10.00	10.00	10.00	5.00	15.00	5.00	5.00
Bareground	35.00	10.00	30.00	30.00	20.00	30.00	20.00	30.00	15.00	20.00	35.00
Rock	25.00	20.00	25.00	25.00	25.00	10.00	25.00	25.00	20.00	20.00	15.00
% COMPOSITION											
Shrubs	42.86	61.54	25.00	25.00	0.00	0.00	44.44	0.00	0.00	72.73	66.67
Forbs	42.86	15.38	12.50	0.00	11.11	0.00	22.22	50.00	10.00	0.00	11.11
Grasses	14.29	23.08	62.50	75.00	88.89	100.00	33.33	50.00	90.00	27.27	22.22

12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	Mean	SDev	Freq
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	3.91	15.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	7.50	10.55	40.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.50	2.18	5.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00
0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	2.18	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	2.38	10.00
25.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	3.50	6.54	30.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	10.00	2.00	2.92	35.00
5.00	25.00	15.00	0.00	15.00	25.00	30.00	5.00	0.00	11.25	12.44	65.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	15.00	1.25	3.49	15.00
25.00	5.00	0.00	5.00	10.00	0.00	0.00	30.00	0.00	7.75	10.30	60.00
5.00	0.00	15.00	25.00	0.00	20.00	10.00	0.00	10.00	8.25	7.46	70.00
65.00	40.00	35.00	35.00	40.00	45.00	45.00	40.00	45.00	45.00	8.37	
5.00	5.00	5.00	10.00	10.00	5.00	5.00	5.00	10.00	7.00	2.92	
10.00	35.00	10.00	30.00	45.00	30.00	20.00	10.00	15.00	24.00	10.07	
20.00	20.00	50.00	25.00	5.00	20.00	30.00	45.00	30.00	24.00	9.82	
7.69	0.00	0.00	0.00	25.00	0.00	0.00	0.00	22.22	19.66	24.53	
38.46	25.00	14.29	0.00	12.50	0.00	11.11	12.50	22.22	15.56	14.08	
53.85	75.00	85.71	100.00	62.50	100.00	88.89	87.50	55.56	64.78	27.94	

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "C" - Portal Pad
Exposure: E
Slope: 2 deg.
Sample Date: 19 Aug 1993

TREES & SHRUBS
Chrysothamus nauseosus
Artemisia tridentata
Gutierrezia sarothae

FORBS
Medicago sativa
Circium sp.
Melilotus officinalis
Aster foliaceus
Machaeranthera canescens

GRASSES
Poa pratensis
Elymus lanceolatus
Elymus cinereus
Elymus spicatus

COVER
Total Living Cover
Litter
Bareground
Rock

% COMPOSITION
Shrubs
Forbs
Grasses

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "D"
Exposure: SE E
Slope: 25 - 30 deg.

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Chrysothamnus nauseosus	0.00	55.00	0.00	0.00	20.00	20.00	10.00	0.00	5.00	0.00	50.00
Artemisia tridentata	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Suaeda torreyana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ceratoides lanata	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS											
Hedysarum boreale	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
Medicago sativa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aster foliaceus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00	0.00
Melilotus officinalis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tragopogon dubius	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES											
Poa pratensis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus lanceolatus	0.00	5.00	0.00	0.00	25.00	0.00	0.00	10.00	15.00	15.00	5.00
Elymus cinerus	10.00	0.00	5.00	0.00	0.00	10.00	5.00	10.00	0.00	5.00	5.00
Elymus spicatus	30.00	5.00	15.00	45.00	0.00	15.00	20.00	25.00	15.00	15.00	0.00
COVER											
Total Living Cover	40.00	65.00	30.00	50.00	50.00	45.00	45.00	45.00	40.00	35.00	60.00
Litter	10.00	5.00	5.00	10.00	10.00	15.00	20.00	25.00	25.00	10.00	10.00
Bareground	30.00	5.00	40.00	25.00	25.00	20.00	10.00	10.00	10.00	30.00	15.00
Rock	20.00	25.00	25.00	15.00	15.00	20.00	25.00	20.00	25.00	25.00	15.00
% COMPOSITION											
Shrubs	0.00	84.62	33.33	0.00	50.00	44.44	22.22	0.00	12.50	0.00	83.33
Forbs	0.00	0.00	0.00	10.00	0.00	0.00	22.22	0.00	12.50	0.00	0.00
Grasses	100.00	15.38	66.67	90.00	50.00	55.56	55.56	100.00	75.00	100.00	16.67

12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	Mean	SDev	Freq
0.00	5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	8.50	15.90	40.00
0.00	0.00	5.00	5.00	0.00	0.00	10.00	0.00	0.00	1.50	3.20	20.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00
0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00	20.00
0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00	5.00	0.75	1.79	15.00
0.00	0.00	25.00	10.00	0.00	20.00	0.00	0.00	0.00	2.75	6.98	15.00
5.00	5.00	0.00	0.00	5.00	10.00	5.00	10.00	5.00	2.75	3.34	45.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.50	2.18	5.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00
0.00	0.00	15.00	0.00	0.00	0.00	10.00	0.00	0.00	1.25	3.83	10.00
5.00	10.00	0.00	5.00	20.00	5.00	0.00	10.00	10.00	7.00	7.14	65.00
0.00	5.00	0.00	5.00	0.00	5.00	0.00	40.00	20.00	6.25	9.20	60.00
25.00	0.00	0.00	15.00	0.00	10.00	10.00	0.00	0.00	12.25	12.09	65.00
35.00	35.00	50.00	45.00	35.00	50.00	50.00	60.00	40.00	45.25	9.15	
5.00	10.00	10.00	25.00	15.00	5.00	10.00	5.00	10.00	12.00	6.60	
20.00	35.00	25.00	10.00	30.00	15.00	15.00	10.00	15.00	19.75	9.55	
40.00	20.00	15.00	20.00	20.00	30.00	25.00	25.00	35.00	23.00	6.40	
0.00	14.29	10.00	22.22	14.29	0.00	20.00	0.00	0.00	20.56	25.77	
14.29	42.86	60.00	22.22	28.57	60.00	40.00	16.67	25.00	17.72	19.40	
85.71	42.86	30.00	55.56	57.14	40.00	40.00	83.33	75.00	61.72	25.86	

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "D"
Exposure: SE E
Slope: 25 - 30 deg.
Sample Date: 19 Aug 1993

TREES & SHRUBS
Chrysothamnus nauseosus
Artemisia tridentata
Suaeda torreyana
Ceratoides lanata

FORBS
Hedysarum boreale
Medicago sativa
Aster foliaceus
Machaeranthera canescens
Melilotus officinalis
Tragopogon dubius

GRASSES
Poa pratensis
Elymus lanceolatus
Elymus cinerus
Elymus spicatus

COVER
Total Living Cover
Litter
Bareground
Rock

% COMPOSITION
Shrubs
Forbs
Grasses

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "E"
Exposure: SW
Slope:

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
TREES & SHRUBS										
Chrysothamus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	20.00
Kochia prostrata	0.00	0.00	30.00	0.00	5.00	0.00	20.00	15.00	0.00	5.00
Ceratoides lanata	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS										
GRASSES										
Agropyron cristatum	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
Poa pratensis	20.00	20.00	0.00	40.00	10.00	25.00	15.00	0.00	0.00	5.00
Elymus cinereus	25.00	30.00	25.00	20.00	20.00	35.00	20.00	55.00	50.00	10.00
COVER										
Total Living Cover	45.00	50.00	65.00	60.00	45.00	60.00	55.00	70.00	75.00	40.00
Litter	25.00	15.00	5.00	15.00	25.00	25.00	15.00	10.00	5.00	5.00
Bareground	25.00	25.00	20.00	15.00	20.00	10.00	20.00	15.00	15.00	45.00
Rock	5.00	10.00	10.00	10.00	10.00	5.00	10.00	5.00	5.00	10.00
% COMPOSITION										
Shrubs	0.00	0.00	61.54	0.00	11.11	0.00	36.36	21.43	33.33	62.50
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	100.00	100.00	38.46	100.00	88.89	100.00	63.64	78.57	66.67	37.50

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "E"
Exposure: SW
Slope:
Sample Date: 19 Aug 1993

Mean	SDev	Freq	
			TREES & SHRUBS
4.50	9.07	20.00	Chrysothamus nauseosus
7.50	10.06	50.00	Kochia prostrata
1.00	3.00	10.00	Ceratoides lanata
			FORBS
			GRASSES
1.00	3.00	10.00	Agropyron cristatum
13.50	12.46	70.00	Poa pratensis
29.00	13.38	100.00	Elymus cinereus
			COVER
56.50	10.97		Total Living Cover
14.50	7.89		Litter
21.00	9.17		Bareground
8.00	2.45		Rock
			% COMPOSITION
22.63	23.64		Shrubs
0.00	0.00		Forbs
77.37	23.64		Grasses

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "F"
Exposure: SW
Slope:

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
TREES & SHRUBS										
Artemisia tridentata	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kochia prostrata	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ceratoides lanata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
FORBS										
Melilotus officinalis	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hedysarum boreale	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
GRASSES										
Agropyron cristatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
Poa pratensis	10.00	0.00	10.00	20.00	0.00	20.00	0.00	10.00	10.00	0.00
Elymus lanceolatus	15.00	20.00	0.00	25.00	0.00	0.00	10.00	0.00	15.00	0.00
Elymus cinereus	0.00	5.00	20.00	0.00	20.00	10.00	40.00	15.00	25.00	40.00
Elymus spicatus	0.00	0.00	40.00	0.00	30.00	20.00	10.00	10.00	10.00	25.00
COVER										
Total Living Cover	40.00	35.00	70.00	45.00	50.00	50.00	60.00	45.00	70.00	70.00
Litter	5.00	5.00	15.00	15.00	5.00	25.00	5.00	20.00	5.00	5.00
Bareground	30.00	35.00	10.00	20.00	25.00	20.00	25.00	15.00	10.00	20.00
Rock	25.00	25.00	5.00	20.00	20.00	5.00	10.00	20.00	15.00	5.00
% COMPOSITION										
Shrubs	37.50	14.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.14
Forbs	0.00	14.29	0.00	0.00	0.00	0.00	0.00	22.22	0.00	0.00
Grasses	62.50	71.43	100.00	100.00	100.00	100.00	100.00	77.78	100.00	92.86

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "F"
Exposure: SW
Slope:
Sample Date: 19 Aug 1993

Mean	SDev	Freq	
			TREES & SHRUBS
1.50	4.50	10.00	Artemisia tridentata
0.50	1.50	10.00	Kochia prostrata
0.50	1.50	10.00	Ceratoides lanata
			FORBS
0.50	1.50	10.00	Melilotus officinalis
1.00	3.00	10.00	Hedysarum boreale
			GRASSES
1.00	3.00	10.00	Agropyron cristatum
8.00	7.48	60.00	Poa pratensis
8.50	9.23	50.00	Elymus lanceolatus
17.50	13.83	80.00	Elymus cinereus
14.50	13.12	70.00	Elymus spicatus
			COVER
53.50	12.46		Total Living Cover
10.50	7.23		Litter
21.00	7.68		Bareground
15.00	7.75		Rock
			% COMPOSITION
5.89	11.46		Shrubs
3.65	7.51		Forbs
90.46	13.63		Grasses

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "G"
Exposure: E
Slope:

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
TREES & SHRUBS										
Artemisia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00
FORBS										
Hedysarum boreale	20.00	15.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
GRASSES										
Dactylis glomeratus	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	10.00	0.00
Poa pratensis	20.00	15.00	0.00	25.00	0.00	0.00	0.00	0.00	15.00	10.00
Elymus lanceolatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00
Elymus cinereus	10.00	10.00	75.00	35.00	30.00	75.00	0.00	10.00	5.00	10.00
Elymus spicatus	0.00	0.00	0.00	0.00	20.00	0.00	20.00	20.00	20.00	0.00
COVER										
Total Living Cover	50.00	40.00	75.00	60.00	50.00	75.00	50.00	55.00	50.00	45.00
Litter	20.00	15.00	5.00	20.00	5.00	5.00	25.00	5.00	10.00	5.00
Bareground	15.00	30.00	15.00	15.00	30.00	15.00	5.00	30.00	35.00	30.00
Rock	15.00	15.00	5.00	5.00	15.00	5.00	20.00	10.00	5.00	20.00
% COMPOSITION										
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.36	0.00	0.00
Forbs	40.00	37.50	0.00	0.00	0.00	0.00	0.00	9.09	0.00	0.00
Grasses	60.00	62.50	100.00	100.00	100.00	100.00	100.00	54.55	100.00	100.00

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "G"
Exposure: E
Slope:
Sample Date: 19 Aug 1993

Mean	SDev	Freq	
			TREES & SHRUBS
2.00	6.00	10.00	Artemisia tridentata
			FORBS
4.00	7.00	30.00	Hedysarum boreale
			GRASSES
4.00	9.17	20.00	Dactylis glomeratus
8.50	9.23	50.00	Poa pratensis
2.50	7.50	10.00	Elymus lanceolatus
26.00	26.53	90.00	Elymus cinereus
8.00	9.80	40.00	Elymus spicatus

		COVER
55.00	11.18	Total Living Cover
11.50	7.43	Litter
22.00	9.54	Bareground
11.50	5.94	Rock
		% COMPOSITION
3.64	10.91	Shrubs
8.66	15.29	Forbs
87.70	18.87	Grasses

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "H"
Exposure: E
Slope:

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
TREES & SHRUBS										
Chrysothamus nauseosus	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	10.00
Artemisia tridentata	0.00	5.00	0.00	15.00	0.00	0.00	0.00	25.00	0.00	0.00
FORBS										
Medicago sativa	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola iberica	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00
Kochia scoparia	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
GRASSES										
Poa pratensis	25.00	20.00	30.00	15.00	20.00	0.00	0.00	0.00	0.00	0.00
Elymus lanceolatus	0.00	0.00	0.00	0.00	0.00	20.00	15.00	0.00	25.00	10.00
Elymus cinereus	10.00	15.00	5.00	0.00	0.00	0.00	0.00	5.00	30.00	25.00
Elymus spicatus	0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
Bromus tectorum	0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
COVER										
Total Living Cover	35.00	40.00	45.00	40.00	45.00	30.00	40.00	35.00	55.00	45.00
Litter	5.00	10.00	10.00	5.00	10.00	5.00	5.00	10.00	15.00	25.00
Bareground	40.00	30.00	25.00	35.00	15.00	35.00	45.00	40.00	5.00	15.00
Rock	20.00	20.00	20.00	20.00	30.00	30.00	10.00	15.00	25.00	15.00
% COMPOSITION										
Shrubs	0.00	12.50	0.00	37.50	44.44	0.00	0.00	71.43	0.00	22.22
Forbs	0.00	0.00	0.00	25.00	11.11	16.67	62.50	0.00	0.00	0.00
Grasses	100.00	87.50	100.00	37.50	44.44	83.33	37.50	28.57	100.00	77.78

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "H"
Exposure: E
Slope:
Sample Date: 19 Aug 1993

Mean	SDev	Freq	
			TREES & SHRUBS
3.00	6.40	20.00	Chrysothamus nauseosus
4.50	8.20	30.00	Artemisia tridentata
			FORBS
1.00	2.00	20.00	Medicago sativa
1.00	3.00	10.00	Machaeranthera canescens
1.50	4.50	10.00	Salsola iberica
1.00	3.00	10.00	Kochia scoparia
			GRASSES
11.00	11.58	50.00	Poa pratensis
7.00	9.27	40.00	Elymus lanceolatus
9.00	10.44	60.00	Elymus cinereus
1.00	2.00	20.00	Elymus spicatus
1.00	2.00	20.00	Bromus tectorum
			COVER
41.00	6.63		Total Living Cover
10.00	5.92		Litter
28.50	12.46		Bareground
20.50	6.10		Rock
			% COMPOSITION
18.81	23.66		Shrubs
11.53	18.98		Forbs
69.66	27.79		Grasses

