ATTACHMENT D.1
1999 SAMPLING NOTE SUMMARIES

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	Northwest Wall
DRILL HOLE #:	Hand Sample - see map	NORTHING:	112,348
COLLAR ELEVATION:	7,158'	EASTING:	102,408
DEPTH INTERVAL:		ELEVATION RANGE:	7,158'
SAMPLE #	WRC 01		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado
KC - Light to dark gray to greenish gray, silicified and indurated, fine to medium grained, subangular to subrounded, clast to matrix supported (clast > matrix) quartz arenite to subarenite. Locally very arkosic, with matrix and feldspar constituents altered to clay. Darker gray portion of sample is primarily medium to coarse grained siltstone. Cut by submillimeter quartz +/- sulfide veins and quartz-sericite- pyrite veins with around three millimeter weak selvages. Sulfides in veins and on fractures leached and replaced by limonites, ranging from orange/black goethite > hematite in veins, red powdery hematite in veins, black hematite pits with red halos in veins and on fractures, and veins and fractures covered by black botyroidal goethite. Fractures stained with brown to ochre colored goethite. Trace jarosite stains on kaolinite clays which cover some fracture surfaces. Possible black manganese oxides on surfaces as small cular blooms.

ALTERATION STYLE

Sandstones and siltstones are silicified and hardened. In more arkosic areas, matrix and feldspars are clay altered, probably to kaolinite. Sandstones and siltstones are cut by quartz/sulfide veins, and quartz/sericite/pyrtie veins. Sulfides are leached and replaced, primarily by goethite and hematite with some jarosite stains on clays covering some surfaces.

1% Quartz/sulfide veining
<1% Quartz/sericite/pyrite veining
locally up to 15% kaolinite alteration of matrix and feldspars; average ~ 5%

METAL MINERALOGY CONTENT AND STYLE

1-2% limonites, predominantly goethite and hematite with some jarosite; occurs as stians on fractures and on the clays covering fractures, botryoidal masses on fractures, pits and stains in veins and on fracture surfaces.

Possible .1% Manganese Oxides as circular florets on fractures

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	West Wall near #2 Portal
DRILL HOLE #:	Hand Sample - see map	NORTHING:	111,328
COLLAR ELEVATION:	6,482'	EASTING:	103,277
DEPTH INTERVAL:		ELEVATION RANGE:	6,482'
SAMPLE #	WRC 02		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Syrena and Permian Abo
CS – Predominantly a light gray/green well-developed hornfels. Locally darker green to medium gray and light gray/white in places. Hornfels mineralogy (quartz, pyroxenes, etc.) preserves bedding and lamination textures and creates swirling patterns in the rock. Locally contains relict sand and silt grains. Pods of limestone altered to green, tan, and brown fine grained to massive garnet. The hornfels is locally calcareous and cut by small sub-millimeter calcite veinlets. Cut by hairline straight and wavy quartz veinlets. Also cut by quartz veinlets with one to four millimeter bleached selvages, quartz/chlorite veins, chlorite veins, possible actinolite veins, and a variety of veins containing two or more of the following minerals: garnet, quartz, wollastonite, chlorite, sulfides, and trace magnetite. Small amounts of pyrite, chalcopyrite, and sphalerite occur in veins, along fractures, and in pods of garnet.

ALTERATION STYLE

Previously a mixture of siltstones and shales with local pods of limestone, the Abo and Syrena formations have been altered to hornfels with garnet replacing the limestone. Locally, the hornfels is spotted by small patches of chlorite. The rock is cut by a variety of veins containing one or more of the following minerals: quartz, chlorite, garnet, actinolite, calcite, wollastonite, magnetite, and sulfides. Sulfides, associated with garnet, chlorite, and quartz, include pyrite, chalcopyrite, and sphalerite.

85% Hornfels (pyroxene, quartz, etc.)
10% Garnet
2% Chlorite
3% various veins and veinlets

METAL MINERALOGY CONTENT AND STYLE

< .1% goethite as stains on fractures (transported)
.1-.2% chalcopyrite in garnet pods, veins and, along fractures
.3% sphalerite in garnet pods, veins, and along fractures
1% pyrite in garnet pods, veins, and along fractures
trace magnetite in garnet veins

SIZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	North-east Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	112,164
COLLAR ELEVATION:	6,584'	EASTING:	104,131
DEPTH INTERVAL:		ELEVATION RANGE:	6,584'
SAMPLE #	WRC 03		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Lake Valley
Clv – Very fine grained to fine grained green to tan garnet replaced in part by fine grained magnetite and overprinted by intense chlorite alteration. Small relict pods of calcite. Cut by one to two millimeter barren quartz veins. Local wollastonite pods and sprays. Mineralized with pyrite, chalcopyrite, and small amounts of bornite. Sulfides closely associated with magnetite, also occurring as veins and replacements in the garnet.

ALTERATION STYLE

Originally a limestone with local chert nodules, Lake Valley is altered to a mixture of garnet, magnetite, and chlorite. Small amounts of wollasotnite represent altered chert. Cut by quartz veins and sulfide veins.

33% Chlorite
35% Magnetite
30% Garnet
<1% Quartz veins
~1% sulfide

METAL MINERALOGY CONTENT AND STYLE

35% Magnetite as fine grained replacements of garnet
1% Pyrite as veins and replacements in the garnet and magnetite
.15-.2% Chalcopyrite and Bornite as veins and replacements in garnet and Magnetite

E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,306
COLLAR ELEVATION:	6,537'	EASTING:	103,818
DEPTH INTERVAL:		ELEVATION RANGE:	6,537'
SAMPLE #	WRC 04		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Silurian-Ordovician Fusselman and Montoya Dolomites
SOfm – Intermixtures of lime green, forest green, and light yellow/green serpentine minerals with fine grain magnetite. Small amounts of talc and chlorite mixed with serpentine. Local asbestiform antigorite. Veins and small disseminations of sulfide, primarily pyrite and chalcopyrite, with small amounts of brassy/brown valleriite. Cut by calcite veinlets.

ALTERATION STYLE

Originally a dolomitic limestone, now a mixture of serpentine and magnetite, with small amounts of talc and chlorite. Cut by small calcite veinlets. Sulfides occur as veins and disseminations.

55% Magnetite
40% Serpentine minerals
3% Chlorite
1.5% Calcite
.5% Sulfide

METAL MINERALOGY CONTENT AND STYLE

55% fine grained Magnetite is primary constituent of rock
.3% pyrite as veins and disseminations in serpentine and magnetite
.1% chalcopyrite as veins and disseminations in serpentine and magnetite
.1% valleriite as veins and disseminations in serpentine and magnetite

-E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	Bottom of Pit, East Wall
DRILL HOLE #:	Hand Sample - see map	NORTHING:	111,625
COLLAR ELEVATION:	6,307'	EASTING:	103,643
DEPTH INTERVAL:		ELEVATION RANGE:	6,307'
SAMPLE #	WRC 05		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Lake Valley Marble
Mrb – White to light gray to light greenish/gray marble, composed of coarse grained (.5 to 2 centimeter) calcite. Local 1-5 millimeter veins of chlorite. Local sub-millimeter green garnet veins. Some magnetite/sulfide veins. Local sphalerite and magnetite.

ALTERATION STYLE

Originally a limestone, recrystallized to a coarse grained marble locally cut by small chlorite, garnet, and magnetite/sulfide veins and veinlets. Local disseminations of magnetite and sulfide.

95% Marble
2.5% Chlorite
1% Garnet
1% Magnetite
.5% Sulfide

METAL MINERALOGY CONTENT AND STYLE

1% Magnetite as disseminations and veins in marble
.3% Sphalerite as dissemination in marble
.1% Pyrite as disseminations and veins in marble
.1% Chalcopyrite as disseminations and veins in marble

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	East Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	111,544
COLLAR ELEVATION:	6,660'	EASTING:	104,397
DEPTH INTERVAL:		ELEVATION RANGE:	6,660'
SAMPLE #	WRC 06		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Hanover-Fierro Stock
Medium grained, holocrystalline, porphyritic quartz monzonite to granodiorite. Composed of about 15% light gray aphanitic matrix, ~10% 2-5 millimeter euhedral biotite books, ~5% euhedral, slender 1-7 millimeter amphibole prisms, ~5% anhedral quartz "eyes," and about 65% subhedral to euhedral, 1-8 millimeter plagioclase and potassium feldspars (plag> K-spar). Also contains minor disseminated magnetite and sphene, and trace amounts of disseminated pyrite and chalcopyrite. Mafics incipiently altered by chlorite, some alteration of feldspars. Cut by local thin quartz veins and calcite veins.

ALTERATION STYLE

Predominantly unaltered, except for incipient chloritic alteration of amphiboles and some biotites, and local clay alteration of feldspars. Some chlorite occurs in the matrix as small disseminated flakes. Cut by quartz and calcite veins. Some pyrite and chalcopyrite disseminated along fractures.

4% Chlorite
3% Clay
<1% Quartz veins
<1% Calcite Veins

METAL MINERALOGY CONTENT AND STYLE

< 1% Magnetite as primary disseminations in matrix
~.2% Pyrite as primary disseminations in matrix and along fractures
<.1% Chalcopyrite as dissemination and along fractures

..ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/12/98	PIT AREA:	Hanover Mountain
DRILL HOLE #:	CF-0217	NORTHING:	115,375
COLLAR ELEVATION:	7,307'	EASTING:	107,019
DEPTH INTERVAL:	251' - 268'	ELEVATION RANGE:	7,056' - 7,039'
SAMPLE #	WRC 07		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	251' - 268'
TOTAL CU ASSAY	0.39%
QUICK LEACH TEST	36.10%
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado – Chalcocite Zone
KC – Light to medium gray, subangular to subrounded, matrix to clast supported (matrix > clast), fine grained indurated subarenite, interbedded with medium to dark gray siltstones near the end of the interval. Weak clay overprint as kaolinite in matrix and on fractures. Heavily fractured with pyrite coatings on fracture surfaces. Also cut by quartz veinlets (locally containing sulfides) and quartz-sericite-pyrite veins with millimeter scale sericite selvages. Covellite and chalcocite enrichment on sulfides in veins, veinlets, on fracture surfaces, and disseminated throughout sandstones. Some veins and fractures unenriched.

LTERATION STYLE

Sandstones and siltstones hardened and slightly silicified. Cut by quartz veins and quartz-sericite-pyrite veins with 2-4 millimeter sericite-flooded selvages. Heavily fractured with kaolinite on fractures. Weak clay overprint present as clay in matrix. Primary sulfides replaced and enriched with chalcocite and covellite. Trace amounts of transported iron oxide as goethite on fractures.

2% Quartz-Sericite-Pyrite veins
2% Quartz veins
5% Clay overprint
2% Pyrite
.1% Goethite

METAL MINERALOGY CONTENT AND STYLE

2% Pyrite in quartz veinlets, quartz-sericite-pyrite veins, on fractures, and disseminated throughout the matrix of the sandstones
.2-.3% Chalcocite and Covellite as coatings on primary sulfides in veins, veinlets, on fractures, and disseminated throughout the sandstone matrix
.1% Goethite as transported iron oxide stains on a few fractures

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/12/98	PIT AREA:	Hanover Mountain
DRILL HOLE #:	CF - 0216	NORTHING:	116,172
COLLAR ELEVATION:	7,281	EASTING:	107,216
DEPTH INTERVAL:	206' - 228'	ELEVATION RANGE:	7,075 - 7,053'
SAMPLE #	WRC 08		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	206' - 228'
TOTAL CU ASSAY	
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado – Chalcocite Zone
Kc – Light gray, subangular to subrounded, matrix supported, fine grained arkose to subarenite, interbedded with dark gray and grayish-green siltstone. Locally a hornfelsic drab gray. Cut by hairline quartz veinlets and quartz-sericite-pyrite veins with 1-3 millimeter selvages. Clay alteration as a weakly pervasive overprint on non-quartz constituents in sandstone. Clay also occurs on fractures with or without iron oxides. Hematite wash throughout sections of sandstone. Pyrite disseminated in matrix, on fractures and in quartz and quartz-sericite-pyrite veins. Chalcocite enrichment forms thick coats on most pyrite in veins, veinlets, fractures, and disseminated. Some veins of pyrite unenriched.

TERATION STYLE

Sandstones and siltstones were originally indurated and locally hornfelsic. Cut by quartz veinlets and quartz-sericite-pyrite veins with up to 3 millimeter sericite selvages. Sandstones overprinted with clay and washed with hematite. Primary sulfide enriched with chalcocite. Hematite on fractures as surface coats.

15% Hornfels
7% Clay
1% Hematite
2% Quartz veinlets
3% Quartz-Sericite-Pyrite veins
2% Pyrite

METAL MINERALOGY CONTENT AND STYLE

2% Pyrite as disseminations in sandstone matrix, on fractures, and in veins and veinlets often with quartz or quartz-sericite.
.4% Chalcocite as coatings on pyrite in veinlets, veins, fractures, and disseminated in sandstone matrix.
1% Hematite as stains and coats on fractures and as washes throughout sandstone.

E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/12/98	PIT AREA:	Hanover Mountain
DRILL HOLE #:	CF - 0217	NORTHING:	115,375
COLLAR ELEVATION:	7,307'	EASTING:	107,019
DEPTH INTERVAL:	10' - 38'	ELEVATION RANGE:	7,297' - 7,269'
SAMPLE #	WRC 09		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	10' - 38'
TOTAL CU ASSAY	0.03%
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado – Barren Leach Cap
Kc – Light gray, subangular to subrounded, fine grained subarenite interbedded with greenish-gray siltstones. Overprinted by pervasive clay alteration. Heavily fractured with hematite/goethite stains and washes along fractures. Locally brecciated and cemented by iron oxides. Cut by quartz veinlets and quartz-sericite-pyrite veins with 3-4 millimeter selvages. All veins, veinlets, and fractures leached and coated with hematite and goethite. Boxwork textures common in veins and along fractures. Small hematite-filled pits occur disseminated throughout matrix. At 23' is a small dike with a medium gray matrix and 1-2 millimeter goethite stained feldspars. Probably a diorite porphyry.

ALTERATION STYLE

Sandstones and siltstones hardened and cut by quartz and quartz-sericite-pyrite veins and veinlets. Overprinted by clay alteration and leached of sulfides. Sulfides replaced by iron oxides as disseminated pits in sandstone matrix and as boxworks along veins and fractures. Iron oxide also occurs as stains and washes along veins and fractures and as massive iron oxide cementing brecciated sandstone.

2% Quartz veinlets
3% Quartz-Sericite-Pyrite veins
15% Clay, probably Kaolinite
5% Iron Oxides as Goethite and Hematite

METAL MINERALOGY CONTENT AND STYLE

5% Goethite and Hematite as powdery stains and washes along fractures and veins. Also as boxworks in fractures, veins and veinlets, and disseminated throughout matrix. Goethite occurs as glassy, botryoidal limonite along some fractures. Goethite and Hematite occur as porous masses cementing brecciated sandstone.

...ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/12/98	PIT AREA:	North-west of Pit
DRILL HOLE #:	CF - 0140	NORTHING:	113,258.50
COLLAR ELEVATION:	7,135'	EASTING:	101,911.70
DEPTH INTERVAL:	167' - 308.5'	ELEVATION RANGE:	6,968' - 6,827'
SAMPLE #	WRC 10		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	167' - 308.5'
TOTAL CU ASSAY	0.07%
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Continental Breccia
KBrx – Intrusive breccia with a dark gray, locally vuggy, aphanitic matrix. Contains clasts which range in size from sub-millimeter to eight centimeters in length. Predominantly angular clasts, although locally rounded. Clasts exhibit a wide range of composition, including: felsic ingneous porphyry; indurated and hornfelsed light to dark gray Colorado sandstones and siltstones; gray Beartooth quartzite; white to light gray marble; green and gray hornfels cut by chlorite veinlets and quartz veinlets (probably Syrena); and brown to green garnet fragments, often with magnetite. Magnetite pervasive throughout matrix. Sulfides occur as veins and veinlets within breccia fragments and include pyrite and chalcopyrite. Locally, vugs in matrix contain pyrite and quartz. Breccia fractured in places and recemented with calcite. Entire breccia erprinted by chlorite and clay alteration with local heavy iron oxide staining. Interval includes a zone of ghly fractured and crushed breccia.

ALTERATION STYLE

Breccia clasts contain a variety of alteration styles including: induration and hardening of sand and siltstones, hornfelsic alteration of siltstones and shales, garnetization of limestone or marble, marble alteration of limestone, magnetite replacement of garnet or marble, and clay and chlorite overprinting of igneous porphyry. In addition, many breccia fragments are veined with chlorite, quartz, calcite, garnet, magnetite, and sulfide. Overall, the breccia matrix and clasts are clay and chlorite altered. Calcite cements broken breccia zones. Also, sulfide and quartz occur lining local vugs.

METAL MINERALOGY CONTENT AND STYLE

1% Pyrite occurs as veins, veinlets, and disseminations in breccia clasts, as well as in matrix lining vugs with quartz and other sulfide.
~.1% Chalcopyrite with trace Bornite occurs in veins, veinlets, and disseminations in breccia clasts, as well as lining vugs in igneous matrix.
~10% Magnetite as disseminations in igneous matrix and as constituent of local breccia clasts as pervasive fine grained magnetite or as veins in other rocks.
.4% Iron Oxide as Goethite and Hematite stains along fractures in breccia.

IZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/13/98	PIT AREA:	Hanover Moutain
DRILL HOLE #:	CF - 0214	NORTHING:	114,233
COLLAR ELEVATION:	6,798'	EASTING:	106,615
DEPTH INTERVAL:	309' - 327.5'	ELEVATION RANGE:	6,489' - 6,470.5'
SAMPLE #	WRC11		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	309' - 327.5'
TOTAL CU ASSAY	
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Barringer Fault Zone
Flt – Predominantly fault gouge, rubble, and brecciated Carboniferous Syrena hornfels. Includes one interval which may be strongly clay altered felsic intrusive. Syrena fragments bleached light green, heavily argillized and chlorite altered. Syrena breccia fragments commonly contain chlorite veins and quartz veins. Goethite stains in fault clays and on breccia fragments, probably representing transported iron oxides. Local magnetite, possibly as veins. Calcite veins also occur in Syrena, as do pyrite veins.

TERATION STYLE

Original rock ground and powdered to fault gouge with chlorite slickensides and local areas of heavy chlorite alteration of remaining rock. Breccia fragments are hornfelsically altered and cut by chlorite, quartz, magnetite, and calcite veins and veinlets. Subsequently extremely argillized and chloritized. Small amounts of goethite coat fractures and gouge.

40% Gouge and Clay alteration
15% Chlorite
1% Magnetite
4% Veins
3% Goethite
~40% Hornfels

METAL MINERALOGY CONTENT AND STYLE

.4% Pyrite as veins and veinlets in breccia fragments, often with quartz or chlorite
1% Magnetite as veins in breccia fragments
3% Goethite as transported iron oxide stains on clay and breccia fragments
Possible trace chalcocite on fractures

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,278
COLLAR ELEVATION:	7,099'	EASTING:	102,771
DEPTH INTERVAL:		ELEVATION RANGE:	7,099'
SAMPLE #	WRC12		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado
Kc – Soft, friable, locally hardened, clay altered, fine grained arkose/graywacke, colored tan to light gray. Local beds of finer grained, gray siltstone. Relict bedding features. Leached quartz veins stained by hematite and goethite with boxworks common. Possible relict chalcocite in veins.

ALTERATION STYLE

Hardened sandstones and siltstones, cut by quartz veins and later leached and stained with iron oxides. Possible relict chalcocite in fractures and veins.

2% Veins
.5% Hematite and Goethite
<.1% Chalcocite

METAL MINERALOGY CONTENT AND STYLE

<.1% Chalcocite as relict sulfide in veins and on fractures
.5% Hematite and Goethite boxworks and stains

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	West Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	111,073
COLLAR ELEVATION:	7,109'	EASTING:	102,554
DEPTH INTERVAL:		ELEVATION RANGE:	7,109'
SAMPLE #	WRC13		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado
Kc – Dark gray to black, indurated silty mudstone, cut by hairline quartz veinlets and quartz-sericite-pyrite veinlets. Both types of veins and their selvages leached and contain goethite and hematite stains and boxworks. Fracture surfaces are coated by hematite and goethite. No remaining sulfide.

ALTERATION STYLE

Shale hardened and cut by quartz and quartz-sericite-pyrite veinlets. Later leached and covered by iron oxides.

2% Limonites, primarily goethite and hematite
2% Veins

METAL MINERALOGY CONTENT AND STYLE

2% Goethite and Hematite as stains on fractures and as boxworks in veins and vein selvages

E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,667
COLLAR ELEVATION:	7,105	EASTING:	102,603'
DEPTH INTERVAL:		ELEVATION RANGE:	7,105
SAMPLE #	WRC 14		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado
Kc - Gray indurated siltstone, with some clay (probably kaolinite) on fractures, powdery goethite and hematite on fractures. Also black, glassy botryoidal goethite on fractures. Hematite and goethite boxworks in veins.

ALTERATION STYLE

Hardened siltstone cut by quartz veins, now leached and stained with goethite and hematite.

1% Veins
2% Goethite and Hematite

METAL MINERALOGY CONTENT AND STYLE

2% Goethite and Hematite as stains on fractures, botryoidal masses on fractures, and boxworks in veins.

E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,282
COLLAR ELEVATION:	6,926'	EASTING:	103,125
DEPTH INTERVAL:		ELEVATION RANGE:	6,926'
SAMPLE #	WRC 15		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado
Kc – Fine grained, light gray (stained yellow), subangular to subrounded clast supported, arkose to subarenite with 15% clay-altered matrix. Locally indurated. Millimeter scale quartz veinlets with goethite/hematite boxworks and stains. Fractures are also stained by goethite and jarosite with minor hematite.

ALTERATION STYLE

Hardened sandstone, cut by quartz veinlets and subsequently leached and stained with iron oxides.

1-2% Goethite > Jarosite > Hematite
2% Veins

METAL MINERALOGY CONTENT AND STYLE

1-2% Goethite, Jarosite, and Hematite as stains and boxworks

'E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	North-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	112,604
COLLAR ELEVATION:	7,121'	EASTING:	102,368
DEPTH INTERVAL:		ELEVATION RANGE:	7,121'
SAMPLE #	WRC 16		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado
Kc – Fine grained, light gray, subrounded, matrix supported subarenite. Matrix makes up 15% of rock and is slightly clay altered. Quartz veins cut sandstone and are leached and stained with hematite and goethite. Hematite and goethite also coat all fracture surfaces.

ALTERATION STYLE

Clay altered sandstone cut by leached quartz veins. Limonites stain veins and fractures.

5% Clay alteration
3% Goethite and Hematite

METAL MINERALOGY CONTENT AND STYLE

3% Goethite and Hematite as washes on fracture surfaces, stains around veins and vein selvages, and boxworks within veins.

'E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	North-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	112,479'
COLLAR ELEVATION:	7,143'	EASTING:	102,437'
DEPTH INTERVAL:		ELEVATION RANGE:	7,143'
SAMPLE #	WRC 17		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado
Kc – Orange, brown, and red stained white to light gray, very fine grained to fine grained, subrounded, matrix supported, subarenite. Matrix is clay altered and soft. Small quartz veinlets leached and stained with hematite and goethite. Fracture surfaces coated with brown and red goethite and hematite stains.

ALTERATION STYLE

Clay altered sandstone cut by quartz veins. Leached and stained with iron oxides.

2% Veins
2% Goethite and Hematite

METAL MINERALOGY CONTENT AND STYLE

2% Goethite and Hematite as stains and boxworks in veins and as stains on fracture surfaces

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	North-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	112,227
COLLAR ELEVATION:	7,173'	EASTING:	102,291
DEPTH INTERVAL:		ELEVATION RANGE:	7,173'
SAMPLE #	WRC 18		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Colorado
Kc - Light gray indurated siltstone. Intensely fractured with powdery hematite and goethite stains on fractures and black, glassy botryoidal goethite in veins and on larger fractures. Siltstone cut by millimeter scale quartz veins. Relict pyrite and possible chalcocite on fractures.

ALTERATION STYLE

Indurated siltstone cut by quartz veins with sulfide. Later leached and covered by limonites.

2% Veins
2% Hematite and Goethite
<.2% Sulfide

METAL MINERALOGY CONTENT AND STYLE

2% Hematite and Goethite as stains and boxworks in veins and on fracture surfaces.
<.1% Pyrite on fractures
<.1% Chalcocite on fractures

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,367
COLLAR ELEVATION:	6,816'	EASTING:	103,232
DEPTH INTERVAL:		ELEVATION RANGE:	6,816'
SAMPLE #	WRC 19		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Beartooth
Kb – Light gray, medium grained, subrounded to rounded, clast supported (<10% matrix) quartz arenite, now a quartzite. Cut by molybdenite veins and pyrite veins. Extremely fractured, with fractures coated by goethite/jarosite stains.

ALTERATION STYLE

Originally a quartz arenite, now hardened to a quartzite. Cut by sulfide veins. Stained on fractures by limonites, primarily goethite with some jarosite.

2% Goethite and Jarosite
1% Pyrite

METAL MINERALOGY CONTENT AND STYLE

.6% Molybdenite on veins
1% Pyrite on veins and veinlets cutting Beartooth. Also on fractures
1% Limonites, predominantly goethite with jarosite

...E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,677
COLLAR ELEVATION:	6,786'	EASTING:	103,149
DEPTH INTERVAL:		ELEVATION RANGE:	6,786'
SAMPLE #	WRC 20		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Beartooth
Kb – Light gray, medium grained, subrounded to rounded, clast supported (<10% matrix) quartz arenite, hardened and metamorphosed to quartzite. Extremely fractured, healed by quartz cement. Cut by one to two millimeter pyrite veins. Jarosite stained clays on fractures.

ALTERATION STYLE

Originally a quartz arenite, now hardened and metamorphosed to quartzite. Clays on fractures stained with jarosite. Cut by pyrite veins.

1% Jarosite
3% Clays (probably kaolinite)
2% Pyrite

METAL MINERALOGY CONTENT AND STYLE

2% Pyrite as large one to two millimeter veins cutting quartzite. Smaller amounts of pyrite on fractures and as sub-millimeter veinlets.

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	North of Pit near Tailings Dam
DRILL HOLE #:	Hand Sample - see map	NORTHING:	113,183
COLLAR ELEVATION:	6,882'	EASTING:	102,302
DEPTH INTERVAL:		ELEVATION RANGE:	6,882'
SAMPLE #	WRC21		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Beartooth
Kb – Light gray, medium grained, subrounded to rounded, clast supported (<10% matrix) quartz arenite, baked and altered to a quartzite. Calcite on fractures. Large five millimeter barren quartz vein. Weathered, with matrix removed and relict sand grains exposed in places. No sulfide. Goethite on fractures.

ALTERATION STYLE

Quartz arenite altered to quartzite. Cut by at least one large barren quartz vein. Calcite on some fracture surfaces. Goethite staining on most fracture surfaces.

2% Goethite
<1% Calcite

METAL MINERALOGY CONTENT AND STYLE

2% Goethite as stains on fracture surfaces

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,666
COLLAR ELEVATION:	6,752'	EASTING:	103,216
DEPTH INTERVAL:		ELEVATION RANGE:	6,752'
SAMPLE #	WRC22		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Syrena and Permian Abo
Cs – Light green and gray to darker brownish-green hornfels. Incipient spotty chlorite alteration throughout. Cut by sub-millimeter barren quartz veins, some with small, bleached selvages. Also cut by sub-millimeter chlorite veinlets, calcite veinlets, and possibly actinolite (darker green) veinlets. Sulfides present include pyrite and chalcopyrite, occurring as veins and veinlets, alone or with chlorite and sometimes quartz.

TERATION STYLE

Siltstones and shales altered to green and gray hornfels, probably consisting primarily of quartz and pyroxenes with some garnet. Incipient chlorite alteration as small patches and blooms in hornfels. Cut by quartz, chlorite, actinolite, sulfide, and calcite veins and veinlets.

94% Hornfels
2% Chlorite
1% Quartz veins
1% Calcite veins
1% Actinolite veins
1% Sulfides

METAL MINERALOGY CONTENT AND STYLE

.8% Pyrite in veins and veinlets and along fractures
.2% Chalcopyrite in veins and veinlets and along fractures

E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/13/98	PIT AREA:	North-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	112,708
COLLAR ELEVATION:	6,562'	EASTING:	103,377
DEPTH INTERVAL:		ELEVATION RANGE:	6,562'
SAMPLE #	WRC23		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Syrena and Permian Abo
Cs – Medium to dark forest green hornfels with local pods and veins of fine grained brown garnet. Incipient chlorite alteration of hornfels as small patches and flakes. Cut by hairline quartz veinlets, millimeter scale chlorite and actinolite veins, and calcite veins. Magnetite veins are found in or near garnet pods. Pyrite and chalcopyrite occur in veins and veinlets, either alone or with quartz, chlorite, or magnetite. Both are also found in garnet pods.

TERATION STYLE

riginal rock altered to dark green hornfels and brown garnet. Later cut by chlorite, quartz, actinolite, calcite, magnetite, and sulfide veins and veinlets. Incipient chlorite alteration of hornfels.

15% Garnet
8% Chlorite
2% Actinolite
3% Magnetite
~1% Sulfides
2% Quartz veins
2% Calcite veins

METAL MINERALOGY CONTENT AND STYLE

3% Magnetite in veins
.9% Pyrite in veins and veinlets with one or more of the following: chalcopyrite, quartz, chlorite, magnetite, garnet. Also on fractures in garnet pods.
.3% Chalcopyrite in veins and veinlets and on fractures in garnet pods, associated with one or more of the following: pyrite, quartz, chlorite, and magnetite.

SIZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	West Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	112,322
COLLAR ELEVATION:	6,557	EASTING:	103,080
DEPTH INTERVAL:		ELEVATION RANGE:	6,557
SAMPLE #	WRC24		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Syrena and Permian Abo
Cs – Light gray to drab green hornfels. Cut by millimeter scale, green and brown garnet veinlets, quartz veinlets, actinolite veinlets and chlorite veinlets. Calcite veins abundant. Local massive brown garnet. Incipient chlorite alteration as small patches throughout otherwise homogenous hornfels. Molybdenite veins in places and pyrite/chalcopyrite veins with one to two millimeter bleached selvages. Pyrite and chalcopyrite also in chlorite and garnet veins.

ALTERATION STYLE

Hornfels alteration pervasive, being overprinted incipiently by chlorite as small patches. Massive brown garnet replacing parts of hornfels. Cut by veins with one or more of the following minerals: calcite, quartz, chlorite, actinolite, garnet, and sulfide.

90% Hornfels
4% Garnet
3% Chlorite / Actinolite
1% Calcite
1% Quartz
1% Sulfide

METAL MINERALOGY CONTENT AND STYLE

.4% Pyrite in veins with chalcopyrite, garnet, or chlorite
.1% Chalcopyrite in veins with pyrite, garnet, or chlorite
.5% Molybdenite in veins

SIZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	Bottom of Pit, West Wall
DRILL HOLE #:	Hand Sample - see map	NORTHING:	111,666
COLLAR ELEVATION:	6,310'	EASTING:	103,546
DEPTH INTERVAL:		ELEVATION RANGE:	6,310'
SAMPLE #	WRC25		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Oswaldo, Parting Shale member (Felsite sill, Hornblende-Quartz Diorite)
Cops – Fine grained highly altered diorite with relict millimeter size, euhedral, square plagioclase in a dark gray to greenish-black aphanitic matrix. Relict hornblendes occasionally visible as chlorite pseudomorphs. Matrix composed of varying amounts of quartz, chlorite, magnetite, and locally fine grained garnet. Cut by magnetite veinlets, chlorite veinlets, and actinolite veinlets, none greater than one millimeter in width. Also cut by quartz veinlets, some with bleached sericite selvages less than two millimeters wide. Local epidote patches.

ALTERATION STYLE

Extremely altered hornblende-quartz diorite, with mafics altered to chlorite and matrix altered to a mixture of magnetite, chlorite, quartz and fine grained garnet. Cut by quartz, quartz-sericite, chlorite, actinolite, magnetite, and calcite veins and veinlets.
Local patches of epidote.

10% Magnetite
20% Chlorite
4% Various veins and veinlets
1% Epidote

METAL MINERALOGY CONTENT AND STYLE

10% Magnetite as pervasive alteration in matrix and as veins

:E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	North-east Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	112,356
COLLAR ELEVATION:	6,561'	EASTING:	103,989
DEPTH INTERVAL:		ELEVATION RANGE:	6,561'
SAMPLE #:	WRC26		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Oswaldo, Parting Shale member (Felsite sill, Hornblende-Quartz Diorite)
Cops – Greenish-black apahnitic matrix with relict one millimeter, euhedral, square plagioclase. Cut by numerous veins with less than one to over four millimeter selvages. Vein centers include quartz, chlorite, actinolite, and possibly pyroxenes. Also cut by calcite veins and trace garnet veins. Matrix composed of magnetite, chlorite, and quartz, with small amounts of garnet. Pyrite and chalcopyrite occur as veins, either alone or with quartz.

ALTERATION STYLE

eavily altered Diorite with matrix replaced by varying amounts of the following: quartz, magnetite, chlorite, and garnet. Cut by numerous veins containing one or more of the following: quartz, magnetite, calcite, chlorite, actinolite, pyroxene, garnet, and sulfide.

10% Magnetite
8% Chlorite
2% Garnet
5% Quartz
3% Actinolite
2% Pyroxene
2% Calcite
<1% Sulfide

METAL MINERALOGY CONTENT AND STYLE

10% Magnetite as pervasive alteration of the matrix and as veinlets
.2% Pyrite in veins and veinlets with quartz and chalcopyrite
<.1% Chalcopyrite in veins and veinlets with quartz and pyrite

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	Bottom of Pit, East Wall
DRILL HOLE #:	Hand Sample - see map	NORTHING:	111,956
COLLAR ELEVATION:	6,311'	EASTING:	103,695
DEPTH INTERVAL:		ELEVATION RANGE:	6,311'
SAMPLE #:	WRC27		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Lake Valley
Clv – Intermixture of fine grained brown to green garnet and magnetite, with overprinting of chlorite. Contains patches of relict calcite. Also cut by local calcite veins. Pyrite, chalcopyrite, and bornite on fractures, in veins, and replacing garnet and magnetite.

ALTERATION STYLE

Limestone altered to marble and further altered to green and brown garnet. Replaced by magnetite and overprinted with chlorite. Cut by calcite veins and sulfide veins. Sulfide replacing magnetite and garnet in places.

20% garnet
40-90% Magnetite
2% Calcite
30% Chlorite
~1% Sulfide

METAL MINERALOGY CONTENT AND STYLE

.5% Pyrite as replacements, in veins, and on fractures
.4% Chalcopyrite/bornite as replacements, in veins, and on fractures
40-90% Magnetite as primary constituent of rock

SIZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	Bottom of Pit, South-west Wall
DRILL HOLE #:	Hand Sample - see map	NORTHING:	111,129
COLLAR ELEVATION:	6,381'	EASTING:	103,621
DEPTH INTERVAL:		ELEVATION RANGE:	6,381'
SAMPLE #	WRC28		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Devonian Percha
Dp - Brownish-black hornfels with relict shaly partings. Cut by millimeter scale calcite, quartz, pyroxene, and chlorite veinlets. One vein of pyroxene?/chlorite? With eight millimeter hard pale green selvage. Pyrite and chalcopyrite present in quartz, chlorite , and pyroxene veinlets and on shaly partings.

ALTERATION STYLE

Shale or mudstone altered to hornfels. Cut by quartz, chlorite, calcite, and pyroxene veinlets.
Pyrite and chalcopyrite as constituents of quartz, chlorite, and pyroxene veinlets.
Also on shaly partings

METAL MINERALOGY CONTENT AND STYLE

.4% Pyrite in veins and on shaly partings
Trace Chalcopyrite in veins

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	Bottom of Pit, East Wall
DRILL HOLE #:	Hand Sample - see map	NORTHING:	111,165
COLLAR ELEVATION:	6,378'	EASTING:	103,689
DEPTH INTERVAL:		ELEVATION RANGE:	6,378'
SAMPLE #	WRC29		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Devonian Percha
Dp – Hornfelsic micaceous-looking shale varying in color from maroon, brown, and black to reddish-gray. Relict shaly partings. Calcite veinlets locally, from one to two millimeters in width. Chlorite on some fractures and partings. Local sub-millimeter chlorite veinlets. Pyrite and trace amounts of chalcopyrite on partings. Bulk of hornfels probably composed of quartz, biotite, sericite, and pyroxenes.

ALTERATION STYLE

Shale or mudstone altered to hornfels. Cut by calcite and chlorite veinlets.

97% Hornfels
1% Calcite veins
1% Chlorite veins
1% Sulfide

METAL MINERALOGY CONTENT AND STYLE

.7-1% Pyrite on shaly partings
<.1% Chalcopyrite on shaly partings with pyrite

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South-west Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,250
COLLAR ELEVATION:	6,545'	EASTING:	103,932
DEPTH INTERVAL:		ELEVATION RANGE:	6,545'
SAMPLE #	WRC30		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Silurian-Ordovician Fusselman/Montoya Dolomites
Sofm – Dark forest green, lime green, and greenish-yellow serpentine minerals with lesser magnetite and trace amounts of talc. Magnetite cuts serpentine as veins and veinlets and is locally massive. Relict yellowish chert nodules occur in places. Cut by quartz veins locally. Some disseminated pyrite and trace chalcopyrite in magnetite as small pods.

ALTERATION STYLE

Dolomite altered to serpentine, talc and magnetite, cut locally by quartz veins.
Pyrite and chalcopyrite associated with magnetite.

15 – 80%, average 30% Magnetite
20 – 85% Serpentine
Small amounts of Talc
1% Quartz veins
~.2% Sulfide

METAL MINERALOGY CONTENT AND STYLE

15-80% Magnetite as a primary constituent of the rock
.2% Pyrite as small disseminated pods in magnetite
Trace Chalcopyrite with pyrite

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South pit, near Waste Dump
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,285
COLLAR ELEVATION:	6,524'	EASTING:	103,987
DEPTH INTERVAL:		ELEVATION RANGE:	6,524'
SAMPLE #	WRC31		
SAMPLE/THIN SECTION :			

SAMPLE CLASS __________

SAMPLE INTERVAL __________
TOTAL CU ASSAY __________
QUICK LEACH TEST __________
CUOXIDE ASSAY __________
SULFUR ASSAY __________

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Silurian-Ordovician Fusselman/Montoya Dolomites
Sofm – Light to dark green serpentine minerals cut by magnetite veins and local massive fine grained magnetite. Patchy chlorite and talc on fractures and throughout serpentine. Cut by hairline quartz veinlets. Small amount of pyrite disseminated in magnetite.

ALTERATION STYLE

Dolomite successively replaced by serpentine and talc, magnetite, and chlorite. Cut by quartz veinlets. Small amount of sulfide as disseminations in magnetite.

15 – 90%, average 25% Magnetite
10 – 85% Serpentine
4% Talc
3% Chlorite
.1% Pyrite

METAL MINERALOGY CONTENT AND STYLE

15-90% Magnetite as a primary constituent of the rock
.1% Pyrite as disseminations in magnetite

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	South Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,105
COLLAR ELEVATION:	6,779'	EASTING:	103,703
DEPTH INTERVAL:		ELEVATION RANGE:	6,779'
SAMPLE #	WRC32		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Marble – Silurian-Ordovician Fusselman/Montoya Dolomites
Mrb – White to light to medium gray dolomitic marble with a sugary, fine grained texture. Hairline magnetite veinlets, some veins of serpentine. Patches and swirls of serpentine throughout marble. One pyrite vein with calcite.

ALTERATION STYLE

Recrystallized dolostone, now a marble. Incipient replacement by serpentine minerals. Cut by serpentine and magnetite veinlets. At least one pyrite veinlet with calcite also cuts the marble.

94% Marble
5% Serpentine
1% Magnetite
.1% Pyrite

METAL MINERALOGY CONTENT AND STYLE

1% Magnetite as veinlets in marble
.1% Pyrite as veinlet in marble

SIZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	Bottom of Pit, North Wall
DRILL HOLE #:	Hand Sample - see map	NORTHING:	111,852
COLLAR ELEVATION:	6,309'	EASTING:	103,566
DEPTH INTERVAL:		ELEVATION RANGE:	6,309'
SAMPLE #	WRC33		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Marble – Carboniferous Lake Valley
Mrb – Light gray marble composed of coarse grained five millimeter to one and a half centimeter calcite crystals. Four to five millimeter green garnet veins cut marble. Interstitial pyrite and sphalerite.

ALTERATION STYLE

Recrystallized limestone, now a marble. Cut by garnet veins. Contains interstitial pyrite and sphalerite.

99% Marble
1% Garnet
.1% Sphalerite
.1% Pyrite

METAL MINERALOGY CONTENT AND STYLE

.1% Sphalerite interstitial in marble
.1% Pyrite interstitial in marble

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE: 10/10/98
DRILL HOLE #: Hand Sample - see map
COLLAR ELEVATION: 6,644'
DEPTH INTERVAL:
SAMPLE # WRC34
SAMPLE/THIN SECTION :

PIT AREA: South-east Wall of Pit
NORTHING: 110,441
EASTING: 104,379
ELEVATION RANGE: 6,644'

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Hanover-Fierro Stock
Medium grained, holocrystalline, porphyritic quartz monzonite to granodiorite. Composed of about 15% light gray aphanitic matrix, ~10% 2-5 millimeter euhedral biotite books, ~5% euhedral, slender 1-7 millimeter amphibole prisms, ~5% anhedral quartz "eyes," and about 65% subhedral to euhedral, 1-8 millimeter plagioclase and potassium feldspars (plag> K-spar). Also contains minor disseminated magnetite and sphene, and disseminated pyrite and chalcopyrite.
Mafics incipiently altered by chlorite, some alteration of feldspars. Cut by local thin quartz veins and calcite veins.

ALTERATION STYLE

Predominantly unaltered, except for incipient chloritic alteration of amphiboles and some biotites, and local clay alteration of feldspars. Some chlorite occurs in the matrix as small disseminated flakes. Cut by quartz and calcite veins. Some pyrite and chalcopyrite disseminated along fractures.

4% Chlorite
3% Clay
<1% Quartz veins
<1% Calcite Veins

METAL MINERALOGY CONTENT AND STYLE

< 1% Magnetite as primary disseminations in matrix
.7% Pyrite as primary disseminations in matrix and along fractures
<.1% Chalcopyrite as dissemination and along fractures

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	10/10/98	PIT AREA:	East Wall of Pit
DRILL HOLE #:	Hand Sample - see map	NORTHING:	110,767
COLLAR ELEVATION:	6,672'	EASTING:	104,234
DEPTH INTERVAL:		ELEVATION RANGE:	6,672'
SAMPLE #	WRC35		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Hanover-Fierro Stock
Medium grained, holocrystalline, porphyritic quartz monzonite to granodiorite. Composed of about 15% light gray aphanitic matrix, ~10% 2-5 millimeter euhedral biotite books, ~5% euhedral, slender 1-7 millimeter amphibole prisms, ~5% anhedral quartz "eyes," and about 65% subhedral to euhedral, .1 to 1.2 centimeter plagioclase and potassium feldspars (plag> K-spar). Also contains minor disseminated magnetite and sphene, and trace amounts of disseminated pyrite and chalcopyrite. Mafics incipiently altered by chlorite, some alteration of feldspars. Cut by local thin quartz veins and calcite veins.

ALTERATION STYLE

Predominantly unaltered, except for incipient chloritic alteration of amphiboles and some biotites, and local clay alteration of feldspars. Some chlorite occurs in the matrix as small disseminated flakes. Cut by quartz and calcite veins. Some pyrite and chalcopyrite disseminated along fractures.

4% Chlorite
3% Clay
<1% Quartz veins
<1% Calcite Veins

METAL MINERALOGY CONTENT AND STYLE

< 1% Magnetite as primary disseminations in matrix
.4% Pyrite as primary disseminations in matrix and along fractures
<.1% Chalcopyrite as dissemination and along fractures

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	11/6/98	PIT AREA:	Humboldt Moutain
DRILL HOLE #:	9864	NORTHING:	108,179
COLLAR ELEVATION:	6,876'	EASTING:	100,947
DEPTH INTERVAL:	110' - 140'	ELEVATION RANGE:	6,766' - 6,736'
SAMPLE #	WRC 36		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	
TOTAL CU ASSAY	<.01%
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Syrena
Cs – Light gray to medium gray, bleached mudstones and siltstones. Local weak hornfelsic alteration. Cut by calcite veins and local quartz veins. Goethite veins and stains present in all intervals.

ALTERATION STYLE

Mudstones and siltstones bleached in places; locally hornfelsically altered. Cut by calcite veins and sparse quartz veins. Also cut by goethite veins and with goethite as pervasive stains.

.3% Quartz veins
2% Calcite veins
20% Goethite in veins and as pervasive stains
.5% Hornfels alteration

METAL MINERALOGY CONTENT AND STYLE

20% Goethite in veins and as pervasive stains

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	11/6/98	PIT AREA:	Humboldt Mountain
DRILL HOLE #:	9864	NORTHING:	108,179
COLLAR ELEVATION:	6,876'	EASTING:	100,947
DEPTH INTERVAL:	220' - 250'	ELEVATION RANGE:	6,656' - 6,626'
SAMPLE #	WRC 37		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL

TOTAL CU ASSAY <.01%

QUICK LEACH TEST

CUOXIDE ASSAY

SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Oswaldo
Co – Dark gray micritic limestone with some lighter gray recrystallized marble. Silty intervals of limestone common. Some beds of tan calcareous siltstones and mudstones. Cut by sparse pyrite veinlets and goethite veins.

ALTERATION STYLE

Locally altered to a light gray marble and cut by pyrite veinlets and goethite veins. Otherwise unaltered.

1% - 2% Marble
~.1% Pyrite as veinlets
2% Goethite as veins

METAL MINERALOGY CONTENT AND STYLE

~.1% Pyrite as veinlets
2% Goethite as veins

SIZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	11/6/98	PIT AREA:	Humboldt Mountain
DRILL HOLE #:	9873	NORTHING:	107,210
COLLAR ELEVATION:	6,818'	EASTING:	101,714
DEPTH INTERVAL:	110' - 140'	ELEVATION RANGE:	6,708' - 6,678'
SAMPLE #	WRC 38		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	
TOTAL CU ASSAY	<.01%
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Oswaldo – Parting Shale Member
Cops – Unaltered black shale cut by calcite veins and veinlets, quartz and quartz/pyrite veins and veinlets, and pyrite veins. Some disseminated pyrite near pyrite and quartz/pyrite veins. One interval shows some white clay gouge, possibly a small fault.

.LTERATION STYLE

Cut by calcite veins and veinlets, quartz and quartz/pyrite veins and veinlets, and pyrite veins. Some disseminated pyrite near pyrite and quartz/pyrite veins. Some white clay gouge in one interval.

1% Calcite veins and veinlets
.3% Quartz veins and veinlets
.3% Quartz/Pyrite veins and veinlets
.4% Pyrite in veins and veinlets
.5% White Clay

METAL MINERALOGY CONTENT AND STYLE

.4% Pyrite in veins and veinlets

:E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	11/6/98	PIT AREA:	Humboldt Mountain
DRILL HOLE #:	WR9873C	NORTHING:	107,210
COLLAR ELEVATION:	6,818'	EASTING:	101,714
DEPTH INTERVAL:	250' - 290'	ELEVATION RANGE:	
SAMPLE #	WRC 39		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	
TOTAL CU ASSAY	<.01%
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Lake Valley
Clv – Dark gray biomicrite or bioclastic packstone with scattered crinoid drums. Local quartz and calcite veining. Weak hematite stains on fractures in one interval.

ALTERATION STYLE

This sample cut by quartz and calcite veinlets. Hematite stains on a few fractures in one interval. Otherwise unaltered.

1% Calcite veins
.5% Quartz veins
<.1% Hematite stains on fractures

METAL MINERALOGY CONTENT AND STYLE

<.1% Hematite stains coating fractures

ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	11/6/98	PIT AREA:	Humboldt Mountain
DRILL HOLE #:	9873	NORTHING:	107,210
COLLAR ELEVATION:	6,818	EASTING:	101,714
DEPTH INTERVAL:	400' - 440'	ELEVATION RANGE:	6,418' - 6,378'
SAMPLE #	WRC 40		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	
TOTAL CU ASSAY	0.01%
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Devonian Percha - Box Member
Dp – White to medium gray, heavily clay-altered shale or mudstone, with local relict rock fragments. Some intervals show quartz veining and/or disseminated pyrite.

ALTERATION STYLE

Originally a shale or mudstone, the majority of the sample is now a sticky white to medium gray clay. Only a few chips of competent rock remain. In addition, the original rock was cut by quartz veinlets. Pyrite occurs as disseminations in the clay.

60% White Clays
<1% Quartz veinlets
<.1% Pyrite

METAL MINERALOGY CONTENT AND STYLE

<.1% Pyrite as disseminations in a clay matrix. Pyrite does not occur in competent rock chips.

SIZE FRACTIONS (see attached photos)

TIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	11/4/98	PIT AREA:	Humboldt Mountain
‹ILL HOLE #:	9877	NORTHING:	107,069
CU‿ ‹ ELEVATION:	6,771'	EASTING:	104,434
DEPTH INTERVAL:	360' - 400'	ELEVATION RANGE:	6411' - 6371'
SAMPLE #	WRC 41		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	360' - 400'
TOTAL CU ASSAY	<.01%
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Silurian-Ordovician Fusselman-Montoya Dolomite
Sofm – The Fusselman is a white to light gray to dark gray crystalline dolomitic marble with abundant hard dark gray to white chert nodules. The dolomites are altered to magnetite near the contact with the Devonian Percha (interval 360' – 370'). In places the chert nodules or the dolomites surrounding the chert nodules have been altered to slender, radiating sprays of wollastonite. Pyrite occurs on fractures and associated with magnetite.

ALTERATION STYLE

The Fusselman-Montoya is a dolomitized limestone. Magnetite with some pyrite replaces the dolomite along a bedding contact with the Devonian Percha. Wollastonite also occurs near the contact as slender sprays, probably the metasomatically altered rims of chert nodules and the surrounding dolomite.

2.5% Wollastonite as slender sprays
5% Magnetite as massive replacements along bedding contacts
<.1% Pyrite along fractures

METAL MINERALOGY CONTENT AND STYLE

5% Magnetite occurs as replacements of dolomite along bedding contacts
<.1% Pyrite occurs along fractures and associated with magnetite

'E FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	11/4/98	PIT AREA:	Humboldt Mountain
DRILL HOLE #:	9877	NORTHING:	107,069
COLLAR ELEVATION:	6771	EASTING:	104,434
DEPTH INTERVAL:	210' - 240'	ELEVATION RANGE:	6561' - 6531'
SAMPLE #	WRC 42		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	210' - 240'
TOTAL CU ASSAY	<.01%
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Cretaceous Syenodiorite
Ksy – The Ksy is a dark gray syenodiorite porphyry with about 25% white subhedral to euhedral <1 to 3 millimeter plagioclase phenocrysts and 10% 3 to 4 mm black hornblende prisms in a fine-grained to aphanitic matrix. The porphyry is cut locally by quartz veinlets, chlorite veins, calcite veins, quartz/pyrite veins, chlorite/epidote/pyrite veins, and quartz/epidote +/- pyrite veins. Epidote is also present along fractures.

LTERATION STYLE

The Ksy is altered primarily by the veins that cut it and to a lesser extent by chloritic alteration of the hornblende phenocrysts. The veins cutting the Ksy include: quartz veinlets, quartz/pyrite veins, quartz/epidote +/- pyrite veins, calcite veins, chlorite veins, chlorite/epidote/pyrite veins, and pyrite veinlets. Epidote is also present along fractures.

1% Chlorite as selectively pervasive alteration in hornblendes and as veins
<1% Epidote on fractures and in veins
~1% Quartz as veins and veinlets
1-2% Calcite as veins
.2% Pyrite in veins and veinlets

METAL MINERALOGY CONTENT AND STYLE

Pyrite is the only sulfide present in the rock. It occurs in veins and veinlets, either alone or with one or more of these minerals: quartz, chlorite, epidote.

.2% Pyrite

IZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	11/6/98	PIT AREA:	Humboldt Mountain
DRILL HOLE #:	9873	NORTHING:	107,210
COLLAR ELEVATION:	6,818'	EASTING:	101,714
DEPTH INTERVAL:	500' - 530'	ELEVATION RANGE:	
SAMPLE #	WRC 43		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL	
TOTAL CU ASSAY	<.01%
QUICK LEACH TEST	
CUOXIDE ASSAY	
SULFUR ASSAY	

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Devonian Percha – Ready-Pay Member
Dp – Light brown to chocolate brown shale, locally cut by calcite veins and veinlets. Trace pyrite occurs on fracture surfaces.

ALTERATION STYLE

The shale is cut by calcite veins and veinlets. Pyrite occurs on local fractures. Otherwise, the shale is unaltered.

2% Calcite veins and veinlets
<.1% Pyrite on fractures

METAL MINERALOGY CONTENT AND STYLE

<.1% Pyrite as disseminations on fracture surfaces

'ZE FRACTIONS (see attached photos)

DESCRIPTIVE LOG FORM FOR WASTE DUMP CHARACTERIZATION PROJECT

DATE:	11/6/98	PIT AREA:	Humboldt Mountain
DRILL HOLE #:	9867	NORTHING:	106,314
COLLAR ELEVATION:	6,838	EASTING:	102,732
DEPTH INTERVAL:	200' - 240'	ELEVATION RANGE:	6,638' - 6,598'
SAMPLE #	WRC 44		
SAMPLE/THIN SECTION :			

SAMPLE CLASS

SAMPLE INTERVAL
TOTAL CU ASSAY <.01%
QUICK LEACH TEST
CUOXIDE ASSAY
SULFUR ASSAY

SAMPLE INTERVAL DESCRIPTION (geologic/mineralogic features, sample composition, and color)

Carboniferous Lake Valley
Clv – Medium gray micrite to biomicrite (or bioclastic packstone) with crinoid drums. Locally altered to marble. Cut by calcite veins and pyrite veins. A few veins stained by goethite.

ALTERATION STYLE

Cut by calcite veins and pyrite veins. Few veins stained by goethite. Locally altered to marble. Otherwise unaltered.

.1% - .2% Goethite as stains on veins
.6% Marble alteration
.2% Calcite veins
.3% Pyrite

METAL MINERALOGY CONTENT AND STYLE

.1% - .2% Goethite as stains on veins
.3% Pyrite

ZE FRACTIONS (see attached photos)

ATTACHMENT D.2 KINETIC TESTING DATA

ATTACHMENT D.2

LIST OF TABLES

TABLES

Table D.2-1 Humidity Cell Test Results for Leach Cap Sample CF-164: 0-73'

Constituent	Week	1	2	3	4	5	6	7	8	9	10
Sulfate	mg/L	237	570	380	398	348	337	214	158	161	132
Cum. Sulfate	mg	36.0	131	193	261	321	377	413	440	468	489
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	0.76	1.60	2.41	3.27	4.12	4.95	5.81	6.66	7.51	8.33
pH		4.34	4.33	4.18	4.28	4.30	4.27	4.34	4.37	4.34	4.36
Acidity	mg/L $CaCO_3$	30	90	70	50	40	40	20	20	<10	20
Cum. Acidity	mg $CaCO_3$	4.56	19.6	30.9	39.5	46.4	53.0	56.5	59.8	61.5	64.8
Leachate Quantity	L	0.152	0.167	0.162	0.172	0.171	0.166	0.172	0.169	0.170	0.164
Initial pH		5.28	5.94	5.67	6.06	5.96	6.00	5.91	5.91	5.91	5.64
Conductivity	mmhos/cm	562	1160	893	760	690	678	470	380	380	340
Iron	mg/L	0.34	0.62	0.56	0.26	0.18	0.18	0.09	0.06	<0.03	0.07
Cum. Iron	mg	0.05	0.16	0.25	0.29	0.32	0.35	0.37	0.38	0.38	0.39

Table D.2-1 Humidity Cell Test Results for Leach Cap Sample CF-164: 0-73' (continued)

Constituent	Week	11	12	13	14	15	16	17	18	19	20
Sulfate	mg/L	105	127	81	81	80	67	64	61	62	61
Cum. Sulfate	mg	507	527	540	554	567	578	588	598	608	618
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	9.15	9.96	10.8	11.6	12.4	13.2	14.0	14.9	15.7	16.5
pH		4.35	4.43	4.52	4.49	4.44	4.58	4.53	4.60	4.48	5.19
Acidity	mg/L $CaCO_3$	20	20	10	10	10	10	<10	<10	<10	<10
Cum. Acidity	mg $CaCO_3$	68.1	71.4	73.0	74.7	76.3	77.9	79.5	81.2	82.8	84.4
Leachate Quantity	L	0.165	0.162	0.164	0.168	0.162	0.163	0.160	0.167	0.157	0.160
Initial pH		5.68	5.96	6.08	6.25	5.98	6.62	6.01	6.23	6.23	5.97
Conductivity	mmhos/cm	282	308	215	218	206	172	171	171	180	167
Iron	mg/L	0.05	0.06	<0.03	<0.03	0.04	<0.03	0.04	<0.03	0.04	<0.03
Cum. Iron	mg	0.40	0.41	0.42	0.42	0.43	0.43	0.44	0.44	0.45	0.46

Table D.2-1 Humidity Cell Test Results for Leach Cap Sample CF-164: 0-73' (continued)

Constituent	Week	21	22	23	24	25	26	27	28	29	30
Sulfate	mg/L	53	48	31	47	81	48	<10	23	13	<10
Cum. Sulfate	mg	626	634	639	647	660	668	670	674	676	678
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	17.3	18.1	18.8	19.7	20.5	21.4	22.2	23.1	23.9	24.8
pH		4.50	4.61	4.59	4.65	4.46	4.70	4.72	4.70	4.77	4.56
Acidity	mg/L $CaCO_3$	10	10	10	<10	10	20	10	<10	<10	<10
Cum. Acidity	mg $CaCO_3$	86.0	87.6	89.1	90.8	92.5	95.9	97.5	99.3	101	103
Leachate Quantity	L	0.161	0.161	0.15	0.167	0.170	0.170	0.168	0.174	0.170	0.170
Initial pH		5.86	6.68	6.40	6.03	6.20	5.97	6.07	6.07	6.00	5.93
Conductivity	mmhos/cm	147	138	85	129	227	118	74	74	58	64
Iron	mg/L	0.04	<0.03	<0.03	0.03	0.05	0.03	0.06	<0.03	<0.03	<0.03
Cum. Iron	mg	0.46	0.47	0.47	0.48	0.48	0.49	0.50	0.50	0.51	0.52

Table D.2-1 Humidity Cell Test Results for Leach Cap Sample CF-164: 0-73' (continued)

Constituent	Week	31	32	33	34	35	36	37	38	39	40
Sulfate	mg/L	<10	<10	13	<10	18	18	13	11	<10	10
Cum. Sulfate	mg	680	682	684	685	689	691	694	695	697	699
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	25.6	26.6	27.4	28.2	29.1	29.9	30.7	31.6	32.4	33.2
pH		5.02	4.90	5.24	6.01	4.70	4.60	4.88	4.60	4.75	4.72
Acidity	mg/L $CaCO_3$	<10	10	<10	<10	<10	<10	<10	<10	<10	<10
Cum. Acidity	mg $CaCO_3$	104	106	108	110	111	113	115	116	118	120
Leachate Quantity	L	0.169	0.188	0.165	0.169	0.168	0.165	0.168	0.165	0.17	0.168
Initial pH		6.21	5.80	5.62	5.90	5.92	5.60	6.20	5.70	5.65	5.54
Conductivity	mmhos/cm	53	33	44	35	40	52	32	38	32	39
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.52	0.53	0.53	0.54	0.54	0.55	0.55	0.56	0.56	0.57

Table D.2-2 Humidity Cell Test Results for Leach Cap Sample CF-175: 0-65'

Constituent	Week	1	2	3	4	5	6	7	8	9	10
Sulfate	mg/L	<10	19	13	32	26	17	11	<10	<10	<10
Cum. Sulfate	mg	1.46	4.16	6.11	10.8	14.6	17.1	18.8	20.3	21.8	23.2
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	0.73	1.44	2.19	2.93	3.65	4.40	5.14	5.91	6.64	7.38
pH	S.U.	5.06	5.56	5.16	5.01	5.17	5.20	5.49	5.34	5.10	5.50
Acidity	mg/L $CaCO_3$	20	10	10	<10	<10	<10	<10	<10	20	<10
Cum. Acidity	mg $CaCO_3$	2.92	4.34	5.84	7.32	8.75	10.3	11.7	13.3	16.2	17.7
Leachate Quantity	L	0.146	0.142	0.150	0.148	0.143	0.151	0.148	0.15	0.15	0.148
Initial pH	S.U.	5.28	5.94	5.67	6.06	5.96	6.00	5.91	5.91	5.91	5.64
Conductivity	µmhos/cm	48	99	72	72	60	44	38	35	30	27
Iron	mg/L	<0.03	0.04	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.004	0.01	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.05

Table D.2-3 Humidity Cell Test Results for Leach Cap Sample CF-163: 0-42'

Constituent	Week	1	2	3	4	5	6	7	8	9	10
Sulfate	mg/L	27	80	38	40	32	18	17	10	10	<10
Cum. Sulfate	mg	4.10	17.2	23.5	29.7	34.6	37.6	40.0	41.5	43.1	44.6
Alkalinity	mg/L $CaCO_3$	<5	12	7	6	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	0.76	2.73	3.88	4.82	5.58	6.40	7.11	7.87	8.65	9.41
pH		5.24	6.42	6.09	6.61	6.31	6.10	5.80	5.72	5.82	5.54
Acidity	mg/L $CaCO_3$	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cum. Acidity	mg $CaCO_3$	1.52	3.16	4.80	6.37	7.90	9.54	11.0	12.5	14.0	15.6
Leachate Quantity	L	0.152	0.164	0.164	0.157	0.153	0.164	0.141	0.152	0.156	0.152
Initial pH		5.28	5.94	5.67	6.06	5.96	6.00	5.91	5.91	5.91	5.64
Conductivity	mmhos/cm	106	266	136	110	87	47	48	40	45	35
Iron	mg/L	0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05

Table D.2-4 Humidity Cell Test Results for Leach Cap Sulfate CF-183: 0-66'

Constituent	Week	1	2	3	4	5	6	7	8	9	10
Sulfate	mg/L	<10	<10	<10	14	<10	<10	<10	<10	<10	<10
Cum. Sulfate	mg	1.68	3.45	5.17	7.68	9.37	11.2	12.9	14.6	16.3	18.0
Alkalinity	mg/L $CaCO_3$	10	26	8	7	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	1.68	6.28	7.66	8.91	9.76	10.7	11.5	12.4	13.2	14.1
pH		6.34	6.73	6.14	6.82	6.35	6.13	6.30	6.19	6.38	6.39
Acidity	mg/L $CaCO_3$	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cum. Acidity	mg $CaCO_3$	1.68	3.45	5.17	6.96	8.65	10.4	12.2	13.9	15.6	17.3
Leachate Quantity	L	0.168	0.177	0.172	0.179	0.169	0.179	0.173	0.172	0.172	0.171
Initial pH		5.28	5.94	5.67	6.06	5.96	6.00	5.91	5.91	5.91	5.64
Conductivity	mmhos/cm	59	100	63	40	30	21	17	17	14	14
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.07	0.11	0.07	0.08
Cum. Iron	mg	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.06	0.07	0.09

Table D.2-5 Humidity Cell Test Results for Leach Cap Sample CF-161: 0-67'

Constituent	Week	1	2	3	4	5	6	7	8	9	10
Sulfate	mg/L	<10	13	<10	14	13	12	<10	<10	<10	<10
Cum. Sulfate	mg	1.56	3.52	5.09	7.32	9.45	11.5	13.1	14.7	16.3	17.9
Alkalinity	mg/L $CaCO_3$	8	18	9	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	1.25	3.97	5.38	6.17	6.99	7.85	8.66	9.43	10.2	11.0
pH		6.15	6.73	6.33	6.57	6.40	6.17	6.23	6.26	6.36	6.36
Acidity	mg/L $CaCO_3$	<10	<10	<<10	<10	<10	<10	<10	<10	<10	<10
Cum. Acidity	mg $CaCO_3$	1.56	3.07	4.64	6.23	7.87	9.58	11.2	12.8	14.4	15.9
Leachate Quantity	L	0.156	0.151	0.157	0.159	0.164	0.171	0.162	0.16	0.16	0.157
Initial pH		5.28	5.94	5.67	6.06	5.96	6.00	5.91	5.91	5.91	5.64
Conductivity	mmhos/cm	52	86	48	47	39	29	28	23	27	27
Iron	mg/L	0.07	0.23	0.06	0.05	0.13	0.04	0.24	0.30	0.13	0.18
Cum. Iron	mg	0.01	0.05	0.06	0.06	0.08	0.09	0.13	0.18	0.20	0.23

Table D.2-6 Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-172: 302-370'

Constituent	Week	1	2	3	4	5	6	7	8	9	10
Sulfate	mg/L	50	124	76	81	66	57	45	54	70	45
Cum. Sulfate	mg	8.80	30.9	44.7	58.7	70.0	77.2	82.7	91.5	103	111
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	0.88	1.77	2.68	3.55	4.40	5.03	5.65	6.46	7.30	8.12
pH		5.40	5.36	5.29	4.91	4.75	5.39	5.65	5.13	5.10	5.06
Acidity	mg/L $CaCO_3$	20	40	40	30	40	40	30	40	60	50
Cum. Acidity	mg $CaCO_3$	3.52	10.6	17.9	23.1	30.0	35.0	38.7	45.2	55.2	63.4
Leachate Quantity	L	0.176	0.178	0.182	0.173	0.171	0.126	0.123	0.162	0.168	0.164
Initial pH		5.28	5.94	5.67	6.06	5.96	6.00	5.91	5.91	5.91	5.64
Conductivity	mmhos/cm	160	346	228	193	170	144	122	145	170	141
Iron	mg/L	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	0.04	<0.03
Cum. Iron	mg	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.06

Table D.2-6 (continued) **Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-172: 302-370'**

Constituent	Week	11	12	13	14	15	16	17	18	19	20
Sulfate	mg/L	47	42	27	32	28	20	13	19	16	14
Cum. Sulfate	mg	118	125	129	135	139	143	145	148	150	153
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	8.93	9.69	10.5	11.4	12.2	13.0	13.8	14.6	15.5	16.3
pH		5.06	5.03	5.35	5.28	5.31	5.42	5.48	5.47	5.56	5.47
Acidity	mg/L $CaCO_3$	50	40	30	40	30	20	20	20	20	20
Cum. Acidity	mg $CaCO_3$	71.5	77.6	82.7	89.4	94.4	97.7	101	104	107	111
Leachate Quantity	L	0.162	0.152	0.170	0.167	0.167	0.165	0.158	0.164	0.166	0.168
Initial pH		5.68	5.96	6.08	6.25	5.98	6.62	6.01	6.23	6.23	5.97
Conductivity	mmhos/cm	136	117	76	89	80	59	50	61	58	49
Iron	mg/L	0.03	0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.06	0.06	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.10

Table D.2-6 (continued) **Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-172: 302-370'**

Constituent	Week	21	22	23	24	25	26	27	28	29	30
Sulfate	mg/L	20	10	23	23	30	18	<10	15	<10	<10
Cum. Sulfate	mg	156	158	161	165	168	172	173	176	178	179
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	8	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	17.2	17.9	18.7	20.0	20.6	21.5	22.3	23.2	24.0	24.8
pH		5.33	5.35	5.18	5.57	5.15	4.68	5.40	5.52	5.39	5.45
Acidity	mg/L $CaCO_3$	20	10	20	20	50	30	20	20	20	10
Cum. Acidity	mg $CaCO_3$	114	116	119	122	128	133	137	140	143	145
Leachate Quantity	L	0.170	0.151	0.157	0.165	0.116	0.172	0.169	0.174	0.169	0.165
Initial pH		5.86	6.68	6.40	6.03	6.20	5.97	6.07	6.07	6.00	5.93
Conductivity	mmhos/cm	55	30	52	54	93	61	43	30	38	35
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.11	0.11	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15

Table D.2-6 (continued) **Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-172: 302-370'**

Constituent	Week	31	32	33	34	35	36	37	38	39	40
Sulfate	mg/L	10	<10	580	519	437	250	94	351	58	85
Cum. Sulfate	mg	181	183	319	376	422	452	467	526	536	550
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	25.7	26.6	27.8	28.3	28.9	29.5	30.3	31.1	32.0	32.8
pH		5.44	5.76	3.10	3.06	3.21	3.46	3.58	3.72	3.92	3.81
Acidity	mg/L $CaCO_3$	250	10	480	460	380	230	90	80	50	90
Cum. Acidity	mg $CaCO_3$	186	188	300	351	391	418	433	446	457	472
Leachate Quantity	L	0.163	0.191	0.235	0.109	0.106	0.119	0.164	0.168	0.167	0.173
Initial pH		6.21	5.80	5.62	5.90	5.92	5.60	6.20	5.70	5.65	5.54
Conductivity	mmhos/cm	54	30	1260	1190	930	577	288	216	177	245
Iron	mg/L	<0.03	<0.03	70.1	14.9	16.5	9.94	3.44	3.91	3.43	7.05
Cum. Iron	mg	0.16	0.16	16.6	18.3	20.0	21.2	21.8	22.4	23.0	24.2

Table D.2-7 Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-144: 91-170'

Constituent	Week	1	2	3	4	5	6	7	8	9	10
Sulfate	mg/L	52	158	96	100	59	46	32	26	32	23
Cum. Sulfate	mg	8.37	33.8	49.2	65.4	74.5	81.3	86.4	90.3	95.3	98.8
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	0.81	1.61	2.41	3.22	3.99	4.73	5.53	6.29	7.07	7.83
pH		4.63	4.68	4.54	4.77	4.88	4.96	5.06	4.88	4.76	4.80
Acidity	mg/L $CaCO_3$	40	80	60	50	30	20	20	20	20	20
Cum. Acidity	mg $CaCO_3$	6.44	19.3	28.9	37.0	41.6	44.6	47.8	50.8	53.9	57.0
Leachate Quantity	L	0.161	0.161	0.160	0.162	0.154	0.148	0.16	0.152	0.155	0.152
Initial pH		5.28	5.94	5.67	6.06	5.96	6.00	5.91	5.91	5.91	5.64
Conductivity	µmhos/cm	163	382	238	224	143	121	85	87	107	90
Iron	mg/L	0.06	0.22	0.08	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.01	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09

Table D.2-7 Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-144: 91-170'
(continued)

Constituent	Week	11	12	13	14	15	16	17	18	19	20
Sulfate	mg/L	17	26	19	14	21	18	13	17	19	13
Cum. Sulfate	mg	101	105	108	110	114	117	119	121	124	126
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	8.48	9.24	10.0	10.9	11.7	12.5	13.2	14.0	14.8	15.6
pH		4.97	4.89	4.83	4.89	4.76	5.05	4.93	5.03	4.83	5.14
Acidity	mg/L $CaCO_3$	20	20	20	10	20	10	10	10	20	10
Cum. Acidity	mg $CaCO_3$	59.6	62.6	65.8	67.5	70.6	72.2	73.8	75.3	78.4	80.0
Leachate Quantity	L	0.130	0.152	0.161	0.17	0.154	0.16	0.154	0.157	0.154	0.155
Initial pH		5.68	5.96	6.08	6.25	5.98	6.62	6.01	6.23	6.23	5.97
Conductivity	µmhos/cm	67	78	59	48	67	58	48	55	71	46
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.10	0.10	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.14

Table D.2-7 Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-144: 91-170' (continued)

Constituent	Week	21	22	23	24	25	26	27	28	29	30
Sulfate	mg/L	19	<10	12	14	19	23	18	<10	<10	<10
Cum. Sulfate	mg	129	131	133	135	138	141	144	146	147	149
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<<5	5	16	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	16.4	17.1	17.9	18.7	19.5	22.0	22.8	23.6	24.4	25.2
pH		4.70	4.81	4.85	4.93	4.58	6.00	4.92	4.83	4.99	4.83
Acidity	mg/L $CaCO_3$	20	10	10	20	30	10	20	20	20	20
Cum. Acidity	mg $CaCO_3$	83.1	84.7	86.2	89.3	94.1	95.7	98.8	102	105	109
Leachate Quantity	L	0.159	0.156	0.152	0.156	0.159	0.157	0.155	0.168	0.164	0.158
Initial pH		5.86	6.68	6.40	6.03	6.20	5.97	6.07	6.07	6.00	5.93
Conductivity	µmhos/cm	64	38	48	59	73	78	45	36	38	40
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.18	0.18	0.19

Table D.2-7 (continued) **Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-144: 91-170'**

Constituent	Week	31	32	33	34	35	36	37	38	39	40
Sulfate	mg/L	<10	11	30	11	16	16	13	12	13	24
Cum. Sulfate	mg	151	153	158	159	162	164	166	168	170	174
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	26.0	26.9	27.8	28.5	29.3	30.1	30.9	31.7	32.5	33.3
pH		4.70	5.79	4.72	4.98	4.85	4.60	4.70	4.59	4.72	4.62
Acidity	mg/L $CaCO_3$	20	<10	30	20	20	0	10	20	10	20
Cum. Acidity	mg $CaCO_3$	112	114	119	122	125	128	130	133	134	137
Leachate Quantity	L	0.163	0.184	0.162	0.159	0.155	0.159	0.157	0.162	0.153	0.156
Initial pH		6.21	5.80	5.62	5.90	5.92	5.60	6.20	5.70	5.65	5.54
Conductivity	µmhos/cm	39	29	85	42	36	46	36	41	49	71
Iron	mg/L	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.19	0.20	0.20	0.21	0.21	0.22	0.22	0.23	0.23	0.24

Table D.2-8 Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-177: 173-262'

Constituent	Week	1	2	3	4	5	6	7	8	9	10
Sulfate	mg/L	114	244	146	104	130	49	38	31	32	26
Cum. Sulfate	mg	17.7	59.4	83.9	102	123	131	138	143	147	152
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	5.16	10.3	15.5	20.7	25.8	31.0	36.2	41.3	46.5	51.6
pH		5.23	5.55	5.21	5.55	5.59	5.44	5.46	5.47	5.53	5.50
Acidity	mg/L $CaCO_3$	30	40	30	20	20	10	10	<10	10	10
Cum. Acidity	mg $CaCO_3$	4.65	11.5	16.5	20.0	23.2	24.9	26.6	28.2	29.7	31.3
Leachate Quantity	L	0.155	0.171	0.168	0.171	0.164	0.168	0.168	0.164	0.142	0.164
Initial pH		5.28	5.94	5.67	6.06	5.96	6.00	5.91	5.91	5.91	5.64
Conductivity	mmhos/cm	294	527	332	238	296	126	100	93	101	88
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	<0.03	<0.03
Cum. Iron	mg	0.005	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.05

Table D.2-8 (continued) **Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-177: 173-262’**

Constituent	Week	11	12	13	14	15	16	17	1	19	20
Sulfate	mg/L	22	23	13	18	25	24	12	16	12	12
Cum. Sulfate	mg	155	158	160	163	167	171	173	176	177	179
Alkalinity	mg/L $CaCO_3$	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	56.8	61.9	67.1	72.3	77.4	82.6	87.7	92.9	98.1	103
pH		5.59	5.47	5.78	5.54	5.51	5.63	5.89	5.64	5.67	5.42
Acidity	mg/L $CaCO_3$	<10	<10	<10	<10	10	<10	<10	<10	<10	<10
Cum. Acidity	mg $CaCO_3$	32.8	34.2	35.9	37.5	39.2	40.8	42.3	43.9	45.5	47.1
Leachate Quantity	L	0.147	0.147	0.163	0.168	0.162	0.159	0.156	0.159	0.160	0.161
Initial pH		5.68	5.86	6.08	6.25	5.98	6.62	6.01	6.23	6.23	5.97
Conductivity	mmhos/cm	74	72	37	50	71	64	42	52	46	39
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.10

Table D.2-8 (continued) **Humidity Cell Test Results for Unoxidized Colorado Formation Sample CF-177: 173-262'**

Constituent	Week	21	22	23	24	25	26	27	28	29	30
Sulfate	mg/L	16	<10	12	18	13	<10	17	<10	<10	20
Cum. Sulfate	mg	182	184	186	189	191	193	195	197	199	202
Alaklinity	mg/L $CaCO_3$	6	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cum. Alkalinity	mg $CaCO_3$	109	115	120	125	130	135	140	146	151	156
pH		5.52	5.44	5.54	5.55	5.29	5.48	5.64	5.70	5.53	5.35
Acidity	mg/L $CaCO_3$	<10	<10	<10	<10	10	10	<10	<10	<10	10
Cum. Acidity	mg $CaCO_3$	48.7	50.4	52.1	53.7	55.5	57.2	58.9	60.6	62.2	63.9
Leachate Quantity	L	0.162	0.169	0.167	0.165	0.172	0.172	0.168	0.173	0.161	0.166
Initial pH		5.86	6.68	6.40	6.03	6.20	5.97	6.07	6.07	6.00	5.93
Conductivity	mmhos/cm	57	32	40	31	62	49	33	29	38	46
Iron	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	0<.03	<0.03	<0.03	<0.03	<0.03
Cum. Iron	mg	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.14	0.14	0.15

Table D.2.9 Humidity Cell Test Results for WRC-01

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	0	0.8	0	0	0	0	0	0	0.8
Acidity	mg/L	-2	2	0	-2	0	-1	0	-2	2
Acidity Cum	mg/Kg	0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.6
Alk	mg/Kg	4.4	3.2	2.8	2.5	2.4	1.5	2.4	3.1	2.3
Alk	mg/L	11	8	7	6	6	4	6	8	6
Alk Cum	mg/Kg	4.4	7.6	10.4	12.9	15.3	16.8	19.2	22.3	24.6
Fe	mg/Kg	0.16	0.41	0.15	0.15	0.18	0.16	0.19	0.29	0.25
Fe	mg/L	0.4	1.02	0.36	0.37	0.46	0.41	0.47	0.73	0.63
Fe Cum	mg/Kg	0.16	0.57	0.72	0.87	1.05	1.21	1.4	1.69	1.94
Fe(II)	mg/L	0.25	0.55	0.21	0.18	0.13	0.13	0.23	0.29	0.23
Fe(III)	mg/L	0.15	0.47	0.15	0.19	0.33	0.28	0.24	0.44	0.4
pH	std. units	7.2	7.27	6.95	8.18	8.02	6.39	6.69	7.51	7.46
Redox	mV (vs Ag/AgCl)	259	271	309	235	237	237	253	281	277
SO4	mg/Kg	6.4	10.1	6.5	5.8	6.4	5.8	6.1	5.9	5.1
SO4	mg/L	16	25	16	14	16	15	15	15	13
SO4 Cum	mg/Kg	6.4	16.5	23	28.8	35.2	41	47.1	53	58.1
Vol	ml	486.3	491	490.2	500.4	483.2	467.7	493.3	474.3	472.4

Table D.2.9 Humidity Cell Test Results for WRC-01 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
1.2	0	0.7	0	1.2	0	0.8	1.5	1.7	2.5	1.6
3	-1	2	0	3	0	2	4	4	6	4
2.8	2.8	3.5	3.5	4.7	4.7	5.5	7	8.7	11.2	12.8
0.8	2.2	0.7	1.6	0.8	1.6	1.3	0.7	0.8	0.8	0.8
2	6	2	4	2	4	3	2	2	2	2
25.4	27.6	28.3	29.9	30.7	32.3	33.6	34.3	35.1	35.9	36.7
0.13	0.21	0.17	0.19	0.15	0.22	0.27	0.27	0.2	0.22	0.32
0.33	0.58	0.47	0.47	0.37	0.56	0.65	0.71	0.47	0.52	0.81
2.07	2.28	2.45	2.64	2.79	3.01	3.28	3.55	3.75	3.97	4.29
0.17	0.4	0.22	0.25	0.23	0.35	0.39	0.44	0.23	0.23	0.42
0.16	0.18	0.25	0.22	0.14	0.21	0.26	0.27	0.24	0.29	0.39
5.87	6.64	6.13	5.79	5.71	6.3	6.34	5.85	5.86	6.23	5.92
285	208	355	318	335	225	360	228	206	297	189
1.9	5.5	5.9	4	3.6	4	0.4	4.9	3.7	3.7	4.7
5	15	16	10	9	10	1	13	9	9	12
60	65.5	71.4	75.4	79	83	83.4	88.3	92	95.7	100.4
472.4	446	450.6	488.8	488.9	485.1	511.1	453.4	503.8	505	475.6

Table D.2.10 Humidity Cell Test Results for WRC-02

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	0	0	0	0	0	0	0	0	0
Acidity	mg/L	-9	-10	-11	-14	-9	-12	-12	-4	-15
Acidity Cum	mg/Kg	0	0	0	0	0	0	0	0	0
Alk	mg/Kg	10.4	12	11.6	11.1	10.4	11.6	11.5	11	12.4
Alk	mg/L	26	30	28	27	26	30	28	28	31
Alk Cum	mg/Kg	10.4	22.4	34	45.1	55.5	67.1	78.6	89.6	102
Fe	mg/Kg	0.05	0.01	0.02	0.02	0.02	0.02	0.02	0.05	0.03
Fe	mg/L	0.13	0.03	0.05	0.04	0.05	0.04	0.05	0.12	0.08
Fe Cum	mg/Kg	0.05	0.06	0.08	0.1	0.12	0.14	0.16	0.21	0.24
Fe(II)	mg/L	0.09	0.02	0.04	0.03	0.02	0.03	0.05	0.04	0.04
Fe(III)	mg/L	0.04	0.01	0.01	0.01	0.03	0.01	0	0.08	0.04
pH	std. units	8.36	8.49	8.11	8.14	8.3	7.85	8.38	8.14	8.16
Redox	mV (vs Ag/AgCl)	198	182	223	141	142	87	162	277	198
SO4	mg/Kg	14	5.6	4.6	4.9	3.2	3.5	0.8	2.4	0.8
SO4	mg/L	35	14	11	12	8	9	2	6	2
SO4 Cum	mg/Kg	14	19.6	24.2	29.1	32.3	35.8	36.6	39	39.8
Vol	ml	484.7	486.2	501.6	496.6	485.5	470.1	496.5	477.4	483.2

Table D.2.10 Humidity Cell Test Results for WRC-02 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
0	0	0	0	0	0	0	0	0	0	0
-19	-24	-23	-24	-22	-18	-18	-12	-16	-15	-15
0	0	0	0	0	0	0	0	0	0	0
9.6	11.5	10.7	11.8	10.3	9.4	9.9	8.9	9.4	9.8	9.5
25	30	27	30	26	24	25	23	24	25	24
111.6	123.1	133.8	145.6	155.9	165.3	175.2	184.1	193.5	203.3	212.8
0.02	0.02	0.02	0.02	0	0.02	0.02	0.01	0.02	0.01	0.01
0.04	0.05	0.04	0.05	0.01	0.05	0.04	0.03	0.04	0.03	0.03
0.26	0.28	0.3	0.32	0.32	0.34	0.36	0.37	0.39	0.4	0.41
0.01	0.04	0.04	0.04	0.01	0.05	0.03	0.01	0.01	0.03	0.02
0.03	0.01	0	0.01	0	0	0.01	0.02	0.03	0	0.01
7.9	7.5	7.91	7.08	7.71	7.78	8.08	8.05	7.91	8.02	7.99
246	149	312	206	246	221	200	138	183	217	110
0.4	0.8	1.2	0.8	0.8	0.8	4	0.4	0.4	0.4	0.4
1	2	3	2	2	2	10	1	1	1	1
40.2	41	42.2	43	43.8	44.6	48.6	49	49.4	49.8	50.2
462.7	462.8	480.8	475.8	480.8	472.7	478.9	470.7	473.6	473.6	480.1

Table D.2.11 Humidity Cell Test Results for WRC-03

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	0	0	0	0	0	0	0	0	0
Acidity	mg/L	-9	-6	-9	-12	-12	-13	-8	-8	-20
Acidity Cum	mg/Kg	0	0	0	0	0	0	0	0	0
Alk	mg/Kg	8.9	9.4	10.1	12.2	10	14	9.9	8.7	13.1
Alk	mg/L	22	24	25	30	24	33	24	28	34
Alk Cum	mg/Kg	8.9	18.3	28.4	40.6	50.6	64.6	74.5	83.2	96.3
Fe	mg/Kg	0.03	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.04
Fe	mg/L	0.07	0.02	0.03	0.03	0.04	0.05	0.05	0.06	0.11
Fe Cum	mg/Kg	0.03	0.04	0.05	0.06	0.08	0.1	0.12	0.14	0.18
Fe(II)	mg/L	0.07	0.01	0.01	0.02	0.02	0.02	0.01	0.04	0.1
Fe(III)	mg/L	0	0.01	0.02	0.01	0.02	0.03	0.04	0.02	0.01
pH	std. units	8.4	8.11	8.01	8.64	8.27	7.88	7.81	7.75	8.05
Redox	mV (vs Ag/AgCl)	198	198	211	133	134	84	170	212	201
SO4	mg/Kg	25.8	8.6	6.1	5.7	5	6.8	5.3	4.7	5.8
SO4	mg/L	64	22	15	14	12	16	13	15	15
SO4 Cum	mg/Kg	25.8	34.4	40.5	46.2	51.2	58	63.3	68	73.8
Vol	ml	489.3	474.4	492.4	495	504.4	513.2	499	376.6	468.2