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "A" thru "H" Combined
Exposure: Area A = 1 thru 30
Slope:

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Rosa woodsii	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Symphoricarpos oreophilus	0.00	0.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00
Quercus gambelii	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Artemisia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Abies concolor	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
Gutierrezia sarothae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Suaeda torreyana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ceratoides lanata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kochia prostrata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS											
Aster foliaceus	10.00	0.00	0.00	0.00	0.00	20.00	5.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Salsola iberica	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum sp.	0.00	0.00	0.00	5.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00
Circium sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Melilotus officinalis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Epilobium brachycarpum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medicago sativa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hedysarum boreale	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tragopogon dubius	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kochia scoparia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES											
Poa pratensis	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	10.00	0.00	5.00
Elymus lanceolatus	15.00	20.00	10.00	25.00	30.00	20.00	10.00	5.00	25.00	0.00	0.00
Elymus cinereus	5.00	0.00	20.00	0.00	0.00	5.00	0.00	0.00	5.00	25.00	5.00
Elymus spicatus	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	35.00
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agropyron cristatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dactylis glomeratus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bromus tectorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER											
Total Living Cover	40.00	50.00	35.00	40.00	35.00	60.00	35.00	35.00	40.00	50.00	55.00
Litter	5.00	5.00	15.00	5.00	5.00	10.00	5.00	5.00	15.00	20.00	10.00
Bareground	35.00	25.00	5.00	35.00	35.00	10.00	45.00	40.00	20.00	10.00	10.00
Rock	20.00	20.00	45.00	20.00	25.00	20.00	15.00	20.00	25.00	20.00	25.00
% COMPOSITION											
Shrubs	0.00	40.00	0.00	12.50	0.00	16.67	57.14	0.00	0.00	0.00	9.09
Forbs	25.00	0.00	14.29	25.00	0.00	33.33	14.29	85.71	0.00	0.00	9.09
Grasses	75.00	60.00	85.71	62.50	100.00	50.00	28.57	14.29	100.00	100.00	81.82

12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	20.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	25.00	0.00	0.00	15.00	0.00	30.00	15.00	5.00	20.00	20.00	10.00
30.00	0.00	0.00	50.00	15.00	5.00	5.00	0.00	0.00	60.00	0.00	0.00	15.00
25.00	10.00	0.00	5.00	15.00	10.00	25.00	5.00	15.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	35.00	25.00	70.00	45.00	30.00	50.00	35.00	30.00	65.00	20.00	20.00	35.00
10.00	15.00	10.00	10.00	10.00	10.00	15.00	10.00	10.00	5.00	10.00	10.00	30.00
15.00	30.00	45.00	10.00	25.00	30.00	15.00	10.00	35.00	5.00	45.00	55.00	25.00
15.00	20.00	20.00	10.00	20.00	30.00	20.00	45.00	25.00	25.00	25.00	15.00	10.00
0.00	57.14	0.00	7.14	33.33	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	14.29	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	28.57	100.00	92.86	66.67	100.00	60.00	100.00	100.00	100.00	100.00	100.00	100.00

Area B = 31 thru 40

25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	25.00	0.00	10.00	0.00	5.00	5.00	0.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
25.00	25.00	0.00	35.00	0.00	35.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00
10.00	0.00	0.00	0.00	0.00	5.00	15.00	20.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	5.00	10.00	25.00	20.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	25.00	25.00	35.00	25.00	40.00	35.00	35.00	35.00	25.00	40.00	35.00	30.00
10.00	10.00	5.00	15.00	10.00	10.00	5.00	10.00	10.00	10.00	10.00	5.00	5.00
35.00	25.00	60.00	45.00	40.00	45.00	40.00	35.00	45.00	45.00	25.00	35.00	55.00
10.00	40.00	10.00	5.00	25.00	5.00	20.00	20.00	10.00	20.00	25.00	25.00	10.00
11.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.29	0.00	0.00	28.57	0.00
0.00	0.00	100.00	0.00	100.00	0.00	28.57	14.29	28.57	60.00	25.00	14.29	83.33
88.89	100.00	0.00	100.00	0.00	100.00	71.43	85.71	57.14	40.00	75.00	57.14	16.67

Area C = 41 thru 60

38.00	39.00	40.00	41.00	42.00	43.00	44.00	45.00	46.00	47.00	48.00	49.00	50.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	15.00	25.00	10.00	10.00	0.00	0.00	20.00	0.00	0.00	30.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	10.00	15.00	5.00	0.00
0.00	0.00	0.00	5.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.00	0.00	10.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	20.00	20.00	0.00	45.00	5.00	0.00	10.00	0.00
5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	25.00	35.00	0.00	0.00	5.00	5.00	30.00	5.00	0.00	0.00	25.00	5.00
0.00	10.00	0.00	5.00	15.00	0.00	5.00	10.00	0.00	10.00	20.00	10.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	35.00	40.00	35.00	65.00	40.00	40.00	45.00	50.00	45.00	40.00	50.00	55.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00	10.00	10.00	10.00	5.00	15.00	5.00
50.00	10.00	45.00	35.00	10.00	30.00	30.00	20.00	30.00	20.00	30.00	15.00	20.00
15.00	50.00	10.00	25.00	20.00	25.00	25.00	25.00	10.00	25.00	25.00	20.00	20.00
0.00	0.00	0.00	42.86	61.54	25.00	25.00	0.00	0.00	44.44	0.00	0.00	72.73
83.33	0.00	0.00	42.86	15.38	12.50	0.00	11.11	0.00	22.22	50.00	10.00	0.00
16.67	100.00	100.00	14.29	23.08	62.50	75.00	88.89	100.00	33.33	50.00	90.00	27.27

51.00	52.00	53.00	54.00	55.00	56.00	57.00	58.00	59.00	60.00	61.00	62.00	63.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	25.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	10.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	25.00	15.00	0.00	15.00	25.00	30.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	15.00	0.00	5.00	0.00
5.00	25.00	5.00	0.00	5.00	10.00	0.00	0.00	30.00	0.00	10.00	0.00	5.00
0.00	5.00	0.00	15.00	25.00	0.00	20.00	10.00	0.00	10.00	30.00	5.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	65.00	40.00	35.00	35.00	40.00	45.00	45.00	40.00	45.00	40.00	65.00	30.00
5.00	5.00	5.00	5.00	10.00	10.00	5.00	5.00	5.00	10.00	10.00	5.00	5.00
35.00	10.00	35.00	10.00	30.00	45.00	30.00	20.00	10.00	15.00	30.00	5.00	40.00
15.00	20.00	20.00	50.00	25.00	5.00	20.00	30.00	45.00	30.00	20.00	25.00	25.00
66.67	7.69	0.00	0.00	0.00	25.00	0.00	0.00	0.00	22.22	0.00	84.62	33.33
11.11	38.46	25.00	14.29	0.00	12.50	0.00	11.11	12.50	22.22	0.00	0.00	0.00
22.22	53.85	75.00	85.71	100.00	62.50	100.00	88.89	87.50	55.56	100.00	15.38	66.67

Area D = 61 thru 80

64.00	65.00	66.00	67.00	68.00	69.00	70.00	71.00	72.00	73.00	74.00	75.00	76.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	20.00	20.00	10.00	0.00	5.00	0.00	50.00	0.00	5.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	10.00	0.00
0.00	0.00	0.00	5.00	0.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00
0.00	25.00	0.00	0.00	10.00	15.00	15.00	5.00	5.00	10.00	0.00	5.00	20.00
0.00	0.00	10.00	5.00	10.00	0.00	5.00	5.00	0.00	5.00	0.00	5.00	0.00
45.00	0.00	15.00	20.00	25.00	15.00	15.00	0.00	25.00	0.00	0.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	50.00	45.00	45.00	45.00	40.00	35.00	60.00	35.00	35.00	50.00	45.00	35.00
10.00	10.00	15.00	20.00	25.00	25.00	10.00	10.00	5.00	10.00	10.00	25.00	15.00
25.00	25.00	20.00	10.00	10.00	10.00	30.00	15.00	20.00	35.00	25.00	10.00	30.00
15.00	15.00	20.00	25.00	20.00	25.00	25.00	15.00	40.00	20.00	15.00	20.00	20.00
0.00	50.00	44.44	22.22	0.00	12.50	0.00	83.33	0.00	14.29	10.00	22.22	14.29
10.00	0.00	0.00	22.22	0.00	12.50	0.00	0.00	14.29	42.86	60.00	22.22	28.57
90.00	50.00	55.56	55.56	100.00	75.00	100.00	16.67	85.71	42.86	30.00	55.56	57.14

Area E = 81 thru 90

77.00	78.00	79.00	80.00	81.00	82.00	83.00	84.00	85.00	86.00	87.00	88.00	89.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	5.00	0.00	20.00	15.00	0.00
20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	5.00	10.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	20.00	20.00	0.00	40.00	10.00	25.00	15.00	0.00	0.00
5.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	40.00	20.00	25.00	30.00	25.00	20.00	20.00	35.00	20.00	55.00	50.00
10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	50.00	60.00	40.00	45.00	50.00	65.00	60.00	45.00	60.00	55.00	70.00	75.00
5.00	10.00	5.00	10.00	25.00	15.00	5.00	15.00	25.00	25.00	15.00	10.00	5.00
15.00	15.00	10.00	15.00	25.00	25.00	20.00	15.00	20.00	10.00	20.00	15.00	15.00
30.00	25.00	25.00	35.00	5.00	10.00	10.00	10.00	10.00	5.00	10.00	5.00	5.00
0.00	20.00	0.00	0.00	0.00	0.00	61.54	0.00	11.11	0.00	36.36	21.43	33.33
60.00	40.00	16.67	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40.00	40.00	83.33	75.00	100.00	100.00	38.46	100.00	88.89	100.00	63.64	78.57	66.67

Area F = 91 thru 100

90.00	91.00	92.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	20.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	10.00	0.00	10.00	20.00	0.00	20.00	0.00	10.00	10.00	0.00	20.00	15.00
0.00	15.00	20.00	0.00	25.00	0.00	0.00	10.00	0.00	15.00	0.00	0.00	0.00
10.00	0.00	5.00	20.00	0.00	20.00	10.00	40.00	15.00	25.00	40.00	10.00	10.00
0.00	0.00	0.00	40.00	0.00	30.00	20.00	10.00	10.00	10.00	25.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40.00	40.00	35.00	70.00	45.00	50.00	50.00	60.00	45.00	70.00	70.00	50.00	40.00
5.00	5.00	5.00	15.00	15.00	5.00	25.00	5.00	20.00	5.00	5.00	20.00	15.00
45.00	30.00	35.00	10.00	20.00	25.00	20.00	25.00	15.00	10.00	20.00	15.00	30.00
10.00	25.00	25.00	5.00	20.00	20.00	5.00	10.00	20.00	15.00	5.00	15.00	15.00
62.50	37.50	14.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.14	0.00	0.00
0.00	0.00	14.29	0.00	0.00	0.00	0.00	0.00	22.22	0.00	0.00	40.00	37.50
37.50	62.50	71.43	100.00	100.00	100.00	100.00	100.00	77.78	100.00	92.86	60.00	62.50

Area G = 101 thru 110

103.00	104.00	105.00	106.00	107.00	107.00	109.00	110.00	111.00	112.00	113.00	114.00	115.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	5.00	0.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	25.00	0.00	0.00	0.00	0.00	15.00	10.00	25.00	20.00	30.00	15.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00
75.00	35.00	30.00	75.00	0.00	10.00	5.00	10.00	10.00	15.00	5.00	0.00	0.00
0.00	0.00	20.00	0.00	20.00	20.00	20.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	30.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
75.00	60.00	50.00	75.00	50.00	55.00	50.00	45.00	35.00	40.00	45.00	40.00	45.00
5.00	20.00	5.00	5.00	25.00	5.00	10.00	5.00	5.00	10.00	10.00	5.00	10.00
15.00	15.00	30.00	15.00	5.00	30.00	35.00	30.00	40.00	30.00	25.00	35.00	15.00
5.00	5.00	15.00	5.00	20.00	10.00	5.00	20.00	20.00	20.00	20.00	20.00	30.00
0.00	0.00	0.00	0.00	0.00	36.36	0.00	0.00	0.00	12.50	0.00	37.50	44.44
0.00	0.00	0.00	0.00	0.00	9.09	0.00	0.00	0.00	0.00	0.00	25.00	11.11
100.00	100.00	100.00	100.00	100.00	54.55	100.00	100.00	100.00	87.50	100.00	37.50	44.44

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reclaimed Mine Site
Area "A" thru "H" Combined
Exposure:
Slope:
Sample Date: 19 Aug 1993

Area Area H = 111 thru 120

116.00	117.00	118.00	119.00	120.00	Mean	SDev	Freq	
								TREES & SHRUBS
0.00	0.00	0.00	0.00	0.00	0.17	1.82	0.83	Rosa woodsii
0.00	0.00	0.00	0.00	10.00	2.38	8.04	15.00	Chrysothamnus nauseosus
0.00	0.00	0.00	0.00	0.00	0.38	2.25	3.33	Symphoricarpos oreophilus
0.00	0.00	0.00	0.00	0.00	0.25	1.69	3.33	Quercus gambelii
0.00	0.00	25.00	0.00	0.00	2.29	6.15	18.33	Artemisia tridentata
0.00	0.00	0.00	0.00	0.00	0.08	0.91	0.83	Abies concolor
0.00	0.00	0.00	0.00	0.00	0.08	0.91	0.83	Gutierrezia sarothae
0.00	0.00	0.00	0.00	0.00	0.04	0.45	0.83	Suaeda torreyana
0.00	0.00	0.00	0.00	0.00	0.17	1.11	2.50	Ceratoides lanata
0.00	0.00	0.00	0.00	0.00	0.67	3.59	5.00	Kochia prostrata
								FORBS
0.00	0.00	0.00	0.00	0.00	1.50	4.90	10.83	Aster foliaceus
0.00	0.00	0.00	0.00	0.00	1.50	3.45	22.50	Machaeranthera canescens
0.00	15.00	0.00	0.00	0.00	0.17	1.43	1.67	Salsola iberica
0.00	0.00	0.00	0.00	0.00	0.46	2.89	5.00	Eriogonum sp.
0.00	0.00	0.00	0.00	0.00	0.21	1.63	1.67	Circium sp.
0.00	0.00	0.00	0.00	0.00	0.46	2.33	5.00	Melilotus officinalis
0.00	0.00	0.00	0.00	0.00	0.21	1.19	3.33	Epilobium brachycarpum
5.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00	Medicago sativa
0.00	0.00	0.00	0.00	0.00	0.58	2.60	3.33	Hedysarum boreale
0.00	0.00	0.00	0.00	0.00	0.04	0.45	4.16	Tragopogon dubius
0.00	10.00	0.00	0.00	0.00	0.08	0.91	1.67	Kochia scoparia
								GRASSES
0.00	0.00	0.00	0.00	0.00	5.92	9.49	45.00	Poa pratensis
20.00	15.00	0.00	25.00	10.00	6.54	9.48	43.33	Elymus lanceolatus
0.00	0.00	5.00	30.00	25.00	12.17	15.87	70.00	Elymus cinereus
5.00	0.00	0.00	0.00	0.00	7.75	10.06	51.67	Elymus spicatus
0.00	0.00	0.00	0.00	0.00	0.04	0.45	0.83	Stipa hymenoides
0.00	0.00	0.00	0.00	0.00	0.17	1.28	1.67	Agropyron cristatum
0.00	0.00	0.00	0.00	0.00	0.33	2.87	3.33	Dactylis glomeratus
0.00	0.00	5.00	0.00	0.00	0.08	0.64	2.50	Bromus tectorum
								COVER
30.00	40.00	35.00	55.00	45.00	44.96	12.24		Total Living Cover
5.00	5.00	10.00	15.00	25.00	10.25	6.15		Litter
35.00	45.00	40.00	5.00	15.00	25.42	12.74		Bareground
30.00	10.00	15.00	25.00	15.00	19.38	9.63		Rock
								% COMPOSITION
0.00	0.00	71.43	0.00	22.22	13.51	21.17		Shrubs
16.67	62.50	0.00	0.00	0.00	14.02	22.12		Forbs
83.33	37.50	28.57	100.00	77.78	72.47	28.51		Grasses

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reference Area Sagebrush/Grass
Exposure: E
Slope: 36 deg.