Table D.2.11 Humidity Cell Test Results for WRC-03 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
0	0	0	0	0	0	0	0	0	0	0
-15	-22	-18	-19	-18	-19	-17	-16	-16	-16	-16
0	0	0	0	0	0	0	0	0	0	0
8.8	11.7	9	10	8.5	9.6	9.7	8.7	9	8	16.7
23	30	24	26	22	25	25	23	24	24	23
105.1	116.8	125.8	135.8	144.3	153.9	163.6	172.3	181.3	189.3	206
0.01	0.02	0.03	0.01	0	0.03	0.02	0.02	0.01	0.02	0.04
0.03	0.04	0.07	0.03	0.01	0.07	0.05	0.05	0.02	0.05	0.06
0.19	0.21	0.24	0.25	0.25	0.28	0.3	0.32	0.33	0.35	0.39
0.02	0.04	0.03	0.01	<0.01	0.05	0.04	0.04	0.01	0.04	0.04
0.01	0	0.04	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.02
7.78	7.31	7.35	7.34	7.27	7.65	7.84	7.68	7.71	7.69	7.75
227	173	314	206	243	227	254	152	174	218	120
4.2	5.1	4.1	3.8	5.8	5.4	5.1	3.8	5.3	3.4	8
11	13	11	10	15	14	13	10	14	10	11
78	83.1	87.2	91	96.8	102.2	107.3	111.1	116.4	119.8	127.8
462.3	474.6	452.8	466.8	470.4	465.4	472.2	457.3	455.8	406.4	882.3

Table D.2.12 Humidity Cell Test Results for WRC-04

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	0	0	0	0	0	0	0	0	0
Acidity	mg/L	-86	-76	-186	-162	-111	-186	-112	-146	-156
Acidity Cum	mg/Kg	0	0	0	0	0	0	0	0	0
Alk	mg/Kg	66.8	70.1	122.6	105.5	86.2	101.9	99.1	108	111.2
Alk	mg/L	162	172	300	258	222	269	238	282	292
Alk Cum	mg/Kg	66.8	136.9	259.5	365	451.2	553.1	652.2	760.2	871.4
Fe	mg/Kg	0.03	0.01	0.02	0.02	0.09	0	0	0.03	0.01
Fe	mg/L	0.07	0.02	0.04	0.04	0.22	0.01	0.01	0.09	0.02
Fe Cum	mg/Kg	0.03	0.04	0.06	0.08	0.17	0.17	0.17	0.2	0.21
Fe(II)	mg/L	0.01	0.01	0.03	0.02	0.02	0.01	<0.01	0.03	0.02
Fe(III)	mg/L	0.06	0.01	0.01	0.02	0.2	0	0.01	0.06	0
pH	std. units	9.62	9.55	9.65	9.51	9.45	9.81	9.48	9.68	9.47
Redox	mV (vs Ag/AgCl)	119	104	125	106	81	38	111	126	119
SO4	mg/Kg	19	30.1	80.1	65.8	34.2	63.6	25	50.5	46.8
SO4	mg/L	46	74	196	161	88	168	60	132	123
SO4 Cum	mg/Kg	19	49.1	129.2	195	229.2	292.8	317.8	368.3	415.1
Vol	ml	496	489.6	491.1	491.6	466.7	455.2	500.5	460.3	457.7

Table D.2.12 Humidity Cell Test Results for WRC-04 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
0	0	0	0	0	0	0	0	0	0	0
-217	-274	-252	-258	-250	-251	-210	-207	-236	-251	-234
0	0	0	0	0	0	0	0	0	0	0
96.2	108.5	107.6	102.6	102.9	106.5	88.6	84.9	95.1	101.9	93.5
254	286	279	270	264	275	224	223	254	270	240
967.6	1076.1	1183.7	1286.3	1389.2	1495.7	1584.3	1669.2	1764.3	1866.2	1959.7
0.01	0.03	0	0	0.01	0.01	0	0	0.01	0	0.02
0.03	0.09	0.01	0.01	0.03	0.02	0.01	0.01	0.02	0.01	0.04
0.22	0.25	0.25	0.25	0.26	0.27	0.27	0.27	0.28	0.28	0.3
0.02	0.02	<0.01	0.01	0.02	0.02	<0.01	0.01	<0.01	0.01	0.02
0.01	0.07	0.01	0	0.01	0	0.01	0	0.02	0	0.02
9.3	9.2	9.26	8.49	9.31	9.26	9.44	9.33	9.24	9.38	9.28
192	95	220	94	97	127	187	88	85	141	79
30.7	31.5	32.4	28.1	29.6	27.9	22.9	12.9	23.6	12.1	12.5
81	83	84	74	76	72	58	34	63	32	32
445.8	477.3	509.7	537.8	567.4	595.3	618.2	631.1	654.7	666.8	679.3
455.1	455.9	463.4	456.9	468.4	465.6	475.4	457.6	450	453.7	468.5

Table D.2.13 Humidity Cell Test Results for WRC-05

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	0	0	0	0	0	0	0	0	0
Acidity	mg/L	-10	-31	-8	-20	-15	-8	-14	-14	-19
Acidity Cum	mg/Kg	0	0	0	0	0	0	0	0	0
Alk	mg/Kg	14.9	20.9	11.3	14.7	12.4	12.8	15	13.9	15.5
Alk	mg/L	36	52	28	36	31	34	36	36	41
Alk Cum	mg/Kg	14.9	35.8	47.1	61.8	74.2	87	102	115.9	131.4
Fe	mg/Kg	0.03	0.03	0.02	0.02	0	0.02	0.01	0.09	0.02
Fe	mg/L	0.08	0.07	0.04	0.04	0.01	0.04	0.02	0.23	0.06
Fe Cum	mg/Kg	0.03	0.06	0.08	0.1	0.1	0.12	0.13	0.22	0.24
Fe(II)	mg/L	0.07	0.02	0.01	<0.01	<0.01	0.02	0.01	0.04	0.01
Fe(III)	mg/L	0.01	0.05	0.03	0.04	0.01	0.02	0.01	0.19	0.05
pH	std. units	8.46	8.61	8.59	8.66	8.47	8.3	8.53	8.27	8.44
Redox	mV (vs Ag/AgCl)	149	153	151	172	112	92	146	153	175
SO4	mg/Kg	11.6	7.6	4.5	5.3	5.2	5.3	4.6	5.4	4.5
SO4	mg/L	28	19	11	13	13	14	11	14	12
SO4 Cum	mg/Kg	11.6	19.2	23.7	29	34.2	39.5	44.1	49.5	54
Vol	ml	497.6	482.3	486.8	492.3	481.2	451.8	501.5	464.6	453.5

Table D.2.13 Humidity Cell Test Results for WRC-05 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
0	0	0	0	0	0	0	0	0	0	0
-37	-42	-30	-30	-28	-48	-25	-23	-28	-18	-28
0	0	0	0	0	0	0	0	0	0	0
14.6	15.8	11.6	9.2	12.3	14.5	13.6	12	12.1	11.4	12.4
39	42	38	24	32	38	34	32	32	30	32
146	161.8	173.4	182.6	194.9	209.4	223	235	247.1	258.5	270.9
0.01	0.11	0	0.01	0.01	0.02	0	0.01	0	0	0.01
0.02	0.29	0.01	0.03	0.02	0.04	0.01	0.03	0.01	0.01	0.03
0.25	0.36	0.36	0.37	0.38	0.4	0.4	0.41	0.41	0.41	0.42
<0.01	0.03	<0.01	<0.01	0.02	0.01	0.01	0.01	<0.01	<0.01	0.01
0.02	0.26	0.01	0.03	0	0.03	0	0.02	0.01	0.01	0.02
8.58	8.31	8.05	7.94	8.18	8.3	8.16	8.25	8.21	8.03	8.28
196	158	237	181	198	156	229	105	92	164	112
3.8	4.9	0.3	3.5	3.9	3.4	4	3.8	4.5	3.4	3.9
10	13	1	9	10	9	10	10	12	9	10
57.8	62.7	63	66.5	70.4	73.8	77.8	81.6	86.1	89.5	93.4
451	451.5	367.8	462.1	463.1	459.2	480	450.8	454.8	455.1	464.9

Table D.2.14 Humidity Cell Test Results for WRC-06

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	0	0	0	0	0	0	0	0	0
Acidity	mg/L	-7	-7	-7	-12	-8	-10	-13	-12	-10
Acidity Cum	mg/Kg	0	0	0	0	0	0	0	0	0
Alk	mg/Kg	9.9	11.7	11.1	13.3	11.8	11.3	11.2	10.4	10.8
Alk	mg/L	24	29	27	32	30	30	28	28	29
Alk Cum	mg/Kg	9.9	21.6	32.7	46	57.8	69.1	80.3	90.7	101.5
Fe	mg/Kg	0.05	0.04	0.04	0.02	0.02	0.03	0.03	0.05	0.02
Fe	mg/L	0.13	0.09	0.09	0.05	0.04	0.07	0.08	0.13	0.05
Fe Cum	mg/Kg	0.05	0.09	0.13	0.15	0.17	0.2	0.23	0.28	0.3
Fe(II)	mg/L	0.1	0.06	0.06	0.05	0.03	0.07	0.08	0.07	0.05
Fe(III)	mg/L	0.03	0.03	0.03	0	0.01	0	0	0.06	0
pH	std. units	8.25	8.51	7.96	8.68	8.24	8.48	7.92	7.91	8.09
Redox	mV (vs Ag/AgCl)	145	163	168	170	127	132	162	160	170
SO4	mg/Kg	7.4	8.1	4.9	4.6	1.2	1.1	1.2	1.1	0.7
SO4	mg/L	18	20	12	11	3	3	3	3	2
SO4 Cum	mg/Kg	7.4	15.5	20.4	25	26.2	27.3	28.5	29.6	30.3
Vol	ml	498.9	488.7	494.4	500.9	476.2	453.1	482.1	450.2	451.2

Table D.2.14 Humidity Cell Test Results for WRC-06 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
0	0	0	0	0	0	0	0	0	0	0
-17	-20	-16	-16	-16	-20	-18	-14	-13	-15	-14
0	0	0	0	0	0	0	0	0	0	0
9.2	9.6	8.8	9.1	8.4	8.6	11	8.9	6.8	10	8.4
25	26	24	24	22	24	26	24	20	25	22
110.7	120.3	129.1	138.2	146.6	155.2	166.2	175.1	181.9	191.9	200.3
0.03	0.03	0.01	0.02	0.02	0.03	0.03	0.01	0.01	0.01	0.02
0.07	0.08	0.04	0.04	0.05	0.08	0.06	0.04	0.02	0.03	0.04
0.33	0.36	0.37	0.39	0.41	0.44	0.47	0.48	0.49	0.5	0.52
0.03	0.04	0.02	0.03	0.04	0.07	0.04	0.04	0.01	0.01	0.02
0.04	0.04	0.02	0.01	0.01	0.01	0.02	0	0.01	0.02	0.02
8.29	7.98	7.74	7.32	7.61	7.62	8.11	7.77	7.56	7.69	7.66
208	168	240	190	248	174	237	121	98	184	129
1.1	0.7	0.7	0.8	0.8	1.1	0.4	0.4	0.7	0.4	0.4
3	2	2	2	2	3	1	1	2	1	1
31.4	32.1	32.8	33.6	34.4	35.5	35.9	36.3	37	37.4	37.8
443.4	445.3	442.6	456.5	458.6	433.5	509	448.6	412.4	484.2	460.3

Table D.2.15 Humidity Cell Test Results for WRC-07

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	264.7	96.9	73.7	47	43.2	38.5	36.7	39	40.4
Acidity	mg/L	637	235	178	116	112	102	89	102	106
Acidity Cum	mg/Kg	264.7	361.6	435.3	482.3	525.5	564	600.7	639.7	680.1
Alk	mg/Kg	0	0	0	0	0	0	0.4	1.5	0
Alk	mg/L	0	0	0	0	0	0	1	4	0
Alk Cum	mg/Kg	0	0	0	0	0	0	0.4	1.9	1.9
Fe	mg/Kg	0.44	0.76	1.37	1.12	1.33	0.4	0.83	0.36	1.19
Fe	mg/L	1.07	1.84	3.32	2.75	3.46	1.05	2.01	0.93	3.12
Fe Cum	mg/Kg	0.44	1.2	2.57	3.69	5.02	5.42	6.25	6.61	7.8
Fe(II)	mg/L	0.9	1.36	0.94	0.18	0.19	0.12	0.05	0.23	0.12
Fe(III)	mg/L	0.17	0.48	2.38	2.57	3.27	0.93	1.96	0.7	3
pH	std. units	4.16	4.5	4.25	4.4	4.28	4.16	4.56	4.73	4.43
Redox	mV (vs Ag/AgCl)	364	365	362	351	372	349	372	383	396
SO4	mg/Kg	501.1	185.6	126.7	97.7	88.3	59.6	60.2	75.3	60.9
SO4	mg/L	1206	450	306	241	229	158	146	197	160
SO4 Cum	mg/Kg	501.1	686.7	813.4	911.1	999.4	1059	1119.2	1194.5	1255.4
Vol	ml	499.9	496.2	498.2	487.8	463.7	453.9	496.4	459.6	458.2

Table D.2.15 Humidity Cell Test Results for WRC-07 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
36.4	40.1	39.2	40.3	38.1	40.5	50.3	55.2	60.1	66.2	61.1
98	110	105	106	100	106	130	148	162	178	160
716.5	756.6	795.8	836.1	874.2	914.7	965	1020.2	1080.3	1146.5	1207.6
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
0.94	0.83	1.24	0.82	0.34	0.73	0.42	0.36	0.96	0.9	1.47
2.54	2.28	3.32	2.15	0.9	1.92	1.08	0.96	2.6	2.43	3.84
8.74	9.57	10.81	11.63	11.97	12.7	13.12	13.48	14.44	15.34	16.81
0.13	0.04	0.09	0.1	0.09	0.07	0.18	0.13	0.16	0.26	0.43
2.41	2.24	3.23	2.05	0.81	1.85	0.9	0.83	2.44	2.17	3.41
4.11	4.08	4.05	3.85	3.95	3.88	3.65	3.49	3.31	3.33	3.39
472	408	415	405	422	453	528	485	513	519	534
62.8	63.1	72	70.6	65.5	67.3	73.1	83.2	83.8	88.1	141
169	173	193	186	172	176	189	223	226	237	369
1318.2	1381.3	1453.3	1523.9	1589.4	1656.7	1729.8	1813	1896.8	1984.9	2125.9
446.7	438.6	448.7	456.8	457.8	459.8	465.2	448.8	446.1	447.2	459.7

Table D.2.16 Humidity Cell Test Results for WRC-08

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	199.6	125.1	69	42.8	35.3	31.7	27	28.2	27.7
Acidity	mg/L	481	302	169	106	86	81	66	72	68
Acidity Cum	mg/Kg	199.6	324.7	393.7	436.5	471.8	503.5	530.5	558.7	586.4
Alk	mg/Kg	0	0	0.8	0	0.8	0	0.8	0.8	0.8
Alk	mg/L	0	0	2	0	2	0	2	2	2
Alk Cum	mg/Kg	0	0	0.8	0.8	1.6	1.6	2.4	3.2	4
Fe	mg/Kg	0.52	1.13	1.83	0.89	0.94	0.23	0.77	0.27	0.19
Fe	mg/L	1.26	2.74	4.47	2.21	2.28	0.59	1.89	0.69	0.46
Fe Cum	mg/Kg	0.52	1.65	3.48	4.37	5.31	5.54	6.31	6.58	6.77
Fe(II)	mg/L	0.4	2.02	0.75	0.14	0.04	0.06	0.05	0.06	0.06
Fe(III)	mg/L	0.86	0.72	3.72	2.07	2.24	0.53	1.84	0.63	0.4
pH	std. units	4.5	4.14	4.66	4.5	4.61	4.29	4.68	4.63	4.7
Redox	mV (vs Ag/AgCl)	375	376	365	359	370	352	362	386	390
SO4	mg/Kg	390.9	282	96	60.6	64.5	48.1	41.7	51.8	38.7
SO4	mg/L	942	681	235	150	157	123	102	132	95
SO4 Cum	mg/Kg	390.9	672.9	768.9	829.5	894	942.1	983.8	1035.6	1074.3
Vol	ml	500	499	492	487.1	494.7	471.3	492.3	472.5	491.2

Table D.2.16 Humidity Cell Test Results for WRC-08 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
28.2	29.5	28.3	29	29.1	29.5	32.9	39.2	35.2	38.7	36.4
73	74	70	74	74	76	82	95	91	94	88
614.6	644.1	672.4	701.4	730.5	760	792.9	832.1	867.3	906	942.4
0	0.4	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0
4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
1.21	0.47	0.25	0.96	1.07	0.36	0.48	0.14	0.12	0.73	0.2
3.13	1.18	0.61	2.45	2.73	0.93	1.19	0.35	0.31	1.78	0.49
7.98	8.45	8.7	9.66	10.73	11.09	11.57	11.71	11.83	12.56	12.76
0.04	0.06	0.03	0.03	0.05	0.07	0.06	0.05	0.03	0.05	0.06
3.09	1.12	0.58	2.42	2.68	0.86	1.13	0.3	0.28	1.73	0.43
4.44	4.75	4.47	4.31	4.42	4.27	4.19	4.07	4.08	4.15	4.12
414	390	438	436	477	434	508	454	463	395	442
38.7	47.9	50.9	43.1	43.6	51.2	57	57.8	56.4	61.8	61.2
100	120	126	110	111	132	142	140	146	150	148
1113	1160.9	1211.8	1254.9	1298.5	1349.7	1406.7	1464.5	1520.9	1582.7	1643.9
465.9	480.5	487	472.1	473.2	467.3	483.9	497.2	465.5	496.7	498.5

Table D.2.17 Humidity Cell Test Results for WRC-09

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	99.4	99.2	50.2	50.5	30.8	24.6	15.6	12.1	11
Acidity	mg/L	252	242	126	124	80	67	38	32	27
Acidity Cum	mg/Kg	99.4	198.6	248.8	299.3	330.1	354.7	370.3	382.4	393.4
Alk	mg/Kg	0	0	0	0	0	0	0	0	0
Alk	mg/L	0	0	0	0	0	0	0	0	0
Alk Cum	mg/Kg	0	0	0	0	0	0	0	0	0
Fe	mg/Kg	4.69	3.53	1.18	0.76	0.66	0.6	0.13	0.06	0.04
Fe	mg/L	11.9	8.6	2.95	1.87	1.72	1.63	0.31	0.16	0.1
Fe Cum	mg/Kg	4.69	8.22	9.4	10.16	10.82	11.42	11.55	11.61	11.65
Fe(II)	mg/L	11.7	3.8	2.75	1.8	0.83	0.7	0.21	0.12	0.05
Fe(III)	mg/L		4.8	0.2		0.89	0.93	0.1	0.04	0.05
pH	std. units	2.52	4.03	3.77	3.78	3.71	3.94	4.08	4.35	4.25
Redox	mV (vs Ag/AgCl)	350	372	368	386	368	368	390	436	433
SO4	mg/Kg	147.1	114.4	82.9	87.2	46.6	36.8	19.3	16.2	13
SO4	mg/L	373	279	208	214	121	100	47	43	32
SO4 Cum	mg/Kg	147.1	261.5	344.4	431.6	478.2	515	534.3	550.5	563.5
Vol	ml	476.4	495.2	481.5	492.2	465.2	444	495.3	456	491.4

Table D.2.17 Humidity Cell Test Results for WRC-09 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
10.5	9.7	8.7	9.3	7.9	6.9	7.3	6.5	5.4	12.4	6.5
28	25	22	22	20	18	18	16	14	31	16
403.9	413.6	422.3	431.6	439.5	446.4	453.7	460.2	465.6	478	484.5
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0.03	0.03	0.04	0.05	0.07	0.05	0.11	0.04	0.01	0.03	0.07
0.07	0.08	0.11	0.13	0.18	0.14	0.27	0.09	0.02	0.07	0.18
11.68	11.71	11.75	11.8	11.87	11.92	12.03	12.07	12.08	12.11	12.18
0.04	0.05	0.03	0.06	0.06	0.09	0.16	0.04	0.01	0.02	0.09
0.03	0.03	0.08	0.07	0.12	0.05	0.11	0.05	0.01	0.05	0.09
3.42	3.9	3.9	3.6	3.88	3.91	3.92	3.84	3.88	3.93	3.88
498	457	481	525	490	413	524	411	445	373	395
9.8	8.1	9.5	7.2	5.5	5.7	6.1	4.1	5.4	5.6	5.7
26	21	24	17	14	15	15	10	14	14	14
573.3	581.4	590.9	598.1	603.6	609.3	615.4	619.5	624.9	630.5	636.2
453.7	466.5	478.3	508.2	477.5	462.7	489.4	493.4	465.9	483.3	492.6

Table D.2.18 Humidity Cell Test Results for WRC-11

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	0	0	0	0	0	0	0	0	0
Acidity	mg/L	-19	-36	-76	-55	-28	-11	-5	-10	-15
Acidity Cum	mg/Kg	0	0	0	0	0	0	0	0	0
Alk	mg/Kg	25.5	45.5	63.7	39.1	17.3	12.8	11.6	10.5	17
Alk	mg/L	64	110	153	96	42	32	28	29	42
Alk Cum	mg/Kg	25.5	71	134.7	173.8	191.1	203.9	215.5	226	243
Fe	mg/Kg	0.04	0.02	0.01	0.06	0.15	0.05	0.03	0.03	0.02
Fe	mg/L	0.09	0.05	0.02	0.15	0.37	0.12	0.07	0.08	0.04
Fe Cum	mg/Kg	0.04	0.06	0.07	0.13	0.28	0.33	0.36	0.39	0.41
Fe(II)	mg/L	0.08	0.05	0.02	0.1	0.3	0.08	0.04	0.05	0.02
Fe(III)	mg/L	0.01	0	0	0.05	0.07	0.04	0.03	0.03	0.02
pH	std. units	8.05	7.98	8.29	8.3	8.3	7.91	7.68	7.98	7.92
Redox	mV (vs Ag/AgCl)	211	227	227	193	164	182	194	288	231
SO4	mg/Kg	647	368.5	152	45.3	28	10.4	9.5	8.7	10.1
SO4	mg/L	1626	891	365	111	68	26	23	24	25
SO4 Cum	mg/Kg	647	1015.5	1167.5	1212.8	1240.8	1251.2	1260.7	1269.4	1279.5
Vol	ml	477.9	496.7	500	489.6	495.2	480.6	497.5	436	486.2

Table D.2.18 Humidity Cell Test Results for WRC-11

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
0	0	0	0	0	0.8	0	0	0	0	0
-12	-27	-25	-24	-25	2	-9	-37	-39	-25	-37
0	0	0	0	0	0.8	0.8	0.8	0.8	0.8	0.8
7.5	12.7	13.5	11.4	13.2	9.3	7.8	19.9	19.1	26.3	20.5
21	32	31	30	31	24	20	50	48	61	49
250.5	263.2	276.7	288.1	301.3	310.6	318.4	338.3	357.4	383.7	404.2
0.01	0.02	0.11	0.03	0.03	0.04	0.04	0.02	0	0	0.04
0.04	0.05	0.26	0.08	0.08	0.1	0.1	0.04	0.01	0.01	0.09
0.42	0.44	0.55	0.58	0.61	0.65	0.69	0.71	0.71	0.71	0.75
0.03	0.05	0.19	0.05	0.08	0.08	0.07	0.04	0	0.01	0.07
0.01	0	0.07	0.03	0	0.02	0.03	0	0.01	0	0.02
7.3	7.6	7.54	7.3	7.57	7.67	7.66	7.52	7.49	7.64	7.46
275	245	330	260	313	263	303	257	270	251	248
6.4	8.8	17	6.1	10.2	7.4	10.5	9.9	8.8	8.2	8.8
18	22	39	16	24	19	27	25	22	19	21
1285.9	1294.7	1311.7	1317.8	1328	1335.4	1345.9	1355.8	1364.6	1372.8	1381.6
429	477.7	523	455.1	509.5	467.3	465.7	477.1	477.7	518.1	503.2

Table D.2.19 Humidity Cell Test Results for WRC-99-1

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	0	0	0	0	0	0	0	0	0
Acidity	mg/L	-24	-18	-21	-20	-16	-21	-12	-14	-14
Acidity Cum	mg/Kg	0	0	0	0	0	0	0	0	0
Alk	mg/Kg	10.8	10.1	10.3	9.8	8.6	11.3	10.3	7.6	9.9
Alk	mg/L	28	28	28	26	24	30	28	23	27
Alk Cum	mg/Kg	10.8	20.9	31.2	41	49.6	60.9	71.2	78.8	88.7
Fe	mg/Kg	0.03	0.06	0.02	0.03	0.05	0.12	0.04	0.04	0.02
Fe	mg/L	0.08	0.17	0.06	0.07	0.15	0.31	0.12	0.12	0.06
Fe Cum	mg/Kg	0.03	0.09	0.11	0.14	0.19	0.31	0.35	0.39	0.41
Fe(II)	mg/L	0.07	0.11	0.05	0.04	0.1	0.19	0.04	0.07	0.05
Fe(III)	mg/L	0.01	0.06	0.01	0.03	0.05	0.12	0.08	0.05	0.01
pH	std. units	7.29	7.03	7.51	7.56	7.73	8.08	7.87	7.7	7.69
Redox	mV (vs Ag/AgCl)	210	306	221	250	216	254	234	240	209
SO4	mg/Kg	107.6	96.4	59.1	26.4	30.4	27.8	29.4	25.7	28.1
SO4	mg/L	280	268	161	70	85	74	80	78	77
SO4 Cum	mg/Kg	107.6	204	263.1	289.5	319.9	347.7	377.1	402.8	430.9
Vol	ml	480	449.2	458.1	471	446.2	469.3	459.1	411.6	456.4

Table D.2.19 Humidity Cell Test Results for WRC-99-1 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20	Week 21	Week 22
0	0	0	0	0	0	0	0	0	0	0	0	0
-12	-16	-18	-16	-24	-20	-22	-9	-16	-14	-13	-19	-18
0	0	0	0	0	0	0	0	0	0	0	0	0
8.9	10.6	10.9	10.9	11.4	10.1	11.8	5.6	10.3	8.8	7	9.9	10.7
26	28	29	28	30	26	30	15	26	22	20	26	28
97.6	108.2	119.1	130	141.4	151.5	163.3	168.9	179.2	188	195	204.9	215.6
0.04	0.1	0.05	0.08	0.06	0.05	0.07	0.3	0.13	0.01	0.02	0.06	0.08
0.13	0.27	0.14	0.2	0.17	0.14	0.17	0.8	0.32	0.03	0.05	0.16	0.2
0.45	0.55	0.6	0.68	0.74	0.79	0.86	1.16	1.29	1.3	1.32	1.38	1.46
0.07	0.23	0.06	0.13	0.04	0.08	0.02	0.07	0.14	<0.01	0.03	0.03	0.05
0.06	0.04	0.08	0.07	0.13	0.06	0.15	0.73	0.18	0.03	0.02	0.13	0.15
7.68	7.75	7.51	7.49	7.81	6.77	7.5	6.47	7.18	7.79	7.04	7.65	7.2
184	240	273	251	560	267	242	169	223	198	257	252	222
20.5	16.6	19.1	21.7	17.5	23.6	20.4	21.5	33.6	9.1	11.2	28.4	18.7
60	44	51	56	46	61	52	58	85	23	32	75	49
451.4	468	487.1	508.8	526.3	549.9	570.3	591.8	625.4	634.5	645.7	674.1	692.8
427.6	472.2	468.4	484.4	474.3	482.9	490.8	463.6	494	496.8	437.5	473.4	477.6

Table D.2.20 Humidity Cell Test Results for WRC-99-2

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	10.4	4.9	3.3	1.5	1.5	2.6	2.5	1.6	2
Acidity	mg/L	28	14	9	4	4	7	7	5	6
Acidity Cum	mg/Kg	10.4	15.3	18.6	20.1	21.6	24.2	26.7	28.3	30.3
Alk	mg/Kg	0	0.4	0.4	0.7	0.7	0.4	0.4	0.3	0.3
Alk	mg/L	0	1	1	2	2	1	1	1	1
Alk Cum	mg/Kg	0	0.4	0.8	1.5	2.2	2.6	3	3.3	3.6
Fe	mg/Kg	1.37	0.34	0.15	0.07	0.08	0.07	0.07	0.05	0.06
Fe	mg/L	3.68	0.97	0.42	0.18	0.21	0.2	0.19	0.16	0.18
Fe Cum	mg/Kg	1.37	1.71	1.86	1.93	2.01	2.08	2.15	2.2	2.26
Fe(II)	mg/L	3.46	0.95	0.4	0.17	0.18	0.18	0.18	0.13	0.16
Fe(III)	mg/L	0.22	0.02	0.02		0.03	0.02	0.01	0.03	0.02
pH	std. units	4.5	4.63	4.67	5.36	4.99	4.81	4.77	4.65	4.77
Redox	mV (vs Ag/AgCl)	298	345	322	329	307	454	319	341	326
SO4	mg/Kg	60	33.3	34.7	22.5	14.2	26.3	17.3	13.4	9.2
SO4	mg/L	161	95	96	62	39	71	48	43	27
SO4 Cum	mg/Kg	60	93.3	128	150.5	164.7	191	208.3	221.7	230.9
Vol	ml	460.5	433.6	446.8	449.3	448.5	457.9	446.5	385.8	421.9

Table D.2.20 Humidity Cell Test Results for WRC-99-2 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20	Week 21	Week 22
2.3	7.4	9	14	28.5	30.2	37	39.9	42	36.2	41.7	42.5	38.1
6	20	24	37	76	81	94	108	104	93	110	111	96
32.6	40	49	63	91.5	121.7	158.7	198.6	240.6	276.8	318.5	361	399.1
0.4	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	4	4	4	4	4	4	4	4
0.13	0.14	0.15	0.27	1.76	2.09	1.82	1.55	1.55	1.2	1.34	1.89	1.5
0.34	0.39	0.41	0.72	4.69	5.62	4.64	4.2	3.84	3.08	3.54	4.93	3.78
2.39	2.53	2.68	2.95	4.71	6.8	8.62	10.17	11.72	12.92	14.26	16.15	17.65
0.28	0.21	0.37	0.08	0.43	0.46	0.37	0.44	0.43	0.31	0.56	0.33	0.25
0.06	0.18	0.04	0.64	4.26	5.16	4.27	3.76	3.41	2.77	2.98	4.6	3.53
4.62	4.49	4.22	3.63	3.35	3.08	3.36	3.03	3	3.22	3.04	3	2.99
313	343	350	542	470	535	574	549	553	524	566	560	547
21.4	8.1	9.7	37.2	64.4	75.3	78.6	76.8	84.4	80.6	73.2	88.5	60.4
57	22	26	98	172	202	200	208	209	207	193	231	152
252.3	260.4	270.1	307.3	371.7	447	525.6	602.4	686.8	767.4	840.6	929.1	989.5
464.3	455.6	462.1	468.6	463	460.4	485.9	456	499	481.4	468.5	473.2	490.9

Table D.2.21 Humidity Cell Test Results for WRC-99-3

Constituent	Units	Week 01	Week 02	Week 03	Week 04	Week 05	Week 06	Week 07	Week 08	Week 09
Acidity	mg/Kg	206.6	124	68	39.8	26.5	21.3	16.7	14	12.5
Acidity	mg/L	555	322	186	105	72	56	45	40	34
Acidity Cum	mg/Kg	206.6	330.6	398.6	438.4	464.9	486.2	502.9	516.9	529.4
Alk	mg/Kg	0	0	0	0	0	0	0	0	0
Alk	mg/L	0	0	0	0	0	0	0	0	0
Alk Cum	mg/Kg	0	0	0	0	0	0	0	0	0
Fe	mg/Kg	3.96	2	0.33	0.45	0.17	0.19	0.09	0.04	0.03
Fe	mg/L	10.65	5.2	0.9	1.19	0.45	0.49	0.23	0.1	0.09
Fe Cum	mg/Kg	3.96	5.96	6.29	6.74	6.91	7.1	7.19	7.23	7.26
Fe(II)	mg/L	5.2	4.75	0.75	0.44	0.33	0.28	0.14	0.1	0.04
Fe(III)	mg/L	5.45	0.45	0.15	0.75	0.12	0.21	0.09	0	0.05
pH	std. units	3.75	3.74	3.61	3.71	3.77	3.74	3.77	3.73	3.8
Redox	mV (vs Ag/AgCl)	353	384	407	456	420	522	394	426	374
SO4	mg/Kg	370.4	203.6	104.5	58.8	44.2	35.8	25.7	20	9.2
SO4	mg/L	995	529	286	155	120	94	69	57	25
SO4 Cum	mg/Kg	370.4	574	678.5	737.3	781.5	817.3	843	863	872.2
Vol	ml	461.6	477.3	453.2	470.2	456.2	472.7	461.3	434.7	455.4

Table D.2.21 Humidity Cell Test Results for WRC-99-3 (continued)

Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20	Week 21	Week 22
15.4	8.3	9.2	6.9	7.7	5.8	5.6	4	6.4	4.7	5	5.3	5.3
40	22	24	18	20	15	14	11	16	12	13	14	14
544.8	553.1	562.3	569.2	576.9	582.7	588.3	592.3	598.7	603.4	608.4	613.7	619
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0.12	0.03	0.1	0.1	0.05	0.15	0.05	0.1	0.08	0.03	0.02	0.02	0.03
0.3	0.09	0.27	0.27	0.12	0.39	0.13	0.27	0.21	0.08	0.06	0.04	0.08
7.38	7.41	7.51	7.61	7.66	7.81	7.86	7.96	8.04	8.07	8.09	8.11	8.14
0.18	0.05	0.11	0.15	0.05	0.19	0.06	0.1	0.09	0.03	0.04	0.02	0.02
0.12	0.04	0.16	0.12	0.07	0.2	0.07	0.17	0.12	0.05	0.02	0.02	0.06
3.76	3.82	3.66	3.99	4.27	3.7	4.11	3.99	3.85	4.14	3.96	3.89	3.82
344	392	381	425	421	472	496	439	462	491	472	487	472
12.7	31.5	9.2	6.1	5.8	3.8	4.4	4.4	4	4.3	3.4	5.3	3.1
33	84	24	16	15	10	11	12	10	11	9	14	8
884.9	916.4	925.6	931.7	937.5	941.3	945.7	950.1	954.1	958.4	961.8	967.1	970.2
477	465.6	473.3	472.4	479.2	475.8	493.8	451.6	493.5	488	474.4	472.9	473.3

Table D.2.22 Humidity Cell 5-Week Composites (page 1 of 6)

	Acidity	Alkalinity mg/L CaCO3	CO3 mg/L CaCO3	HCO3 mg/L CaCO3	TDS	Calcium	Chloride	Fluoride	Potassium	Magnesium	Sodium	Sulfate	Silver	Aluminum
HC-1: WRC-01 Colorado Fm., Continental Pit														
Week 5	--	3.6	<1.0	3.6	53	1.57	3.4	0.2	3.7	0.350	6.23	12.5	<0.005	<0.037
Week 10	--	3.1	<1.0	3.1	16	0.908	0.7	0.2	1.7	0.154	2.44	4.7	<0.005	0.058
Week 15	--	5.5	<1.0	5.5	209	49.8	0.6	0.3	<2.1	0.355	1.64	130	<0.007	<0.031
Week 20		4.6	<1.0	4.6	<10	1.08	0.6	0.2	<1.7	0.097	1.19	1.6	<0.006	<0.024
HC-2: WRC-02 Syrena and Abo Fms., Continental Pit														
Week 5	--	26.0	<1.0	26.0	80	10.7	0.8	<0.1	<1.5	2.11	4.15	16.9	<0.005	0.051
Week 10	--	25.8	<1.0	25.8	68	7.90	<0.2	<0.1	<1.5	1.20	2.48	4.5	<0.005	0.044
Week 15		27.5	<1.0	27.5	48	7.81	0.5	<0.1	<2.1	1.13	1.96	3.2	<0.007	<0.031
Week 20		25.6	<1.0	25.6	17	7.15	0.7	<0.1	<1.7	0.988	1.43	2.8	<0.006	<0.024
HC-3: WRC-03 Lake Valley Fm., Continental Pit														
Week 5	--	22.0	<1.0	22	79	9.83	3.1	<0.1	<1.5	1.40	6.73	17.9	<0.005	0.061
Week 10	--	27.5	<1.0	27.5	61	9.47	0.3	<0.1	<1.5	1.59	5.40	11.8	<0.005	0.124
Week 15	--	25.7	<1.0	25.7	58	8.42	0.5	<0.1	<2.1	1.37	3.85	11.7	<0.007	<0.031
Week 20	--	24.8	<1.0	24.8	36	8.30	0.4	<0.1	<1.7	1.35	2.65	11.7	<0.006	<0.024
HC-4: WRC-04 Fusselman and Montoya Fms., Continental Pit														
Week 5	--	212	75.9	136	507	2.26	2.9	0.7	4.5	102	2.76	192	<0.005	0.061
Week 10	--	254	102	152	346	1.81	0.3	0.9	3.0	82.3	1.54	91.0	<0.005	0.096
Week 15	--	272	89.0	183	315	1.52	0.7	0.8	2.4	79.1	1.29	62.2	<0.007	<0.031
Week 20	--	103	<1.0	103	285	1.30	0.5	0.8	<1.7	63.2	0.984	42.6	<0.006	<0.024
HC-5: WRC-05 Lake Valley Marble, Continental Pit														
Week 5	--	29.6	<1.0	29.6	84	13.7	1.1	<0.1	<1.5	1.85	3.55	17.7	<0.005	0.068
Week 10	--	31.6	<1.0	31.6	39	11.8	<0.2	<0.1	<1.5	1.26	1.36	6.8	<0.005	<0.037
Week 15	--	33.7	<1.0	33.7	63	12.0	0.3	<0.1	<2.1	1.13	0.76	5.7	<0.007	<0.031
Week 20	--	36.8	<1.0	36.8	43	12.8	0.6	<0.1	<1.7	1.29	0.897	8.0	<0.006	<0.024
HC-6: WRC-06 Hanover-Fierro Stock, Continental Pit														
Week 5	--	25.7	<1.0	25.7	73	8.89	5.8	0.3	2.9	2.64	6.61	14.5	<0.005	0.037
Week 10	--	25.6	<1.0	25.6	40	4.94	0.2	0.1	1.9	1.52	3.21	2.8	<0.005	0.041
Week 15	--	24.9	<1.0	24.9	43	4.95	0.4	<0.1	2.5	1.61	2.16	2.0	<0.007	<0.031
Week 20	--	25.8	<1.0	25.8	19	5.96	0.5	<0.1	<1.7	1.67	1.63	1.8	<0.006	<0.024
HC-7: WRC-07 Colorado Fm.- chalcocite zone, Hanover Mountain														
Week 5	247	--	--	--	434	38.7	1.7	0.1	6.5	4.25	3.81	389	<0.005	7.41
Week 10		<1.0	<1.0	<1.0	245	8.74	0.3	<0.1	2.0	0.768	1.19	146	<0.005	0.927
Week 15	106	--	--	--	240	5.88	0.5	<0.1	<2.1	0.370	0.92	137	<0.007	1.23
Week 20	89.3	--	--	--	186	3.77	0.7	<0.1	<1.7	0.582	0.876	106	<0.006	1.14

Table D.2.22 Humidity Cell 5-Week Composites (page 2 of 6)

	Acidity	Alkalinity mg/L CaCO3	CO3 mg/L CaCO3	HCO3 mg/L CaCO3	TDS	Calcium	Chloride	Fluoride	Potassium	Magnesium	Sodium	Sulfate	Silver	Aluminum
HC-8: WRC-08 Colorado Fm.- chalcocite zone, Hanover Mountain														
Week 5	245	--	--	--	571	16.5	1.8	<0.11	8.1	3.08	4.19	330	<0.005	5.43
Week 10	--	<1.0	<1.0	<1.0	176	4.86	0.7	<0.1	2.5	0.844	1.04	101	<0.005	0.441
Week 15	--	<1.0	<1.0	<1.0	172	4.09	0.6	<0.1	<2.1	0.689	1.06	96.2	<0.007	0.501
Week 20	167	--	--	--	323	6.57	0.8	<0.1	<1.7	0.610	1.15	196	<0.006	5.63
HC-9: WRC-09 Colorado Fm.- barren leach cap, Hanover Mountain														
Week 5	155	--	--	--	369	8.72	12.1	<0.1	14.6	2.43	8.68	193	<0.005	23.2
Week 10	39.0	--	--	--	106	2.15	1.5	<0.1	2.9	0.490	1.54	43.2	<0.005	4.29
Week 15	23.1	--	--	--	<10	0.928	0.7	<0.1	<2.1	0.203	0.93	31.3	<0.007	1.85
Week 20	19.9	--	--	--	40	0.802	0.5	<0.1	<1.7	0.148	0.811	20.6	<0.006	1.05
HC-10: WRC-11 Barringer Fault Zone, Hanover Mountain														
Week 5	--	96.7	<1.0	96.7	796	138	1.2	1.0	7.7	32.3	63.1	472	<0.005	0.042
Week 10	--	29.0	<1.0	29.0	84	11.5	<0.2	0.2	<1.5	2.50	5.49	24.0	<0.005	0.049
Week 15	--	33.7	<1.0	33.7	89	13.9	0.4	0.1	<2.1	3.29	5.64	27.7	<0.007	<0.031
Week 20	--	27.4	<1.0	27.4	160	22.8	0.5	0.2	3.5	6.74	5.97	68.6	<0.006	0.034
HC-12: WRC-99-1 Syrena Fm., Hanover Mountain														
Week 5	--	26.6	<1.0	26.6	278	37.6	4.6	0.2	7.4	11.3	16.0	161	<0.007	<0.031
Week 10	--	27.4	<1.0	27.4	160	22.8	0.5	0.2	3.5	6.74	5.97	68.6	<0.006	0.034
Week 15														
Week 20														
HC-13: WRC-99-2 Colorado Fm., Hanover Mountain														
Week 5	--	<1.0	<1.0	<1.0	141	10.8	1.2	0.5	10.4	5.17	6.52	83.5	<0.007	0.626
Week 10	--	<1.0	<1.0	<1.0	114	8.45	0.4	0.2	6.1	4.08	2.24	51.6	<0.006	0.214
Week 15														
Week 20														
HC-14: WRC-99-3 Colorado Fm., Hanover Mountain														
Week 5	258	--	<1.0	--	487	17.9	4.8	1.7	17.6	6.21	10.6	339	<0.007	40.3
Week 10	41.6	--	--	--	110	2.63	0.7	0.2	2.8	0.790	1.73	49.3	<0.006	5.09
Week 15														
Week 20														

Table D.2.22 Humidity Cell 5-Week Composites (page 3 of 6)

	Arsenic	Barium	Beryllium	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Molybdenum	Nickel	Phosphorus	Lead
HC-1: WRC-01 Colorado Fm., Continental Pit														
Week 5	<0.04	0.007	<0.002	<0.002	<0.003	<0.008	0.008	<0.019	<0.0002	0.060	0.007	0.028	<0.11	<0.001
Week 10	<0.04	0.005	<0.002	<0.002	<0.003	<0.008	0.018	0.087	<0.0004	0.089	0.003	<0.016	0.14	0.004
Week 15	<0.046	0.014	<0.002	0.011	0.008	<0.008	<0.006	<0.02	<0.0002	0.205	<0.014	<0.023	<0.2	0.002
Week 20	<0.04	0.004	<0.002	<0.0024	0.007	<0.005	0.015	<0.02	<0.0002	0.004	<0.008	<0.023	<0.074	0.002
HC-2: WRC-02 Syrena and Abo Fms., Continental Pit														
Week 5	<0.04	0.004	<0.002	<0.002	<0.003	<0.008	<0.004	<0.019	<0.0002	0.014	<0.003	<0.016	<0.11	<0.001
Week 10	<0.04	0.005	<0.002	<0.002	<0.003	<0.008	0.011	0.085	<0.0002	0.016	<0.003	<0.016	<0.11	0.002
Week 15	<0.046	0.012	<0.002	<0.002	<0.007	<0.008	0.008	<0.02	<0.0002	0.018	<0.014	<0.023	<0.2	<0.001
Week 20	<0.04	0.006	<0.002	<0.0024	<0.005	<0.005	<0.003	<0.02	<0.0002	0.010	<0.008	<0.023	<0.074	0.006
HC-3: WRC-03 Lake Valley Fm., Continental Pit														
Week 5	<0.04	0.005	<0.002	<0.002	<0.003	<0.008	0.007	<0.019	<0.0004	0.069	<0.003	<0.016	<0.11	<0.001
Week 10	<0.04	0.012	<0.002	<0.002	0.007	<0.008	0.020	0.166	<0.0002	0.095	<0.003	<0.016	<0.11	0.003
Week 15	<0.046	0.011	<0.002	<0.002	<0.007	<0.008	<0.006	<0.02	<0.0002	0.018	<0.014	<0.023	<0.2	<0.001
Week 20	<0.04	0.005	<0.002	<0.0024	<0.005	<0.005	0.004	<0.02	<0.0002	0.016	<0.008	<0.023	<0.074	<0.001
HC-4: WRC-04 Fusselman and Montoya Fms., Continental Pit														
Week 5	<0.04	0.006	<0.002	<0.002	<0.003	<0.008	<0.004	<0.019	<0.0002	0.004	0.047	<0.016	<0.11	<0.001
Week 10	<0.04	0.011	<0.002	<0.002	0.003	<0.008	0.013	0.126	<0.0002	0.017	0.013	<0.016	0.13	0.002
Week 15	<0.046	0.012	<0.002	<0.002	<0.007	<0.008	0.021	<0.02	<0.0002	0.006	<0.014	<0.023	<0.2	<0.001
Week 20	<0.04	0.008	<0.002	<0.0024	<0.005	<0.005	0.004	0.07	<0.0002	0.002	0.015	<0.023	<0.074	0.002
HC-5: WRC-05 Lake Valley Marble, Continental Pit														
Week 5	<0.04	0.009	<0.002	<0.002	<0.003	<0.008	0.183	<0.019	<0.0002	0.022	0.242	<0.016	<0.11	<0.001
Week 10	<0.04	0.013	<0.002	<0.002	<0.003	<0.008	0.048	0.030	<0.0002	0.013	<0.003	<0.016	<0.11	<0.001
Week 15	<0.046	0.010	<0.002	<0.002	<0.007	<0.008	<0.006	<0.02	<0.0002	0.009	<0.014	<0.023	<0.2	<0.001
Week 20	<0.04	0.008	<0.002	<0.0024	<0.005	<0.005	<0.003	<0.02	<0.0002	0.002	<0.008	<0.023	<0.074	<0.001
HC-6: WRC-06 Hanover-Fierro Stock, Continental Pit														
Week 5	<0.04	0.004	<0.002	<0.002	<0.003	<0.008	0.123	<0.019	<0.0002	0.007	0.007	<0.016	<0.11	<0.001
Week 10	<0.04	0.007	<0.002	<0.002	<0.003	<0.008	0.009	0.031	<0.0002	0.013	0.026	<0.016	<0.11	<0.001
Week 15	<0.046	0.010	<0.002	<0.002	<0.007	<0.008	<0.006	<0.02	<0.0002	0.005	0.051	<0.023	<0.2	<0.001
Week 20	<0.04	0.006	<0.002	<0.0024	<0.005	<0.005	<0.003	<0.02	<0.0002	<0.002	0.065	<0.023	<0.074	<0.001
HC-7: WRC-07 Colorado Fm.- chalcocite zone, Hanover Mountain														
Week 5	<0.04	0.009	<0.002	0.018	1.59	<0.008	151	0.883	<0.0002	0.641	0.004	0.449	2.41	0.058
Week 10	<0.04	0.019	<0.002	<0.002	0.902	<0.008	64.6	0.473	<0.0002	0.081	0.010	0.257	1.85	0.055
Week 15	<0.046	0.015	<0.002	<0.002	0.841	<0.008	71.8	0.49	<0.0002	0.051	<0.014	0.259	1.79	0.065
Week 20	<0.04	0.017	<0.002	<0.0024	0.066	<0.005	56.8	<0.02	<0.0002	0.047	<0.008	0.046	1.47	0.020

Table D.2.22 Humidity Cell 5-Week Composites (page 4 of 6)

	Arsenic	Barium	Beryllium	Cadmium	Cobalt	Chronium	Copper	Iron	Mercury	Manganese	Molybdenum	Nickel	Phosphorus	Lead
HC-8: WRC-08 Colorado Fm.- chalcocite zone, Hanover Mountain														
Week 5	<0.04	0.018	<0.002	0.003	0.164	<0.008	162	0.402	<0.0002	0.355	0.007	0.097	2.51	0.018
Week 10	<0.04	0.017	<0.002	<0.002	0.054	<0.008	45.7	0.162	<0.0002	0.081	<0.003	0.048	1.38	0.011
Week 15	<0.046	0.023	<0.002	<0.002	0.060	<0.008	51.6	0.05	<0.0002	0.055	<0.014	0.045	1.13	0.020
Week 20	<0.04	0.014	<0.002	<0.0024	0.789	<0.005	89.3	0.68	<0.0002	0.074	<0.008	0.255	1.96	0.167
HC-9: WRC-09 Colorado Fm.- barren leach cap, Hanover Mountain														
Week 5	<0.04	0.023	<0.002	0.002	0.178	0.010	7.49	5.08	<0.0002	0.325	0.008	0.113	0.20	0.083
Week 10	<0.04	0.021	<0.002	<0.002	0.030	<0.008	3.06	0.142	<0.0002	0.066	<0.003	<0.016	<0.11	0.017
Week 15	<0.046	0.023	<0.002	<0.002	0.011	<0.008	2.01	<0.02	<0.0002	0.018	<0.014	<0.023	<0.2	0.014
Week 20	<0.04	0.028	<0.002	<0.0024	<0.005	<0.005	1.30	<0.02	<0.0002	0.011	<0.008	<0.023	<0.074	0.018
HC-10: WR -11 Barringer Fault Zone, Hanover Mountain														
Week 5	<0.04	0.021	<0.002	<0.002	0.004	<0.008	0.074	<0.019	<0.0002	0.272	0.040	0.032	<0.11	<0.001
Week 10	<0.04	0.005	<0.002	<0.002	0.003	<0.008	0.114	0.089	<0.0002	0.042	<0.003	<0.016	0.12	<0.001
Week 15	<0.046	0.014	<0.002	<0.002	<0.007	<0.008	0.079	<0.02	<0.0002	0.068	<0.014	<0.023	<0.2	<0.001
Week 20	<0.04	0.007	<0.002	<0.0024	<0.005	<0.008	0.010	<0.02	<0.0002	0.062	<0.008	<0.023	<0.074	<0.001
HC-12: WR -99-1 Syrena Fm., Hanover Mountain														
Week 5	<0.046	0.008	<0.002	<0.002	<0.007	<0.008	0.038	<0.02	<0.0002	0.155	<0.014	<0.023	<0.2	<0.001
Week 10	<0.04	0.007	<0.002	<0.0024	<0.005	<0.005	0.010	<0.02	<0.0002	0.062	<0.008	<0.023	<0.074	<0.001
Week 15														
Week 20														
HC-13: WR -99-2 Colorado Fm., Hanover Mountain														
Week 5	<0.046	0.014	<0.002	<0.002	0.024	<0.008	0.168	1.03	<0.0002	0.655	<0.014	<0.023	<0.2	0.002
Week 10	<0.04	0.013	0.002	<0.0024	0.032	<0.005	0.126	0.07	<0.0002	0.513	<0.008	0.033	<0.074	0.005
Week 15														
Week 20														
HC-14: WR -99-3 Colorado Fm., Hanover Mountain														
Week 5	<0.046	0.017	<0.002	<0.002	0.224	0.009	8.08	3.10	<0.0002	0.460	<0.014	0.126	0.30	0.022
Week 10	<0.04	0.012	<0.002	<0.0024	0.021	<0.005	1.66	<0.02	<0.0002	0.066	<0.008	0.033	0.124	0.021
Week 15														
Week 20														

Table D.2.22 Humidity Cell 5-Week Composites (page 5 of 6)

	Antimony	Selenium	Silica	Thallium	Zinc
HC-1: WRC-01 Colorado Fm., Continental Pit					
Week 5	<0.002*	0.101	5.60	<0.001	0.041
Week 10	<0.002*	<0.048	5.03	<0.001	0.062
Week 15	<0.002*	<0.048	5.27	<0.001	0.057
Week 20	<0.002	0.07	4.43	<0.001	0.003
HC-2: WRC-02 Syrena and Abo Fms., Continental Pit					
Week 5	<0.002*	<0.048	10.6	<0.001	0.012
Week 10	<0.002*	<0.048	8.71	<0.001	0.036
Week 15	<0.002*	<0.048	8.24	<0.001	0.010
Week 20	<0.002*	<0.04	7.84	<0.001	0.008
HC-3: WRC-03 Lake Valley Fm., Continental Pit					
Week 5	<0.002*	<0.048	8.18	<0.001	0.025
Week 10	<0.002*	<0.048	10.4	<0.001	0.028
Week 15	<0.002*	<0.048	9.91	<0.001	<0.007
Week 20	<0.002*	0.05	9.30	<0.001	0.004
HC-4: WRC-04 Fusselman and Montoya Fms., Continental Pit					
Week 5	<0.002*	<0.048	0.80	<0.001	<0.004
Week 10	<0.002*	<0.048	0.57	<0.001	0.012
Week 15	<0.002*	<0.048	0.769	<0.001	<0.007
Week 20	0.003	<0.04	1.01	<0.001	<0.003
HC-5: WRC-05 Lake Valley Marble, Continental Pit					
Week 5	<0.002*	<0.048	4.77	<0.001	0.011
Week 10	<0.002*	<0.048	2.06	<0.001	0.014
Week 15	<0.002*	<0.048	1.33	<0.001	<0.007
Week 20	0.003	<0.04	1.41	<0.001	<0.003
HC-6: WRC-06 Hanover-Fierro Stock, Continental Pit					
Week 5	<0.002*	<0.048	5.62	<0.001	0.008
Week 10	<0.002*	<0.048	4.35	<0.001	0.009
Week 15	<0.002*	<0.048	3.98	<0.001	<0.007
Week 20	0.002	0.05	3.74	<0.001	0.004
HC-7: WRC-07 Colorado Fm.- chalcocite zone, Hanover Mountain					
Week 5	<0.002*	<0.048	10.2	<0.001	4.83
Week 10	<0.002*	<0.048	6.47	<0.001	0.561
Week 15	<0.002*	0.048	4.42	<0.001	0.306
Week 20	0.002	0.05	4.19	<0.001	0.169

Table D.2.22 Humidity Cell 5-Week Composites (page 6 of 6)

	Antimony	Selenium	Silica	Thallium	Zinc
HC-8: WRC-08 Colorado Fm.- chalcocite zone, Hanover Mountain					
Week 5	<0.002*	<0.048	9.52	<0.001	0.948
Week 10	<0.002*	<0.048	5.94	<0.001	0.282
Week 15	<0.002*	<0.048	4.49	<0.001	0.176
Week 20	0.003	0.05	4.34	<0.001	0.313
HC-9: WRC-09 Colorado Fm.- barren leach cap, Hanover Mountain					
Week 5	<0.002*	<0.048	14.3	<0.001	3.05
Week 10	<0.002*	<0.048	8.13	<0.001	0.618
Week 15	<0.002*	<0.048	5.65	<0.001	0.216
Week 20	0.004	0.07	3.93	<0.001	0.149
HC-10: WR -11 Barringer Fault Zone, Hanover Mountain					
Week 5	<0.002*	<0.048	4.57	<0.001	0.017
Week 10	<0.002*	<0.048	1.28	<0.001	0.014
Week 15	<0.002*	<0.048	1.25	<0.001	0.008
Week 20	0.004	0.04	4.42	<0.001	0.004
HC-12: WR -99-1 Syrena Fm., Hanover Mountain					
Week 5	<0.002*	<0.048	11.4	<0.001	0.009
Week 10	0.004	0.04	4.42	<0.001	0.004
Week 15					
Week 20					
HC-13: WR -99-2 Colorado Fm., Hanover Mountain					
Week 5	0.002	<0.048	8.00	<0.001	0.750
Week 10	0.008	0.05	8.23	<0.001	0.213
Week 15					
Week 20					
HC-14: WR -99-3 Colorado Fm., Hanover Mountain					
Week 5	0.002	<0.048	11.9	<0.001	2.82
Week 10	<0.002*	<0.04	6.16	<0.001	0.376
Week 15					
Week 20					

FIGURES

ERA	PERIOD	DESCRIPTION	FORMATION
CENOZOIC	TERTIARY	MAFIC TO FELSIC FLOWS AND TUFFS	VOLCANIC FLOWS & TUFF (0-1000 FT.)
MESOZOIC	?	ANDESITE BRECCIA WITH MINOR TUFFS AND EPICLASTIC UNITS	ANDESITE BRECCIA (0-500 FT.)
MESOZOIC	CRETACEOUS	UPPER PART OF INTERBEDDED SANDSTONE AND SHALE WITH MINOR CONGLOMERATE; LOWER PART OF LAMINATED SHALE AND SILTSTONE	COLORADO FORMATION (+1000 FT.)
MESOZOIC	?	FINE-GRAINED QUARTZITE	BEARTOOTH QUARTZITE (60-140 FT.)
PALEOZOIC	P.	RED SHALE OR SHALY LIMESTONE	ABO FORMATION (0-265 FT.)
PALEOZOIC	PENNSYLVANIAN	IMPURE LIMESTONE INTERBEDDED WITH MINOR CALCAREOUS SHALE	SYRENA FORMATION (170-390 FT.)
PALEOZOIC	PENNSYLVANIAN	LIMESTONE WITH MINOR SHALE; PARTING SHALE AT BASE	OSWALDO FORMATION (330-420 FT.)
PALEOZOIC	MISS.	CRINOIDAL LIMESTONE WITH MINOR ARGILLACEOUS LIMESTONE; NODULAR CHERT THROUGHOUT	LAKE VALLEY LIMESTONE (300-400 FT.)
PALEOZOIC	DEV.	UPPER NODULAR CALCAREOUS SHALE; LOWER BLACK FISSILE SHALE	PERCHA SHALE (230-315 FT.)
PALEOZOIC	SIL.	GRAY MASSIVE DOLOMITE, CHERTY	FUSSELMAN DOLOMITE (100-300 FT.)
PALEOZOIC	ORDOVICIAN	LIGHT GRAY MASSIVE DOLOMITE	MONTOYA DOLOMITE (300-350 FT.)
PALEOZOIC	ORDOVICIAN	THIN TO THICK BEDDED LIMESTONE AND DOLOMITE; CHERT MODULES IN UPPER PART	EL PASO LIMESTONE (500-520 FT.)
PALEOZOIC	Є	GRAY BROWN MASSIVE QUARTZITE	BLISS FORMATION (140-190 FT.)
	pЄ	PRECAMBRIAN GNEISS AND SCHIST	GNEISS & SCHIST

COLUMN

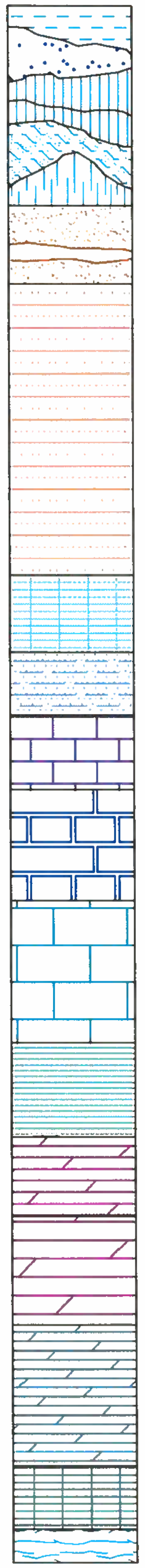

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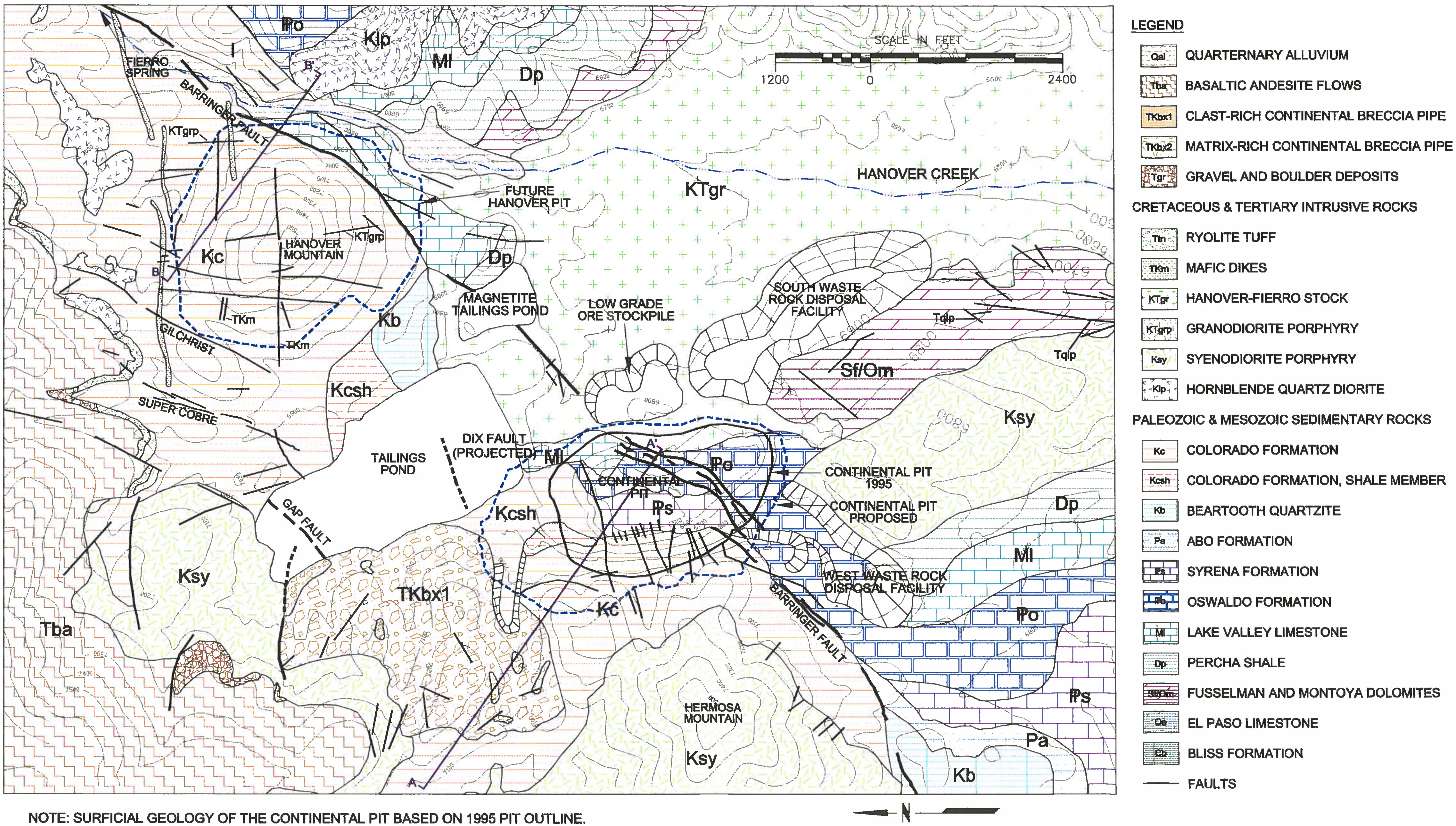
FIGURE D-1
GENERALIZED STRATIGRAPHIC COLUMN
CONTINENTAL MINE AREA, GRANT COUNTY, NM
(HILLESLAND AND OTHERS, 1995)

Date: JANUARY 1998
Project: 100029\TASK3
File: STRATCOL



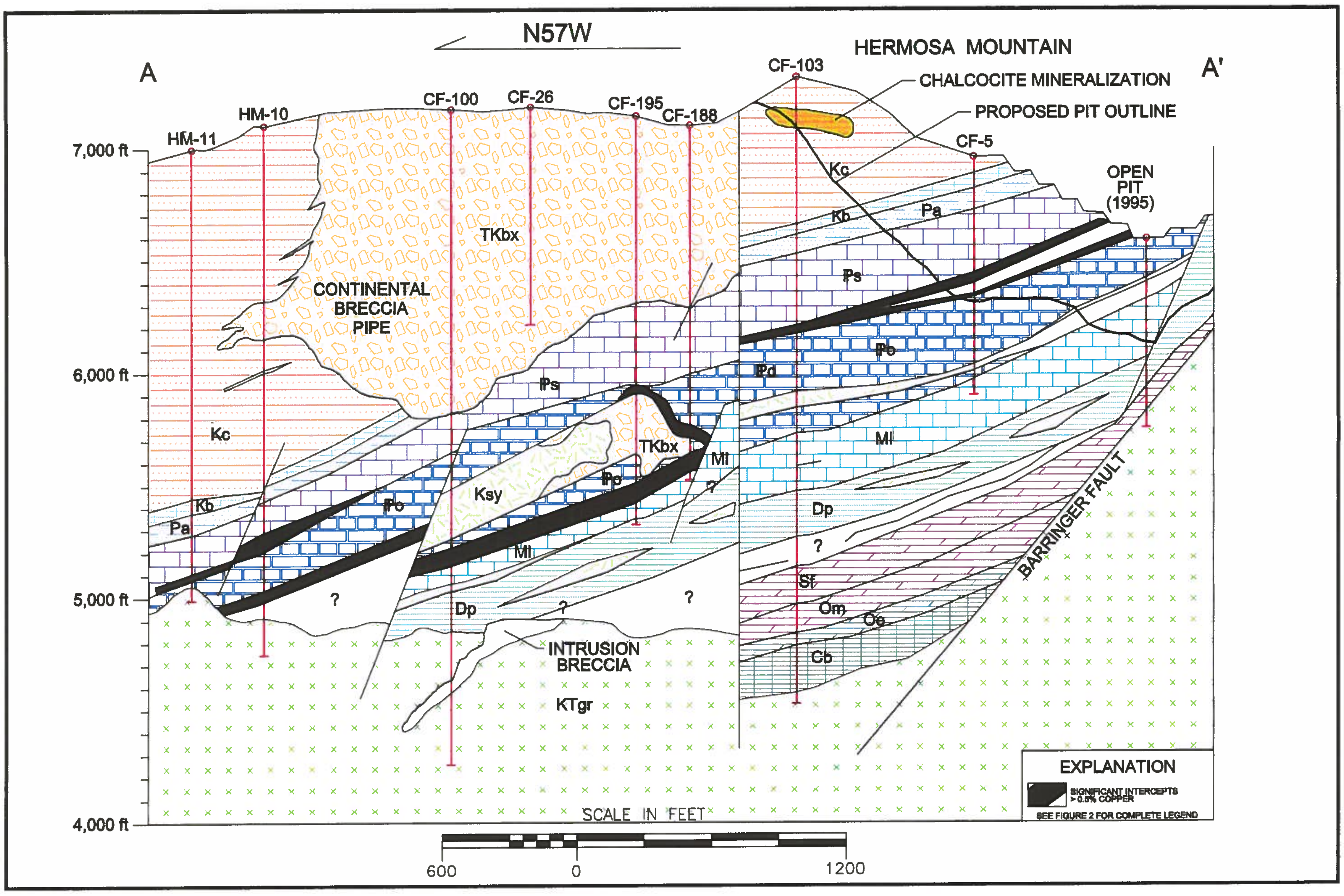
NOTE: SURFICIAL GEOLOGY OF THE CONTINENTAL PIT BASED ON 1995 PIT OUTLINE.

Filename: E...29\Task3\GEOLOGY.dwg
Date: 12/.../1999
Time: 11:59:08.94

SHEPHERD MILLER
INCORPORATED

FIGURE D-2
GENERALIZED GEOLOGY MAP OF THE CONTINENTAL MINE AREA, GRANT COUNTY, NM
(FROM HILLESLAND AND OTHERS, 1995, AND JONES AND OTHERS, 1967)

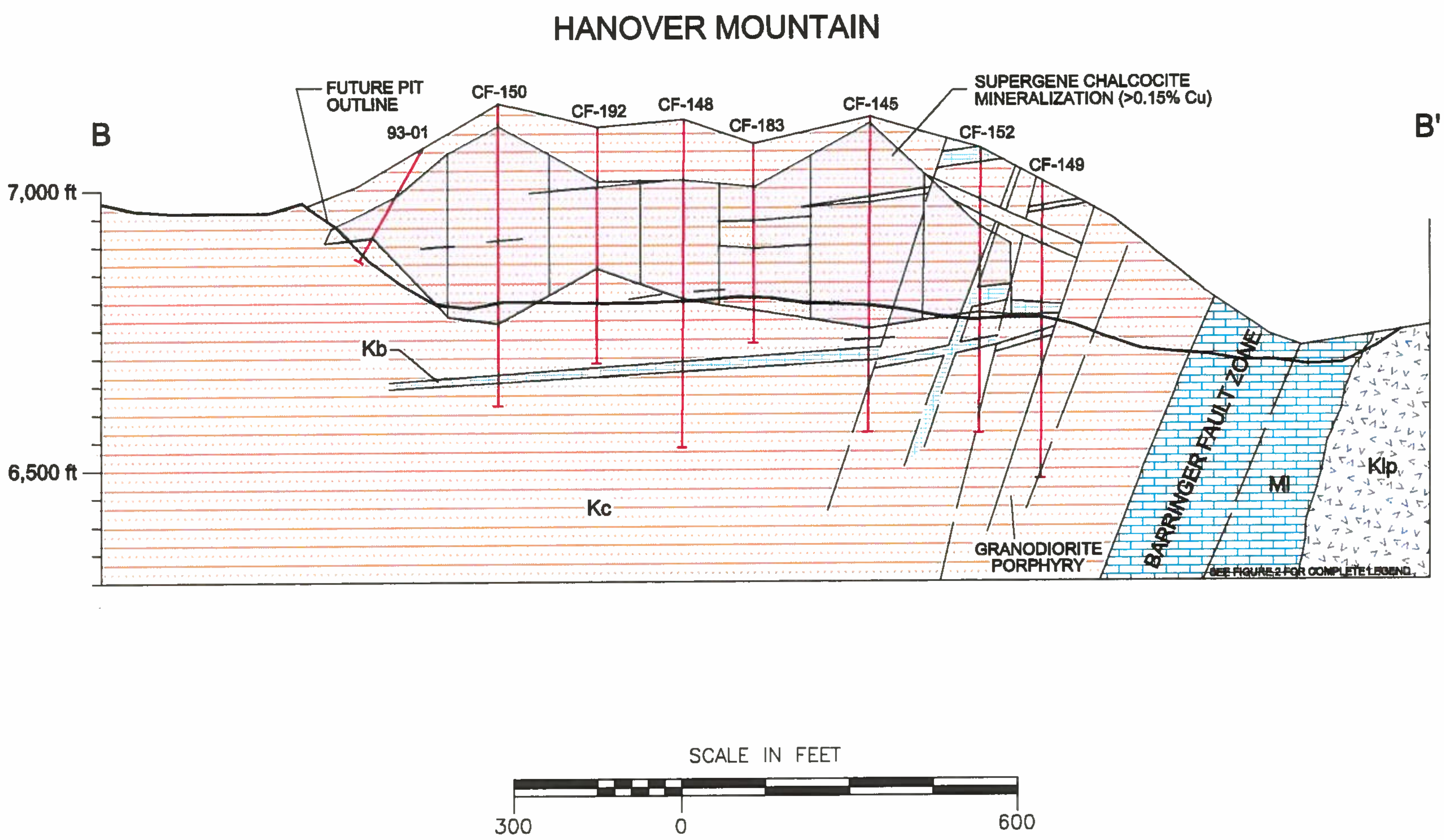
Date:	JANUARY 1998
Project:	100029/TASK3
File:	GEOLOGY



SHEPHERD MILLER INCORPORATED

FIGURE D-3 CROSS-SECTION A-A'
(SEE FIGURE D-2 FOR LOCATION)
(FROM HILLESLAND AND OTHERS, 1995)

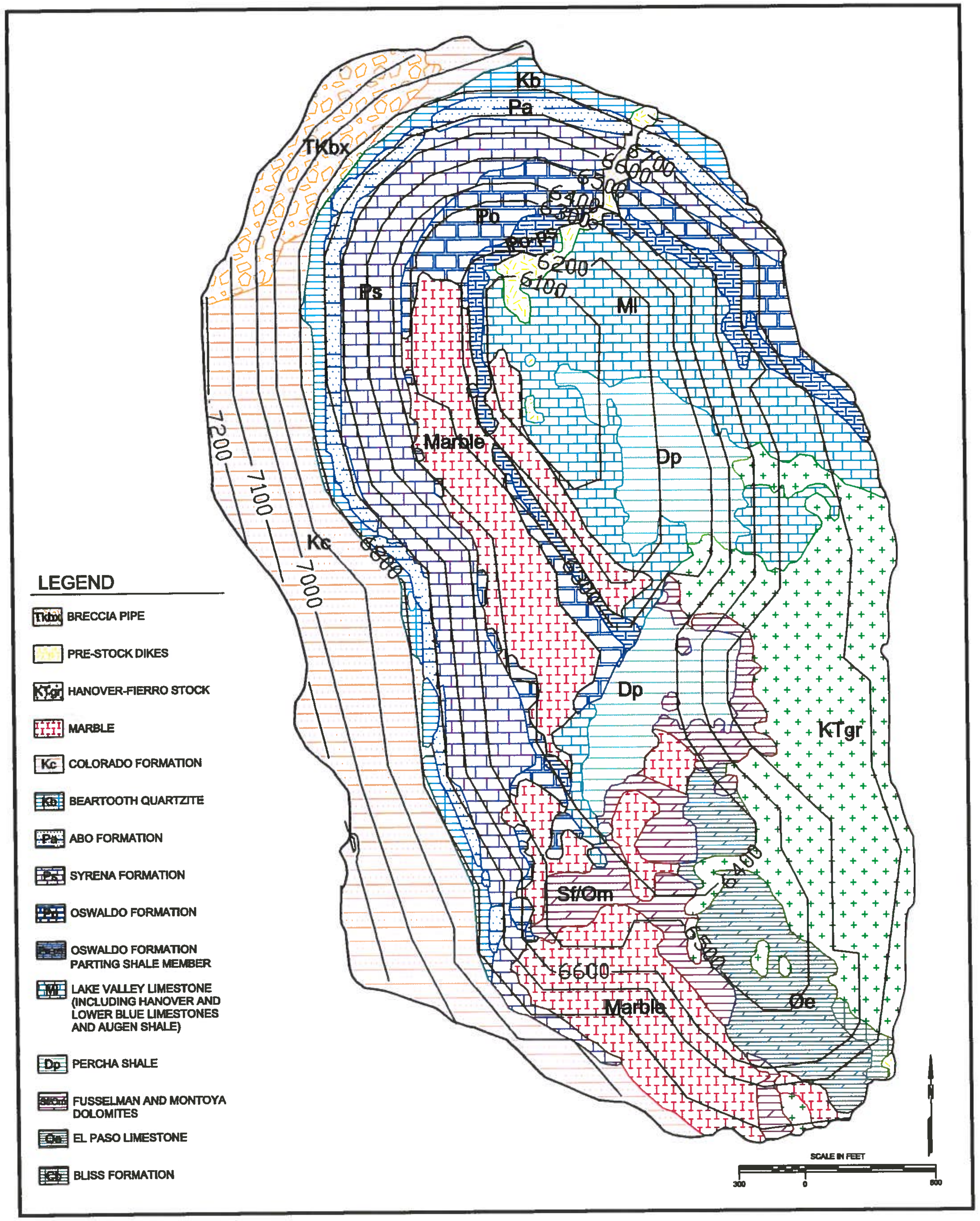
Date:	JANUARY 1998
Project:	100029/TASK3
File:	CROSSAA



SHEPHERD MILLER INCORPORATED

FIGURE D-4 CROSS-SECTION B-B'
(SEE FIGURE D-2 FOR LOCATION)
(FROM HILLESLAND AND OTHERS, 1995)

Date:	JANUARY 1998
Project:	100029/TASK3
File:	CROSSBB



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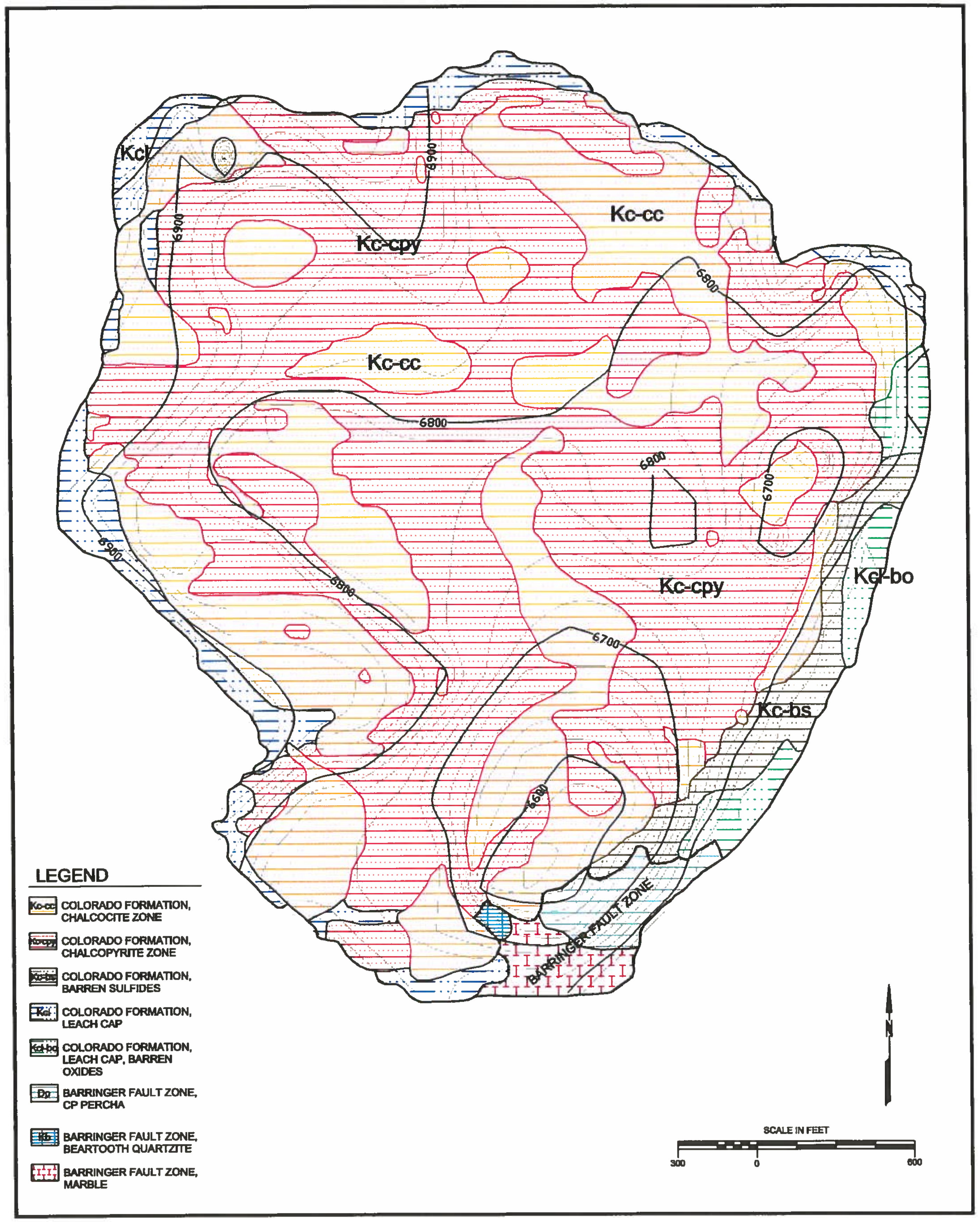
INCORPORATED

FIGURE D-5
POST-MINING GEOLOGY OF
THE PROPOSED CONTINENTAL PIT

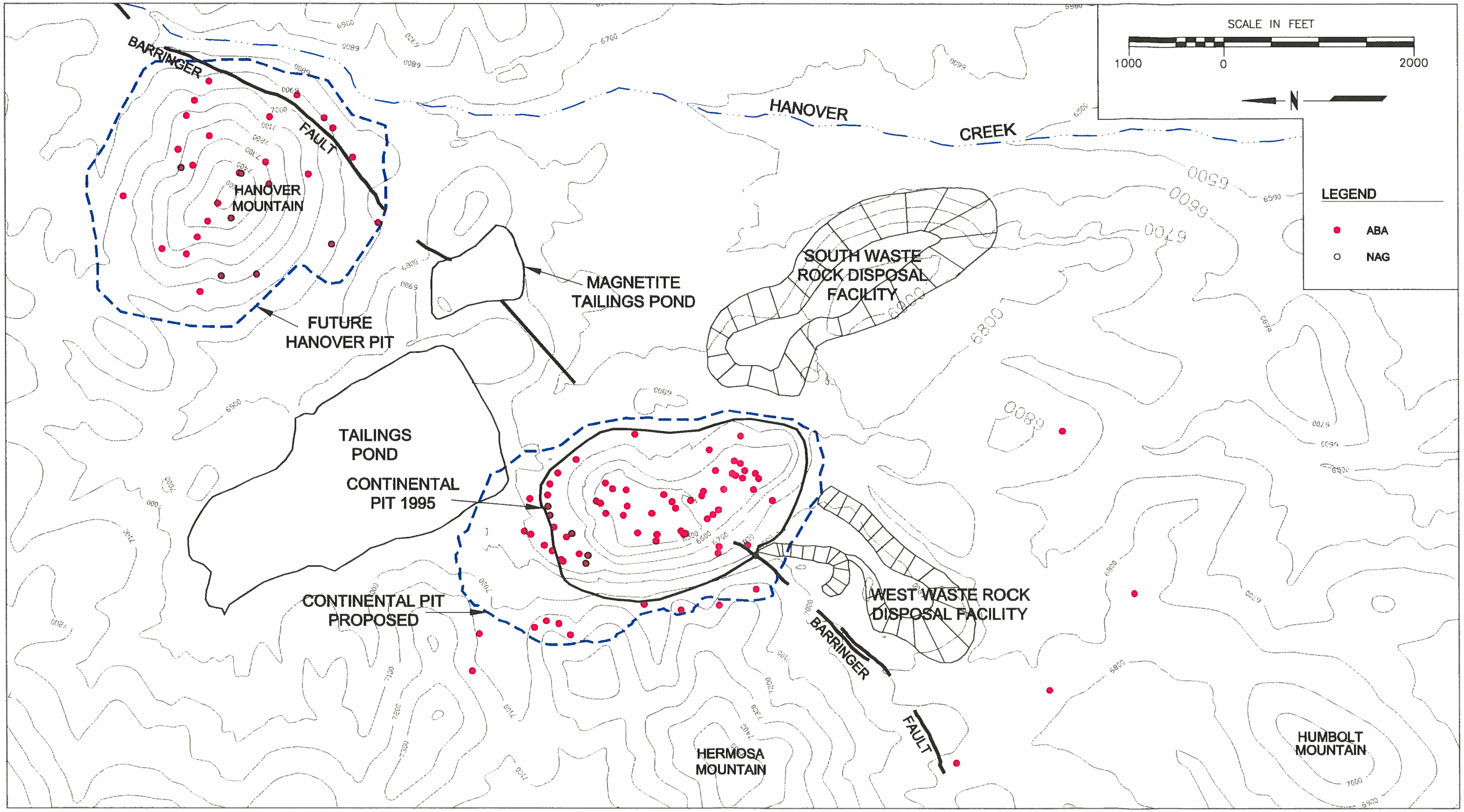
Date:	JANUARY 1998
Project:	100029/TASK 3
File:	CONTGEO2_A