Sample Date: 19 Aug 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Artemisia	5.00	20.00	5.00	25.00	10.00	25.00	25.00	30.00	0.00	5.00	15.00
Cercocarpos montanus	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrezia sarothrae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00
Eriogonum corymbosum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
FORBS											
Hedysarum boreale?	0.00	5.00	0.00	10.00	30.00	0.00	0.00	0.00	5.00	0.00	15.00
Yellow LM	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Penstemon (fat?)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera grindelioi	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES											
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Elymus salinus	10.00	10.00	15.00	5.00	10.00	10.00	10.00	15.00	10.00	30.00	15.00
COVER											
Total Living Cover	20.00	35.00	25.00	40.00	50.00	40.00	35.00	45.00	25.00	45.00	45.00
Litter	5.00	10.00	10.00	5.00	10.00	10.00	10.00	5.00	5.00	5.00	15.00
Bareground	45.00	30.00	25.00	30.00	15.00	10.00	25.00	25.00	25.00	15.00	20.00
Rock	30.00	25.00	40.00	25.00	25.00	40.00	30.00	25.00	45.00	35.00	20.00
% COMPOSITION											
Shrubs	25.00	57.14	32.00	62.50	20.00	62.50	71.43	66.67	20.00	33.33	33.33
Forbs	25.00	14.29	8.00	25.00	60.00	0.00	0.00	0.00	40.00	0.00	33.33
Grasses	50.00	28.57	60.00	12.50	20.00	37.50	28.57	33.33	40.00	66.67	33.33

12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
30.00	10.00	20.00	10.00	10.00	25.00	5.00	10.00	10.00	0.00	15.00	15.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	5.00	5.00	0.00	5.00	0.00	0.00	10.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	15.00	15.00	10.00	15.00	10.00	20.00	10.00	10.00	20.00	20.00	5.00	20.00
40.00	30.00	40.00	20.00	30.00	35.00	30.00	25.00	35.00	55.00	35.00	25.00	50.00
5.00	10.00	5.00	5.00	10.00	10.00	20.00	10.00	25.00	15.00	20.00	10.00	15.00
35.00	15.00	20.00	50.00	25.00	20.00	25.00	10.00	20.00	25.00	20.00	35.00	15.00
20.00	45.00	35.00	25.00	35.00	35.00	25.00	55.00	20.00	5.00	25.00	30.00	20.00
75.00	33.33	50.00	50.00	33.33	71.43	16.67	40.00	57.14	54.55	42.86	60.00	40.00
0.00	16.67	12.50	0.00	16.67	0.00	16.67	20.00	14.29	9.09	0.00	20.00	20.00
25.00	50.00	37.50	50.00	50.00	28.57	66.67	40.00	28.57	36.36	57.14	20.00	40.00

BEAVERCREEK/BLACKHAWK
Gordon Creek 3 & 6
Reference Area Sagebrush/Grass
Exposure: E
Slope: 36 deg.
Sample Date: 19 Aug 1993

25.00	26.00	27.00	28.00	29.00	30.00	Mean	SDev	Freq	
									TREES & SHRUBS
15.00	0.00	10.00	5.00	5.00	15.00	13.17	8.71	90.00	Artemisia
0.00	0.00	10.00	20.00	10.00	0.00	2.43	6.66	16.67	Cercocarpos montanus
0.00	0.00	0.00	0.00	0.00	5.00	0.83	2.27	13.33	Gutierrezia sarothrae
0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.90	3.33	Eriogonum corymbosum
									FORBS
5.00	10.00	0.00	5.00	5.00	0.00	4.00	6.24	46.67	Hedysarum boreale?
0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.28	10.00	Yellow LM
5.00	0.00	0.00	0.00	0.00	0.00	0.17	0.90	3.33	Penstemon (fat?)
0.00	0.00	0.00	5.00	0.00	0.00	0.83	1.86	16.67	Machaeranthera grindelioides
									GRASSES
0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.90	3.33	Stipa hymenoides
10.00	10.00	15.00	10.00	5.00	15.00	12.83	5.27	100.00	Elymus salinus
									COVER
35.00	20.00	35.00	45.00	25.00	35.00	35.00	9.31		Total Living Cover
15.00	15.00	20.00	15.00	25.00	20.00	12.00	6.00		Litter
20.00	10.00	25.00	20.00	30.00	25.00	23.67	9.12		Bareground
30.00	55.00	20.00	20.00	20.00	20.00	29.33	10.93		Rock
									% COMPOSITION
42.86	0.00	57.14	55.56	60.00	57.14	46.03	18.16		Shrubs
28.57	50.00	0.00	22.22	20.00	0.00	15.74	15.36		Forbs
28.57	50.00	42.86	22.22	20.00	42.86	38.23	13.91		Grasses

SEDIMENT PRODUCTION EVALUATION OF THE RECLAIMED AREA FOR THE GORDON CREEK NO. 3 AND NO. 6 MINES

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November 5, 1993

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11/5/93

TABLE OF CONTENTS

Section		Page
CHAPTER 1 - INTRODUCTION		1-1
CHAPTER 2 - METHODS		2-1
2.1	DETERMINATION OF PRECIPITATION DEPTH	2-1
2.2	DETERMINATION OF RUNOFF	2-1
	2.2.1 Runoff Volume	2-1
	2.2.2 Hydrograph Synthesis	2-2
2.3	SEDIMENT VOLUME AND CONCENTRATION DETERMINATION	2-7
CHAPTER 3 - RESULTS, DISCUSSION, AND RECOMMENDATIONS		3-1
3.1	PRE-MINING AND RECLAIMED TOPOGRAPHY	3-1
3.2	PRECIPITATION DEPTH	3-1
3.3	CURVE NUMBER VALUES	3-1
3.4	RUNOFF HYDROGRAPH CALCULATIONS	3-4
3.5	SEDIMENT VOLUME AND CONCENTRATION DETERMINATIONS	3-7
3.6	SUMMARY OF RESULTS	3-7
CHAPTER 4 - REFERENCES		4-1

LIST OF FIGURES

Figure 2-1 Graphs for Estimating Runoff Curve Numbers of Forest-Range Complexes in the Western United States. 2-3

Figure 2-2 Dimensionless Unit Hydrograph and Mass-Curve. 2-5

Figure 2-3 Slope Factor vs. Slope for RUSLE. 2-8

Figure 3-1 Pre-Mining Watershed Boundaries 3-2

Figure 3-2 Post-Mining Watershed Boundaries 3-3

LIST OF TABLES

Table 3-1 Watershed Characteristics for Pre-mining Site Area 3-5

Table 3-2 Watershed Characteristics for Post-mining Site Area 3-6

Table 3-3 Pre-mining Sediment Volume and Concentration Determinations 3-8

Table 3-4 Post-mining Sediment Volume and Concentration Determinations . . . 3-9

LIST OF APPENDICES

Appendix A Hydrologic Calculation Inputs

Appendix B AGEC Particle Size Distributions

Appendix C Pre-Mining SEDCAD+ Run Output

Appendix D Post-Mining SEDCAD+ Run Output

SEDIMENT PRODUCTION EVALUATION OF THE RECLAIMED AREA FOR THE GORDON CREEK NO. 3 AND NO. 6 MINES

CHAPTER 1

INTRODUCTION

This report presents an evaluation of the sediment production from the Gordon Creek No. 3 and 6 Mines, located in Coal Canyon approximately 13 miles northwest of Price, Utah. The sediment production is evaluated under both pre-mining and post-mining topographic and vegetative conditions. The result of these analyses will be a determination of the effectiveness of the reclaimed surface in controlling sediment production compared with that produced from undisturbed areas.

The report is divided into four chapters, including this introduction. Chapter 2 presents a discussion of the methods used to develop runoff and sediment hydrographs. Chapter 3 presents and discusses the results of the evaluation, while the references used in the report are contained in Chapter 4. The appendices follow the references.

CHAPTER 2
METHODS

2.1 DETERMINATION OF PRECIPITATION DEPTH

Precipitation depth was determined for the 10-year, 24-hour storm. The depth values for this storm were determined from National Oceanographic and Atmospheric Administration (NOAA) (1973).

2.2 DETERMINATION OF RUNOFF

The Civil Software Design SEDCAD+ Program, Version 3 (1992) was used to determine the runoff volume and peak flow and the sediment concentration. Within the SEDCAD+ model, the SCS curve number method was used to determine the runoff volume and peak flow.

2.2.1 Runoff Volume

According to the U.S. Soil Conservation Service (SCS) (1972), the algebraic and hydrologic relations between storm rainfall, soil moisture storage, and runoff can be expressed by the equations:

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} \qquad (1)$$

and

$$S = \frac{1000}{CN} - 10 \qquad (2)$$

where:

Q	=	Direct runoff volume (inches)
S	=	Watershed storage factor (inches)
P	=	Rainfall depth (inches)
CN	=	Runoff the curve number (dimensionless)

It should be noted that (a) Equation (1) is valid only for P > = 0.2S (otherwise Q = 0), (b) Equation (2), as stated, is in inches, with the values of 1000 and 10 carrying the dimensions of inches, although metric conversions are possible, and (c) CN is only a convenient transformation of S to establish a scale of 0 to 100 and has no intrinsic meaning.

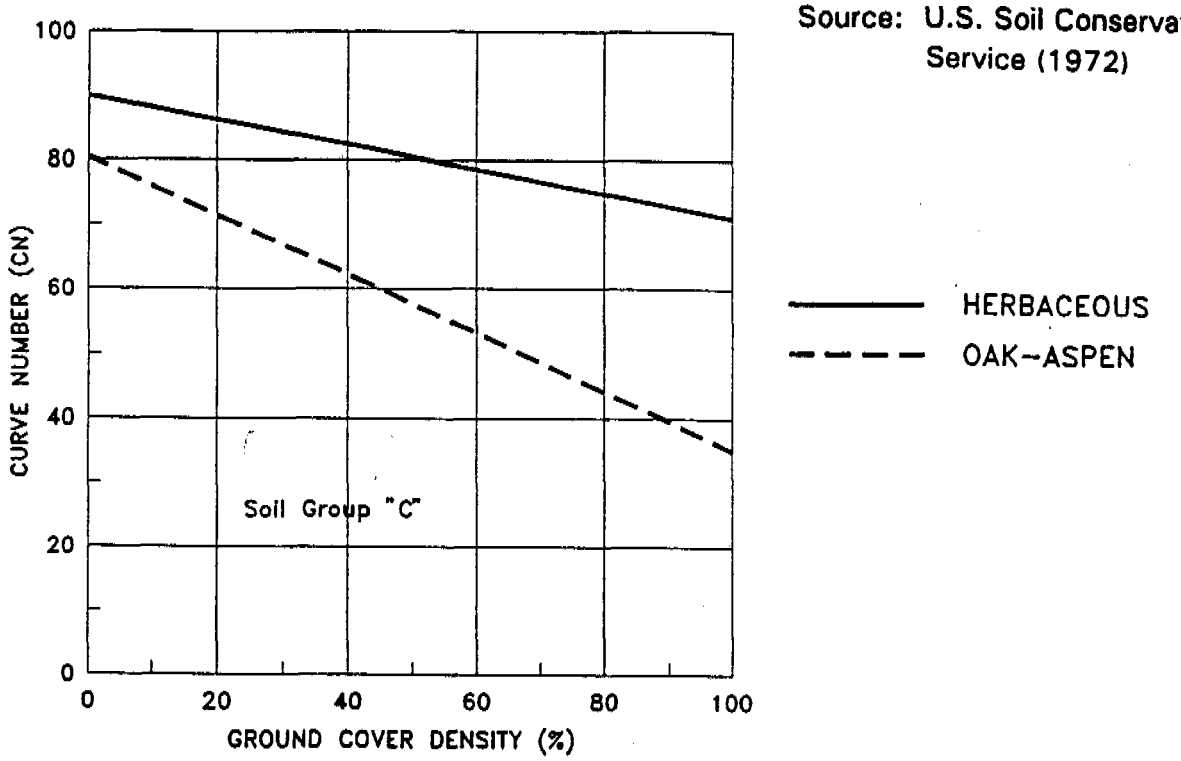
Curve numbers for the watersheds of concern were obtained by evaluating the watershed surface characteristics based on soils and vegetative type. This determination was based on site maps, aerial photos, soil sample results, vegetative studies, and field reconnaissance of the site. The curve numbers for the pre-mining and post-mining watersheds were determined using the estimated cover density of the various vegetative communities, and by reading the value from Figure 2-1, assuming a hydrologic soil group of C (as is typical of much of the region).

2.2.2 Hydrograph Synthesis

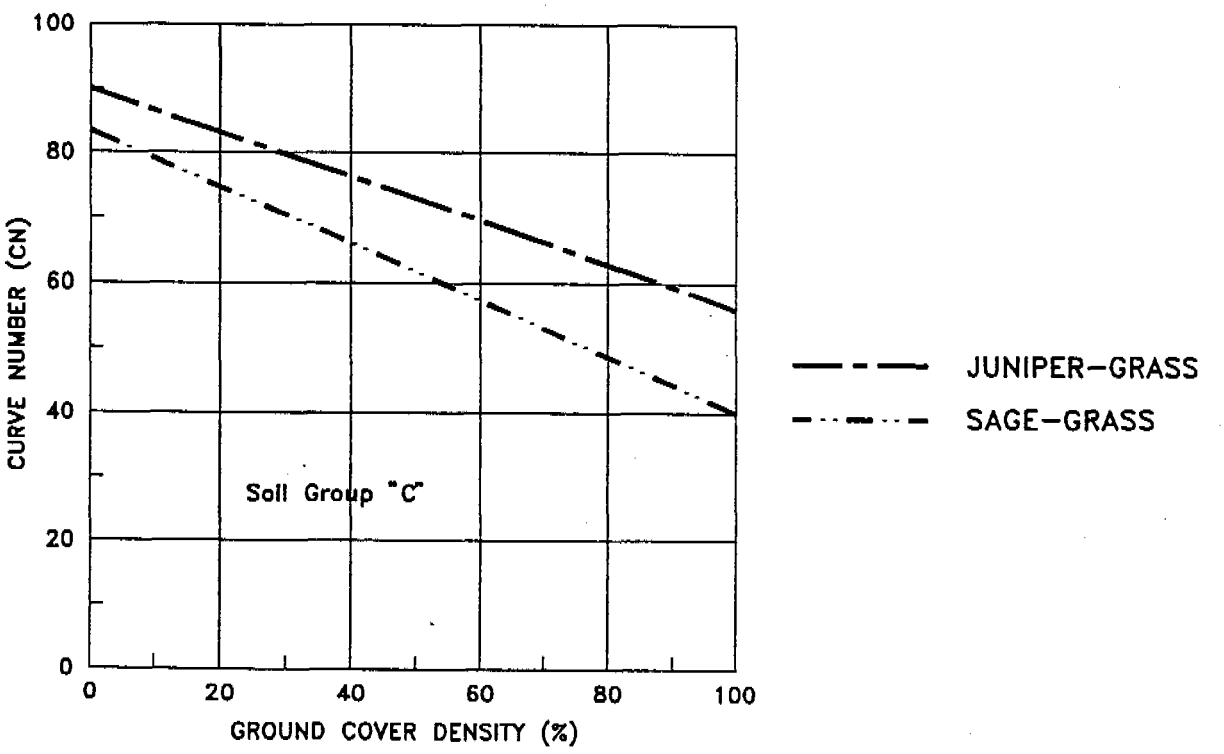
Runoff hydrographs were developed for the 10-year, 24-hour storm event using the SEDCAD+ computer program developed by Civil Software Design (1992). The SEDCAD+ program uses the SCS triangular hydrograph method to simulate the surface runoff response of a drainage to precipitation.