SHEPHERD MILLER INCORPORATED

FIGURE D-6
POST-MINING GEOLOGY OF THE PROPOSED HANOVER PIT

Date:	JANUARY 1998
Project:	100029/TASK 3
File:	HANGEO2_A

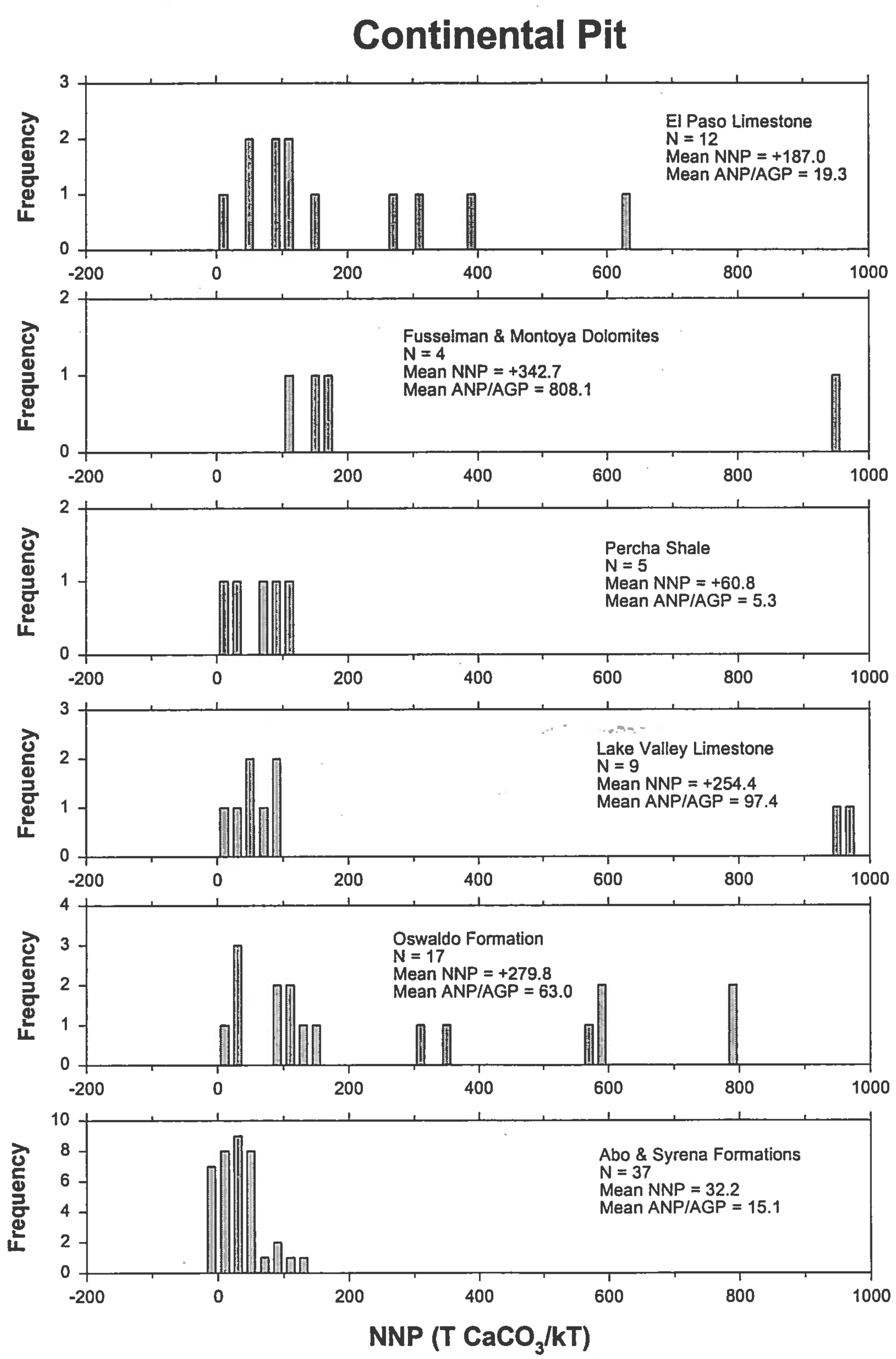


Filename: E... 29\Task4\fig-01.dwg
Date: 12/../1999
Time: 10:46:04.92

SHEPHERD MILLER INCORPORATED

FIGURE D-7
ABA SAMPLE LOCATIONS

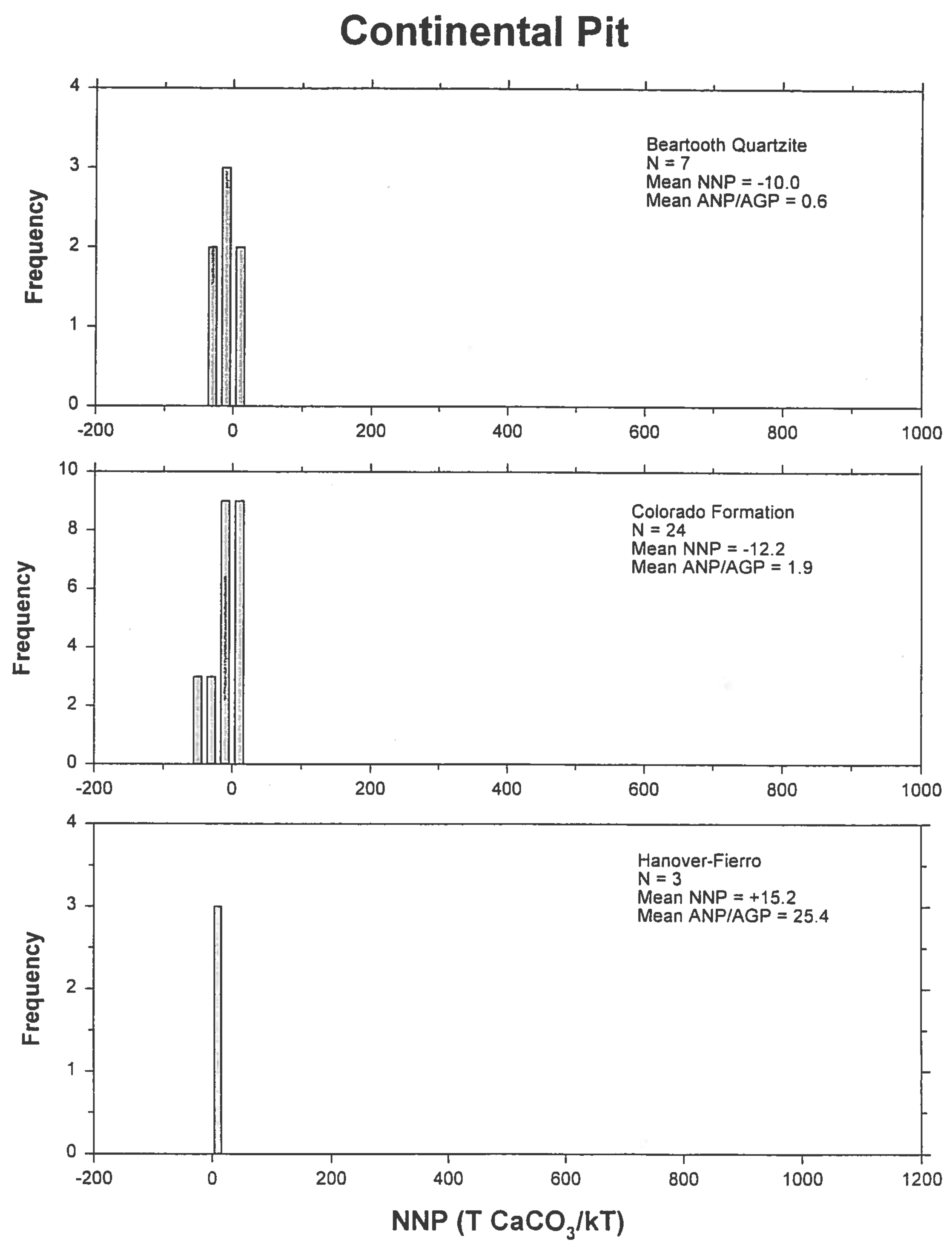
Date:	OCTOBER 1999
Project:	100029/TASK4
File:	FIG-01.DWG



SHEPHERD MILLER INCORPORATED

FIGURE D-8
Frequency Distributions of NNP Data for Paleozoic Rocks from the Continental Pit

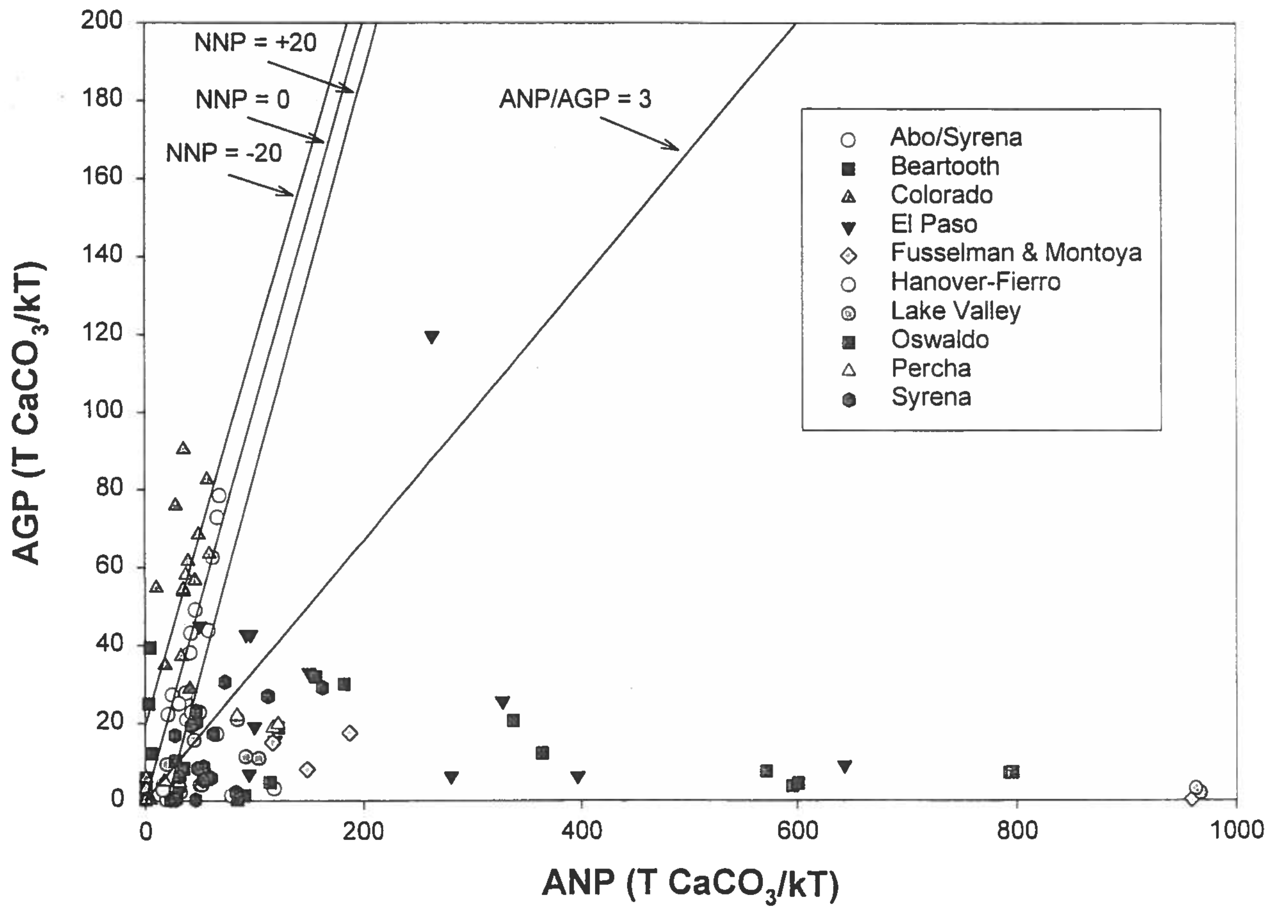
Date: Oct 1999
Project: p:\100029
File: cp_nnp.jnb



SHEPHERD MILLER INCORPORATED

FIGURE D-9
Frequency Distributions of NNP Data for Mesozoic and Intrusive Rocks from the Continental Pit

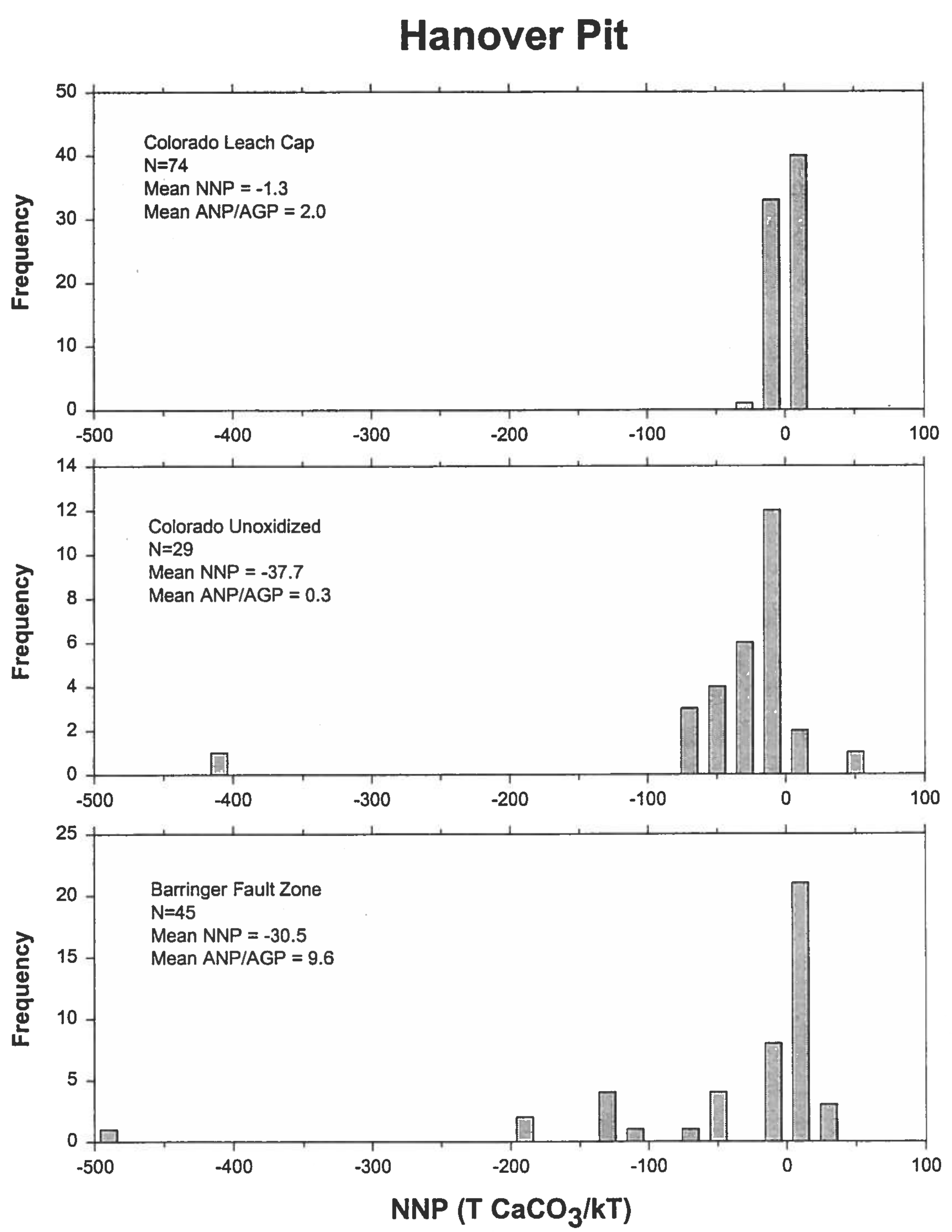
Date:	Oct 1999
Project:	p:\100029
File:	cp_nnp.jnb



SHEPHERD MILLER INCORPORATED

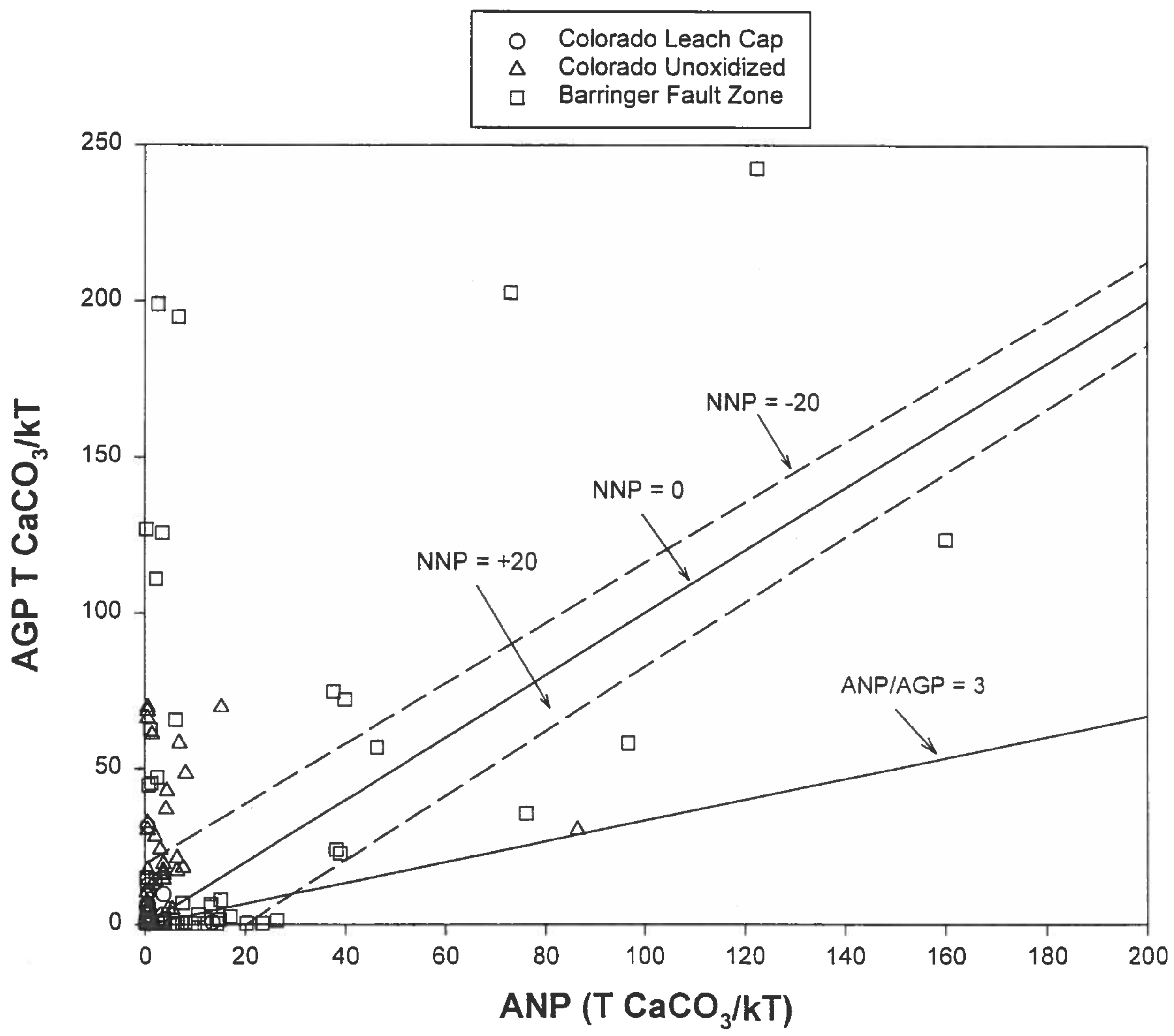
FIGURE D-10
Acid/Base Accounting Results for Rocks from the Continental Pit

Date:	Oct 1999
Project:	p:\100029
File:	agp_anp.jnb



SHEPHERD MILLER INCORPORATED	FIGURE D-11 Frequency Distributions of NNP Data for Hanover Mountain

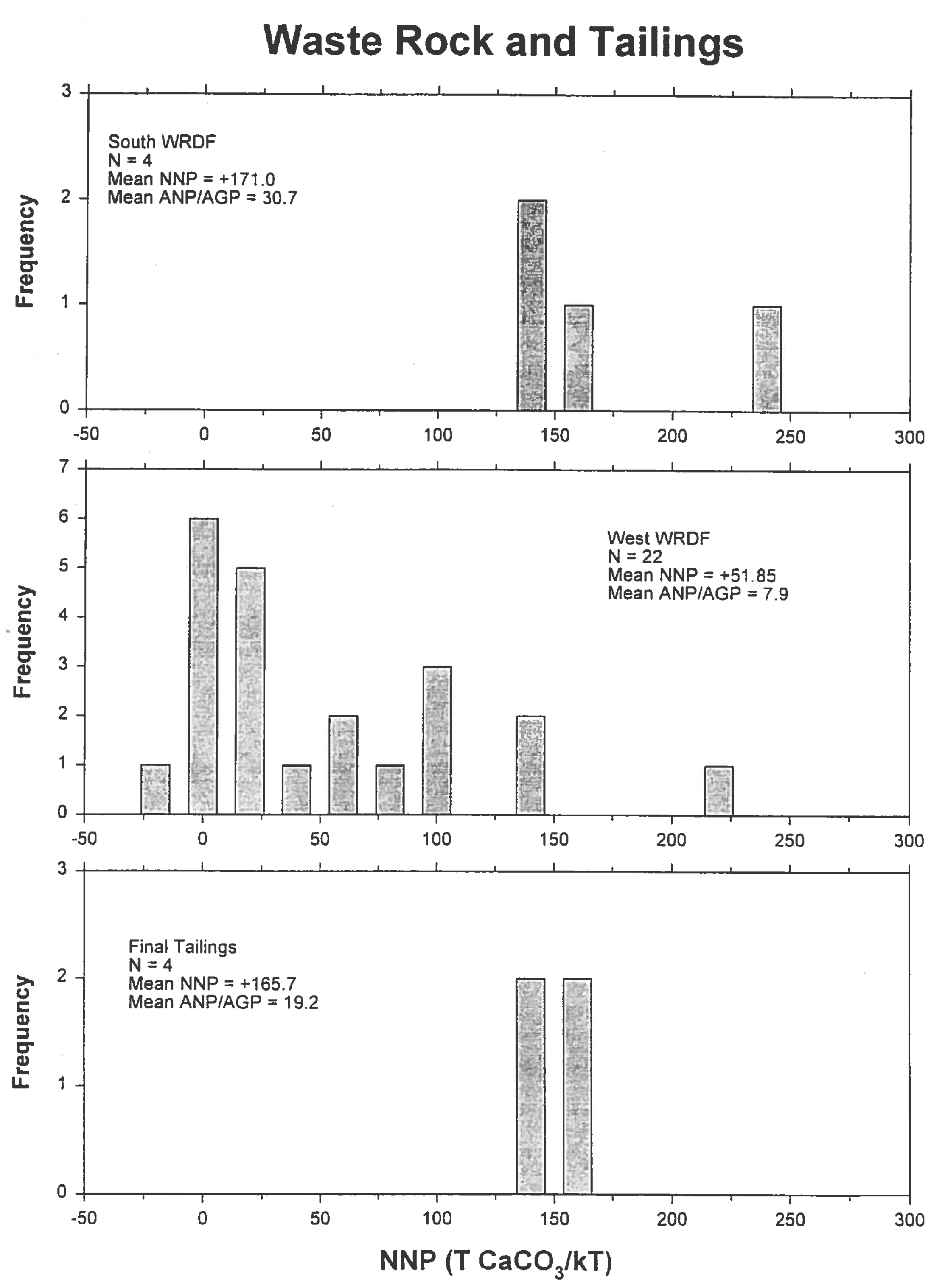
Date: Oct 1999
Project: p:\100029
File: cp_nnp.jnb



SHEPHERD MILLER INCORPORATED

FIGURE D-12
Acid/Base Accounting Results for Rocks from Hanover Mountain

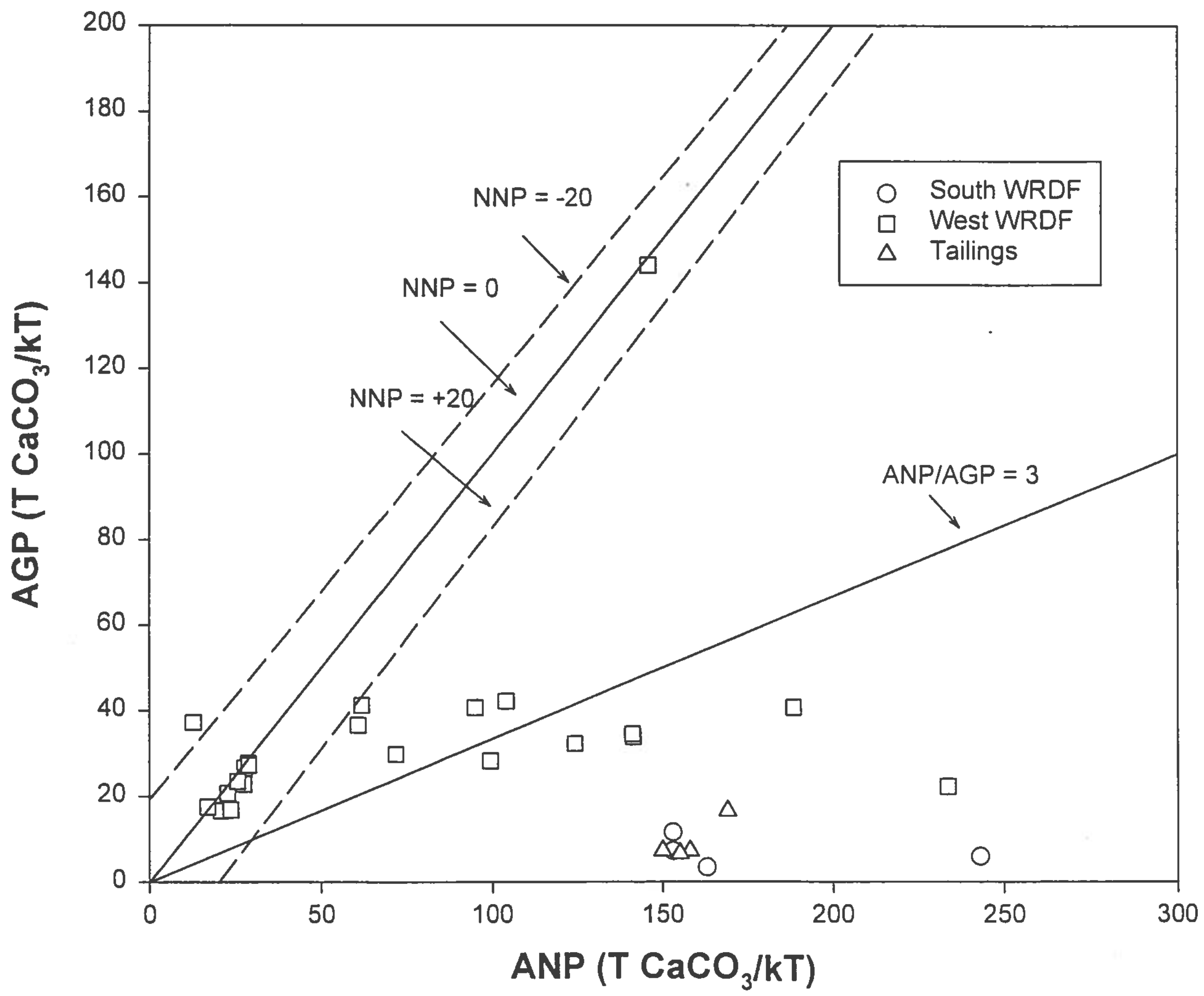
Date:	Oct 1999
Project:	p:\100029
File:	agp_anp.jnb



SHEPHERD MILLER INCORPORATED

FIGURE D-13
Frequency Distributions of NNP data for Waste Rock and Tailings

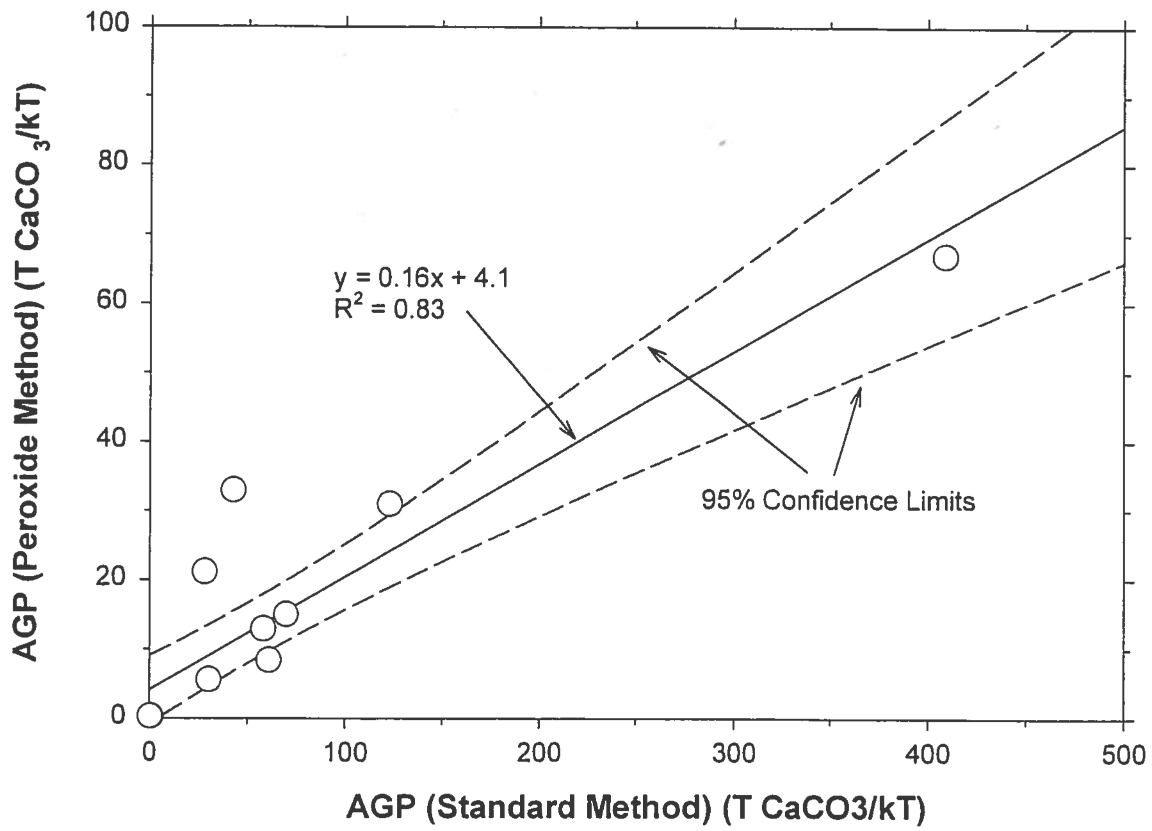
Date: Oct 1999
Project: p:\100029
File: cp_nnp.jnb



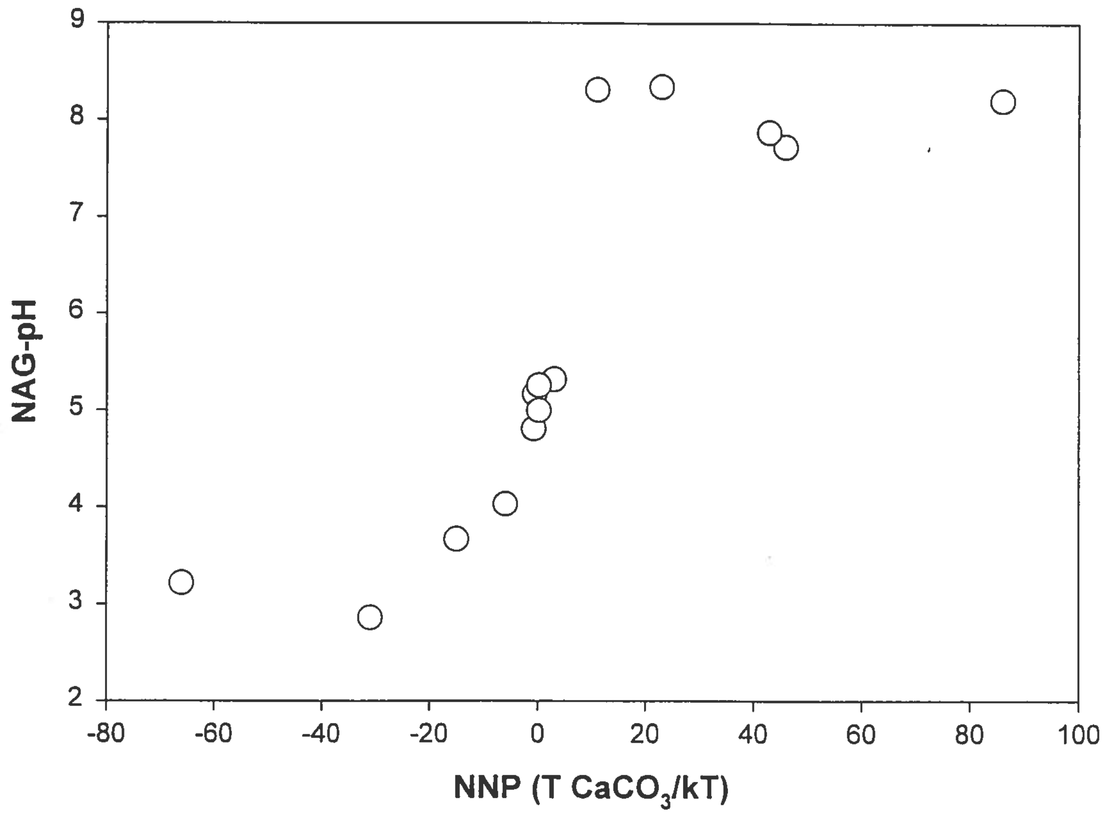
SHEPHERD MILLER INCORPORATED

FIGURE D-14
Acid/Base Accounting Results for Waste Rock and Tailings

Date:	Oct 1999
Project:	p:\100029
File:	agp_anp.jnb



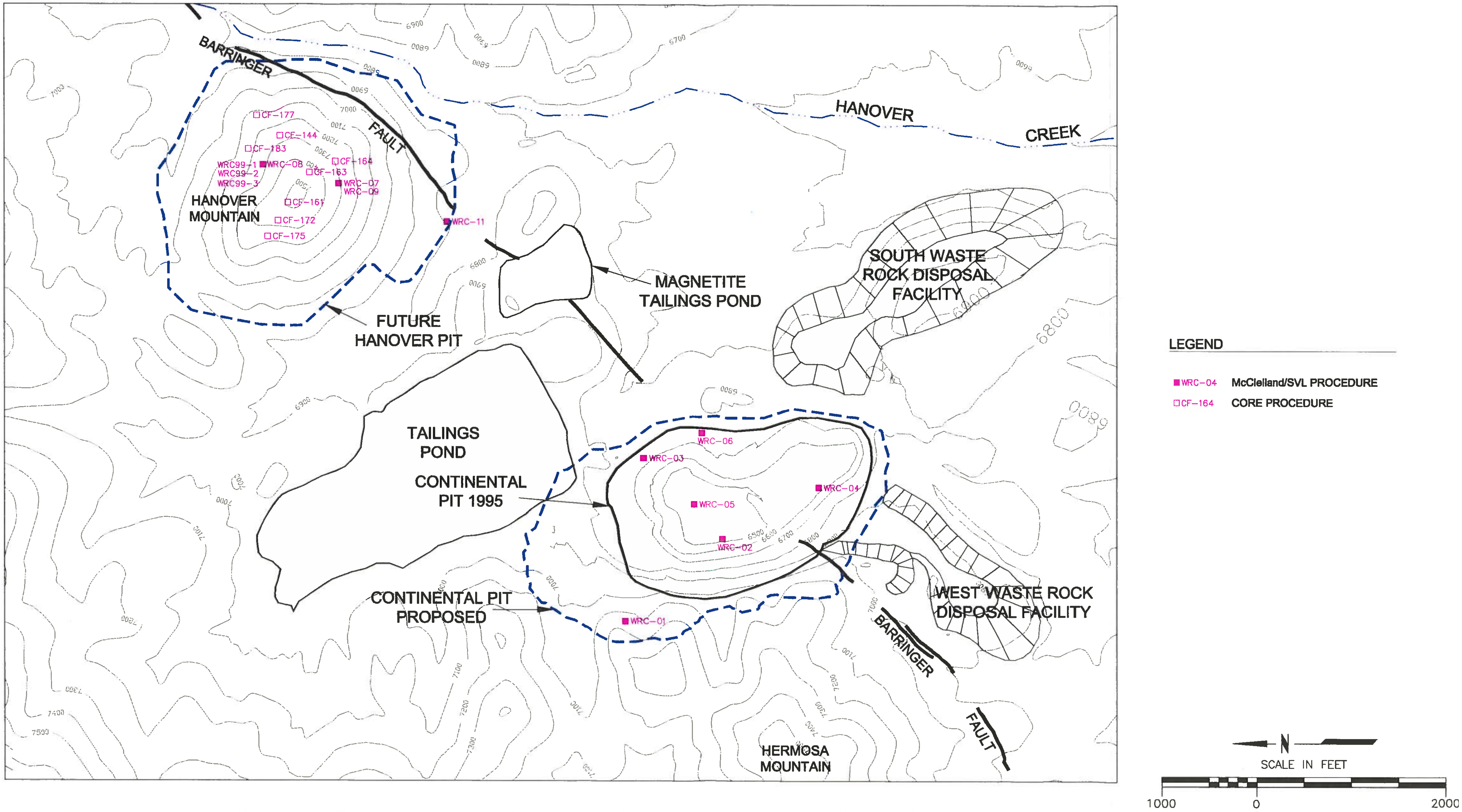
SHEPHERD MILLER INCORPORATED	FIGURE D-15 Correlation Between AGP Determined by Standard Method and AGP Determined from the Peroxide-Sulfur Method	Date: Oct 1999 Project: p:\100029 File: agp_pero.jnb



SHEPHERD MILLER INCORPORATED

FIGURE D-16
NAG-pH as a Function of NNP

Date:	Oct 1999
Project:	p:\100029
File:	nagph.jnb



Filename: E:\100029\Task4\FIG-03.dwg
Date: 12/20/1999
Time: 10:37:43.49

SHEPHERD MILLER INCORPORATED

FIGURE D-17
HUMIDITY CELL TEST SAMPLE LOCATIONS

Date:	OCTOBER 1999
Project:	100029/TASK4
File:	FIG-03.DWG

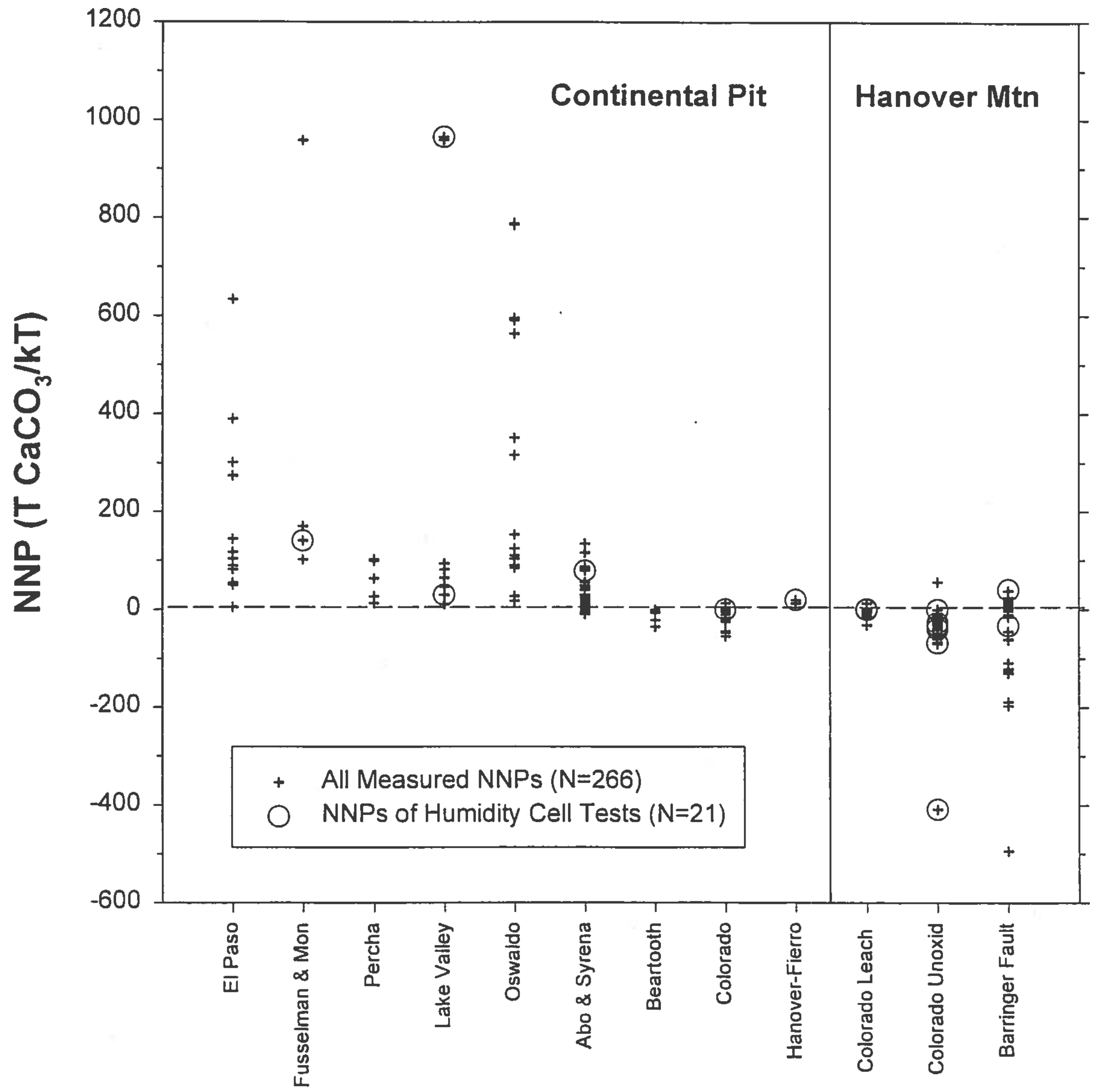


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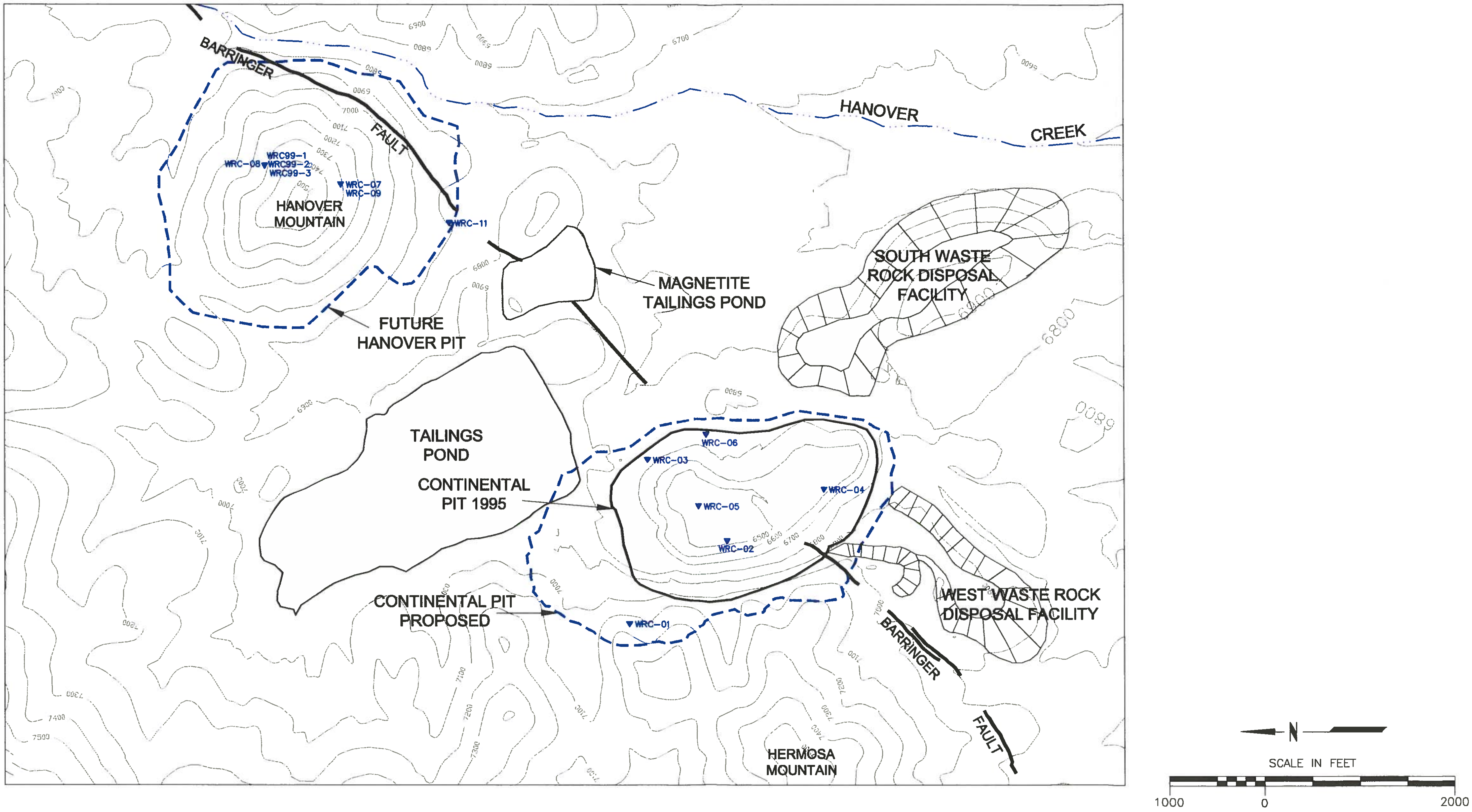
FIGURE D-18
NNP Values of Samples Used in HCTs Compared to Overall Population of NNPs

Date:	Oct 1999
Project:	p:\100029
File:	hct_nnp.jnb

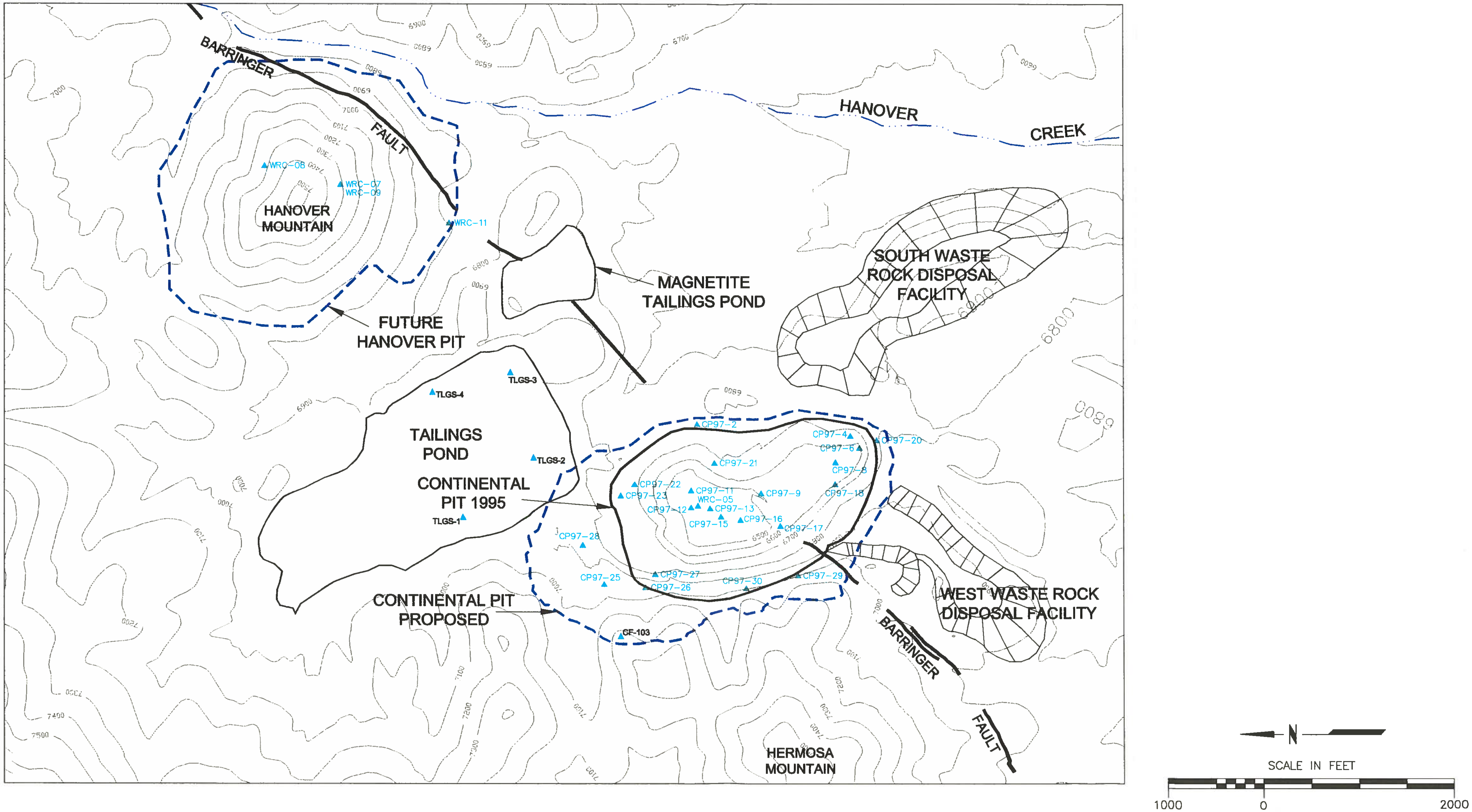


Filename: E:\100029\Task4\fig-04.dwg
Date: 12/20/1999
Time: 10:29:33.42

SHEPHERD MILLER
INCORPORATED

FIGURE D-19
WHOLE ROCK SAMPLE LOCATIONS

Date:	OCTOBER 1999
Project:	100029/TASK4
File:	FIG-O4.DWG



Filename: E:\1...\Task4\FIG-02.dwg
Date: 12/2...9
Time: 10:59:49.34

SHEPHERD MILLER INCORPORATED

FIGURE D-20
MWMP SAMPLE LOCATIONS

Date:	OCTOBER 1999
Project:	100029/TASK4
File:	FIG-02.DWG

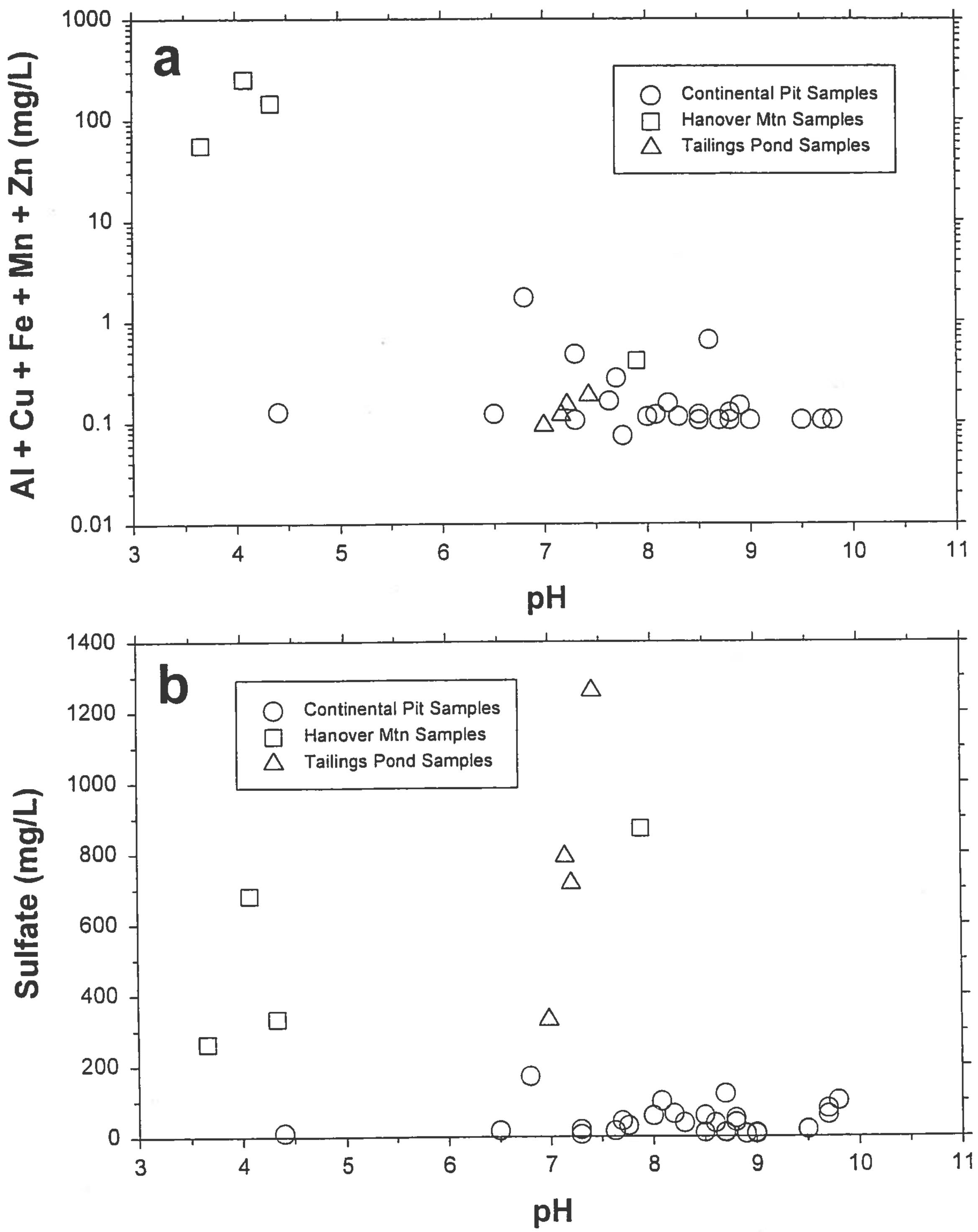


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FIGURE D-21
Sulfate and Metals as Functions of pH Measured in MWMP Tests

Date:	Oct 1999
Project:	p:\100029
File:	mwmp.jnb

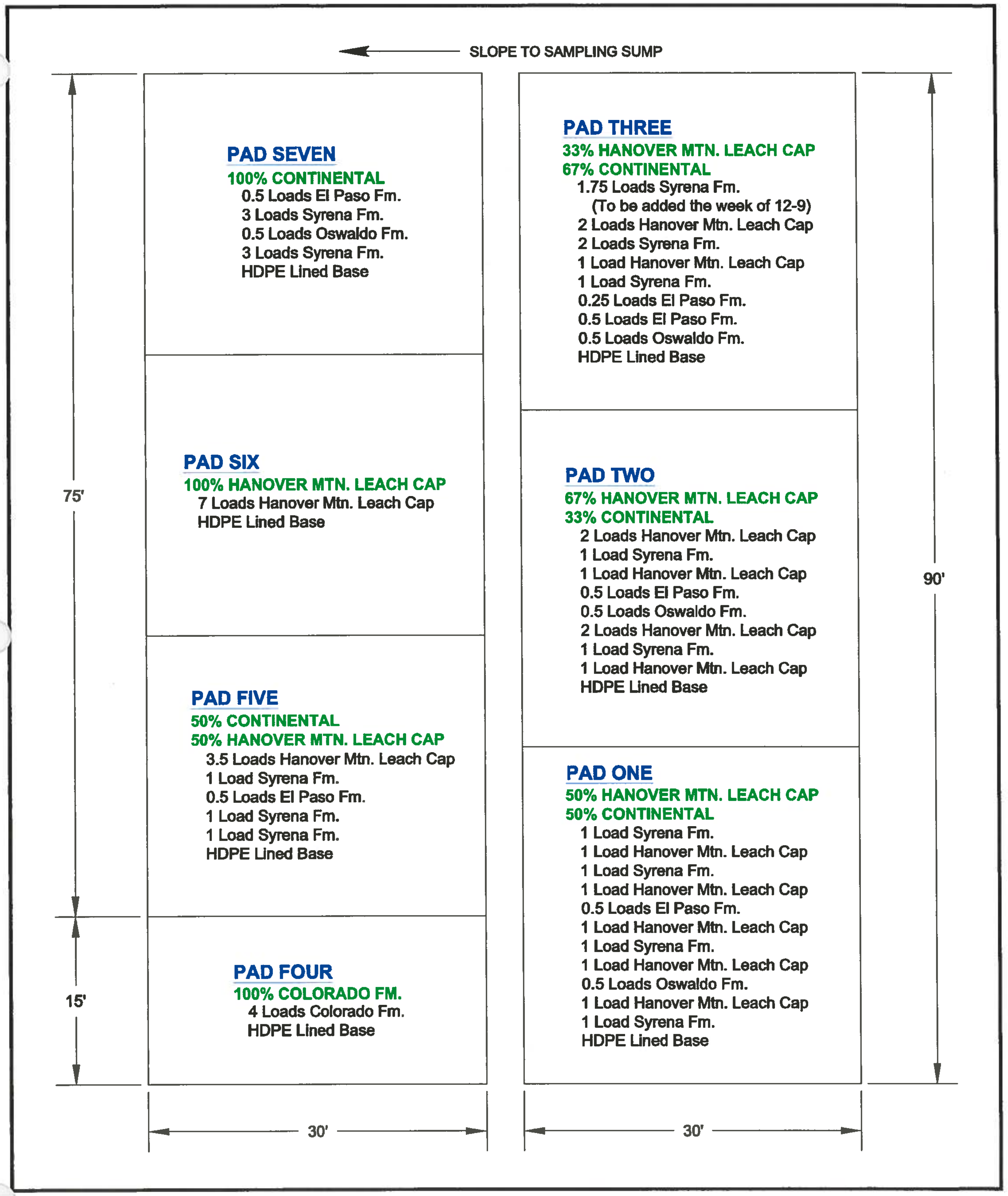

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FIGURE D-22
BULK TEST PAD LAYOUT

Date:	JANUARY 1998
Project:	100029\TASK3
File:	PADLYOUT

TABLES

Table D-1 Estimated Proportions of Surface Areas of Different Geologic Units Comprising the Final Pit Walls

CONTINENTAL PIT		
Formation	**Area (square ft)**	**Wall Rock %**
Colorado Formation	1169375	17%
Beartooth Quartzite	237500	3%
Abo Formation	194375	3%
Syrena Formation	832500	12%
Oswaldo Formation	356250	5%
Oswaldo Formation, Parting Shale Member	196875	3%
Lake Valley Limestone*	770625	11%
Percha Shale	428125	6%
Fusselman and Montoya Dolomites	270000	4%
El Paso Limestone	307500	4%
Bliss Formation	13750	0.2%
Marble Alteration	978125	14%
Pre-Stock Dikes and Sills	55625	0.8%
Hanover-Fierro Stock	942500	14%
Breccia Pipe	193750	3%
Total	6946875	100%
HANOVER PIT		
Formation	**Area (square ft)**	**Wall Rock %**
Colorado Formation, Chalcocite Zone	2510000	39%
Colorado Formation, Chalcopyrite Zone	2987500	47%
Colorado Formation, Barren Sulfides	182500	3%
Colorado Formation Leach Cap	382500	6%
Colorado Formation Leach Cap, Barren Oxides	135000	2.1%
Colorado Formation Leach Cap, Carbonate Oxides	0	0%
Barringer Fault Zone, CP Percha	117500	1.8%
Barringer Fault Zone, South Zone	5000	0.1%
Barringer Fault Zone, Faults	0	0%
Barringer Fault Zone, Beartooth Quartzite	10000	0.2%
Barringer Fault Zone, Percha Shale	0	0%
Barringer Fault Zone, Marble	77500	1.2%
Total	6407500	100%

* Includes Hanover and Lower Blue Limestones and Augen Shale

Table D-2 Summary of ABA Sampling by Date and Location

	ABA Sample Locations						
Date	Laboratory/ Method	Continental Pit	Hanover Pit	Waste Rock Facilities	Tailings	Humboldt Mountain	Totals
1995 to 1996	CORE/ Sobek		15	12	4		31
1996	SVL/ Modified Sobek	77	121	16			214
1999	SVL/ Modified Sobek	31	7			9	47
Totals		108	143	28	4	9	277

Table D-3 Acid/Base Accounting Results for Samples from the Continental Pit (continued)

Formation	Sample Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/ AGP
Abo & Syrena	94-115: 380-400	SVL	1996	1.69	0.28	1.4	0.01	58.6	43.8	14.9	1.3
Abo & Syrena	94-115: 400-420	SVL	1996	2.67	0.32	2.33	0.02	66.9	72.8	-5.9	0.9
Abo & Syrena	94-115: 400-420 dup.	SVL	1996	2.64	0.09	2.51	0.04	69.1	78.4	-9.4	0.9
Abo & Syrena	94-115: 420-440	SVL	1996	0.83	0.16	0.67	< 0.01	38.4	20.9	17.5	1.8
Abo & Syrena	94-115: 420-440 dup.	SVL	1996	0.84	0.11	0.73	< 0.01	42.9	22.8	20.0	1.9
Abo & Syrena	94-115: 440-460	SVL	1996	1.56	0.18	1.38	< 0.01	42.3	43.1	-0.8	1.0
Abo & Syrena	94-115: 460-480	SVL	1996	1.37	0.15	1.22	< 0.01	41.8	38.1	3.7	1.1
Abo & Syrena	94-115: 480-500	SVL	1996	0.8	0.09	0.71	< 0.01	21.3	22.2	-0.9	1.0
Abo & Syrena	94-115: 500-520	SVL	1996	1.13	0.28	0.83	0.02	37.1	25.9	11.2	1.4
Abo & Syrena	94-115: 520-540	SVL	1996	0.9	0.16	0.73	0.01	50.2	22.8	27.4	2.2
Abo & Syrena	94-115: 540-560	SVL	1996	0.71	0.16	0.55	< 0.01	66.2	17.2	49.0	3.9
Abo & Syrena	94-115: 560-580	SVL	1996	1	0.07	0.89	0.04	37.7	27.8	9.9	1.4
Abo & Syrena	94-115: 580-600	SVL	1996	0.99	0.12	0.87	< 0.01	25.1	27.2	-2.1	0.9
Abo & Syrena	94-115: 600-620	SVL	1996	2.27	0.13	2	0.14	62.5	62.5	0.0	1.0
Abo & Syrena	94-115: 620-640	SVL	1996	2.54	0.3	1.57	0.67	46.3	49.1	-2.8	0.9
	Average- Abo & Syrena		**1996**	**1.46**	**0.17**	**1.23**	**0.07**	**47.10**	**38.31**	**8.78**	**1.44**
Abo & Syrena	WRC02	SVL	1999	0.0765	0.03	0.04	< 0.01	79.7	1.3	78.5	63.8
Abo & Syrena	WRC22	SVL	1999	1.06	0.25	0.8	< 0.01	31.3	25.0	6.3	1.3
Abo & Syrena	WRC23	SVL	1999	0.0774	0.01	0.07	< 0.01	32.2	2.2	30.0	14.7
Abo & Syrena	WRC24	SVL	1999	0.208	0.1	0.1	0.0137	118.4	3.1	115.3	37.9
	Average- Abo & Syrena		**1999**	**0.36**	**0.10**	**0.25**	**0.01**	**65.41**	**7.89**	**57.52**	**29.42**
	Average- Abo & Syrena			**1.23**	**0.16**	**1.02**	**0.06**	**50.95**	**31.91**	**19.04**	**7.33**
Beartooth	94-115: 320-340	SVL	1996	0.94	0.14	0.8	< 0.01	3.5	25.0	-21.5	0.1
Beartooth	94-115: 340-360	SVL	1996	0.5	0.11	0.39	< 0.01	6.2	12.2	-6.0	0.5
Beartooth	94-115: 360-380	SVL	1996	1.35	0.08	1.26	0.01	4.6	39.4	-34.7	0.1
	Average- Beartooth		**1996**	**0.93**	**0.11**	**0.82**	**0.01**	**4.77**	**25.52**	**-20.75**	**0.25**
Beartooth	WRC19	SVL	1999	0.159	0.06	0.1	< 0.01	< 0.5	3.1	-2.6	0.2
Beartooth	WRC20	SVL	1999	0.347	0.15	0.19	< 0.01	0.6	5.9	-5.4	0.1
Beartooth	WRC21	SVL	1999	< 0.01	< 0.01	< 0.01	< 0.01	< 0.5	< 0.3	0.2	1.7
Beartooth (dup)	WRC21	SVL	1999	< 0.01	< 0.01	< 0.01	< 0.01	< 0.5	< 0.3	0.2	1.7
	Average- Beartooth		**1999**	**0.13**	**0.06**	**0.08**	**0.01**	**0.51**	**2.41**	**-1.90**	**0.90**
	Average- Beartooth			**0.47**	**0.08**	**0.39**	**0.01**	**2.34**	**12.32**	**-9.98**	**0.62**
	Drill hole samples										
Colorado, oxidized	94-115: 20-40	SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	4.9	< 0.3	4.6	15.8
Colorado cc min.	94-115: 40-60	SVL	1996	1.25	0.12	1.12	0.01	18.5	35.0	-16.6	0.5
Colorado cc min.	94-115: 60-80	SVL	1996	2.73	0.2	2.43	0.1	28.3	75.9	-47.6	0.4
Colorado cc min.	94-115: 80-100	SVL	1996	3.05	0.06	2.89	0.1	35.7	90.3	-54.6	0.4
Colorado cc min.	94-115: 100-120	SVL	1996	2.01	0.04	1.86	0.11	37.8	58.1	-20.3	0.7
Colorado	94-115: 120-140	SVL	1996	2.3	0.23	1.97	0.1	39.7	61.6	-21.9	0.6
Colorado	94-115: 140-160	SVL	1996	1.06	0.13	0.92	0.01	41.4	28.8	12.7	1.4
Colorado	94-115: 160-180	SVL	1996	1.93	0.19	1.72	0.02	35.5	53.8	-18.3	0.7
Colorado	94-115: 180-200	SVL	1996	2.08	0.2	1.81	0.07	46.0	56.6	-10.5	0.8
Colorado	94-115: 200-220	SVL	1996	2.81	0.08	2.64	0.09	57.5	82.5	-25.0	0.7
Colorado	94-115: 220-240	SVL	1996	2.18	0.08	2.03	0.07	59.5	63.4	-4.0	0.9

Table D-3 Acid/Base Accounting Results for Samples from the Continental Pit (continued)

Formation	Sample Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/ AGP
Colorado	94-115: 240-260	SVL	1996	1.19	< 0.01	1.19	< 0.01	33.4	37.2	-3.7	0.9
Colorado	94-115: 260-280	SVL	1996	1.95	0.12	1.75	0.08	10.6	54.7	-44.1	0.2
Colorado	94-115: 280-300	SVL	1996	2.49	0.25	2.19	0.05	49.4	68.4	-19.0	0.7
Colorado	94-115: 300-320	SVL	1996	1.83	0.04	1.74	0.05	35.3	54.4	-19.1	0.6
	Average- Colorado		**1996**	**1.92**	**0.12**	**1.75**	**0.06**	**35.57**	**54.73**	**-19.16**	**1.69**
Colorado	WRC01	SVL	1999	< 0.01	< 0.01	< 0.01	< 0.01	< 0.5	< 0.3	0.2	1.7
Colorado	WRC12	SVL	1999	0.148	0.04	0.1	< 0.01	< 0.5	3.1	-2.6	0.2
Colorado	WRC13	SVL	1999	< 0.01	< 0.01	< 0.01	< 0.01	3.0	< 0.3	2.7	10.1
Colorado	WRC14	SVL	1999	0.02	0.01	< 0.01	< 0.01	0.6	< 0.3	0.3	2.0
Colorado	WRC15	SVL	1999	0.356	0.16	0.19	0.0147	< 0.5	5.9	-5.4	0.1
Colorado	WRC16	SVL	1999	0.0138	< 0.01	0.01	< 0.01	< 0.5	0.3	0.2	1.6
Colorado	WRC17	SVL	1999	0.016	0.02	< 0.01	< 0.01	< 0.5	< 0.3	0.2	1.7
Colorado	WRC18	SVL	1999	< 0.01	< 0.01	< 0.01	< 0.01	< 0.5	< 0.3	0.2	1.7
Colorado (dup)	WRC01	SVL	1999	< 0.01	< 0.01	< 0.01	< 0.01	< 0.5	< 0.3	0.2	1.7
	Average- Colorado	**SVL**	**1999**	**0.07**	**0.03**	**0.04**	**0.01**	**0.79**	**1.24**	**-0.45**	**2.30**
	Average- Colorado			**1.23**	**0.09**	**1.11**	**0.04**	**22.53**	**34.67**	**-12.15**	**1.92**
Continental breccia	WRC10	SVL	1999	0.431	< 0.01	0.42	< 0.01	138.6	13.1	125.4	10.6
	Bench shot samples										
El Paso	6520-23	SVL	1996	0.36	0.04	0.29	0.03	642.8	9.1	633.8	70.9
El Paso	6520-25	SVL	1996	0.9	0.04	0.82	0.04	326.9	25.6	301.2	12.8
El Paso	6520-26	SVL	1996	1.22	0.13	1.06	0.03	150.2	33.1	117.1	4.5
El Paso	6520-27	SVL	1996	1.37	< 0.01	1.37	0.01	93.2	42.8	50.3	2.2
El Paso	6520-27 dup.	SVL	1996	1.37	< 0.01	1.37	< 0.01	97.5	42.8	54.7	2.3
El Paso	6520-28	SVL	1996	1.5	0.06	1.44	< 0.01	50.2	45.0	5.2	1.1
El Paso	6500-22	SVL	1996	0.54	0.07	0.2	0.27	396.3	6.3	390.1	63.4
El Paso	6520-29	SVL	1996	0.97	0.13	0.5	0.34	119.0	15.6	103.4	7.6
El Paso	6520-30	SVL	1996	1.02	< 0.01	0.61	0.41	100.8	19.1	81.7	5.3
El Paso	6500-23	SVL	1996	0.3	< 0.01	0.22	0.08	95.6	6.9	88.7	13.9
El Paso	6500-24	SVL	1996	6.15	0.89	3.83	1.43	263.9	119.7	144.2	2.2
El Paso	6520-32	SVL	1996	0.55	0.04	0.2	0.31	279.8	6.3	273.6	44.8
	Average- El Paso	**SVL**	**1996**	**1.35**	**0.12**	**0.99**	**0.25**	**218.01**	**31.02**	**186.99**	**19.25**
Fusselman & Montoya	WRC04	SVL	1999	0.402	0.09	0.26	0.0539	148.4	8.1	140.3	18.3
Fusselman & Montoya	WRC30	SVL	1999	0.755	0.16	0.56	0.0426	187.6	17.5	170.1	10.7
Fusselman & Montoya	WRC31	SVL	1999	0.54	0.03	0.48	0.034	117.1	15.0	102.1	7.8
Fusselman & Montoya - Marble	WRC32	SVL	1999	< 0.01	< 0.01	< 0.01	< 0.01	958.7	< 0.3	958.4	3195.6
	Average - Fusselman & Montoya		**1999**	**0.43**	**0.07**	**0.33**	**0.04**	**352.96**	**10.23**	**342.73**	**808.10**
Hanover-Fierro stock	WRC06	SVL	1999	< 0.01	< 0.01	< 0.01	< 0.01	19.9	< 0.3	19.6	66.2
Hanover-Fierro stock	WRC34	SVL	1999	0.13	< 0.01	0.13	< 0.01	16.5	4.1	12.4	4.1
Hanover-Fierro stock	WRC35	SVL	1999	0.1	0.01	0.09	< 0.01	16.5	2.8	13.7	5.9
	Average - Hanover-Fierro stock		**1999**	**0.08**	**0.01**	**0.08**	**0.01**	**17.61**	**2.39**	**15.23**	**25.37**
Lake Valley	6460-3	SVL	1996	0.5	0.11	0.13	0.26	50.4	4.1	46.3	12.4

Table D-3 Acid/Base Accounting Results for Samples from the Continental Pit (continued)

Formation	Sample Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/ AGP
Lake Valley	6460-3 dup.	SVL	1996	0.56	0.14	0.13	0.29	52.4	4.1	48.3	12.9
Lake Valley	6460-4	SVL	1996	1.22	0.12	0.67	0.43	85.4	20.9	64.4	4.1
Lake Valley	6480-12	SVL	1996	0.43	0.05	0.35	0.03	104.6	10.9	93.6	9.6
Lake Valley	6480-13	SVL	1996	0.39	0.01	0.36	0.02	92.6	11.3	81.3	8.2
	Average- Lake Valley		**1996**	**0.62**	**0.09**	**0.33**	**0.21**	**77.05**	**10.25**	**66.80**	**9.43**
Lake Valley	WRC03	SVL	1999	0.581	0.07	0.5	0.0126	45.4	15.6	29.8	2.9
Lake Valley	WRC27	SVL	1999	0.397	0.09	0.3	0.0126	20.1	9.4	10.7	2.1
Lake Valley - Marble	WRC05	SVL	1999	0.19	0.1	0.06	0.0334	966.8	1.9	964.9	515.6
Lake Valley - Marble	WRC33	SVL	1999	0.174	0.07	0.1	< 0.01	962.2	3.1	959.1	308.4
	Average - Lake Valley		**1999**	**0.34**	**0.08**	**0.24**	**0.02**	**498.61**	**7.50**	**491.11**	**207.27**
	Average - Lake Valley			**0.49**	**0.08**	**0.29**	**0.12**	**264.41**	**9.03**	**255.38**	**97.36**
Oswaldo	6480-13	SVL	1996	0.9	0.49	0.24	0.17	571.2	7.5	563.7	76.2
Oswaldo	6480-15	SVL	1996	0.47	0.12	0.33	0.02	27.9	10.3	17.6	2.7
Oswaldo	6480-15 dup.	SVL	1996	0.45	0.15	0.27	0.03	35.4	8.4	27.0	4.2
Oswaldo	6480-18	SVL	1996	0.49	0.18	0.23	0.08	793.1	7.2	785.9	110.3
Oswaldo	6480-18 dup.	SVL	1996	0.47	0.15	0.23	0.09	795.5	7.2	788.3	110.7
Oswaldo	6480-19	SVL	1996	1.12	0.11	0.96	0.05	182.6	30.0	152.6	6.1
Oswaldo	6460-1	SVL	1996	0.31	< 0.01	0.04	0.3	91.3	1.3	90.1	73.1
Oswaldo	6460-1 dup.	SVL	1996	0.35	0.13	< 0.01	0.36	85.0	< 0.3	84.6	271.8
Oswaldo	6480-22	SVL	1996	0.47	0.22	0.15	0.1	114.3	4.7	109.6	24.4
Oswaldo	6480-23	SVL	1996	1.79	0.28	0.66	0.85	336.8	20.6	316.1	16.3
Oswaldo	6480-10	SVL	1996	0.37	0.19	0.12	0.06	595.0	3.8	591.2	158.7
Oswaldo	6480-10 dup.	SVL	1996	0.32	0.1	0.14	0.08	600.2	4.4	595.9	137.2
Oswaldo	6480-26	SVL	1996	0.72	0.17	0.39	0.16	363.7	12.2	351.5	29.8
Oswaldo	6480-30	SVL	1996	1.31	0.18	1.02	0.11	156.3	31.9	124.4	4.9
Oswaldo	6480-31	SVL	1996	0.97	0.18	0.6	0.19	122.1	18.8	103.4	6.5
	Average- Oswaldo		**1996**	**0.70**	**0.18**	**0.36**	**0.18**	**324.69**	**11.23**	**313.46**	**68.86**
Oswaldo- Parting Shale	WRC25	SVL	1999	0.125	0.01	0.12	< 0.01	30.8	3.8	27.1	8.2
Oswaldo- Parting Shale	WRC26	SVL	1999	0.0696	0.03	0.03	< 0.01	28.6	0.9	27.6	30.5
	Average- Oswaldo- Parting Shale		**1999**	**0.10**	**0.02**	**0.08**	**0.01**	**29.70**	**2.34**	**27.36**	**19.35**
	Average- Oswaldo			**0.63**	**0.16**	**0.33**	**0.16**	**289.98**	**10.18**	**279.80**	**63.03**
Percha	6520-21	SVL	196	0.7	0.07	0.6	0.03	117.5	18.8	98.8	6.3
Percha	6520-21 dup.	SVL	1996	0.69	0.05	0.63	0.01	122.0	19.7	102.3	6.2
Percha	6520-22	SVL	1996	0.87	0.08	0.7	0.09	84.9	21.9	63.0	3.9
	Average- Percha		**1996**	**0.75**	**0.07**	**0.64**	**0.04**	**108.14**	**20.10**	**88.04**	**5.45**
Percha	WRC28	SVL	1999	0.2	0.05	0.15	< 0.01	31.6	4.7	26.9	6.7
Percha	WRC29	SVL	1999	0.208	0.04	0.16	< 0.01	17.7	5.0	12.7	3.5
	Average- Percha		**1999**	**0.20**	**0.05**	**0.16**	**0.01**	**24.66**	**4.84**	**19.82**	**5.14**
	Average- Percha			**0.53**	**0.06**	**0.45**	**0.03**	**74.75**	**14.00**	**60.75**	**5.33**

Table D-3 Acid/Base Accounting Results for Samples from the Continental Pit (continued)

Formation	Sample	Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/ AGP
Syrena	6800-10		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	23.4	< 0.3	23.1	74.8
Syrena	6780-2		SVL	1996	0.3	< 0.01	0.25	0.05	54.4	7.8	46.5	7.0
Syrena	6500-20		SVL	1996	1.47	0.04	0.93	0.5	162.6	29.1	133.6	5.6
Syrena	6780-5		SVL	1996	0.7	0.05	0.65	< 0.01	47.9	20.3	27.6	2.4
Syrena	6780-6		SVL	1996	0.78	0.02	0.74	0.02	47.0	23.1	23.8	2.0
Syrena	6500-21		SVL	1996	0.72	0.31	0.07	0.34	83.6	2.2	81.4	38.2
Syrena	6780-7		SVL	1996	0.62	0.26	< 0.01	0.39	46.3	< 0.3	46.0	148.3
Syrena	6780-8		SVL	1996	0.68	0.37	< 0.01	0.33	28.0	< 0.3	27.6	89.5
Syrena	6780-9		SVL	1996	0.7	0.08	0.62	< 0.01	42.4	19.4	23.0	2.2
Syrena	6780-10		SVL	1996	0.68	0.09	0.54	0.05	27.4	16.9	10.5	1.6
Syrena	6780-11		SVL	1996	0.37	0.06	0.2	0.11	31.8	6.3	25.6	5.1
Syrena	6760-1		SVL	1996	0.32	0.02	0.19	0.11	60.7	5.9	54.8	10.2
Syrena	6760-2		SVL	1996	0.49	0.06	0.28	0.15	53.6	8.8	44.9	6.1
Syrena	6760-2		SVL	1996	0.44	0.02	0.27	0.15	48.2	8.4	39.7	5.7
Syrena	6780-12		SVL	1996	0.2	< 0.01	0.17	0.03	53.7	5.3	48.4	10.1
Syrena	6760-7		SVL	1996	0.61	< 0.01	0.55	0.06	62.9	17.2	45.7	3.7
Syrena	6760-9		SVL	1996	0.99	< 0.01	0.98	0.01	73.7	30.6	43.1	2.4
Syrena	6760-10		SVL	1996	0.92	< 0.01	0.86	0.06	113.0	26.9	86.1	4.2
	Average- Syrena			**1996**	**0.61**	**0.08**	**0.41**	**0.13**	**58.92**	**12.72**	**46.20**	**23.28**
	Average- Continental Pit				**0.87**	**0.11**	**0.68**	**0.10**	**121.75**	**21.10**	**100.64**	**51.54**

1 Based on geologic modeling; 3% Colorado+Beartooth+Abo Fms; 14% granodiorite stock; 3% El Paso+Bliss Fms; 8% marble; 16% Oswaldo Fm; 4% Parting shale; 5% Augen+Percha Fms; 8% Lake Valley Fm; 22% Syrena Fm; 11% Fusselman+Montoya Fms

* Kinetic test performed on this sample.

Sulfate sulfur calculated from HCl-extractable sulfur; pyritic sulfur calculated from HNO3-extractable sulfur.

When ANP or AGP values were less than the detection limit, the detection limit was used in NNP and ANP/AGP calculations.

dup.= duplicate sample

Averages do not include duplicate samples.