The SCS method yields a total rainfall excess, the difference between rainfall depth and precipitation loss. For a given storm, the incremental excess for a given period of a storm can be computed as the difference between the accumulated excess at the end of the current time

Source: U.S. Soil Conservation Service (1972)



HERBACEOUS AND OAK-ASPEN COMPLEXES



JUNIPER-GRASS AND SAGE-GRASS COMPLEXES

FIGURE 2-1. GRAPHS FOR ESTIMATING RUNOFF CURVE NUMBERS OF FOREST-RAGE COMPLEXES IN THE WESTERN UNITED STATES.

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period and the accumulated excess at the end of the previous period (SCS, 1972). The computer program calculates the incremental volume using:

$$\Delta Q = \left[\frac{(P(t + \Delta t) - 0.2S)^2}{P(t + \Delta t) + 0.8S}\right] - \left[\frac{(P(t) - 0.2S)^2}{P(t) + 0.8S}\right] \quad (3)$$

where S is as previously defined using the curve number and values for $P(t+\Delta t)$ and $P(t)$ are determined from the rainfall mass curve.

This rainfall excess is then translated to an outflow hydrograph using the SCS triangular dimensionless unit hydrograph (SCS, 1972). Figure 2-2 shows a typical curvilinear unit hydrograph. It is characterized by its time to peak (T_p), recession time (T_r), time of base (T_b), and the relations between these parameters (i.e., $T_r = 1.67T_p$; $T_b = 2.67T_p$). Thus, from the geometry of a triangle and the incremental runoff (ΔQ) the peak flow can be defined by the equation:

$$q_p = \frac{0.75\ \Delta Q}{T_p} \quad (4)$$

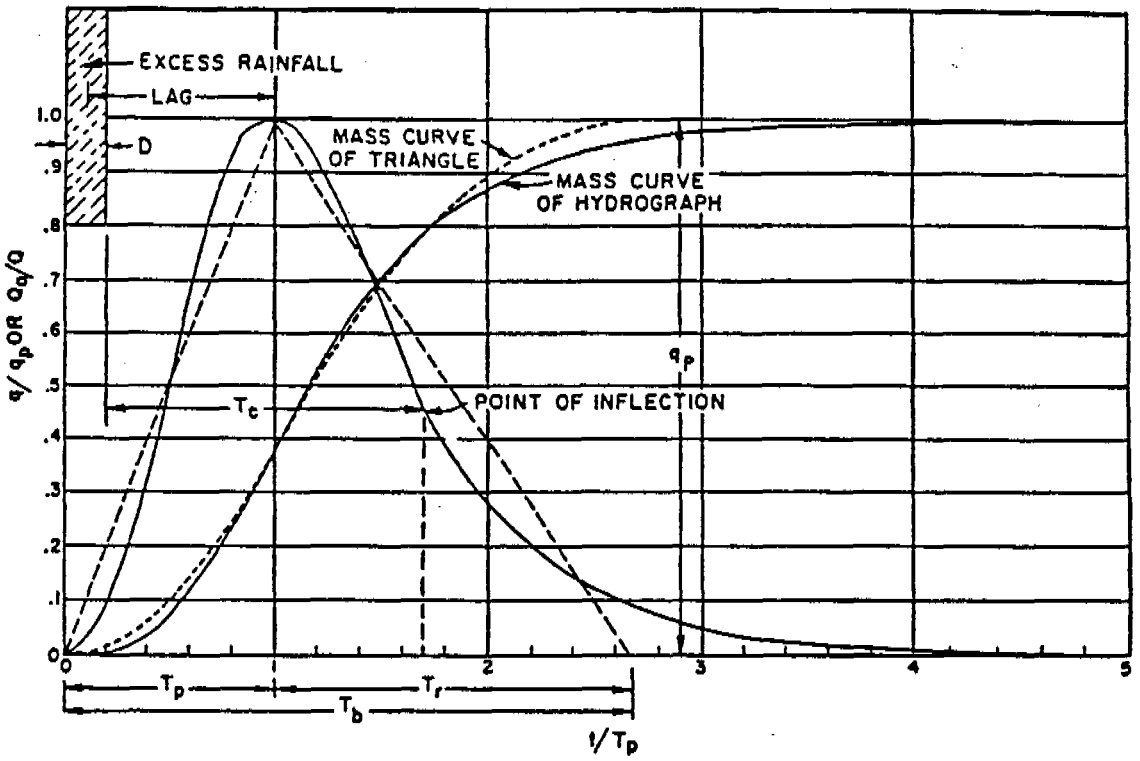
where:

q_p = Peak flow rate (in/hr, if Q is in inches and T_p in hours), and other parameters are previously defined.

The flow at any time $0 < t < T_r$ may be determined by simple linear proportioning of the triangular unit hydrograph. The time to peak is related to the familiar expression "time of concentration" (T_c) by the equation:

$$T_c + \Delta t = 1.7\ T_p \quad (5)$$

in which the factor 1.7 is an empirical finding cited by the U.S. Soil Conservation Service (1972).



Source: U.S. Soil Conservation Service (1972)

FIGURE 2-2. DIMENSIONLESS UNIT HYDROGRAPH AND MASS-CURVE.

EarthFax

The time of concentration may be estimated by several formulas. For this report, T_c was determined from the following equations (SCS, 1972):

$$L = \frac{\lambda^{0.8}\,(S+1)^{0.7}}{1900\,Y^{0.5}} \qquad (6)$$

and

$$T_c = 1.67\,L \qquad (7)$$

where:

L	=	Watershed lag time (hours)
λ	=	Hydraulic length of the watershed, or distance along the main channel to the watershed divide (feet)
S	=	Watershed storage factor defined in Equation (2)
Y	=	Average watershed slope (percent)
T_c	=	Time of concentration (hours)

The U.S. Soil Conservation Service (1972) shows that Δt must equal $0.2T_p$. Therefore, the computer code uses only T_c, and from this value computes Δt, T_p, T_r, and interim unit hydrograph ordinates. To convert the unit hydrograph ordinates to cubic feet per second, the following relation is used:

$$q_{cfs} = q_{\frac{inch}{hr}} * 645.33 * \text{Area} \qquad (8)$$

where:

Area	=	Drainage area (square miles)
q	=	Discharge (cubic feet per second)

2.3 SEDIMENT VOLUME AND CONCENTRATION DETERMINATION

The anticipated sediment production from the pre-mine and reclaimed areas was determined using the Revised Universal Soil Loss Equation (RUSLE) as implemented in the SEDCAD+ computer program, developed by Williams (1975):

$$A = 95\ (Q * q)^{0.56} * K * LS * CP \qquad (9)$$

where:

A	=	Sediment production (tons)
Q	=	Runoff volume (ac-ft)
q	=	Peak flow (cfs)
K	=	Erodibility factor
LS	=	Length slope factor
CP	=	Control practice factor

The LS factor has been modified to account for steep slopes. The revised slope factor is now a piece-wise linear equation rather than a logarithmic equation. The new LS factor is determined from the following equation and Figure 2-3:

$$LS = \left(\frac{\lambda}{72.6}\right)^{m} * (SF)$$

where:

LS	=	Length slope factor
λ	=	Representative slope length (ft)
m	=	0.6 for slopes greater than 10%
		0.5 for slopes less than or equal to 10% and greater than 4%
		0.4 for slopes equal to 4%
		0.3 for slopes less than 4%
SF	=	Slope Factor, determined from Figure 2-3.

The RUSLE provides an estimate of the total sediment eroded and transported from the watershed. Using the sediment volume, the particle size distribution of the site soils, and the

Source: Civil Software Design (1992)

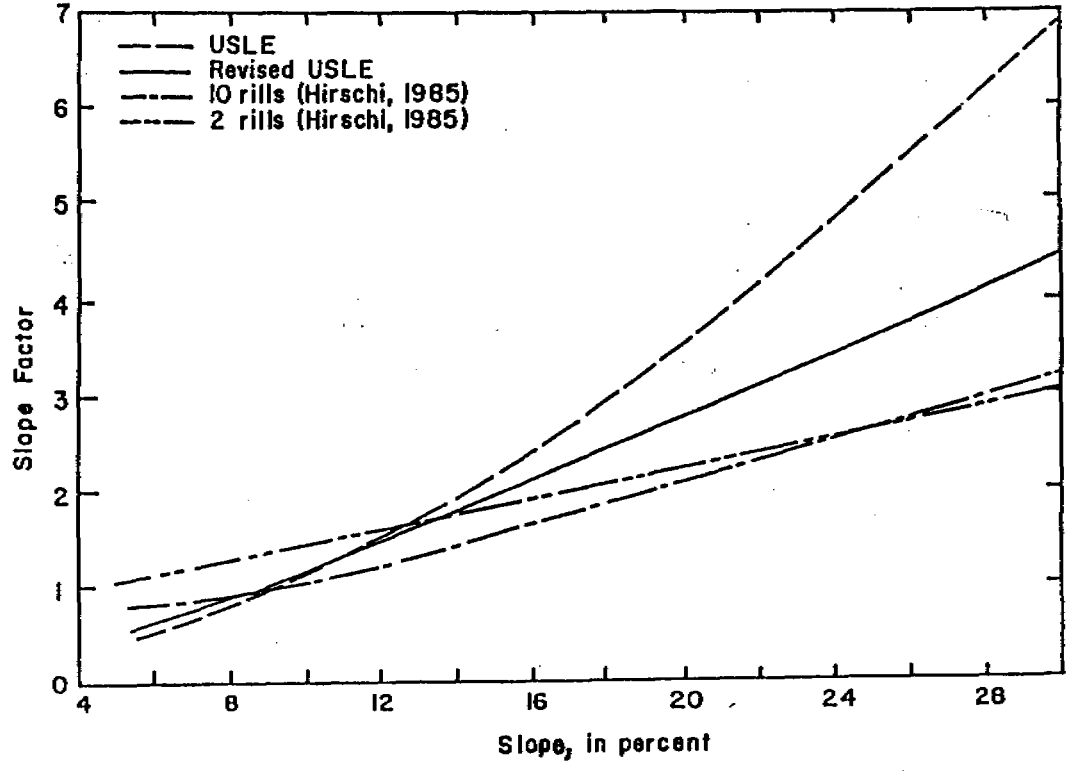


FIGURE 2-3. SLOPE FACTOR VS. SLOPE FOR RUSLE

EarthFax

peak flow from the watershed, SEDCAD+ can determine the estimated sediment concentration in the runoff from the site.

The soil particle size distribution was determined for both pre- and post-mining conditions from soil samples collected from the site. One pre-mining soil sample was collected from the undisturbed area immediately adjacent to the reclaimed surfaces for each of two different soil types identified in the permit area from the permit document (see Plate 8-1). Similarly, three soil samples were collected for post-mining conditions from the reclaimed watershed. All soil samples were submitted to Applied Geotechnical Engineering Consultants, Inc. (AGEC) in Salt Lake City for analysis. The analyses consisted of an undispersed particle size distribution analysis by wet sieving and hydrometer. This type of analysis provides a representative particle size distribution of the eroded soils.

CHAPTER 3
RESULTS, DISCUSSION, AND RECOMMENDATIONS

3.1 PRE-MINING AND POST-MINING TOPOGRAPHY

The pre-mining topography was determined from the USGS 7.5 minute Quadrangle for Jump Creek, Utah. The topography for this quadrangle was based on 1970 aerial photography. This is prior to any mine disturbance in the area. Figure 3-1 presents this topography along with the pre-mining watershed boundaries for the drainages applicable to the sediment analysis.

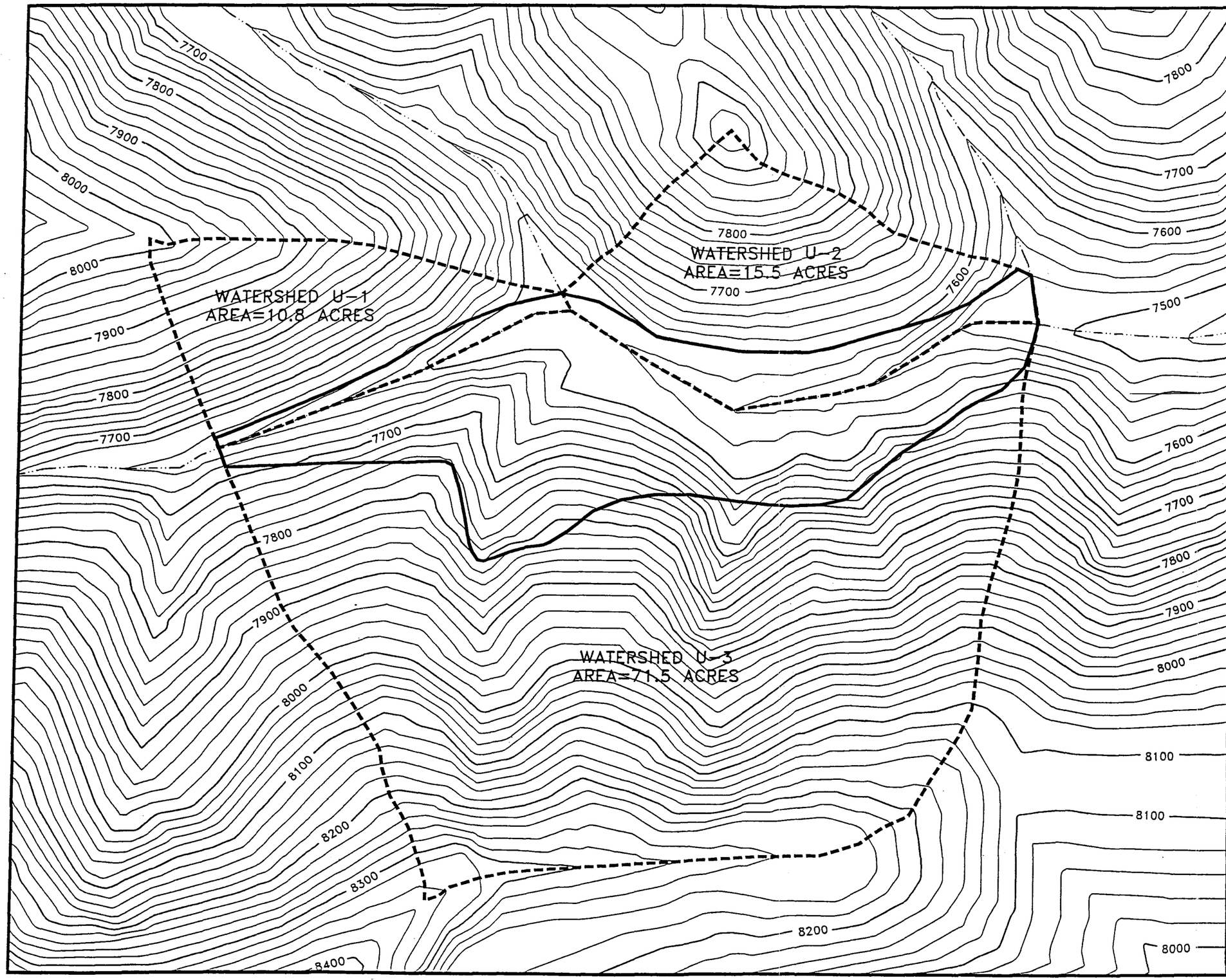
The watershed boundaries for the post-mining sediment analysis, and the topography for the undisturbed watersheds, are shown on Figure 3-2. The post-mining topography within the disturbed area boundary is presented on Plate 3-1A of the permit document. Both topographic maps are based on a 20-foot contour interval.