Table D-4 Acid/Base Accounting Results for Samples from Hanover Mountain (continued)

Formation	Sample	Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	AGP (Peroxide) (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/ AGP (T CaCO3 /kT)
					1								
	HANOVER MOUNTAIN												
	drill hole samples												
	COLORADO LEACH CAP		SVL	1996									
Colorado, leach cap	93-06: 20-30		SVL	1996	0.14	0.09	0.05	< 0.01	3.69	1.56		2.13	2.36
Colorado, leach cap	93-06: 30-50		SVL	1996	0.12	0.09	0.03	< 0.01	3.69	0.94		2.75	3.94
Colorado, leach cap	93-06: 50-70		SVL	1996	0.27	0.16	0.10	0.01	3.69	3.13		0.57	1.18
Colorado, leach cap	93-06: 70-90		SVL	1996	0.13	0.08	0.05	< 0.01	3.69	1.56		2.13	2.36
Colorado, leach cap	93-06: 90-110		SVL	1996	0.10	0.10	< 0.01	< 0.01	3.69	0.31		3.38	11.81
Colorado, leach cap	93-17: 20-35		SVL	1996	0.08	0.06	< 0.01	0.02	0.50	0.31		0.19	1.60
Colorado, leach cap	93-17: 35-55		SVL	1996	0.05	0.03	< 0.01	0.02	0.50	0.31		0.19	1.60
Colorado, leach cap	93-17: 35-55 dup.		SVL	1996	0.05	0.03	< 0.01	0.02	0.50	0.31		0.19	1.60
Colorado, leach cap	93-17: 55-75		SVL	1996	0.03	0.02	< 0.01	0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	93-17: 75-95		SVL	1996	0.09	0.01	< 0.01	0.08	0.50	0.31		0.19	1.60
Colorado, leach cap	93-17: 95-115		SVL	1996	0.06	0.04	< 0.01	0.02	0.50	0.31		0.19	1.60
Colorado, leach cap	93-17: 115-135		SVL	1996	0.03	0.02	< 0.01	0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	93-17: 135-155		SVL	1996	0.05	0.03	0.01	0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	93-17: 155-175		SVL	1996	0.21	0.04	< 0.01	0.17	0.50	0.31		0.19	1.60
Colorado, leach cap	94-50: 20-30		SVL	1996	0.23	0.04	0.19	< 0.01	0.30	5.94		-5.64	0.05
Colorado, leach cap	94-50: 30-40		SVL	1996	0.07	0.02	0.05	< 0.01	0.30	1.56		-1.26	0.19
Colorado, leach cap	94-50: 40-50		SVL	1996	0.10	0.06	0.04	< 0.01	0.30	1.25		-0.95	0.24
Colorado, leach cap	94-50: 50-60		SVL	1996	0.13	0.04	0.09	< 0.01	0.30	2.81		-2.51	0.11
Colorado, leach cap	94-50: 60-70		SVL	1996	0.06	0.03	0.03	< 0.01	0.30	0.94		-0.64	0.32
Colorado, leach cap	94-50: 70-80		SVL	1996	0.03	0.02	0.01	< 0.01	0.30	0.31		-0.01	0.96
Colorado, leach cap	94-50: 80-90		SVL	1996	0.03	0.02	0.01	< 0.01	0.30	0.31		-0.01	0.96
Colorado, leach cap	94-50: 90-100		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	0.30	0.31		-0.01	0.96
Colorado, leach cap	94-50: 100-110		SVL	1996	0.04	0.02	0.02	< 0.01	0.30	0.63		-0.33	0.48
Colorado, leach cap	94-50: 110-120		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	0.30	0.31		-0.01	0.96
Colorado, leach cap	94-50: 120-130		SVL	1996	0.26	0.10	0.16	< 0.01	0.30	5.00		-4.70	0.06
Colorado, leach cap	94-50: 130-140		SVL	1996	0.35	0.13	0.21	0.01	0.30	6.56		-6.26	0.05
Colorado, leach cap	94-50: 140-150		SVL	1996	0.08	0.06	0.02	< 0.01	0.30	0.63		-0.33	0.48
Colorado, leach cap	94-55: 20-40		SVL	1996	0.11	0.07	0.04	< 0.01	3.69	1.25		2.44	2.95
Colorado, leach cap	94-55: 40-60		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	3.69	0.31		3.38	11.81
Colorado, leach cap	94-55: 60-80		SVL	1996	0.05	0.04	0.01	< 0.01	3.69	0.31		3.38	11.81
Colorado, leach cap	94-55: 80-100		SVL	1996	0.56	0.25	0.31	< 0.01	3.69	9.69		-6.00	0.38
Colorado, leach cap	94-59: 20-30		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	3.69	0.31		3.38	11.81
Colorado, leach cap	94-67: 20-30		SVL	1996	0.17	0.03	< 0.01	0.14	0.50	0.31		0.19	1.60
Colorado, leach cap	94-67: 20-30 dup.		SVL	1996	0.18	0.04	< 0.01	0.14	0.50	0.31		0.19	1.60
Colorado, leach cap	94-67: 30-40		SVL	1996	0.03	0.01	< 0.01	0.02	0.50	0.31		0.19	1.60
Colorado, leach cap	94-67: 40-50		SVL	1996	0.09	0.05	< 0.01	0.04	0.50	0.31		0.19	1.60
Colorado, leach cap	94-67: 50-60		SVL	1996	0.07	0.05	< 0.01	0.02	0.50	0.31		0.19	1.60
Colorado, leach cap	94-67: 60-70		SVL	1996	1.07	0.88	0.04	0.15	0.50	1.25		-0.75	0.40
Colorado, leach cap	94-90: 25-30		SVL	1996	0.04	0.01	0.01	0.02	1.25	0.31		0.94	4.00
Colorado, leach cap	94-90: 30-40		SVL	1996	0.04	0.02	< 0.01	0.02	0.30	0.31		-0.01	0.96
Colorado, leach cap	94-90: 40-50		SVL	1996	0.09	0.03	0.05	0.01	0.30	1.56		-1.26	0.19
Colorado, leach cap	94-90: 50-60		SVL	1996	0.07	0.03	0.04	< 0.01	0.30	1.25		-0.95	0.24
Colorado, leach cap	94-90: 60-70		SVL	1996	0.14	0.03	0.10	< 0.01	0.30	3.13		-2.83	0.10
Colorado, leach cap	94-90: 70-80		SVL	1996	0.17	0.06	0.10	0.01	0.30	3.13		-2.83	0.10
Colorado, leach cap	94-90: 80-90		SVL	1996	0.15	0.02	0.13	< 0.01	0.75	4.06		-3.31	0.18
Colorado, leach cap	94-90: 90-100		SVL	1996	0.12	0.08	0.04	< 0.01	0.30	1.25		-0.95	0.24
Colorado, leach cap	95-135: 20-30		SVL	1996	0.21	0.04	0.14	0.03	0.50	4.38		-3.88	0.11
Colorado, leach cap	95-135: 30-40		SVL	1996	0.54	0.11	0.40	0.03	0.50	12.50		-12.00	0.04
Colorado, leach cap	95-135: 40-50		SVL	1996	1.27	0.20	1.01	0.06	0.50	31.56		-31.06	0.02
Colorado, leach cap	95-135: 60-80		SVL	1996	0.28	0.06	0.21	< 0.01	0.50	6.56		-6.06	0.08
Colorado, leach cap	CF-148: 5-15		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-148: 5-15 dup.		SVL	1996	< 0.01	0.01	< 0.01	< 0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-148: 15-25		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-148: 25-35		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-148: 35-45		SVL	1996	0.10	0.01	< 0.01	0.09	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-148: 45-55		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-156: 0-14		SVL	1996	0.01	< 0.01	< 0.01	0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-156: 14-23		SVL	1996	0.03	0.02	< 0.01	< 0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-156: 23-33		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-156: 33-43		SVL	1996	0.20	0.03	0.17	< 0.01	0.50	5.31		-4.81	0.09
Colorado, leach cap	CF-156: 43-53		SVL	1996	0.23	0.00	0.20	< 0.01	0.50	6.25		-5.75	0.08
Colorado, leach cap	CF-156: 53-63		SVL	1996	0.14	0.01	0.13	< 0.01	0.50	4.06		-3.56	0.12
Colorado, leach cap	CF-156: 63-73		SVL	1996	0.38	0.06	0.32	< 0.01	0.50	10.00		-9.50	0.05

Table D-4 Acid/Base Accounting Results for Samples from Hanover Mountain (continued)

Formation	Sample	Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	AGP (Peroxide) (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/ AGP (T CaCO3 /kT)
Colorado, leach cap	CF-156: 73-83		SVL	1996	0.39	0.06	0.33	< 0.01	0.50	10.31		-9.81	0.05
Colorado, leach cap	CF-156: 83-93		SVL	1996	0.09	0.02	< 0.01	0.07	0.50	0.31		0.19	1.60
Colorado, leach cap	CF-156: 93-103		SVL	1996	0.54	0.06	0.47	0.01	0.50	14.69		-14.19	0.03
	Average-Colorado Leach Cap		**SVL**	**1996**	**0.16**	**0.06**	**0.09**	**0.02**	**0.94**	**2.66**		**-1.72**	**1.69**
	HANOVER MOUNTAIN- LEACH CAP		Core	1996									
Colorado - Leach Cap	LC-1	Colorado, 94-46 (30-80'), 93-7 (100-150'). Gener	Core	1996	0.07	< 0.01	0.03	0.04	0.10	0.94	0.30	-0.84	0.11
Colorado - Leach Cap	LC-2	Dioritic dike, 94-72 (30-80'). Dike in leach cap	Core	1996	0.02	< 0.01	0.02	< 0.01	13.40	0.63	0.30	12.78	21.44
Colorado - Leach Cap	CF163*	CF-163 (0-42'); 80-100% oxidized; 4:1 hornfels+	Core	1996	0.09	0.06	0.01	0.02	1.20	0.31	0.30	0.89	3.84
Colorado - Leach Cap	CF175*	CF-175 (0-65'); 95-100% oxidized; similar clastic	Core	1996	0.13	0.05	< 0.01	0.07	0.80	0.31	0.30	0.49	2.56
Colorado - Leach Cap	CF164*	CF-164 (0-73.6'); 95-100% oxidized; similar clas	Core	1996	0.19	0.28	< 0.01	< 0.01	0.20	0.31	0.30	-0.11	0.64
Colorado - Leach Cap	CF161*	CF-161 (0-67'); 95-100% oxidized; similar clastic	Core	1996	0.10	0.04	< 0.01	0.06	1.20	0.31	0.30	0.89	3.84
Colorado - Leach Cap	CF183*	CF-183 (0-68'); 95-100% oxidized; similar clastic	Core	1996	0.46	0.52	< 0.01	< 0.01	1.20	0.31	0.30	0.89	3.84
	Average- Hanover Leach Cap		**Core**	**1996**	**0.15**	**0.14**	**0.01**	**0.03**	**2.59**	**0.45**		**2.14**	**5.16**
	UNOXIDIZED COLORADO FORMATION		SVL	1996									
Colorado	94-59: 30-40		SVL	1996	0.94	0.48	0.46	< 0.01	3.69	14.38		-10.69	0.26
Colorado	94-59: 45-50		SVL	1996	2.81	1.11	1.55	0.15	8.13	48.44		-40.31	0.17
Colorado	94-90: 100-110		SVL	1996	0.34	0.09	0.23	0.02	0.30	7.19		-6.89	0.04
Colorado	94-90: 110-115		SVL	1996	0.49	0.13	0.33	0.03	0.30	10.31		-10.01	0.03
Colorado, pyritic	94-49: 90-100		SVL	1996	0.99	0.44	0.55	< 0.01	3.69	17.19		-13.50	0.21
Colorado, pyritic	94-49: 100-110		SVL	1996	0.95	0.40	0.55	< 0.01	6.40	17.19		-10.79	0.37
Colorado, pyritic	94-49: 110-120		SVL	1996	1.06	0.48	0.58	< 0.01	7.64	18.13		-10.49	0.42
Colorado, pyritic	94-49: 110-120 dup.		SVL	1996	1.09	0.47	0.62	< 0.01	3.69	19.38		-15.69	0.19
Colorado, pyritic	94-49: 120-130		SVL	1996	0.95	0.44	0.51	< 0.01	3.69	15.94		-12.25	0.23
Colorado, pyritic	94-64: 60-70		SVL	1996	0.20	0.04	0.16	< 0.01	4.64	5.00		-0.36	0.93
Colorado, pyritic	94-64: 70-80		SVL	1996	0.17	0.02	0.15	< 0.01	5.41	4.69		0.72	1.15
Colorado, pyritic	94-64: 80-90		SVL	1996	0.85	0.08	0.77	< 0.01	3.09	24.06		-20.97	0.13
Colorado, pyritic	94-67: 120-130		SVL	1996	0.50	0.03	0.41	0.06	1.48	12.81		-11.33	0.12
Colorado, pyritic	94-67: 130-140		SVL	1996	0.87	0.07	0.68	0.12	6.41	21.25		-14.84	0.30
Colorado, pyritic	95-133: 640-650		SVL	1996	2.40	0.22	2.12	0.06	0.50	66.25		-65.75	0.01
Colorado, pyritic	95-133: 660-670		SVL	1996	2.45	0.08	2.23	0.14	0.50	69.69		-69.19	0.01
Colorado, pyritic	95-133: 670-680		SVL	1996	1.03	0.05	0.97	0.01	0.50	30.31		-29.81	0.02
Colorado	95-133: 680-690		SVL	1996	0.66	0.07	0.56	0.03	0.50	17.50		-17.00	0.03
	Average- Unoxidized Colorado Formation		**SVL**	**1996**	**1.04**	**0.26**	**0.75**	**0.04**	**3.36**	**23.32**		**-20.20**	**0.26**
-	HANOVER MOUNTAIN- UNOXIDIZED COLORADO FORMATION		Core	1996									
Colorado - Un-oxidized	Waste-1	Colorado, 94-46 (450-500'). General Colo. Fm.,	Core	1996	2.19	< 0.01	1.86	0.33	6.90	58.13	12.90	-51.23	0.12
Colorado - Un-oxidized	Waste-2	Colorado, 94-67 (230-280'). Medium sulfides, so	Core	1996	1.27	< 0.01	0.97	0.30	86.40	30.31	5.60	56.09	2.85
Colorado - Un-oxidized	Waste-3	Colorado, 94-61 (320-370'). High sulfides, north	Core	1996	2.62	< 0.01	2.23	0.39	15.20	69.69	15.00	-54.49	0.22
Colorado - Un-oxidized	CF172*	CF-172 (302-370'); <5% oxidized; primary min.	Core	1996	18.46	0.03	13.10	5.39	1.00	409.38	67.00	-408.38	0.00
Colorado - Un-oxidized	CF144*	CF-144 (91-164'); mixed oxides and sulfides	Core	1996	2.46	< 0.01	0.90	1.56	2.00	28.13	21.20	-26.13	0.07
Colorado - Un-oxidized	CF177*	CF-177 (173-275'); <10% oxidized; supergene c	Core	1996	4.56	0.04	1.37	3.15	4.40	42.81	33.00	-38.41	0.10
Colorado - Un-oxidized	Ore-1	Colorado, chalcocite ore, 94-46 (130-180'), 93-0	Core	1996	2.39	< 0.01	1.95	0.44	1.40	60.94	8.40	-59.54	0.02
	Average- Unoxidized Colorado Formation		**Core**	**1996**	**4.85**	**0.02**	**3.20**	**1.65**	**16.76**	**99.91**		**-83.15**	**0.48**
	Average- Unoxidized Colorado Formation				**2.11**	**0.19**	**1.43**	**0.49**	**7.11**	**44.76**		**-37.65**	**0.32**
Colorado- chalcocite zone	WRC07		SVL	1999	2.49	0.28	2.19	0.02	0.50	68.44		-67.94	0.01
Colorado- chalcocite zone	WRC08		SVL	1999	1.19	0.14	1.04	0.01	0.50	32.50		-32.00	0.02
Colorado Formation	WRC99-2		SVL	1999	1.32	0.12	1.18	0.02	4.22	36.90		-32.68	0.11
Colorado Formation	WRC99-3		SVL	1999	0.05	0.04	0.01	< 0.01	0.50	0.31		0.19	1.61
	Average Colorado - Calcocite/Colorado Fm				**1.26**	**0.15**	**1.11**	**0.02**	**1.43**	**34.54**		**-33.11**	**0.44**
Barringer Fault zone	94-74: 20-30		SVL	1996	0.01	< 0.01	< 0.01	< 0.01	20.21	0.31		19.90	64.67
Barringer Fault zone	94-74: 30-40		SVL	1996	0.01	< 0.01	< 0.01	< 0.01	5.92	0.31		5.61	18.94
Barringer Fault zone	94-74: 40-50		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	9.86	0.31		9.55	31.55
Barringer Fault zone	94-74: 50-60		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	11.83	0.31		11.52	37.86
Barringer Fault zone	94-78: 60-70		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	7.40	0.31		7.09	23.68
Barringer Fault zone	94-78: 60-70 dup.		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	6.50	0.31		6.19	20.80
Barringer Fault zone	94-78: 70-80		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	5.50	0.31		5.19	17.60
Barringer Fault zone	94-78: 80-90		SVL	1996	0.12	0.03	0.05	0.04	0.30	1.56		-1.26	0.19
Barringer Fault zone	94-78: 90-100		SVL	1996	0.07	0.02	0.03	0.02	0.30	0.94		-0.64	0.32

Table D-4 Acid/Base Accounting Results for Samples from Hanover Mountain (continued)

Formation	Sample	Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	AGP (Peroxide) (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/ AGP (T CaCO3 /kT)
Barringer Fault zone	94-78: 100-110		SVL	1996	0.16	0.04	0.10	0.02	0.30	3.13		-2.83	0.10
Barringer Fault zone	94-78: 110-120		SVL	1996	4.55	0.19	4.06	0.30	0.30	126.88		-126.58	0.00
Barringer Fault zone	94-78: 120-130		SVL	1996	0.50	< 0.01	0.48	0.02	0.30	15.00		-14.70	0.02
Barringer Fault zone	94-78: 130-140		SVL	1996	0.55	0.04	0.46	0.05	2.10	14.38		-12.28	0.15
Barringer Fault zone	94-78: 140-150		SVL	1996	0.26	0.02	0.22	0.02	7.45	6.88		0.58	1.08
Barringer Fault zone	94-78: 150-160		SVL	1996	0.02	< 0.01	0.02	< 0.01	8.00	0.63		7.38	12.80
Barringer Fault zone	94-78: 160-170		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	6.00	0.31		5.69	19.20
Barringer Fault zone	94-78: 170-180		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	5.50	0.31		5.19	17.60
Barringer Fault zone	94-78: 180-190		SVL	1996	1.65	0.05	1.43	0.17	0.75	44.69		-43.94	0.02
Barringer Fault zone	94-78: 190-200		SVL	1996	1.62	0.02	1.45	0.15	1.25	45.31		-44.06	0.03
Barringer Fault zone	94-78: 200-210		SVL	1996	1.66	0.12	1.51	0.03	2.50	47.19		-44.69	0.05
Barringer Fault zone	94-78: 210-220		SVL	1996	2.14	0.06	2.00	0.08	1.10	62.50		-61.40	0.02
Barringer Fault zone	94-78: 220-230		SVL	1996	18.80	2.80	15.83	0.17	0.75	494.69		-493.94	0.00
Barringer Fault zone	94-78: 230-240		SVL	1996	5.15	1.40	3.55	0.20	2.25	110.94		-108.69	0.02
Barringer Fault zone	94-78: 240-250		SVL	1996	4.21	0.05	4.02	0.14	3.50	125.63		-122.13	0.03
Barringer Fault zone	94-78: 250-260		SVL	1996	6.99	0.38	6.24	0.37	6.75	195.00		-188.25	0.03
Barringer Fault zone	94-78: 250-260 dup.		SVL	1996	7.48	0.80	6.37	0.31	2.65	199.06		-196.41	0.01
Barringer Fault zone	94-79: 120-130		SVL	1996	6.55	0.03	6.49	0.03	73.02	202.81		-129.79	0.36
Barringer Fault zone	94-79: 130-140		SVL	1996	1.97	0.11	1.86	< 0.01	96.65	58.13		38.53	1.66
Barringer Fault zone	94-79: 140-150		SVL	1996	7.95	0.12	7.76	0.07	122.42	242.50		-120.08	0.50
Barringer Fault zone	94-79: 150-160		SVL	1996	0.80	0.03	0.73	0.04	38.92	22.81		16.11	1.71
Barringer Fault zone	94-79: 150-160 dup.		SVL	1996	0.80	0.02	0.77	0.01	38.14	24.06		14.08	1.59
Barringer Fault zone	94-80: 20-30		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	23.40	0.31		23.09	74.88
Barringer Fault zone	94-80: 30-40		SVL	1996	0.06	0.02	0.04	< 0.01	26.35	1.25		25.10	21.08
Barringer Fault zone	94-80: 40-50		SVL	1996	0.10	< 0.01	0.10	< 0.01	10.59	3.13		7.47	3.39
Barringer Fault zone	94-80: 50-60		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	14.29	0.31		13.98	45.73
Barringer Fault zone	94-80: 60-70		SVL	1996	0.10	0.02	0.08	< 0.01	17.00	2.50		14.50	6.80
Barringer Fault zone	94-80: 70-80		SVL	1996	0.18	< 0.01	0.18	< 0.01	13.05	5.63		7.43	2.32
Barringer Fault zone	94-80: 85-90		SVL	1996	0.99	0.74	0.25	< 0.01	15.02	7.81		7.21	1.92
Barringer Fault zone	94-80: 90-100		SVL	1996	2.21	0.59	1.82	< 0.01	46.31	56.88		-10.57	0.81
Barringer Fault zone	95-181: 20-30		SVL	1996	< 0.01	< 0.01	< 0.01	< 0.01	2.46	0.31		2.15	7.87
Barringer Fault zone	95-181: 30-40		SVL	1996	0.05	0.03	0.02	< 0.01	0.00	0.63		-0.63	0.00
Barringer Fault zone	95-181: 30-40 dup.		SVL	1996	0.05	0.04	0.01	< 0.01	0.25	0.31		-0.06	0.80
Barringer Fault zone	95-181: 40-50		SVL	1996	0.08	0.03	0.05	< 0.01	14.78	1.56		13.22	9.46
Barringer Fault zone	95-181: 50-60		SVL	1996	0.40	0.19	0.21	< 0.01	13.05	6.56		6.49	1.99
Barringer Fault zone	95-181: 60-70		SVL	1996	2.82	0.58	2.10	0.14	6.16	65.63		-59.47	0.09
	Average- Barringer Fault Zone		**SVL**	**1996**	**1.80**	**0.19**	**1.56**	**0.06**	**15.36**	**48.90**		**-33.54**	**9.99**
Barringer Fault	Waste-4	Barringer Fault Zone, 94-73 (200-250'). High min Core		1996	6.10	< 0.01	3.95	2.15	160.00	123.44	31.00	36.56	1.30
Barringer fault zone	WRC11		SVL	1999	1.40	0.23	1.14	0.03	76.02	35.63		40.39	2.13
	Average- Barringer Fault Zone				**1.89**	**0.19**	**1.61**	**0.10**	**19.73**	**50.20**		**-30.47**	**9.64**
Syrena Formation	WRC99-1		SVL	1999	2.66	0.32	2.31	0.03	39.90	72.20		-32.30	0.55
Syrena Formation (dup)	WRC99-1		SVL	1999	2.70	0.28	2.39	0.03	37.60	74.70		-37.10	0.50
	Average- Syrena Formation				**2.68**	**0.30**	**2.35**	**0.03**	**38.75**	**73.45**		**-34.70**	**0.53**
	Average- Hanover Mountain				**1.08**	**0.13**	**0.84**	**0.13**	**8.40**	**26.11**		**-17.71**	**4.05**

Sulfate sulfur calculated from HCl-extractable sulfur; pyritic sulfur calculated from HNO3-extractable sulfur.
When ANP or AGP was less than the detection limit, the detection limit was used to calculate NNP and ANP/AGP.
dup.= duplicate sample
Averages do not include duplicate samples.

1 Based on geologic modeling; 3% Colorado+Beartooth+Abo Fms; 14% granodiorite stock; 3% El Paso+Bliss Fms; 8% marble; 16% Oswaldo Fm; 4% Parting shale; 5% Augen+Percha Fms; 8% Lake Valley Fm; 22% Syrena Fm; 11% Fusselman+Montoya Fms
* Kinetic test performed on this sample.

Table D-5 Acid/Base Accounting Results for Samples of Waste Rock and Tailings (continued)

Sample	Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/ AGP (T CaCO3 /kT)
SOUTH WRDF		Core	1996								
ED-1	South WRDF, 0-30 feet	Core	1996	0.99	0.02	0.23	0.74	153.00	7.19	145.81	21.29
ED-2	South WRDF, 30-60 feet	Core	1996	0.40	< 0.01	0.37	0.03	153.00	11.56	141.44	13.23
ED-3	South WRDF, 60-90 feet	Core	1996	1.46	< 0.01	0.19	1.27	243.00	5.94	237.06	40.93
ED-4	South WRDF, 90-120 feet	Core	1996	0.86	< 0.01	0.11	0.75	163.00	3.44	159.56	47.42
Average- South WRDF		**Core**	**1996**	**0.93**	**< 0.01**	**0.23**	**0.70**	**178.00**	**7.03**	**170.97**	**30.72**
WEST WRDF		Core	1996								
WD-1	West WRDF, composite of drill holes 95D-5, 6, 7, 8	Core	1996	1.19	0.27	0.06	0.86	146.00	1.88	144.13	77.87
WD-2	West WRDF, composite of drill holes 95D-4, 9, 10, 11	Core	1996	1.16	0.25	0.06	0.85	22.60	1.88	20.73	12.05
WD-3	West WRDF, composite of drill holes 95D-2, 3, 12, 15	Core	1996	0.91	0.23	0.03	0.65	28.60	0.94	27.66	30.51
WD-4	West WRDF, composite of drill holes 95D-1, 13, 14, 15	Core	1996	0.78	0.16	0.13	0.49	20.70	4.06	16.64	5.10
Average- West WRDF		**Core**	**1996**	**1.01**	**0.23**	**0.07**	**0.71**	**54.48**	**2.19**	**52.29**	**31.38**
WEST WRDF-SVL samples		SVL	1996								
95D-04		SVL	1996	1.20	0.33	0.85	0.02	27.55	26.56	0.99	1.04
95D-04 dup.		SVL	1996	1.20	0.30	0.87	0.03	28.77	27.19	1.58	1.06
95D-05		SVL	1996	1.13	0.38	0.73	0.02	27.34	22.81	4.53	1.20
95D-06		SVL	1996	1.45	0.15	1.30	< 0.01	188.45	40.63	147.83	4.64
95D-07		SVL	1996	1.10	0.39	0.71	< 0.01	233.48	22.19	211.29	10.52
95D-08		SVL	1996	1.47	0.44	1.03	< 0.01	124.28	32.19	92.09	3.86
95D-09		SVL	1996	1.14	0.39	0.75	< 0.01	25.51	23.44	2.07	1.09
95D-10		SVL	1996	1.59	0.27	1.32	< 0.01	61.93	41.25	20.68	1.50
95D-11		SVL	1996	0.97	0.41	0.56	< 0.01	16.84	17.50	-0.66	0.96
95D-18		SVL	1996	1.56	0.21	1.35	< 0.01	104.07	42.19	61.88	2.47
95D-19		SVL	1996	1.31	0.22	1.08	0.01	141.62	33.75	107.87	4.20
95D-19 dup.		SVL	1996	1.24	0.10	1.10	0.04	141.31	34.38	106.94	4.11
95D-20		SVL	1996	1.11	0.17	0.90	0.04	99.48	28.13	71.36	3.54
95D-21		SVL	1996	1.05	0.51	0.54	< 0.01	23.47	16.88	6.60	1.39
95D-22		SVL	1996	1.26	0.30	0.95	0.01	71.83	29.69	42.14	2.42
95D-23		SVL	1996	1.53	0.20	1.30	0.03	95.09	40.63	54.47	2.34
95D-24		SVL	1996	1.55	0.36	1.17	0.02	60.91	36.56	24.35	1.67
95D-25		SVL	1996	1.68	0.46	1.19	0.03	12.65	37.19	-24.54	0.34
Average- West WRDF-SVL Samples		**SVL**	**1996**	**1.31**	**0.31**	**0.98**	**0.02**	**82.48**	**30.73**	**51.43**	**2.69**
Continental Future Waste Rock											
OPM-1	Composite[1]	CORE	1996	1.34	< 0.01	0.14	1.20	169.00	4.40	164.60	38.60
OPM-2	Composite1	CORE	1996	1.34	< 0.01	0.13	1.21	199.00	4.10	194.90	49.00
OPM-3	Composite1	CORE	1996	1.30	< 0.01	0.30	1.00	187.00	9.40	177.60	19.90
OPM-4	Composite1	CORE	1996	1.24	< 0.01	0.21	1.03	187.00	6.60	180.40	28.50
Average Continental Future Waste Rock				1.30	0.01	0.20	1.11	185.50	6.13	179.38	34.00
Average- West WRDF				**1.25**	**0.30**	**0.82**	**0.14**	**77.39**	**25.54**	**51.85**	**7.90**
Continental Final Tailings											

Table D-5 Acid/Base Accounting Results for Samples of Waste Rock and Tailings (continued)

Sample	Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/ AGP (T CaCO3 /kT)
FTJ	Final tailings, January	CORE	1996	1.09	0.03	0.23	0.83	158.00	7.20	150.80	22.00
FTF	Final tailings, February	CORE	1996	1.35	0.02	0.21	1.12	155.00	6.60	148.40	23.60
FTM	Final tailings, May	CORE	1996	1.03	< 0.01	0.53	0.50	169.00	16.60	152.40	10.20
FTA	Final tailings, April	CORE	1996	1.41	< 0.01	0.23	1.18	150.00	7.20	142.80	20.90
Average Continental Final Tailings				1.22	0.02	0.30	0.91	158.00	9.40	148.60	19.18

Sulfate sulfur calculated from HCl-extractable sulfur; pyritic sulfur calculated from HNO3-extractable sulfur.
When ANP or AGP was less than the detection limit, the detection limit was used to calculate NNP and ANP/AGP.
dup.= duplicate sample
Averages do not include duplicate samples.

1 Based on geologic modeling; 3% Colorado+Beartooth+Abo Fms; 14% granodiorite stock; 3% El Paso+Bliss Fms; 8% marble; 16% Oswaldo Fm; 4% Parting shale; 5% Augen+Percha Fms; 8% Lake Valley Fm; 22% Syrena Fm; 11% Fusselman+Montoya Fms
* Kinetic test performed on this sample.

Table D-6 Acid/Base Accounting Results for Samples from Humboldt Mountain

Sample	Sample From	Lab	Date	Total S (%)	Sulfate-S (%)	Sulfide-S (%)	Resid. S (%)	ANP (T CaCO3 /kT)	AGP (T CaCO3 /kT)	NNP (T CaCO3 /kT)	ANP/AGP (T CaCO3 /kT)
WRC41	Fusselman & Montoya	SVL	1999	< 0.01	< 0.01	< 0.01	< 0.01	751.04	< 0.30	750.74	2503.46
WRC41	Fusselman & Montoya (dup)	SVL	1999	< 0.01	0.01	< 0.01	< 0.01	753.32	< 0.30	753.02	2511.05
Average- Fusselman & Montoya				**0.01**	**0.01**	**0.01**	**0.01**	**752.18**	**0.30**	**751.88**	**2507.25**
WRC39	Lake Valley	SVL	1999	0.17	0.07	0.10	< 0.01	707.74	3.12	704.62	226.84
WRC44	Lake Valley	SVL	1999	0.26	0.12	0.14	< 0.01	604.17	4.38	599.80	138.10
Average- Lake Valley				**0.21**	**0.10**	**0.12**	**0.01**	**655.95**	**3.75**	**652.21**	**182.47**
WRC37	Oswaldo	SVL	1999	0.14	0.09	0.05	< 0.01	751.54	1.56	749.98	480.99
WRC38	Oswaldo- Parting Shale	SVL	1999	1.48	0.25	1.22	< 0.01	69.94	38.13	31.81	1.83
Average- Oswaldo				**0.81**	**0.17**	**0.64**	**0.01**	**410.74**	**19.84**		**241.41**
WRC40	Percha- Box	SVL	1999	0.87	0.25	0.61	< 0.01	39.30	19.06	20.24	2.06
WRC43	Percha-ReadyPay	SVL	1999	0.51	0.15	0.35	< 0.01	60.21	10.94	49.28	5.51
Average- Percha				**0.69**	**0.20**	**0.48**	**0.01**	**49.76**	**15.00**	**34.76**	**3.78**
WRC42	Syenodiorite	SVL	1999	0.31	0.11	0.19	< 0.01	40.31	5.94	34.37	6.79
WRC36	Syrena	SVL	1999	0.01	0.01	< 0.01	< 0.01	312.21	< 0.30	311.91	1040.72
Average- Humboldt Mountain			**1999**	**0.38**	**0.11**	**0.27**	**0.01**	**408.98**	**8.40**	**400.58**	**691.73**

Table D-7 Comparison of Acid/Base Accounting Results to NAG Test Results

Sample	NNP (T $CaCO_3$/kT)	ANP/AGP	NAG pH	NAG-NNP (pH 4.5) (T $CaCO_3$/kT)	NAG-NNP (pH 7.0) (T $CaCO_3$/kT)
CONTINENTAL PIT- Syrena Formation					
6780-9	23	2.2	8.34	Non-acid forming	
6780-10	11	1.6	8.31	Non-acid forming	
6760-7	46	3.7	7.72	Non-acid forming	
6760-9	43	2.4	7.87	Non-acid forming	
6760-10	86	4	8.20	Non-acid forming	
HANOVER MOUNTAIN- Colorado Formation Leach Cap					
93-06: 30-50	3	4	5.32	Non-acid forming	
94-50: 20-30	-6	0.1	4.03	Non-acid forming	
94-50: 60-70	-0.6	0.3	5.17	Non-acid forming	
94-67: 30-40	0.2	1.6	5.26	Non-acid forming	
94-67: 60-70	-0.8	0.4	4.81	Non-acid forming	
95-135: 40-50	-31	0.02	2.86	10.60	14.24
CF-148: 15-25	0.2	1.6	5.00	Non-acid forming	
HANOVER MOUNTAIN- Unoxidized Colorado Formation					
94-67: 130-140	-15	0.3	3.67	1.62	6.10
95-133: 640-650	-66	0.01	3.22	6.36	14.68

Table D-8 Summary of Humidity Cell Testing Results for Constituents Analyzed Weekly

Sample	Sample From	Sulfide-Sulfur (%)	NNP (T $CaCO_3$/kT)	ANP/AGP	Duration (weeks)	Min. pH	Max. pH	Final pH	Min. SO_4 (mg/L)	Max. SO_4 (mg/L)	Cumul. acidity (mg/Kg)	Cumul. alkalinity (mg/Kg)
CDM (1997) Testing Protocol												
CF163	Hanover Mountain, Colorado Fm., Leach Cap	0.01	0.89	3.84	10	5.24	6.61	5.54	<10	80	6	16
CF175	Hanover Mountain, Colorado Fm., Leach Cap	<0.01	0.49	2.56	10	5.01	5.56	5.50	<10	32	35	0
CF161	Hanover Mountain, Colorado Fm., Leach Cap	<0.01	0.89	3.84	10	6.15	6.73	6.36	<10	14	6	22
CF183	Hanover Mountain, Colorado Fm., Leach Cap	<0.01	0.89	3.84	10	6.13	6.82	6.39	<10	14	7	36
CF164	Hanover Mountain, Colorado Fm., Leach Cap	<0.01	-0.11	0.64	40	4.18	6.01	4.72	<10	570	35.6	0
CF172	Hanover Mountain, Unoxidized Colorado Fm.	13.1	-408.4	0.002	40 *	3.06 *	5.76	3.81	<10	580 *	1730 *	5
CF144	Hanover Mountain, Unoxidized Colorado Fm.	0.9	-26.1	0.07	40	4.54	5.79	4.62	<10	158	54	10
CF177	Hanover Mountain, Unoxidized Colorado Fm.	1.37	-38.4	0.10	30	5.21	5.89	5.35	<10	244	15	4
McClelland/SVL Testing Protocol												
WRC-01	Continental Pit, Colorado Fm.	<0.01	0.2	1.7	20	5.71	8.18	5.92	1	25	13	37
WRC-02	Continental Pit, Abo & Syrena Fm.	0.04	78.5	63.8	20	7.08	8.49	7.99	1	35	0	213
WRC-03	Continental Pit, Lake Valley Fm.	0.5	29.8	2.9	20	7.27	8.64	7.75	10	64	0	206
WRC-04	Continental Pit, Fusselman & Montoya Fm.	0.26	140.3	18.3	20	8.49	9.81	9.28	32	196	0	1960
WRC-05	Continental Pit, Lake Valley Fm.	0.06	964.9	515.6	20	7.94	8.66	8.28	1	28	0	271
WRC-06	Continental Pit,Hanover-Fierro Stock	<0.01	19.6	66.6	20	7.32	8.68	7.66	1	20	0	200
WRC-07	Hanover Mountain, Unoxidized Colorado	2.19	-67.9	0.01	20	3.31	4.73	3.39	146	1206	1208	2
WRC-08	Hanover Mountain, Unoxidized Colorado	1.04	-32.0	0.02	20	4.07	4.75	4.12	95	942	942	4
WRC-09	Hanover Mountain, Colorado Fm., Leach	0.01	-0.3	1.6	20	2.52	4.35	3.88	10	373	485	0
WRC-11	Hanover Mountain, Barringer Fault Zone	1.14	40.4	2.1	20	7.30	8.30	7.46	16	1626	0.8	404
WRC-99	Hanover Mountain, Syrena Fm.	2.31	-32.3	0.6	22	6.47	8.08	7.20	23	280	0	98
WRC-99	Hanover Mountain, Unoxidized Colorado	1.18	-32.7	0.1	22	2.99	5.36	2.99	22	231	33	4
WRC-99	Hanover Mountain, Unoxidized Colorado	0.01	-0.3	1.6	22	3.61	4.27	3.82	8	995	545	0

* Test was innoculated with iron-oxidized bacteria at 32 weeks. Just prior to inoculation, minimum pH was 4.68, maximum SO_4 was 124 mg/L, and total acidity was 0.594 T/kT.

Table D-9 Whole Rock Chemical Compositions

Sample	Sample Source	Date	Laboratory	Constituent (mg/kg)							
				Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium
Continental Pit											
WD-1, WD-2, WD-3, WD-4	West WRDF composite	1995	CORE	17700	<20	10	25	<1	NA	10	2
ED-1, ED-2, ED-3, ED-4	South WRDF composite	1995	CORE	11100	<50	<30	15	<3	NA	<30	5
OP-1, OP-2, OP-3, OP-4	Future waste rock composite[1]	1995	CORE	8900	<20	20	36	<1	NA	10	<1
FTJ, FTF, FTM, FTA	Final tailings composite	1995	CORE	7110	<50	<30	5	<3	NA	<30	<3
WRC-01	Colorado Formation	1999	SVL	57100	<24	<40	552	<2.0	59	NA	<2.0
WRC-02	Abo & Syrena Formation	1999	SVL	51600	<24	<40	209	<2.0	63	NA	<2.0
WRC-03	Lake Valley Formation	1999	SVL	23500	<24	<40	16.7	<2.0	47	NA	<2.0
WRC-04	Fusselman & Montoya Formation	1999	SVL	17200	<24	<40	31.6	<2.0	54	NA	<2.0
WRC-05	Lake Valley Formation	1999	SVL	360	<24	<40	<2.0	<2.0	33	NA	<2.0
WRC-06	Hanover-Fierro	1999	SVL	65900	<24	<40	1040	<2.0	<27	NA	<2.0
Hanover Mountain											
LC-1	Colorado Formation Leach Cap	1995	CORE	5150	<10	<5	58	<0.5	NA	<5	<0.5
Waste-1	Unoxidized Colorado Formation (low sulfide)	1995	CORE	10700	<20	<10	65	<1	NA	<10	<1
Waste-3	Unoxidized Colorado Formation (high sulfide).	1995	CORE	19500	<50	<20	100	<2	NA	<20	<2
Waste-4	Barringer Fault Zone (mineralized)	1995	CORE	8320	150	<20	<5	<2	NA	<20	<2
WRC-07	Unoxidized Colorado Formation	1999	SVL	51700	<24	<40	296	<2.0	56		<2.0
WRC-08	Unoxidized Colorado Formation	1999	SVL	77900	<24	<40	634	<2.0	66		<2.0
WRC-09	Colorado Formation Leach Cap	1999	SVL	68100	<24	<40	602	<2.0	<27		<2.0
WRC-11	Barringer Fault Zone	1999	SVL	47400	<24	<40	41.6	<2.0	<27		<2.0
WRC-99-1	Syrena Formation	1999	SVL	68000	<24	<40	112	<2.0	<27		<2.0
WRC-99-2	Unoxidized Colorado Formation	1999	SVL	77200	<24	<40	684	<2.0	<27		<2.0
WRC-99-3	Unoxidized Colorado Formation	1999	SVL	73400	<24	75	712	<2.0	35		<2.0
Magnetite Tailings											
Mag-1	Magnetite tailings composite	1994/1995	Chemax	6500	<2	22	<10	<0.5	NA	NA	<0.5
Mag-1	Magnetite tailings composite	1994/1995	Chemax	3866	NA	NA	95	NA	NA	NA	NA

[1] Colorado+Beartooth+Abo Fms 3%; granodiorite stock 14%; El Paso+Bliss Fms 3%; marble 8%; Oswaldo Fm16%; Parting shale 4%;
NA = not available

Table D-9 Whole Rock Chemical Compositions (continued)

Sample	Constituent (mg/kg)													
	Calcium	Chromium	Cobalt	Copper	Gallium	Iron	Lanthanum	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel
Continental Pit														
WD-1, WD-2, WD-3, WD-4	23900	29	19	1040	NA	29500	NA	30	<2	5200	1150	<0.10	<10	17
ED-1, ED-2, ED-3, ED-4	52400	26	20	2200	NA	48000	NA	50	<5	32200	2230	<0.10	130	<20
OP-1, OP-2, OP-3, OP-4	59000	26	14	2760	NA	35600	NA	60	<2	16200	1630	<0.10	100	20
FTJ, FTF, FTM, FTA	64900	15	40	1380	NA	104000	NA	30	<5	23200	2520	<0.10	110	<20
WRC-01	157	44.1	9.8	73.3	<33	12300	25.2	<40	5.5	1830	33.9	<0.1	<3.0	<16
WRC-02	105000	161	19.1	389	<33	36800	71.5	<40	5.1	20800	2130	<0.1	<3.0	36
WRC-03	67800	55.0	43.4	1360	<33	184000	33.9	<40	<5.0	14900	2760	<0.1	<3.0	<16
WRC-04	25800	<8.0	33.6	1460	<33	132000	<8.0	<40	<5.0	86800	4890	<0.1	<3.0	<16
WRC-05	330000	<3.0	13.4	89.7	<33	3330	52.3	<40	<5.0	2290	426	<0.1	<3.0	<16
WRC-06	17600	56.0	16.7	58.5	<33	20500	19.0	<40	<5.0	6100	267	<0.1	<3.0	<16
Hanover Mountain														
LC-1	190	18	<3	159	NA	15000	NA	7	NA	270	9	<0.10	10	<4
Waste-1	1050	34	18	1130	NA	28300	NA	60	NA	3150	190	<0.10	10	10
Waste-3	3300	65	20	1760	NA	45300	NA	<20	NA	12400	230	<0.10	<20	20
Waste-4	58400	35	20	530	NA	102000	NA	70	NA	4060	1780	0.14	<20	20
WRC-07	291	42.4	59.1	4400	<33	19200	20.0	<40	<5.0	1970	22.3	<0.1	<3.0	<16
WRC-08	374	33.6	23.7	1580	<33	16400	25.1	<40	<5.0	965	18.3	<0.1	<3.0	<16
WRC-09	332	58.5	12.6	371	<33	32000	27.2	<40	6.3	2600	15.3	<0.1	<3.0	<16
WRC-11	27600	100	32.8	1590	<33	74700	39.3	<40	9.2	5110	1910	0.3	<3.0	<16
WRC-99-1	76200	223	30.3	728	<33	84700	52.2	68	<5.0	11500	1470	<0.1	<3.0	<16
WRC-99-2	1040	90.0	8.3	299	<33	33100	12.3	41	<5.0	5600	164	<0.1	<3.0	51
WRC-99-3	277	101	4.3	162	<33	19400	<8.0	55	<5.0	2520	17.0	<0.1	<3.0	47
Magnetite Tailings														
Mag-1	12700	22	65	540	NA	>150000	NA	<2	NA	16700	4640	<1	<1	23
Mag-1	15571	137	NA	NA	NA	590655	NA	NA	NA	16939	4956	NA	NA	NA

[1] Colorado+Beartooth+A bo Fms 3%; granodiorite stock 14%; El Paso+Bliss Fms 3%; marble 8%; Oswaldo Fm16%; Parting shale 4%;
NA = not available

Table D-9 Whole Rock Chemical Compositions (continued)

Sample	Constituent (mg/kg)													
	Potassium	Scandium	Selenium	Silicon	Silver	Sodium	Strontium	Tellurium	Thallium	Tin	Titanium	Tungsten	Vanadium	Zinc
Continental Pit														
WD-1, WD-2, WD-3, WD-4	2640	4	<20	120	2	1040	85	0.240	<20	<10	370	9	20	287
ED-1, ED-2, ED-3, ED-4	1090	<5	50	260	<5	1010	41	0.200	<50	<30	310	15	<30	520
OP-1, OP-2, OP-3, OP-4	860	4	<20	180	<2	740	42	1.60	20	<10	230	36	10	262
FTJ, FTF, FTM, FTA	700	5	100	410	<5	480	26	0.400	<50	30	250	30	<30	1650
WRC-01	<110	24900	10.5	<48	617000	290000	<5.0	1140	31.3	<130	<38	1580	70.2	6.2
WRC-02	<110	18500	11.8	<48	431000	201000	<5.0	8560	238	<130	<38	3370	69.9	315
WRC-03	<110	<1500	6.9	<48	323000	151000	<5.0	3970	73.9	<130	<38	1200	55.2	105
WRC-04	<110	4300	2.2	<48	234000	109000	<5.0	270	<2.0	<130	<38	1060	7.4	2660
WRC-05	<110	<1500	<2.0	<48	8500	3840	<5.0	170	114	<130	<38	<3.0	<7.0	174
WRC-06	<110	27800	5.7	<48	530000	248000	<5.0	21500	641	<130	<38	2060	52.1	21.7
Hanover Mountain														
LC-1	2500	NA	<10	NA	<1	300	9	NA	NA	NA	28	NA	6	8
Waste-1	6000	NA	<20	NA	<2	400	10	NA	NA	NA	130	NA	10	109
Waste-3	9000	NA	<50	NA	<5	1000	30	NA	NA	NA	470	NA	50	35
Waste-4	<2000	NA	<50	NA	<5	<500	35	NA	NA	NA	30	NA	<20	59
WRC-07	<110	23900	5.6	<48	615000	287000	<5.0	640	51.7	<130	<38	697	46.2	17.5
WRC-08	<110	22800	10.7	<48	563000	263000	<5.0	1680	56.4	<130	<38	2700	67.7	21.8
WRC-09	<110	30100	10.8	<48	562000	263000	<5.0	930	241	<130	<38	1280	98.5	17.1
WRC-11	<110	3500	10.8	<48	458000	214000	<5.0	490	44.8	<130	<38	3250	79.5	136
WRC-99-1	<110	10100	12.2	<48	364000	n.a.	<5.0	9980	287	<130	<38	4030	93.2	91.1
WRC-99-2	<110	29700	11.0	<48	529000	n.a.	<5.0	2130	59.3	<130	<38	2920	83.8	21.5
WRC-99-3	<110	30400	10.5	<48	579000	n.a.	<5.0	1000	76.6	<130	<38	2060	86.3	16.7
Magnetite Tailings														
Mag-1	<100	4	NA	NA	<0.2	100	5	NA	<10	NA	200	<10	29	448
Mag-1	594	NA	NA	42274	NA	3339	14	NA	NA	NA	360	NA	NA	NA

[1] Colorado+Beartooth+A bo Fms 3%; granodiorite stock 14%; El Paso+Bliss Fms 3%; marble 8%; Oswaldo Fm16%; Parting shale 4%;
NA = not available

Table D-10 Average Element Concentrations in Crustal Rocks

Parameters	Average Concentration (mg/kg)						
Rock Type	Granite[1]	Diabase[1]	Shales[1]	Sandstones[1]	Igneous Rocks[1]	Limestone[2]	Soils[2]
Aluminum	74300	79400	80000	25000	81300	NA	NA
Antimony	0.31	1.0	1.5	0.0X	0.2	0.3	2
Arsenic	0.5	1.9	13	1	1.8	1.1	7.5
Barium	1220	160	580	X0	425	92	300
Beryllium	3	0.8	3	0.X	2.8	0.X	0.5 - 4
Boron	NA	NA	NA	NA	NA	20	29
Bismuth	0.07	0.05	0.4	0.17	0.1	NA	0.8
Cadmium	0.03	0.15	0.3	0.0X	0.08	0.035	0.1 - 0.5
Calcium	9900	78300	22100	39100	36300	NA	NA
Chromium	20	114	90	35	100	11	43
Cobalt	2.4	47	19	0.3	25	0.1	10
Copper	13	110	45	X	55	5	15
Gallium	20	16	19	12	15	NA	NA
Iron	13700	77600	47200	9800	50000	3800	21000
Lead	48	7.8	20	7	13	5	17
Lithium	22	15	66	15	20	5	22
Magnesium	2400	39900	15000	7000	20900	NA	NA
Manganese	195	1280	850	X0	950	1100	320
Mercury	0.1	0.2	0.4	0.3	0.2	0.04	0.056
Molybdenu	6.5	0.57	2.6	0.2	1.5	0.4	2.5
Nickel	1	76	68	2	75	20	17
Potassium	45100	5300	26600	10700	25900	2700	11000
Scandium	2.9	35	13	1	22	NA	NA
Selenium	0.007	0.3	0.6	0.05	0.05	0.88	0.31
Silver	0.05	0.08	0.07	0.0X	0.07	0.1	0.1 - 1
Sodium	24600	16000	9600	3300	28300	NA	NA
Strontium	250	190	300	20	375	610	67
Thallium	1.2	0.11	1	0.5	0.8	NA	NA
Tin	3.5	3.2	6	0.X	2	0.X	10
Titanium	1500	6400	4600	1500	4400	NA	NA
Vanadium	17	264	130	20	135	20	57
Zinc	45	86	95	16	70	21	36

The symbol X indicates that the abundance of the element was estimated to an order of magnitude.