3.2 PRECIPITATION DEPTH

The precipitation depth value for the site area was determined from NOAA (1973). The 10-year, 24-hour storm depth of 2.0 inches was used to evaluate the sediment production from both the pre-mining site and the reclaimed site. This value was used to correspond to the regulatory compliance requirement for sediment ponds, which ensures that the 10-year, 24-hour storm event be treated.

3.3 CURVE NUMBER VALUES

For the pre-mining conditions, the vegetative types within the watersheds identified on Figure 3-1 consist of Oak-Aspen, Douglas Fir, and sage-grass units. The curve number values for these vegetation types are based on hydrologic soil groups and vegetative cover.



LEGEND

WATERSHED BOUNDARY

STREAM CHANNEL

DISTURBED AREA BOUNDARY

0' 300'

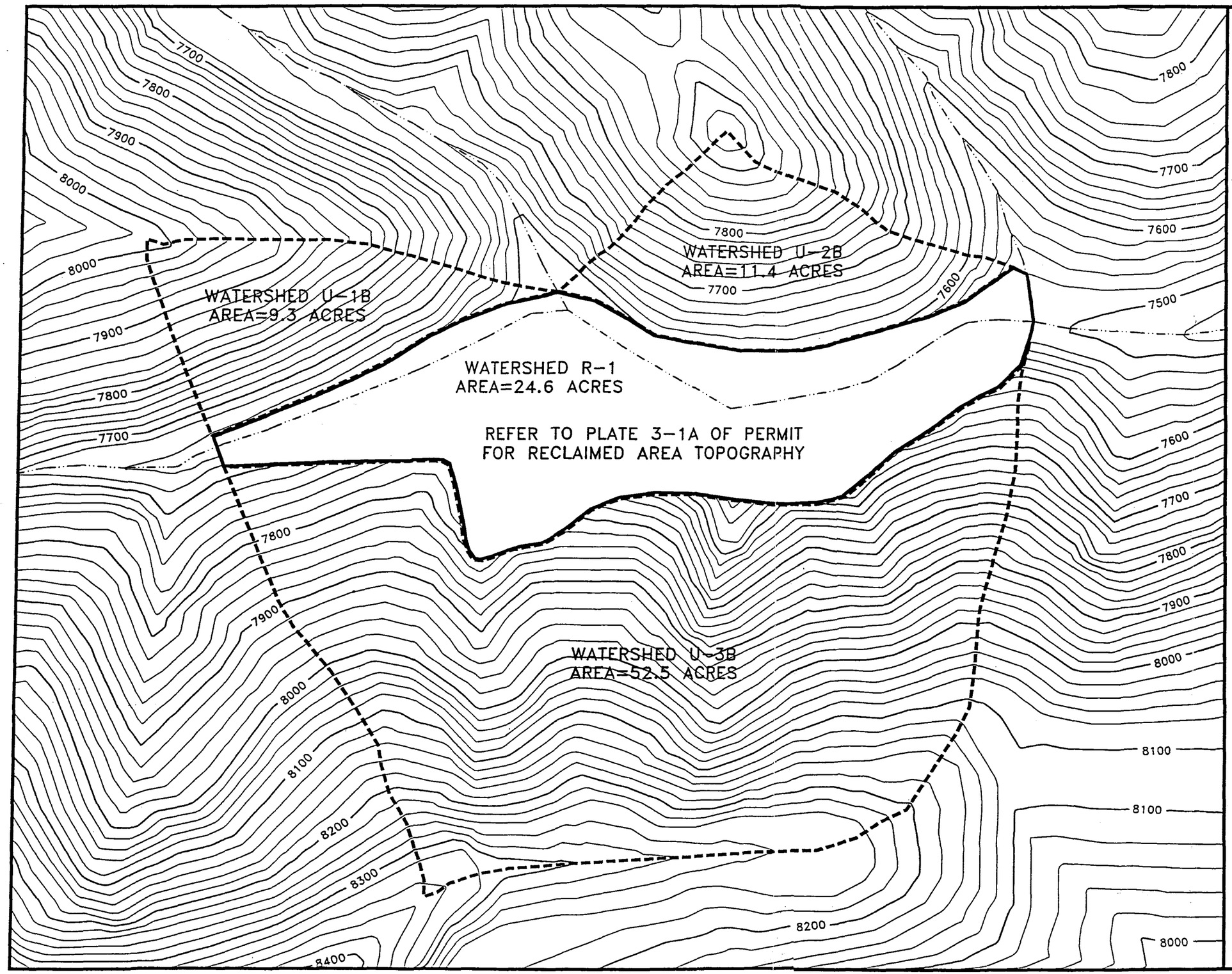
SCALE

CONTOUR INTERVAL = 20'

FIGURE 3-1

PRE-MINING WATERSHED BOUNDARIES

EarthFax



LEGEND

WATERSHED BOUNDARY

STREAM CHANNEL

DISTURBED AREA BOUNDARY AND RECLAIMED AREA WATERSHED BOUNDARY

0' 300'

SCALE
CONTOUR INTERVAL = 20'

FIGURE 3-2

POST-MINING WATERSHED BOUNDARIES

EarthFax

Figure 2-1 was used with these inputs to determine the curve number for each vegetation type. Based on the soil permeability classification and soil texture presented in Chapter 8 of the permit document, the hydrologic soil group for all of the soils in the mine area fall in a C group.

Curve numbers for the pre-mining watersheds were calculated from the vegetation distribution presented on Plate 9-1 and cover densities defined in Chapter 9 of the permit document. Average cover densities of 87.5%, 80.0%, and 41.5%, were reported for the Oak-Aspen, Douglas Fir, and sage-grass vegetative units, respectively. Curve numbers for these vegetative units, based on Figure 2-1, were determined to be 42, 63, and 69, for the Oak-Aspen, Douglas Fir, and sage-grass units, respectively. The areal distribution of each vegetation type was determined for each watershed, and a curve number for each watershed was determined on a weighted basis. Refer to Appendix A for the pre-mining curve number calculations.

For the post-mining conditions, the curve numbers were also determined based on the soils and vegetation characteristics. The vegetation for the reclaimed area was monitored by Mr. Patrick Collins of Mt. Nebo Scientific, Inc. The vegetation type and cover densities reported by Mr. Collins, along with Figure 2-1, were used to determine the curve number for the reclaimed area. The vegetation within the reclaimed area consisted of shrubs, forbs, and grasses. The cover density of 56.6% was reported for the reclaimed area which resulted in an average curve number of 60. The curve numbers for the undisturbed watersheds of the post-mining topography were determined as explained above. Refer to Appendix A for the post-mining curve number calculations.

3.4 RUNOFF HYDROGRAPH CALCULATIONS

For the pre-mining area shown in Figure 3-1, Table 3-1 presents the watershed characteristics and the anticipated peak flows and runoff volumes. Table 3-2 presents the

TABLE 3-1

Watershed Characteristics for Pre-Mining Site Area

Parameters	Watershed		
	U-1	U-2	U-3
Drainage Area (ac)	10.8	15.5	71.5
Hydraulic Length (ft)	1725	1800	3150
Average W.S. Slope (%)	45.0	40.1	45.8
Curve Number	60	60	60
Time of Conc. (hr)	0.212	0.211	0.308
10yr-24hr Runoff Volume (ac-ft)	0.05	0.08	0.36
10yr-24hr Peak Flow (cfs)	0.09	0.12	0.54

* Calculations are presented in Appendices A and C.

TABLE 3-2

Watershed Characteristics for Post-Mining Site Area

Parameters	Watershed			
	U-1B	U-2B	U-3B	R-1
Drainage Area (ac)	9.3	11.4	52.5	24.6
Hydraulic Length (ft)	1725	1800	5200	4150
Average W.S. Slope (%)	49.9	50.2	50.8	31.5
Curve Number	59	59	57	60
Time of Conc. (hr)	0.206	0.213	0.519	0.511
10yr-24hr Runoff Volume (ac-ft)	0.04	0.05	0.13	0.12
10yr-24hr Peak Flow (cfs)	0.05	0.06	0.17	0.17

* Calculations are presented in Appendices A and D.

watershed characteristics, anticipated peak flows, and runoff volumes of the post-mining watersheds. The computer printouts and calculations for these results are presented in Appendix C and Appendix D for pre- and post-mining conditions, respectively.

3.5 SEDIMENT VOLUME AND CONCENTRATION DETERMINATIONS

The sediment production anticipated from the pre-mine and reclaimed areas was determined using the Revised Universal Soil Loss Equation (RUSLE). The inputs for the site area are the runoff volume, peak flow, soil-erodibility factor, sediment particle size distribution, land-slope factor, and the control-practice factor. The soil-erodibility factor was determined, based on information presented in Chapter 8 of the permit document, as an average for the soils found in the site area. The average value of 0.37 was used, due to the similar soil types across the property. The sediment particle size distributions were determined from undispersed sieve and hydrometer analyses. The results of these analyses are presented in Appendix B. The control-practice factor was selected based on the vegetation type and cover density for each watershed. The land-slope factor was determined for each drainage area, based on the representative length and slope of the contributing area from the drainage divide to a drainage channel. The calculated pre-mine sediment volumes and concentrations are summarized in Table 3-3 and the calculations are presented in Appendices A and C. The post-mine sediment volumes and concentrations area summarized in Table 3-4 and calculations are presented in Appendices A and D.

3.6 SUMMARY OF RESULTS

The SEDCAD + output presented in Appendices C and D, and the summaries in Tables 3-3 and 3-4, shows that the peak sediment concentration calculated from the entire drainage as indicated for the outlet of the study area under reclaimed conditions (17,966 mg/l) is substantially lower than the concentration for pre-mined conditions (29,725 mg/l) at the same point. Additionally, the sediment concentrations for each of the individual reclaimed

TABLE 3-3

Pre-Mining Sediment Volume and Concentration Determinations

Watershed I.D.	K Value	L Value (ft)	S Value (%)	CP Value	Sediment Volume (tons)
#1 (U-1)	0.37	300	45.0	0.06	1.6
#2 (U-2)	0.37	300	40.1	0.06	2.1
#3 (U-3)	0.37	300	45.8	0.06	13.1

Peak routed sediment concentration = 29,725 mg/l

TABLE 3-4

Post-mining Sediment Volume and Concentration Determinations

Watershed I.D.	K Value	L Value (ft)	S Value (%)	CP Value	Sediment Volume (tons)
#1 (U-1B)	0.37	300	49.9	0.06	1.1
#2 (U-2B)	0.37	300	50.2	0.06	1.4
#3 (U-3B)	0.37	300	50.8	0.05	3.5
#4 (R-1)	0.37	150	31.5	0.06	1.7

Peak routed sediment concentration = 17,966 mg/l

watersheds are also substantially lower than for the pre-mined watersheds. Based on these comparisons, it is apparent that the sediment production from the reclaimed mine site is lower than from the pre-mine site area.

In addition, the 24-hour volume-weighted settleable solids concentration for pre-mining conditions is 18.49 milliliters/liter (ml/l) (see Appendix C). This is approximately 50 percent more than the post-mining concentration of 12.44 ml/l (see Appendix D).

Based on these results, the post-mining site conditions provide better erosion protection than did the pre-mining conditions. Therefore, removal of the sediment control facilities should not adversely effect the hydrologic regime. Thus, it is recommended that the sediment control facilities at the site be removed and the final reclamation be completed.

CHAPTER 4

REFERENCES

Civil Software Design. 1992. SEDCAD + Version 3 - Training Manual. Ames, IA.

National Oceanic and Atmospheric Administration. 1973. Precipitation-Frequency Atlas of the Western United States: Volume VI - Colorado. NOAA Atlas 2. National Weather Service. Silver Spring, Maryland.

U.S. Soil Conservation Service. 1972. National Engineering Handbook: Section 4 - Hydrology. Washington, D.C.

Williams, Jimmy R. 1975. Sediment-Yeild Prediction with Universal Equation using Runoff Energy Factor. Preceedings of the Sediment-Yield Workshop. USDA Sedimentation Laboratory. Oxford, Mississippi.

APPENDIX A

HYDROLOGIC CALCULATIONS

Gordon Cr. # 3+6 Mines

Pre-Mining Veg. Data for curve numbers ⇒
(Data from Chap. 9 + plate 9-1 of Permit)

Watershed U-1

Veg type	Area	% Ground Cover[a]	CN
Oak	3.4 Ac.	82-95%	42
Doug Fir[b]	0.6 Ac	80%	63
Sage/grass	6.8 Ac	38-45%	69

Weighted Ave. CN = 60

(a) Note: ground cover includes Litter.
(b) Note: Estimate w/ Juniper curve since douglas fir group has a limited area.

Watershed U-2

Use data for watershed U-1 since they have the same exposure + no veg. data are available. CN = 60.

Watershed U-3

Veg type	Area	% ground Cover[a]	CN
Oak	21.0 Ac.	82-95%	42
Doug Fir[b]	11.0 Ac	80%	63
Sage/grass	39.5	38-45%	69

Weighted Ave. CN = 60

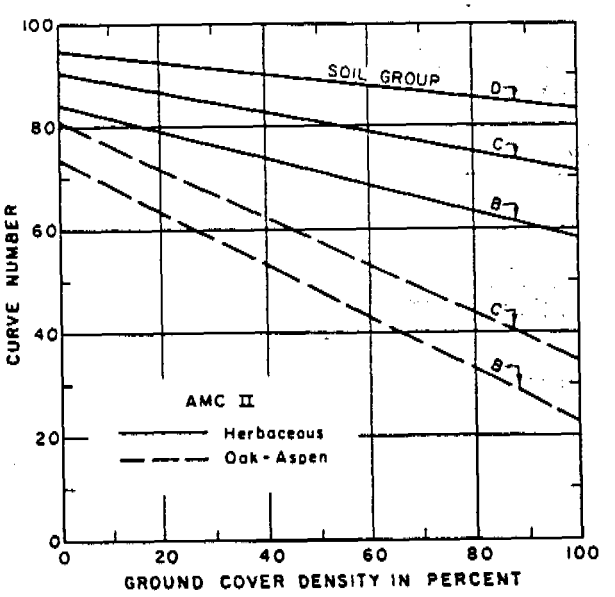


Figure 9.5.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: herbaceous and oak-aspen complexes.

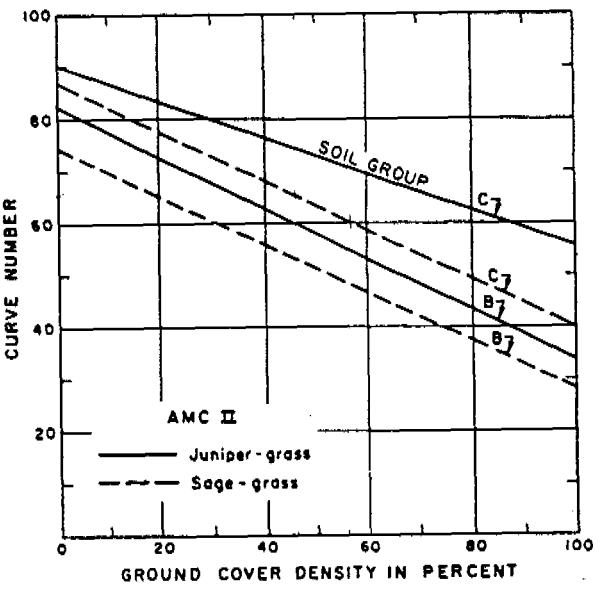


Figure 9.6.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: juniper-grass and sage-grass complexes.

Gordon Cr. # 3 + # 6 Mines

Pre-Mining Watershed Data

① Watershed slopes

Use Simplified Contour-length Method (Chang, 1989)

$WS = .25(EM - EN)(LC_{25} + LC_{50} + LC_{75}) / Area * 100$

EM = Max Elev.
EN = Min Elev.

LC_{25}, LC_{50}, + LC_{75} = contour lengths at 25, 50, + 75% of EM-EN.

WS = ave watershed slope (%)

Watershed	EM	EN	LC_{25}	LC_{50}	LC_{75}	Area (ft^2)	WS (%)
u-1	8010	7592	900	675	450	470,450	45.0
u-2	7940	7510	1260	780	480	675,180	40.1
u-3	8350	7510	2730	2325	1740	3,114,540	45.8

② Hydraulic length

u-1 1725 ft.
u-2 1800 ft.
u-3 3150 ft.

Gordon Cr. #3+6 Mines

Time of Concentration Calc's (Pre-Mining)

$T_c = 1.67 L$ L = lag time (hrs.)

$$L = \frac{l^{0.8} (S+1)^{0.7}}{1900 Y^{0.5}}$$ (hours)

l = hyd. length (ft.)
Y = ave. watershed slope (%)

$S = \frac{1000}{CN} - 10$ CN = curve Number

Area U-1

l = 1725' CN = 60
Y = 45% S = 6.7

L = .127
T_c = .212 hrs

Area U-2

l = 1800' CN = 60
Y = 40.1% S = 6.7

L = .126
T_c = .211 hrs

Area U-3

l = 3150' CN = 60
Y = 45.8% S = 6.7

L = .185
T_c = .308 hrs

Gordon Cr. # 3+6 Mines

Pre-Mining Soil Parameters

① Soil Erodibility Factor K

From data presented in Chapter 8 of the permit, the K value is 0.37.

Soils in the area are composed primarily of the Midfork gravelly loam and the Patmos stony loam.

② Soil gradations

Soil samples were collected from the two major soil types representing pre-mining conditions. These distributions were averaged to provide a composite pre-mining distribution. (See attached)

③ Land-Slope Data

Watershed	representative length (ft)	representative slope (%)
U-1	300'	45.0
U-2	300'	40.1
U-3	300'	45.8

④ CP factor

Watershed	% ground cover	CP Factor *
U-1	58	.06
U-2	58	.06
U-3	61	.06

* use figures 7+8 in Israelson et al (1984) assuming a 25% canopy of tall weeds.

Gordon Cr. #3 + 6

Pre-Mining Composite
Particle Size Distribution

Size (mm)	% Passing 3-U1	3-U3	Composite
4	95.5	74	84.8
2	94	65	79.5
1	92	62	77.0
0.5	88	58.5	73.3
0.25	83	52.5	67.8
0.125	74.5	42	58.3
0.063	48	28	38.0
0.031	13	11.5	12.3
0.016	10.5	4	7.3
0.008	3.5	1.5	2.5
0.004	1.5	0.5	1.0
0.002	0.5	0	0.25
0.001	0	0	0

Data From AGEC Results contained in Appendix B.

Gordon Cr. # 3 + 6 Mines

Post-Mining Veg. Data for Curve Numbers ⇒
(Data for Undisturbed watersheds from Chap 9 + plate 9-1 of permit)

Watershed U-1B

Veg Type	Area	% Ground Cover (a)	CN
Oak	3.2 Ac	82-95%	42
Doug Fir (b)	.5 Ac	80%	63
Sage/grass	5.6 Ac	38-45%	69

Weighted average CN = 59

(a) Note: Ground cover includes litter
(b) Note: Estimate w/ Juniper curve since Douglas Fir group has a limited area.

Watershed U-2B

Use Data for watershed U-1B since they have the same exposure and no veg. data are available
CN = 59

Watershed U-3B

Veg Type	Area	% Ground Cover (a)	CN
Oak	21.0	82-95%	42
Doug Fir	8.8	80%	63
Sage/grass	22.7	38-45%	69

Weighted average CN = 57

Watershed R-1

Curve number for reclaimed area B based on vegetation data collected by Patrick Collins of Mt. Nebo Scientific, Inc.

Calculate average cover based on total living cover and litter data:

Area	% cover
A	50.2
B	41.0
C	52.0
D	57.3
E	71.0
F	64.0
G	66.5
H	51.0

Average = 56.6%

Composition = shrubs / forbs / grass.

Use sagebrush / grass curve assuming 56.6% cover:

CN = 60

Gordon Cr. # 3+6 Mines

Post-Mining Watershed Data

① Watershed Slopes

$$WS = .025(EM - EN)(LC_{25} + LC_{50} + LC_{75}) / Area * 100$$

Variables previously defined.

Watershed	EM	EN	LC_{25}	LC_{50}	LC_{75}	Area (ft^2)	WS (%)
U-1B	8010	7595	825	675	450	405,110	49.9
U-2B	7940	7530	1200	750	480	496,580	50.2
U-3B	8350	7580	2100	2250	1680	2,286,900	50.8
R-1*	7840	7530	1850	1675	825	1,071,580	31.5
			7608	7635	7763		

② Hydraulic length

U-1B	1725 ft	
U-2B	1800 ft	
U-3B	5200 ft	(using ditch D-1)
R-1*	4150 ft	(using ditch D-1)

* Note - watershed data for R-1 obtained from Plate 3-1A in permit

Gordon Cr. #3+6

Time of Concentations (Post-Mining)

$T_c = 1.67 L$ (hrs) L = lag time

$L = \frac{l^{0.8} (S+1)^{0.7}}{1900 Y^{.5}}$ (hrs) $S = \frac{1000}{CN} - 10$

Y = ave. slope (%) CN = Curve Number
l = hyd. length (ft.)

Area U-1B

$l = 1725'$ CN = 59
$Y = 49.9\%$ $S = 6.95$

$L = 0.124$
$T_c = 0.206$

Area U-2B

$l = 1800'$ CN = 59
$Y = 50.2\%$ $S = 6.95$

$L = 0.127$
$T_c = 0.213$

Area U-3B

$l = 5200'$ CN = 57
$Y = 50.8\%$ $S = 7.54$

$L = 0.311$
$T_c = 0.519$

Area R-1

$l = 4150'$ CN = 60
$Y = 31.5\%$ $S = 6.67$

$L = 0.306$
$T_c = 0.511$

Gordon Cr. #3+6 Mines

Post-Mining Soil Parameters

① Soil Erodibility Factor, K

This value of 0.37 used for pre-mine conditions will also be used for post-mine conditions since the origins of the soils are similar.

② Soil gradations

The composite gradation used for pre-mining conditions will be used for post-mining conditions for undisturbed watersheds U-1B, U-2B + U-3B.

The soil gradation used for R-1 watershed is a composite of samples collected of the soils in the reclaimed area (see attached).

③ Land-Slope Data

Watershed	Representative length (ft)	Representative Slope (%)
U-1B	300	49.9
U-2B	300	50.2
U-3B	300	50.8
R-1	150	31.5

④ CP Factor

Watershed	% ground cover	CP Factor *
U-1B	60	.06
U-2B	60	.06
U-3B	67	.05
R-1	57	.06

* Use figures 7+8 in Israelson et al (1984) assuming a 25% canopy of tall weeds.

Gordon Cr. #3 + 6

Post-Mining Composite
Particle Size Distribution

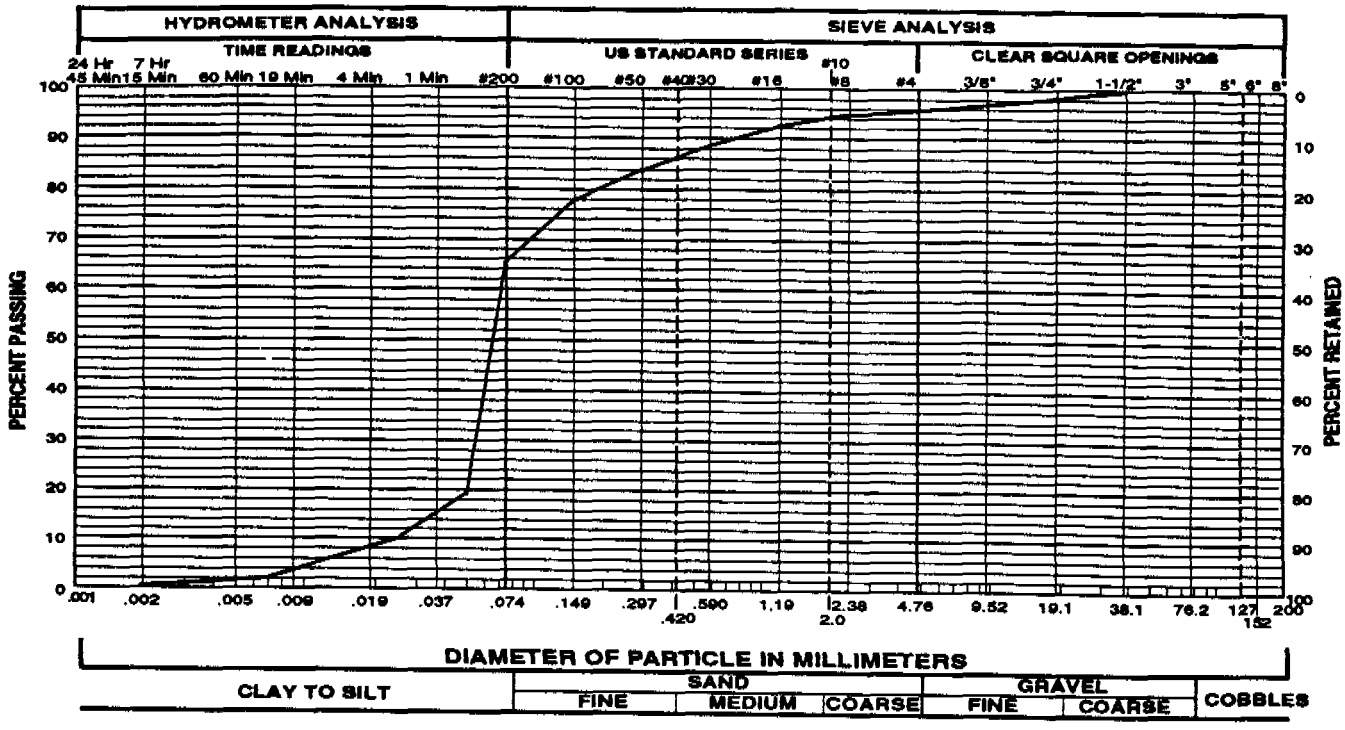
Size (mm)	% Passing 3-R1	3-R2	3-R3	Composite
4	70	46	60	60.7
2	56	33	45	44.7
1	53.5	32	43.5	43.0
0.5	50	30	41.5	40.5
0.25	45	28	39	37.3
0.125	32.5	23.5	35	30.3
0.063	19.5	15.5	25.5	20.2
0.031	10	8	12	10.0
0.016	6	4.5	8	6.2
0.008	3	3	5	3.7
0.004	2.5	2	3.5	2.7
0.002	2	1	2	1.7
0.001	1	.5	1	0.8

Data from AGEC Results contained in Appendix B

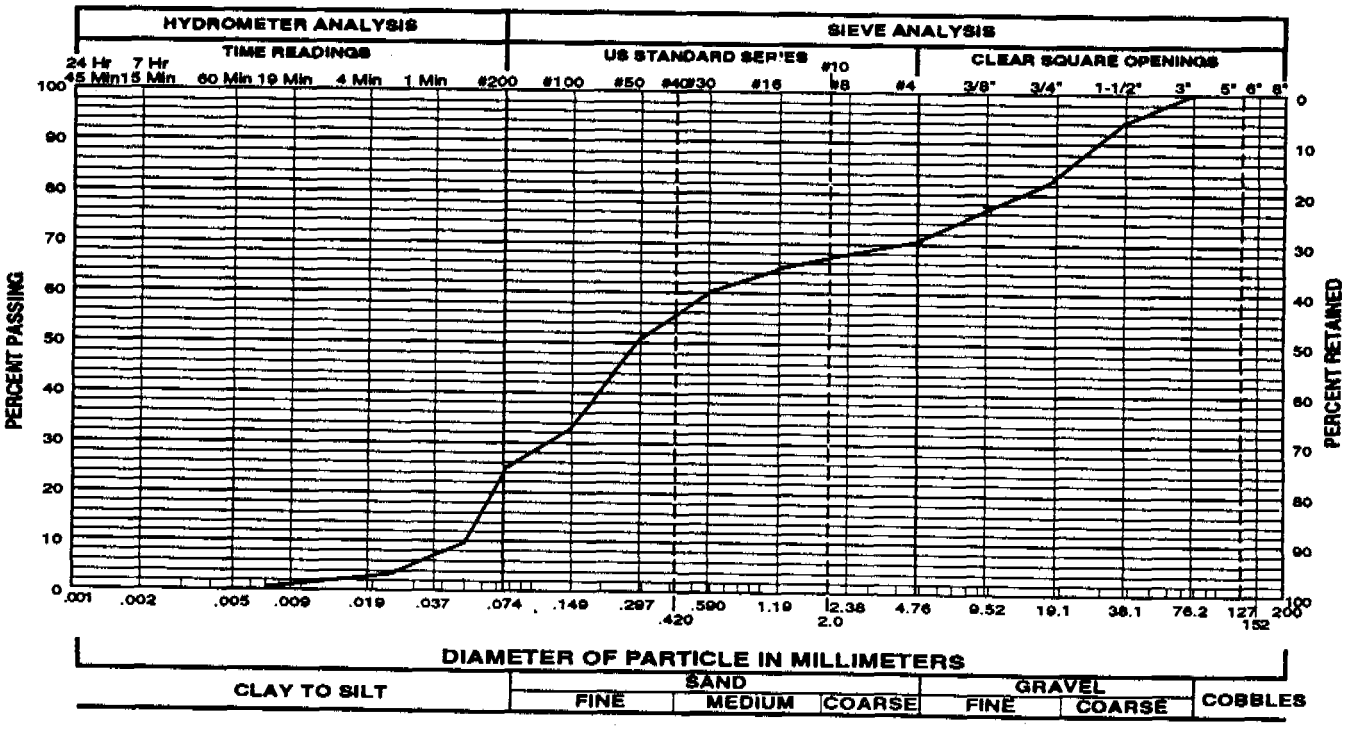
APPENDIX B

AGEC PARTICLE SIZE DISTRIBUTIONS

Applied Geotechnical Engineering Consultants, Inc.



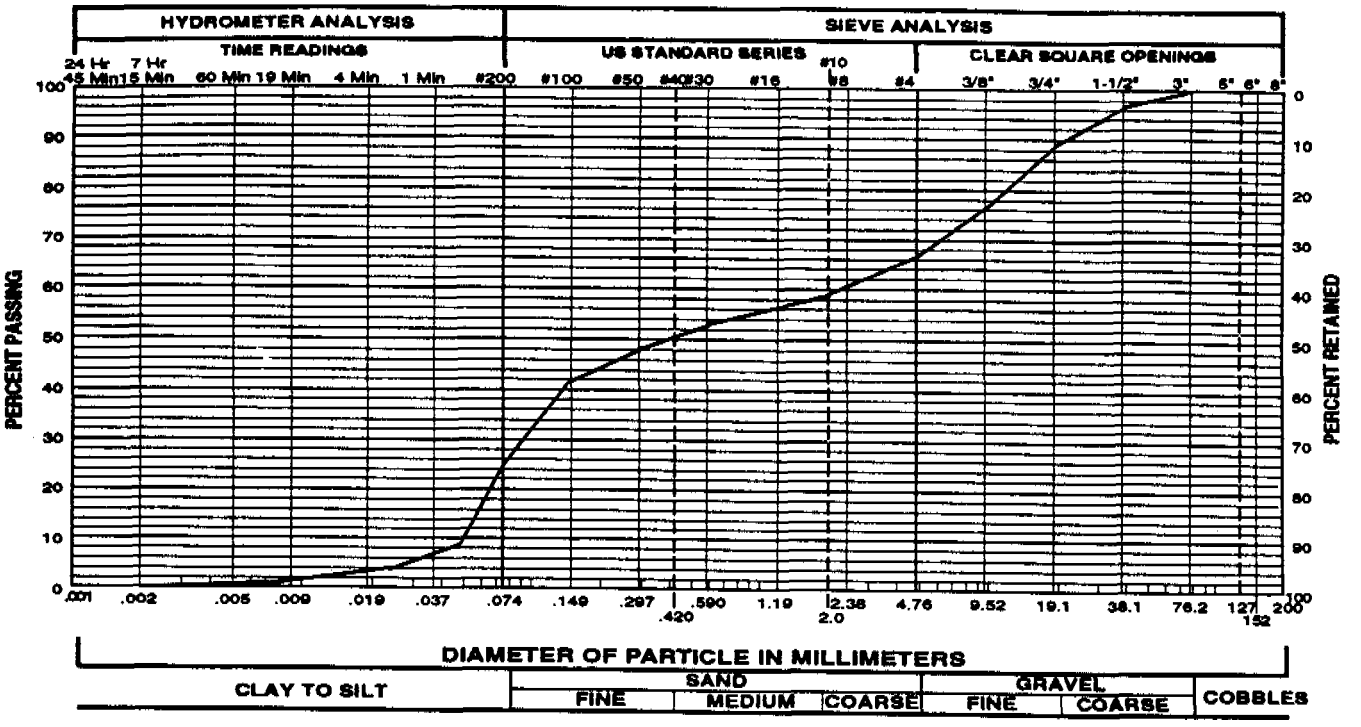
Gravel 4 % Sand 31 % Silt and Clay 65 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Sandy Silt (ML) From 3-U1 @ 3+4



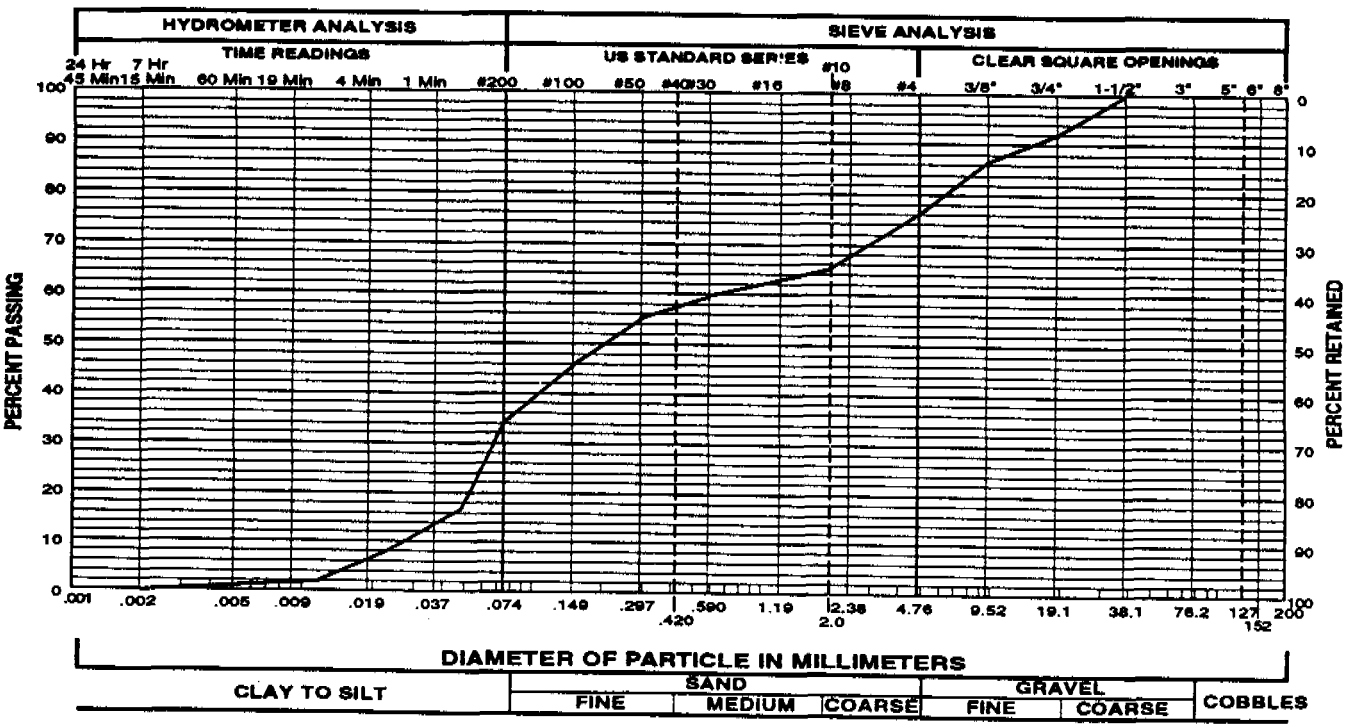
Gravel 29 % Sand 47 % Silt and Clay 24 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 4-U1 @ #4

Project No. 28093 **GRADATION TEST RESULTS** Figure 1

Applied Geotechnical Engineering Consultants, Inc.



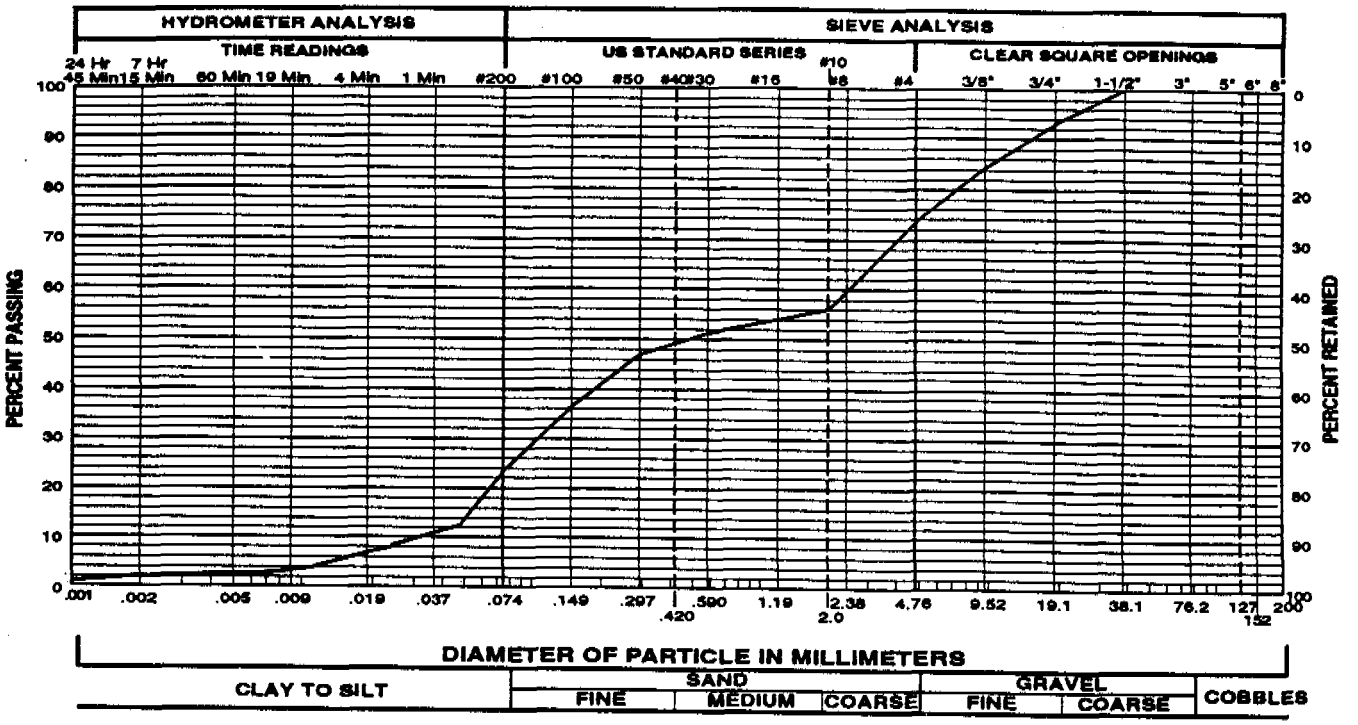
Gravel 33 % Sand 42 % Silt and Clay 25 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 4-U2



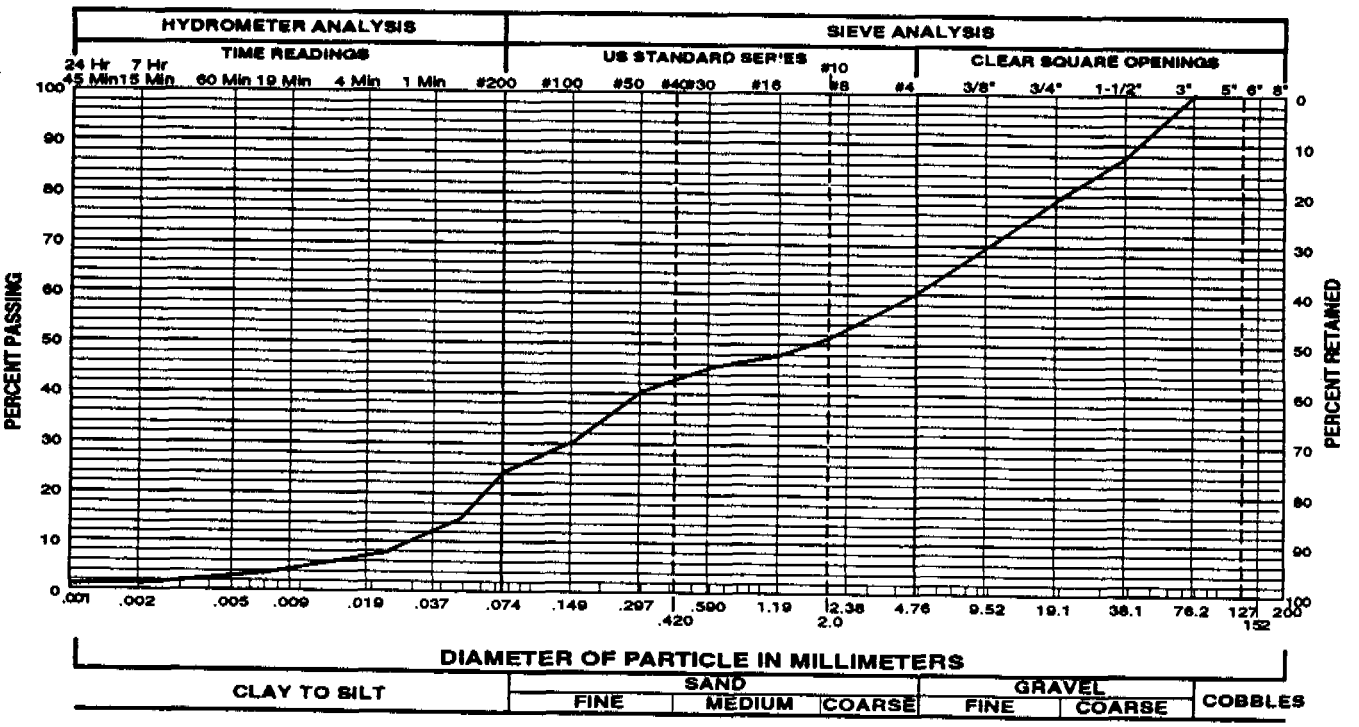
Gravel 24 % Sand 42 % Silt and Clay 34 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 3-U3

Project No. 28093 **GRADATION TEST RESULTS** Figure 2

Applied Geotechnical Engineering Consultants, Inc.



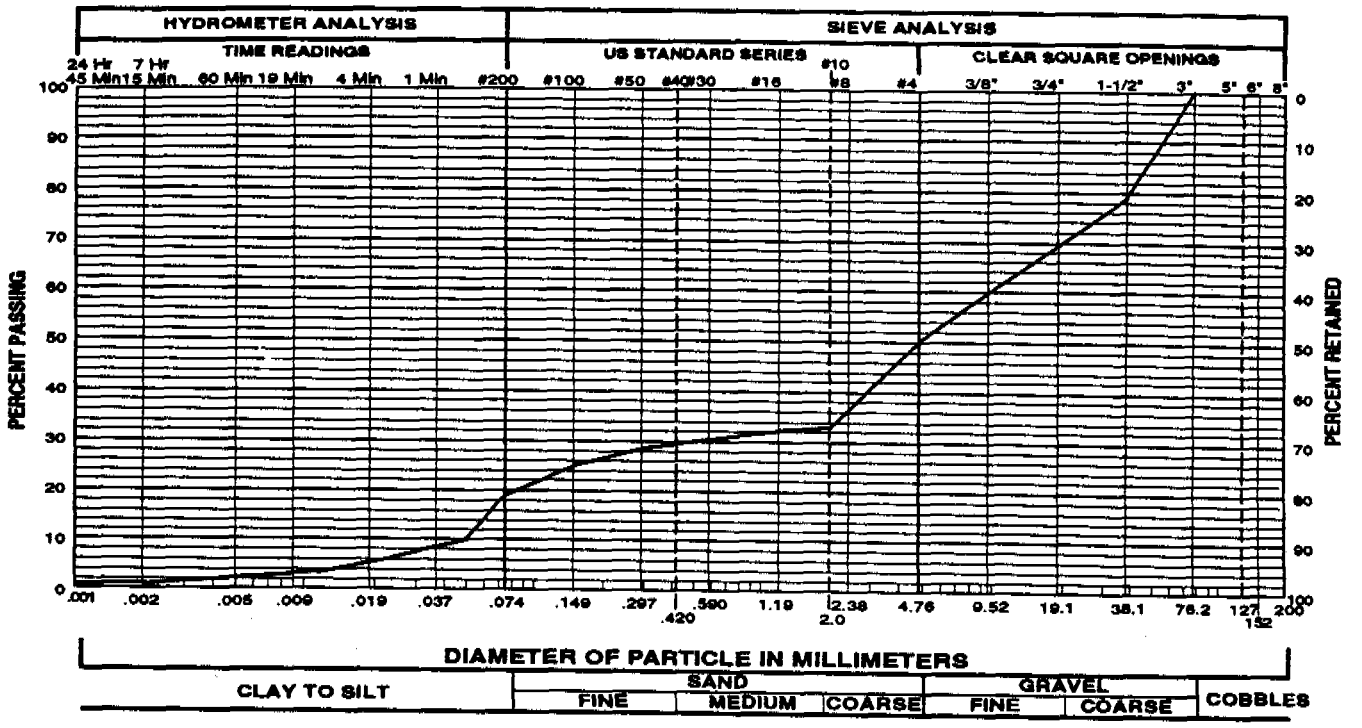
Gravel 27 % Sand 50 % Silt and Clay 23 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 3-R1



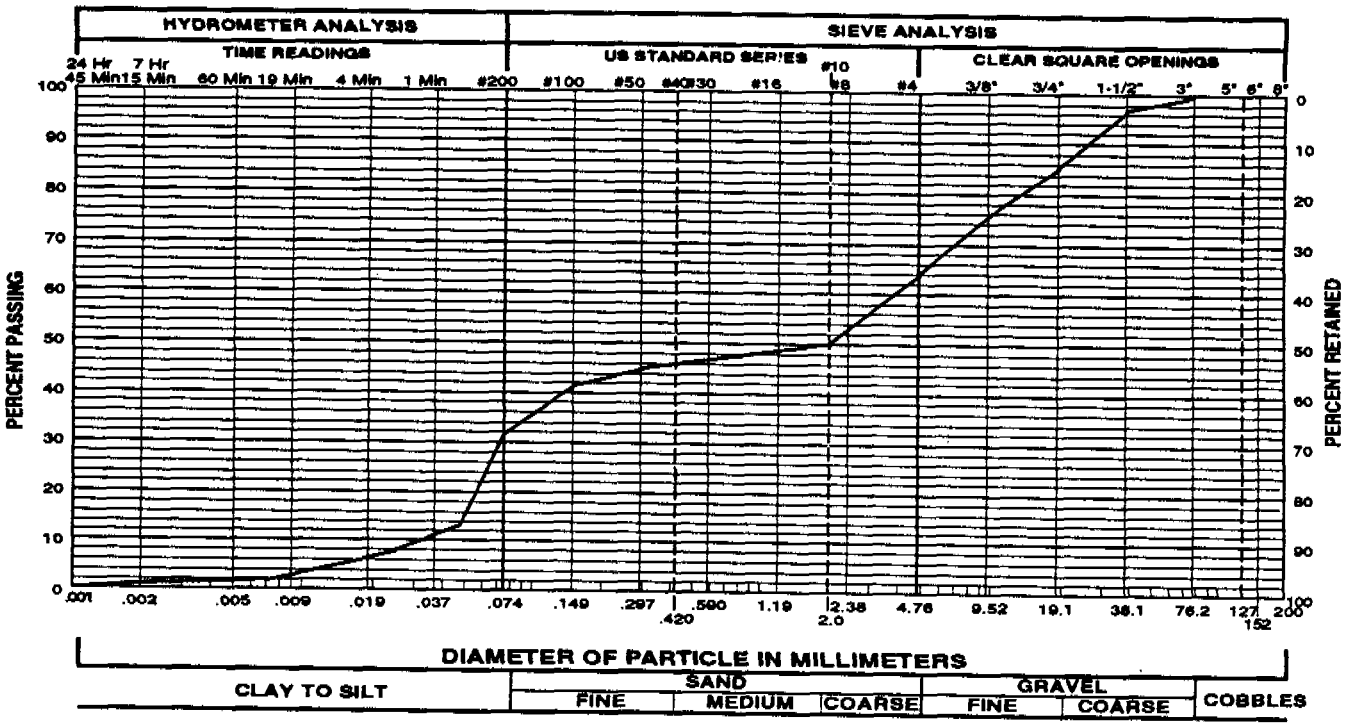
Gravel 40 % Sand 36 % Silt and Clay 24 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Gravel with Sand (GM) From 4-R1

Project No. 28093 **GRADATION TEST RESULTS** Figure 3

Applied Geotechnical Engineering Consultants, Inc.



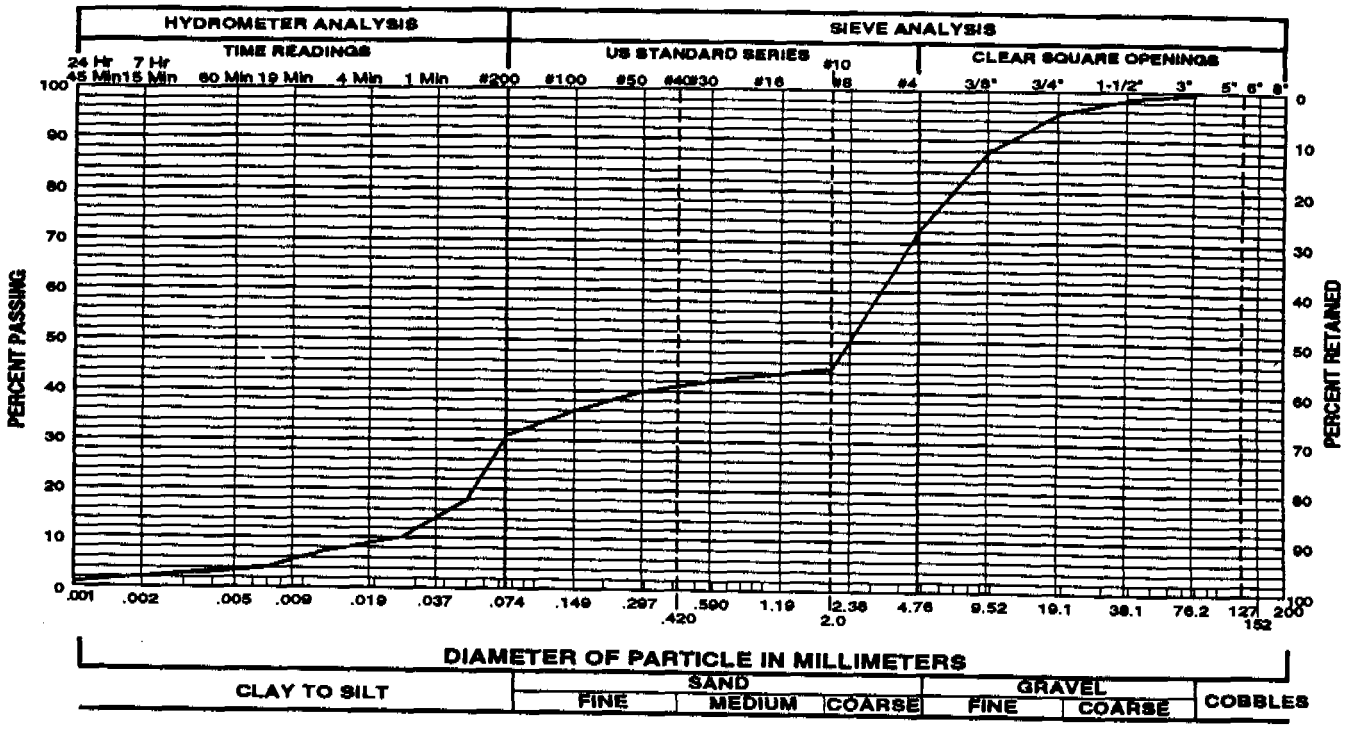
Gravel 50 % Sand 31 % Silt and Clay 19 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Gravel with Sand (GM) From 3-R2



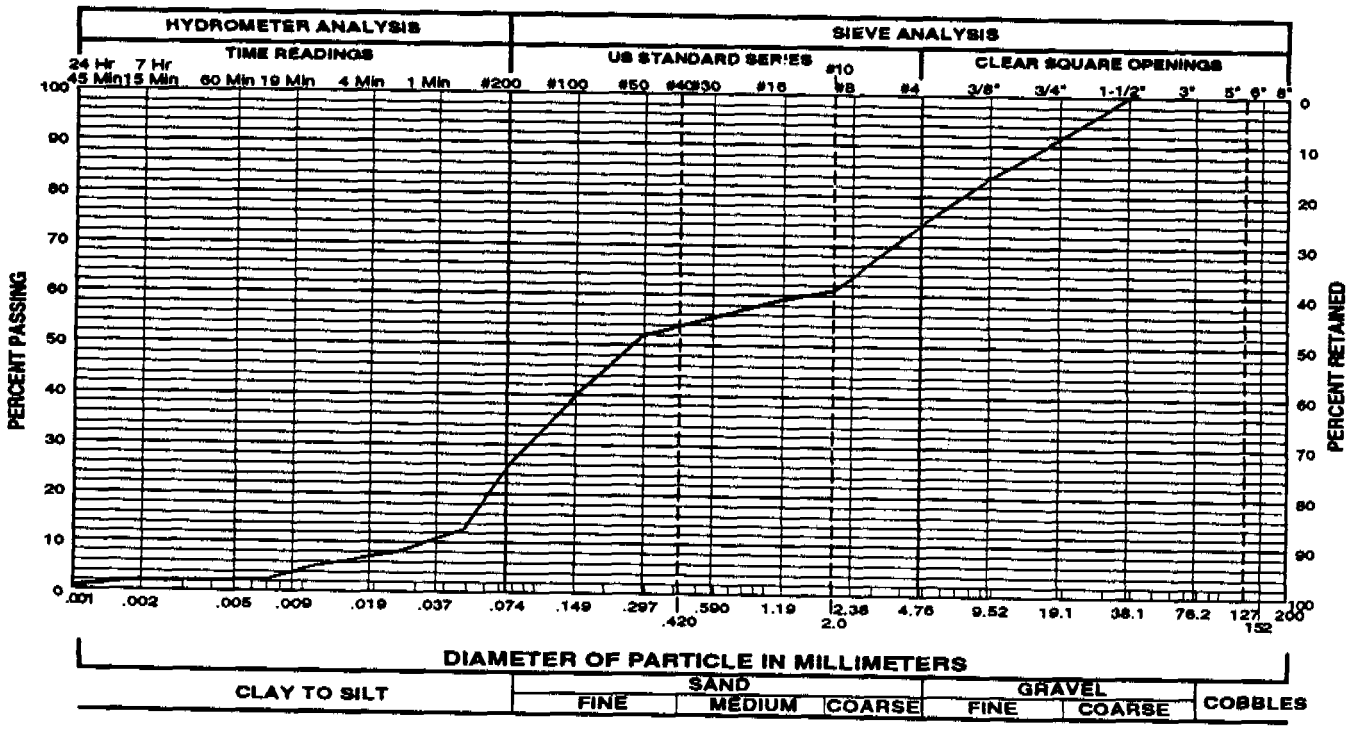
Gravel 36 % Sand 32 % Silt and Clay 32 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Gravel with Sand (GM) From 4-R2

Project No. 28093 **GRADATION TEST RESULTS** Figure 4

Applied Geotechnical Engineering Consultants, Inc.



Gravel 28 % Sand 41 % Silt and Clay 31 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 3-R3



Gravel 26 % Sand 49 % Silt and Clay 25 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 4-R3

Project No. 28093 **GRADATION TEST RESULTS** Figure 5

APPENDIX C

PRE-MINING SEDCAD+ OUTPUT

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

PRE-MINING SEDIMENTOLOGY FOR GORDON CR. #3 AND #6 MINES

by

Name: Carol Bjork

Company Name: EarthFax Engineering INC.
File Name: D:\UC287\SEDIMENT\PRE3-6

Date: 11-03-1993

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: EarthFax Engineering INC.
Filename: D:\UC287\SEDIMENT\PRE3-6 User: Carol Bjork
Date: 11-03-1993 Time: 12:37:27
Pre-mining sedimentology for Gordon Cr. #3 and #6 mines
Storm: 2.00 inches, 10 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

GENERAL INPUT TABLE

Specific Gravity: 2.50
Submerged Bulk Specific Gravity: 1.25

Particle Size Distribution(s):

Size (mm)	pre-mine comp % Finer
4.0000	84.80
2.0000	79.50
1.0000	77.00
0.5000	73.30
0.2500	67.80
0.1250	58.30
0.0630	38.00
0.0310	12.30
0.0160	7.30
0.0080	2.50
0.0040	1.00
0.0020	0.25
0.0010	0.00

Detailed Between Structure Routing:

J	B	To S	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Muskingum K (hr)	X
2	1	1	1	8	1551.94	5.00	6.71	0.06	0.064	0.398

Pre-mining sedimentology for Gordon Cr. #3 and #6 mines
Storm: 2.00 inches, 10 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	10.80	60	M	0.212	0.000	0.000	0.0	0.05	0.09
		Type: Null			Label: Area U-1					
111	Structure	10.80							0.05	
111	Total IN/OUT	10.80							0.05	0.09
211	1	15.50	60	M	0.211	0.000	0.000	0.0	0.08	0.12
211	2	71.50	60	M	0.308	0.000	0.000	0.0	0.36	0.54
		Type: Null			Label: Area U-2					
211	Structure	87.00							0.49	
211	Total IN/OUT	97.80							0.49	0.74
111	to 211 Routing					0.064	0.398			

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Sedimentology-

SED: Sediment
SCp: Peak Sediment Concentration
SSp: Peak Settleable Concentration
24VW: Volume Weighted Average Settleable Concentration - Peak 24 hours
24AA: Arithmetic Average Settleable Concentration - Peak 24 hours

	JBS	SWS	K	L (ft)	S (%)	CP	Tt (hrs)	PS #	SED (tons)	SCp (mg/l)	SSp (ml/l)	24VW (ml/l)	24AA (ml/l)
R	111	1	0.37	300.0	45.0	0.060	0.000	1	1.6				
				Type: Null			Label: Area U-1						
	111	Structure							1.6				
	111	Total IN/OUT							1.6	25916	19.41	15.87	7.87
R	211	1	0.37	300.0	40.1	0.060	0.000	1	2.1				
R	211	2	0.37	300.0	45.8	0.060	0.000	1	13.1				
				Type: Null			Label: Area U-2						
	211	Structure							16.8				
	211	Total IN/OUT							16.8	29725	22.24	18.49	9.32
	111	to 211 Routing					0.064						

APPENDIX D

POST-MINING SEDCAD+ OUTPUT

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

POST-MINING HYDROLOGY AND SEDIMENTOLOGY FOR GORDON CR. #3 AND #6 MINES

by

Name: Carol Bjork

Company Name: EarthFax Engineering INC.
File Name: D:\UC287\SEDIMENT\POST3-6

Date: 11-03-1993

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: EarthFax Engineering INC.
Filename: D:\UC287\SEDIMENT\POST3-6 User: Carol Bjork
Date: 11-03-1993 Time: 12:45:25
Post-mining hydrology and sedimentology for Gordon Cr. #3 and #6 mines
Storm: 2.00 inches, 10 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

GENERAL INPUT TABLE

Specific Gravity: 2.50
Submerged Bulk Specific Gravity: 1.25

Particle Size Distribution(s):

Size (mm)	pre-mine comp % Finer	% Finer
4.0000	84.80	60.70
2.0000	79.50	44.70
1.0000	77.00	43.00
0.5000	73.30	40.50
0.2500	67.80	37.30
0.1250	58.30	30.30
0.0630	38.00	20.20
0.0310	12.30	10.00
0.0160	7.30	6.20
0.0080	2.50	3.70
0.0040	1.00	2.70
0.0020	0.25	1.70
0.0010	0.00	0.80

Detailed Between Structure Routing:

J	B	To S	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Muskingum K (hr)	Muskingum X
2	1	1	1	8	1551.94	5.00	6.71	0.06	0.064	0.398

Post-mining hydrology and sedimentology for Gordon Cr. #3 and #6 mines
Storm: 2.00 inches, 10 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	9.30	59	M	0.206	0.000	0.000	0.0	0.04	0.05
		Type: Null			Label: Area U-1B					
111	Structure	9.30							0.04	
111	Total IN/OUT	9.30							0.04	0.05
211	1	11.40	59	M	0.213	0.000	0.000	0.0	0.05	0.06
211	2	52.50	57	M	0.519	0.000	0.000	0.0	0.13	0.17
211	3	24.60	60	M	0.511	0.000	0.000	0.0	0.12	0.17
		Type: Null			Label: Areas U-2b, U-3b,R-1					
211	Structure	88.50							0.34	
211	Total IN/OUT	97.80							0.34	0.42
111 to 211 Routing						0.064	0.398			

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Sedimentology-

SED: Sediment
SCp: Peak Sediment Concentration
SSp: Peak Settleable Concentration
24VW: Volume Weighted Average Settleable Concentration - Peak 24 hours
24AA: Arithmetic Average Settleable Concentration - Peak 24 hours

	JBS	SWS	K	L (ft)	S (%)	CP	Tt (hrs)	PS #	SED (tons)	SCp (mg/l)	SSp (ml/l)	24VW (ml/l)	24AA (ml/l)
R	111	1	0.37	300.0	49.9	0.060	0.000	1	1.1				
				Type: Null			Label: Area U-1B						
	111	Structure							1.1				

```
  111 Total IN/OUT                                  1.1   23903  18.05  15.68   7.74
  ==================================================================================
R 211  1   0.37  300.0  50.2 0.060  0.000 1    1.4
R 211  2   0.37  300.0  50.8 0.050  0.000 1    3.5
R 211  3   0.37  150.0  31.5 0.060  0.000 2    1.7
                   Type: Null   Label: Areas U-2b, U-3b,R-1
  211 Structure                                     7.7
  ----------------------------------------------------------------------------------
  211 Total IN/OUT                                  7.7   17966  13.54  12.44   6.50
  ==================================================================================
  111 to 211 Routing                 0.064
  ==================================================================================
```