NA - Not available

[1]Turekian and Wedepohl. 1961. *Bulletin of the Geological Society of America*, 72, 175.

[2] Rose, Hawkes, and Webb. 1979. *Geochemistry in Mineral Exploration*.

Table D-11 Meteoric Water Mobility Procedure Results in mg/L

Sample	Sample From	Laboratory	pH (s. u.)	pH Paste (s. u.)	TDS	Alkalinity (total)	Alkalinity (HCO3)	Acidity (total)	Aluminum	Ammonia (as N)	Antimony	Arsenic	Barium
Continental Pit													
CF103	Waste rock composite	SVL	8.08	NA	291	80	80	<1.0	<0.021	<0.1	<0.002*	<0.04	0.017
WRC-05	Lake Valley Formation	SVL	7.63	8.70	103	39.9	39.9	--	0.132	NA	<0.002*	<0.04	0.006
WRC-10	Continental Pit breccia	SVL	7.76	7.18	174	76.5	76.5	--	<0.037	NA	<0.002*	<0.04	0.009
CP97-29	Colorado Formation	IML	4.4	NA	30	1	2	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-30	Colorado Formation	IML	6.5	NA	50	6	11	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-25	Beartooth Formation	IML	7.3	NA	40	22	44	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-26	Beartooth Formation	IML	8.9	NA	40	120	115	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-27	Syrena Formation	IML	8.8	NA	100	24	43	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-28	Syrena Formation	IML	9.0	NA	50	25	38	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-28 (dup)	Syrena Formation	IML	9.0	NA	50	27	43	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-15	Oswaldo Formation	IML	8.3	NA	160	39	67	NA	0.05	NA	<0.005	<0.005	<0.01
CP-97-23	Oswaldo Formation	IML	8.2	NA	180	34	67	NA	0.07	NA	<0.005	<0.005	<0.01
CP97-13	Oswaldo Formation	IML	7.3	NA	50	116	233	NA	0.42	NA	<0.005	<0.005	<0.01
CP97-22	Oswaldo Formation	IML	8.7	NA	40	30	61	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-11	Lake Valley Formation	IML	8.5	NA	180	175	349	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-9	Percha Formation	IML	8.6	NA	90	89	180	NA	0.60	NA	<0.005	<0.005	<0.01
CP97-21	Percha Formation	IML	8.7	NA	70	34	49	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-18	Fusselman & Montoya Format	IML	9.7	NA	180	67	38	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-18 (dup)	Fusselman & Montoya Format	IML	9.7	NA	230	72	48	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-20	Fusselman & Montoya Format	IML	9.5	NA	160	110	136	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-6	El Paso Formation	IML	8.7	NA	230	270	525	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-8	El Paso Formation	IML	9.8	NA	250	87	180	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-12	Lake Valley Formation (marbl	IML	7.7	NA	100	80	161	NA	0.20	NA	<0.005	<0.005	<0.01
CP97-16	Oswaldo Formation (marble)	IML	8.5	NA	60	31	44	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-17	Oswaldo Formation (marble)	IML	8.0	NA	230	36	72	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-2	Hanover-Fierro Stock	IML	6.8	NA	290	<1	0	NA	<0.05	NA	<0.005	<0.005	<0.01
CP97-4	Hanover-Fierro Stock	IML	8.8	NA	120	360	721	NA	0.07	NA	<0.005	<0.005	<0.01
Hanover Mountain													
WRC-07	Unoxidized Colorado Formati	SVL	4.08	4.16	1180	--	--	607	59.4	NA	<0.002*	<0.04	0.026
WRC-08	Unoxidized Colorado Formati	SVL	4.34	4.22	637	--	--	293	10.4	NA	<0.002*	<0.04	0.05
WRC-09	Colorado Formation Leach Ca	SVL	3.66	3.61	460	--	--	272	37	NA	<0.002*	<0.04	0.051
WRC-11	Barringer Fault Zone	SVL	7.90	7.70	1450	131	131	--	<0.037	NA	<0.002*	<0.04	0.007
Tailings Samples													
TLGS-1	Tailings Pond	SVL	7.43	8.19	1830	30.2	30.2	<1.0	0.035	<0.1	<0.001	<0.04	0.007
TLGS-2	Tailings Pond	SVL	6.99	8.30	506	14.3	14.3	<1.0	<0.021	0.6	0.002	<0.04	<0.003
TLGS-3	Tailings Pond	SVL	7.16	8.20	1160	21.8	21.8	<1.0	0.022	<0.1	<0.001	<0.04	<0.003
TLGS-4	Tailings Pond	SVL	7.22	8.20	1090	25.9	25.9	<1.0	0.038	<0.1	<0.001	<0.04	0.005

*Elevated detection limit due to dilution.
WAD = weak acid dissociable
Alkalinity and acidity in mg $CaCO_3$/L
NA = Not Analyzed

Table D-11 Meteoric Water Mobility Procedure Results in mg/L (continued)

Sample	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide (total)	Cyanide (WAD)	Fluoride	Gallium	Iron
Continental Pit														
CF103	<0.001	<0.077	0.053	<0.0024	48.3	7.21	<0.005	<0.005	0.006	<0.01	<0.01	0.180	<0.031	<0.024
WRC-05	<0.002	NA	NA	<0.002	17.7	2.4	<0.008	0.006	<0.004	NA	NA	<0.1	NA	<0.019
WRC-10	<0.002	NA	NA	0.002	23.6	1.5	<0.008	0.005	<0.004	NA	NA	0.600	NA	<0.019
CP97-29	<0.004	NA	NA	<0.004	1.7	8	<0.01	<0.01	<0.01	NA	NA	<0.05	NA	<0.02
CP97-30	<0.004	NA	NA	<0.004	2.6	12	<0.01	<0.01	<0.01	NA	NA	0.2	NA	<0.02
CP97-25	<0.004	NA	NA	<0.004	8.9	8	<0.01	<0.01	<0.01	NA	NA	0.4	NA	<0.02
CP97-26	<0.004	NA	NA	<0.004	20	1	<0.01	<0.01	<0.01	NA	NA	0.1	NA	<0.02
CP97-27	<0.004	NA	NA	<0.004	37	2	<0.01	<0.01	<0.01	NA	NA	0.4	NA	<0.02
CP97-28	<0.004	NA	NA	<0.004	4.5	5	<0.01	<0.01	<0.01	NA	NA	0.1	NA	<0.02
CP97-28 (dup)	<0.004	NA	NA	<0.004	4.6	5	<0.01	<0.01	<0.01	NA	NA	0.1	NA	<0.02
CP97-15	<0.004	NA	NA	<0.004	30	19	<0.01	<0.01	<0.01	NA	NA	0.3	NA	<0.02
CP-97-23	<0.004	NA	NA	<0.004	35	51	<0.01	<0.01	<0.01	NA	NA	0.2	NA	<0.02
CP97-13	<0.004	NA	NA	<0.004	7.3	6	<0.01	<0.01	<0.01	NA	NA	0.1	NA	<0.02
CP97-22	<0.004	NA	NA	<0.004	18	2	<0.01	<0.01	<0.01	NA	NA	0.33	NA	<0.02
CP97-11	<0.004	NA	NA	<0.004	34	15	<0.01	<0.01	<0.01	NA	NA	0.2	NA	<0.02
CP97-9	<0.004	NA	NA	<0.004	20	8	<0.01	<0.01	<0.01	NA	NA	0.1	NA	<0.02
CP97-21	<0.004	NA	NA	<0.004	10	8	<0.01	<0.01	<0.01	NA	NA	0.3	NA	<0.02
CP97-18	<0.004	NA	NA	<0.004	5.3	12	<0.01	<0.01	<0.01	NA	NA	2	NA	<0.02
CP97-18 (dup)	<0.004	NA	NA	<0.004	5.3	12	<0.01	<0.01	<0.01	NA	NA	2	NA	<0.02
CP97-20	<0.004	NA	NA	<0.004	3.9	9	<0.01	<0.01	<0.01	NA	NA	0.5	NA	<0.02
CP97-6	<0.004	NA	NA	<0.004	41	19	<0.01	<0.01	<0.01	NA	NA	0.1	NA	<0.02
CP97-8	<0.004	NA	NA	<0.004	7.1	9	<0.01	<0.01	<0.01	NA	NA	0.4	NA	<0.02
CP97-12	<0.004	NA	NA	<0.004	27	5	<0.01	<0.01	<0.01	NA	NA	0.08	NA	<0.02
CP97-16	<0.004	NA	NA	<0.004	14	4	<0.01	<0.01	<0.01	NA	NA	0.12	NA	<0.02
CP97-17	<0.004	NA	NA	<0.004	49	17	<0.01	<0.01	<0.01	NA	NA	0.6	NA	<0.02
CP97-2	<0.004	NA	NA	<0.004	37	5	<0.01	<0.01	0.38	NA	NA	0.4	NA	<0.02
CP97-4	<0.004	NA	NA	<0.004	20	7	<0.01	<0.01	<0.01	NA	NA	0.3	NA	<0.02
Hanover Mountain														
WRC-07	0.002	NA	NA	0.004	5.99	4	0.016	2.5	175	NA	NA	<0.5*	NA	13.6
WRC-08	<0.002	NA	NA	<0.002	10.7	3.3	<0.008	0.21	134	NA	NA	<0.5*	NA	1.27
WRC-09	<0.002	NA	NA	0.002	7.27	16.8	0.011	0.234	11.3	NA	NA	<0.5*	NA	5.6
WRC-11	<0.002	NA	NA	<0.002	238	2.2	<0.008	0.011	<0.004	NA	NA	<0.5*	NA	<0.019
Tailings Samples														
TLGS-1	<0.001	<0.077	<0.014	<0.0024	203	29.0	<0.005	<0.005	0.003	<0.01	<0.01	1.34	<0.031	<0.024
TLGS-2	<0.001	<0.077	0.018	<0.0024	79.8	25.5	<0.005	<0.005	<0.003	<0.01	<0.01	0.520	<0.031	<0.024
TLGS-3	<0.001	<0.077	0.015	<0.0024	135	21.8	<0.005	<0.005	0.005	<0.01	<0.01	1.17	<0.031	<0.024
TLGS-4	<0.001	<0.077	0.026	<0.0024	130	24.6	<0.005	<0.005	0.005	<0.01	<0.01	0.810	<0.031	<0.024

*Elevated detection limit due to dilution
WAD = weak acid dissociable
Alkalinity and acidity in mg CaCo3/L
NA = Not Analyzed

Table D-11 Meteoric Water Mobility Procedure Results in mg/L (continued)

Sample	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Nitrogen-TKN	NO_2+NO_3 (as N)	Phosphorous	Potassium	Scandium
Continental Pit												
CF103	0.002	0.005	7.14	0.066	<0.0002	0.105	<0.017	<0.1	0.08	<0.18	19.4	<0.001
WRC-05	<0.001	NA	2.36	0.004	<0.0002	0.465	<0.016	NA	NA	<0.11	<1.5	NA
WRC-10	<0.001	NA	6.81	0.01	<0.0002	0.044	<0.016	NA	NA	<0.11	6.4	NA
CP97-29	<0.005	NA	0.7	0.028	<0.001	<0.01	<0.01	NA	NA	<0.5	4.5	NA
CP97-30	<0.005	NA	1.2	0.022	<0.001	<0.01	<0.01	NA	NA	<0.5	5.9	NA
CP97-25	<0.005	NA	1.9	<0.005	<0.001	0.11	<0.01	NA	NA	<0.5	2.5	NA
CP97-26	<0.005	NA	3.3	0.047	<0.001	0.10	<0.01	NA	NA	<0.5	5.2	NA
CP97-27	<0.005	NA	0.3	<0.005	<0.001	0.01	<0.01	NA	NA	<0.5	0.6	NA
CP97-28	<0.005	NA	<0.2	<0.005	<0.001	<0.01	<0.01	NA	NA	<0.5	0.8	NA
CP97-28 (dup)	<0.005	NA	<0.2	<0.005	<0.001	<0.01	<0.01	NA	NA	<0.5	0.7	NA
CP97-15	<0.005	NA	5.8	0.014	<0.001	0.05	<0.01	NA	NA	<0.5	3.9	NA
CP-97-23	<0.005	NA	8.6	0.015	<0.001	<0.01	<0.01	NA	NA	<0.5	1.8	NA
CP97-13	<0.005	NA	1.4	<0.005	<0.001	<0.01	<0.01	NA	NA	<0.5	0.7	NA
CP97-22	<0.005	NA	3.6	<0.005	<0.001	0.06	<0.01	NA	NA	<0.5	1.5	NA
CP97-11	<0.005	NA	12	0.020	<0.001	<0.01	<0.01	NA	NA	<0.5	1.0	NA
CP97-9	<0.005	NA	0.5	<0.005	<0.001	<0.01	<0.01	NA	NA	<0.5	0.6	NA
CP97-21	<0.005	NA	2.5	<0.005	<0.001	0.18	<0.01	NA	NA	<0.5	6.8	NA
CP97-18	<0.005	NA	36	<0.005	<0.001	0.03	<0.01	NA	NA	<0.5	2.9	NA
CP97-18 (dup)	<0.005	NA	35	<0.005	<0.001	0.04	<0.01	NA	NA	<0.5	2.6	NA
CP97-20	<0.005	NA	33	<0.005	<0.001	0.01	<0.01	NA	NA	<0.5	1.6	NA
CP97-6	<0.005	NA	18	<0.005	<0.001	0.01	<0.01	NA	NA	<0.5	7.2	NA
CP97-8	<0.005	NA	43	<0.005	<0.001	0.03	<0.01	NA	NA	<0.5	15	NA
CP97-12	<0.005	NA	1.8	<0.005	<0.001	0.42	<0.01	NA	NA	<0.5	0.8	NA
CP97-16	<0.005	NA	2.2	<0.005	<0.001	0.01	<0.01	NA	NA	<0.5	1.8	NA
CP97-17	<0.005	NA	10	0.014	<0.001	0.04	<0.01	NA	NA	<0.5	2.2	NA
CP97-2	<0.005	NA	14	1.2	<0.001	0.03	<0.01	NA	NA	<0.5	3	NA
CP97-4	<0.005	NA	8.1	<0.005	<0.001	0.07	<0.01	NA	NA	<0.5	6.3	NA
Hanover Mountain												
WRC-07	<0.010*	NA	2.66	0.268	<0.0002	0.006	0.627	NA	NA	3.86	6.5	NA
WRC-08	<0.010*	NA	2.77	0.316	<0.0002	<0.003	0.103	NA	NA	2.96	9.4	NA
WRC-09	<0.001	NA	2.15	0.171	<0.0002	<0.003	0.069	NA	NA	0.22	14.8	NA
WRC-11	<0.001	NA	50	0.344	<0.0002	0.16	<0.016	NA	NA	<0.11	9.9	NA
Tailings Samples												
TLGS-1	<0.005*	0.006	178	0.064	<0.0002	0.304	<0.017	0.3	1.30	<0.18	15.5	<0.001
TLGS-2	<0.005*	0.004	29.9	0.040	<0.0002	0.169	<0.017	0.9	0.42	<0.18	7.34	<0.001
TLGS-3	0.006	0.004	112	0.057	<0.0002	0.059	<0.017	0.2	1.24	<0.18	11.6	<0.001
TLGS-4	0.007	0.005	103	0.069	<0.0002	0.118	<0.017	0.2	2.43	<0.18	14.3	<0.001

*Elevated detection limit due to dilution
WAD = weak acid dissociable
Alkalinity and acidity in mg CaCo3/L
NA = Not Analyzed

Table D-11 Meteoric Water Mobility Procedure Results in mg/L (continued)

Sample	Selenium	Silica	Silver	Sodium	Strontium	Sulfate	Thallium	Tin	Titanium	Vanadium	Zinc
Continental Pit											
CF103	0.008	NA	0.005	25.6	0.189	99	<0.001	<0.046	<0.007	<0.004	<0.002
WRC-05	<0.048	2.52	0.006	1.83	NA	15.4	<0.001	NA	NA	NA	<0.004
WRC-10	<0.048	9.64	<0.005	11.4	NA	29.9	<0.001	NA	NA	NA	<0.004
CP97-29	<0.005	4	<0.01	2.5	NA	11	<0.002	NA	NA	NA	<0.02
CP97-30	<0.005	2	<0.01	6.8	NA	17	<0.002	NA	NA	NA	<0.02
CP97-25	<0.005	2	<0.01	2.9	NA	19	<0.002	NA	NA	NA	<0.02
CP97-26	<0.005	7	<0.01	4.8	NA	7	<0.002	NA	NA	NA	<0.02
CP97-27	<0.005	3	<0.01	26	NA	51	<0.002	NA	NA	NA	<0.02
CP97-28	<0.005	2	<0.01	15	NA	7	<0.002	NA	NA	NA	<0.02
CP97-28 (dup)	<0.005	3	<0.01	14	NA	10	<0.002	NA	NA	NA	<0.02
CP97-15	<0.005	2	<0.01	5.9	NA	38	<0.002	NA	NA	NA	<0.02
CP-97-23	<0.005	2	<0.01	17	NA	63	<0.002	NA	NA	NA	0.03
CP97-13	<0.005	3	<0.01	9.2	NA	6	<0.002	NA	NA	NA	<0.02
CP97-22	<0.005	5	<0.01	13	NA	10	<0.002	NA	NA	NA	<0.02
CP97-11	0.007	10	<0.01	4.9	NA	59	<0.002	NA	NA	NA	<0.02
CP97-9	<0.005	2	<0.01	8.6	NA	37	<0.002	NA	NA	NA	<0.02
CP97-21	<0.005	4	<0.01	4.5	NA	12	<0.002	NA	NA	NA	<0.02
CP97-18	<0.005	<1	<0.01	3.8	NA	61	<0.002	NA	NA	NA	<0.02
CP97-18 (dup)	<0.005	<1	<0.01	3.5	NA	78	<0.002	NA	NA	NA	<0.02
CP97-20	<0.005	<1	<0.01	0.9	NA	19	<0.002	NA	NA	NA	<0.02
CP97-6	<0.005	5	<0.01	4.9	NA	120	<0.002	NA	NA	NA	<0.02
CP97-8	<0.005	<1	<0.01	0.9	NA	100	<0.002	NA	NA	NA	<0.02
CP97-12	<0.005	2	<0.01	2.0	NA	43	<0.002	NA	NA	NA	0.04
CP97-16	<0.005	9	<0.01	3.3	NA	11	<0.002	NA	NA	NA	<0.02
CP97-17	<0.005	2	<0.01	1.6	NA	58	<0.002	NA	NA	NA	<0.02
CP97-2	<0.005	8	<0.01	2.9	NA	170	<0.002	NA	NA	NA	0.07
CP97-4	<0.005	4	<0.01	4.4	NA	40	<0.002	NA	NA	NA	<0.02
Hanover Mountain											
WRC-07	<0.048	2.67	<0.005	4.63	NA	681	<0.001	NA	NA	NA	5.25
WRC-08	<0.048	6.15	<0.005	3.45	NA	332	<0.001	NA	NA	NA	0.693
WRC-09	<0.048	8.99	<0.005	9.89	NA	263	<0.001	NA	NA	NA	1.84
WRC-11	<0.048	4.55	<0.005	104	NA	871	<0.001	NA	NA	NA	<0.004
Tailings Samples											
TLGS-1	<0.04		<0.003	30.3	0.513	1260	<0.001	<0.046	<0.007	<0.004	0.059
TLGS-2	<0.04		<0.003	17.6	0.289	330	<0.001	<0.046	<0.007	<0.004	0.005
TLGS-3	<0.04		<0.003	17.5	0.429	792	<0.001	<0.046	<0.007	<0.004	0.011
TLGS-4	<0.04		0.003	15.5	0.407	716	<0.001	<0.046	<0.007	<0.004	0.015

*Elevated detection limit due to dilution
WAD = weak acid dissociable
Alkalinity and acidity in mg CaCo3/L
NA = Not Analyzed

Table D-12 Chemical Compositions of Test Pad Leachates

Test Pad	Composition	Date	pH	temp	cond.	HCO_3	SO_4	As	Cd	Cu	Fe	Pb	Zn
				(oC)	(µS/cm	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	50% Hanover leach cap, 50% Contine	#######	-	-	-	-	-	-	-	-	-	-	-
1	50% Hanover leach cap, 50% Contine	#######	-	-	-	-	-	-	-	-	-	-	-
2	67% Hanover leach cap, 33% Contine	#######	7.5	7.0	210	59	74	<0.05	<0.03	0.08	<0.10	<0.05	<0.05
2	67% Hanover leach cap, 33% Contine	#######	7.8	9.5	<100	28	17	<0.05	<0.03	0.02	<0.10	<0.05	<0.05
3	33% Hanover leach cap, 67% Contine	#######	7.2	4.5	450	61	243	<0.05	<0.03	0.04	<0.10	<0.05	<0.05
3	33% Hanover leach cap, 67% Contine	#######	7.6	9.5	200	56	104	<0.05	<0.03	0.05	0.10	<0.05	<0.05
4	100% Continental (Colorado Fm.)	#######	-	-	-	-	-	-	-	-	-	-	-
4	100% Continental (Colorado Fm.)	#######	-	-	-	-	-	-	-	-	-	-	-
5	50% Hanover leach cap, 50% Contine	#######	6.6	4.5	660	48	61	<0.05	<0.03	0.07	0.10	<0.05	<0.05
5	50% Hanover leach cap, 50% Contine	#######	7.8	9.5	<100	30	14	<0.05	<0.03	0.03	<0.10	<0.05	<0.05
6	100% Hanover leach cap	#######	6.5	4.5	70	16	29	<0.05	<0.03	0.07	0.16	<0.05	<0.05
6	100% Hanover leach cap	#######	8.0	9.5	<100	14	9.7	<0.05	<0.03	0.03	0.11	<0.05	<0.05
7	100% Continental	#######	6.7	4.5	440	44	156	<0.05	<0.03	0.03	<0.10	<0.05	0.14
7	100% Continental	#######	7.6	9.5	200	35	58	<0.05	<0.03	0.02	<0.10	<0.05	0.06

- = no solution to sample

APPENDIX D

GEOLOGY AND GEOCHEMISTRY, CONTINENTAL MINE, GRANT COUNTY, NEW MEXICO

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INCORPORATED

APPENDIX D

GEOLOGY AND GEOCHEMISTRY, CONTINENTAL MINE, GRANT COUNTY, NEW MEXICO.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ATTACHMENTS

1.0 INTRODUCTION

Shepherd Miller, Inc. (SMI) compiled and reviewed geology and geochemical data associated with the proposed mine expansion at the Cobre Mining Company, Inc. (Cobre) Continental Mine site. This expansion will involve enlargement of the Continental Mine and excavation of a new surface mine at Hanover Mountain. Geologic data were used to identify rock types that will be exposed in mines and to describe general waste rock characteristics. Geochemical data for the different rock types were used: (1) to determine the potential for waste rock and pit walls to produce acid, (2) to estimate the mobility of chemical constituents from weathering of the rock, and (3) for predictive pit lake modeling. The results of this report will be used to support the Continental Mine Closure/Closeout Plan, Environmental Assessment and Environmental Support Statement.

The data used in this report were not obtained by SMI. Therefore, a quality assurance/quality control (QA/QC) analysis was not performed for this report. Also, this report contains information for the Continental Pit based on a pre-1998 expansion plan. Future expansion plans for the Continental Pit are unknown at the present time.

2.0 GEOLOGY AND MINERALOGY

2.1 Mining History

Native Americans were the first to mine copper in the Santa Rita area, possibly beginning in the sixteenth century. The first record of copper production from the Central Mining District was in the early nineteenth century by Spaniards. Sporadic but significant copper production occurred during much of the nineteenth century. One million pounds of copper is thought to have been produced from the Hanover Copper Mine, located in the area of the Continental Mine area, between 1858 and 1861 (Hillesland and others, 1995).

The United States Smelting, Refining, and Mining Company (USSR&M) gradually acquired and consolidated various properties in the northern part of the District in the early- to mid-1900s. Copper production from the Continental Pit first began in 1967. Between 1967 and 1992, the mine was owned by a series of companies: USSR&M, U.V. Industries, Sharon Steel, and Bayard Mining Corporation. Production by these companies totaled 7,568,000 tons of ore at 1.82 percent copper from underground operations and 14,135,000 tons of ore at 0.81 percent copper from open pit mining. The mine closed in 1982 due to depressed copper prices.

Additionally, the Hanover Bessemer Mining Company and others have mined approximately 3,600,000 tons of magnetite ore from the area since 1891. Metallic Ventures, Inc. purchased the Continental Mine in December 1992 and formed Cobre Mining Company, Inc. (Cobre). Production from underground and surface operations was initiated by Cobre in mid-1993 (Hillesland and others, 1995) and continued to 1999. At the current time, mining operations have ceased and the mine is in standby status.

2.2 Regional Geology

The Continental Mine area is located within the Santa Rita Quadrangle, which lies in a broad transitional zone between the Colorado Plateau and the Basin and Range

Province (Jones and others, 1967). To the south and southwest of the quadrangle, Paleozoic to Mesozoic sedimentary rocks and younger volcanic rocks are exposed in north- to northwest-trending ranges; to the north, sedimentary formations thicken and form the broad highlands of the Colorado Plateau.

Within the Santa Rita Quadrangle, northwest-trending faults, such as the Mimbres and Silver City Faults, and northeast-trending faults, such as the Barringer, Nancy, and Groundhog Faults, define a broad area of uplift in the Central Mining District called the Santa Rita Horst (Hillesland and others, 1995). The surface area of the Santa Rita Horst is approximately 40 square miles, and within the horst, the strata are flexed into elongate arches, domes, small synclines, and locally into tight folds (Jones and others, 1967).

2.3 Local Geology

The geology of the northern part of the Central Mining District is complex. The features most relevant to the ore at the Continental Mine are the Barringer Fault and the Hanover-Fierro Stock; both played major roles in the mineral enrichment of the area. Jones and others (1967) provide a comprehensive chronology of structural and igneous events of the district.

A stratigraphic column and a geologic map of the Continental Mine area are included in Figures D-1 and D-2, respectively. Cross sections of the Continental Pit and Hanover Mountain areas are shown in Figures D-3 and D-4, respectively. Geologic maps of the proposed 1998 Continental Pit and the future Hanover Pit are shown in Figures D-5 and D-6, respectively. The estimated geological makeup of the wallrocks of the Continental and Hanover Pits at the completion of mining is provided in Table D-1.

2.3.1 Sedimentary Rocks

The stratigraphic section in the Continental Mine area includes approximately 2,400 feet of Paleozoic sedimentary rocks and 1,200 feet of Mesozoic sedimentary rocks above Precambrian gneiss and schist (Figure D-1). Lower Paleozoic formations are dominated by limestone and dolomite and include the Bliss Formation, the El Paso Limestone, and the Montoya and Fusselman Dolomites. The Montoya and Fusselman Dolomites are indistinguishable in the Continental Mine area (Jones and others, 1967).

Upper Paleozoic units also contain more limestone units, including the Percha Shale, the Lake Valley Limestone, and the Oswaldo, Syrena, and Abo Formations. The Syrena and Abo Formations are often indistinguishable in the area. Quartz sandstone (now quartzite) is a minor constituent of the stratigraphic column.

Mesozoic formations, including the Beartooth Quartzite and the Colorado Formation, consist largely of fine- to medium-grained clastic units and are overlain by up to a few hundred feet of andesitic breccia and tuff (Hillesland and others, 1995) (Figure D-1).

The Continental Pit is comprised of mostly Paleozoic rocks, while the proposed Hanover Pit will be comprised of mostly Mesozoic rocks (Cobre, 1997a). As a result, the geochemical character of the Continental Pit is dominated by abundant carbonate-bearing rocks, whereas the geochemical character of the Hanover Pit is marked by a general absence of carbonates.

2.3.2 Igneous Rocks

More than 30 distinct varieties of intrusive rocks are found within the Santa Rita Quadrangle, with ages between the Late Cretaceous Period and the Miocene Epoch. Hillesland and others (1995) have grouped the intrusive rocks in the vicinity of the Continental Mine into six major categories:

- Syenodiorite porphyry, which forms concordant or semi-concordant bodies within the Colorado Formation and the Percha Shale
- Hanover-Fierro Stock, which is the most significant intrusive rock in the Central Mining District and consists mainly of porphyritic granodiorite

that intrudes sedimentary strata that range in age from Precambrian through Mesozoic

- Granodiorite porphyry, which is present as dikes, particularly at Hanover Mountain
- Quartz diorite porphyry, which is present in parts of the Colorado Formation and the Oswaldo Formation
- Mafic porphyry dikes
- Mafic stocks.

Volcanic rocks in the vicinity of the Continental Mine have been grouped into two major categories (Hillesland and others, 1995):

- Andesite breccia
- Mafic to felsic flows and tuffs.

The volcanic rocks are late Cretaceous to Tertiary in age and overlie the Colorado Formation generally in areas outside of the current and proposed surface mines.

2.3.3 Structure

The Barringer Fault and associated extension fractures and conjugate shears are the most important structural features at the Continental Mine. The Barringer Fault trends approximately N40°E through most of the Central Mining District, except in the southwest, where it turns and strikes about N75°E. Dips range from 55 to 75 degrees to the northwest. Vertical displacement along the Barringer Fault ranges from 1200 to 1600 feet (Jones and others, 1967). In the Continental Pit area, the fault zone is up to 200 feet wide and is associated with strong iron-oxide staining (Hillesland and others, 1995). The Barringer Fault has been intruded and stoped by northeast-trending lobes of the Hanover-Fierro Stock. The fault does not offset the northwest contact of the Stock, indicating that the Hanover-Fierro Stock postdates most movement of the Barringer Fault (Jones and others, 1967).

The Dix, Super Cobre, and Gilchrist Faults belong to a set of north to northeast-striking, steeply dipping faults associated with mineralization (Hillesland and others, 1995) (Figure D-2). The Dix Fault, which trends beneath the tailings pond, is a normal fault dipping north approximately 50 degrees with approximately 600 feet of dip/slip displacement. A fracture zone approximately 100 feet wide, has been identified adjacent to the Dix Fault. The Gap Fault, which also trends beneath the tailings pond, dips northwest 60-65 degrees and has approximately 300 feet of dip/slip displacement (Dahl, 1997, personal communication).

2.3.4 Alteration and Mineralogy

The Hanover-Fierro Stock is almost completely surrounded by a wide zone (up to 4,000 feet) of thermal metamorphism that decreases in intensity away from the contact. The metamorphic effects vary according to the composition of the host rock and the distance from the contact. Observed contact metamorphic facies include hornfels within siltstone- and shale-dominated sections of the Colorado Formation, marble in the Fusselman, Montoya, Lake Valley, and Oswaldo Formations, and skarn in the Syrena, Oswaldo, and Lake Valley Formations (Hillesland and others, 1995).

Hydrothermal alteration related to the Hanover-Fierro Stock and other late-stage porphyry intrusions is superimposed on early contact metamorphic facies. Hillesland and others (1995) identified five types of mineralization at the Continental Mine area: (1) sulfide skarn deposits, (2) massive magnetite, (3) anomalous fracture-controlled or disseminated limonite and hematite, (4) jasper and gossan zones, and (5) stockwork or near-stockwork quartz zones with or without original sulfides.

In the Continental Pit, the majority of copper ore now mined is found in calcic skarns in the Syrena, Oswaldo, and Lake Valley Formations near the Hanover-Fierro contact (Hillesland and others, 1995). Copper minerals include chalcopyrite with lesser bornite and rare chalcocite. In the aforementioned formations, shale units acted as barriers to the upward migration of mineralizing fluids during prograde and retrograde metamorphic events. Metal contents increase significantly below such barriers as the Mountain Home Shale (at the base of the Syrena Formation), the Parting Shale (at the base of the Oswaldo Formation), and the Percha Shale (below the Lake Valley Limestone).

The angle of contact between sedimentary bedding and the intrusion, and pre-stock syenodiorite or diorite dikes, also affected fluid flow and thus skarn formation. Hillesland and others (1995) suggest that the Barringer Fault Zone may have acted as a barrier to hydrothermal fluid migration from an intrusion located northwest of the Hanover-Fierro Stock.

At the proposed Hanover Pit at Hanover Mountain, the ore is hosted in contact metamorphic hornfels and silicified sandstone with minor dikes and sills of intermediate to felsic composition. Pre-metamorphic lithologies consist of intercalated siltstone, shale, and sandstone (Colorado Formation). The vertical thickness of the ore deposit at Hanover Mountain varies from 40 to 600 feet and averages about 280 feet. It mimics the present topographic profile and is centered under Hanover Mountain. The deposit is bounded on the eastern and southern edges by the Barringer Fault (Kilborn, 1997).

The ore zones at Hanover Mountain have been characterized as supergene deposits that formed by oxidation of primary copper (chalcopyrite) mineralization with accompanying replacement by secondary chalcocite. Chalcocite also replaced some of the pyrite. Bornite and covellite have been observed along the margins of the deposit. Primary mineralization, as observed below the chalcocite blanket, consists of pyrite and chalcopyrite associated with chlorite alteration and, less commonly, actinolite. A leached zone (referred to as the Leach Cap) of 80 to 150 feet thick, in which residual sulfides are generally low in abundance, is present above the chalcocite zone.

Detailed mineralogical descriptions of three samples from the Colorado Formation at Hanover Mountain indicate that they are metasediments comprised of coarse quartzite or arkosic laminae that have been metamorphosed at low grade to produce abundant sericite (Camp, Dresser, and McKee, CDM, 1997). The dominant sulfide mineral in these samples is pyrite, most often present as coarse-grained cubes. The pyrite is often present as inclusions or encapsulated in silicate minerals or iron oxides. Other sulfide minerals (chalcopyrite, bornite, digenite, chalcocite, covellite, and djurleite) are present in varying amounts as inclusions in pyrite and as discrete phases. Metal sulfides are generally concentrated along fracture surfaces.

The ore mineralization at Hanover Mountain is predominantly fracture-controlled and temporally distinct from the early metamorphism. Geochemical processes associated with the development of the supergene ore zones include alteration of chlorite and biotite to sericite and bleaching of the host rock. Minor disseminated mineralization is associated with strongly silicified sandstone. Limestone beds or their metamorphic equivalents, such as those found at the Continental Pit, have not been encountered during mineral exploration at Hanover Mountain.

3.0 ACID/BASE ACCOUNTING

Acid/Base Accounting (ABA) evaluates the balance between potentially acid-generating minerals and acid-neutralizing minerals in a rock or soil sample. The acid-generating potential (AGP) of a material is calculated from the amount of either: (1) total sulfur, (2) non-sulfate-sulfur, (3) sulfide-sulfur, or (4) peroxide-removable sulfur within the material.

The acid-neutralizing potential (ANP) is a measure of the amount of carbonate minerals (particularly calcite). AGP and ANP are both reported in units of tons of equivalent $CaCO_3$ per kiloton of material (T $CaCO_3$/kT). ABA results are interpreted by computing the net neutralization potential (NNP) of the material (NNP = ANP - AGP) and the ratio of ANP to AGP of the sample. Rocks with NNP greater than 0.0 $CaCO_3$/kT or an ANP to AGP ratio greater than 1.0 theoretically have more acid-neutralizing material available than acid-generating material. However, to provide a margin of safety, the Bureau of Land Management (BLM) uses a criteria of NNP greater than +20 T $CaCO_3$/kT and an ANP to AGP ratio greater than 3.0 to classify rocks as non-acid-generating (BLM, 1996).

Rocks with NNP less than 0.0 $CaCO_3$/kT and an ANP to AGP less than 1.0 theoretically have more acid-generating potential than acid-neutralizing capacity, hence generally can be expected to produce acidic leachates. For rocks that fall between guidelines, that is, those that have NNP between 0.0 and +20 T $CaCO_3$/kT and ANP/AGP between 1.0 and 3.0, kinetic testing may be conducted to determine if the rock is acid generating (BLM, 1996).

3.1 Sample Selection

Rock samples for ABA analyses were collected from mine areas at different times and analyzed by different laboratories. In summary, a total of 292 samples were collected from locations in the Continental Pit, proposed Hanover Pit, waste rock facilities, and Humbolt Mountain (Figure D-7). A summary of the ABA sampling is provided in Table D-2. Details of the ABA sampling are provided below

- In 1995 and 1996, 31 rock samples were collected and analyzed for ABA by CORE Laboratories (CORE), Aurora, Colorado under the direction of Camp Dresser and McKee (CDM). Sixteen of the samples were collected from waste rock and tailings derived from the Continental Pit. These 16 samples include four from the West Waste Rock Disposal Facility [WRDF] and four from the East WRDF. Another four samples were composites that were assembled in percentages expected to represent the future waste rock that will be derived from the Continental Pit. The final four samples were comprised of tailings derived from Continental Pit rocks.

  The remaining 15 of the 31 samples were from Hanover Mountain (seven samples from the Colorado Formation Leach Cap, seven samples from the unoxidized Colorado Formation, and one sample from the Barringer Fault Zone). The results of these analyses are discussed in a report by CDM (1997).

- In 1996, 214 ABA samples were collected by Cobre and analyzed by SVL Analytical, Inc., Kellogg, Idaho. The breakdown of these samples includes 77 bench-shot and drillhole-samples from the Continental Pit, 16 drillhole-samples from the West WRDF, and 121 drillhole-samples from Hanover Mountain.

  Samples of bench-shot material were obtained during excavation of the Continental Pit by Cobre personnel. Sampled formations included the El Paso Limestone, Lake Valley Limestone, Percha Shale, and Oswaldo and Syrena Formations. Drillhole samples from the Continental Pit were obtained from a location on Hermosa Mountain and represent the Beartooth Quartzite and Colorado, Abo, and Syrena Formations. Sampling did not include marble, Fusselman and Montoya Dolomites, or Hanover-Fierro Stock and other igneous rocks.

  The 16 samples from the West WRDF were collected from drillholes by Cobre personnel.

  The 121 samples from Hanover Mountain were selected by Cobre and SMI and were collected from drillcores and pulps. The Hanover Mountain samples include the Colorado Formation Leach Cap, Unoxidized Colorado Formation, and the Barringer Fault Zone (Cobre, 1997a).

- In 1999, 47 samples were collected by Cobre (see Attachment D.1) and analyzed for ABA by SVL. A total of 31 of these samples were from the Continental Pit, including the following: eight from the Colorado Formation, three from the Beartooth Formation, four from the Syrena/Abo Formations, two from the Oswaldo Formation (Parting Shale member), two from the Lake Valley Formation, two from the Percha Shale, three from the Fusselman and Montoya

Formations, three from Marble alteration, three from the Hanover-Fierro stock, and one from the Continental breccia.

Seven of the 47 samples collected in 1999 were from Hanover Mountain. These samples included four from the Unoxidized Colorado Formation, one from Colorado Formation Leach Cap, one from the Syrena Formation, and one from the Barringer Fault zone.

The remaining nine samples of the 1999 set were from Humbolt Mountain and were analyzed for ABA by SVL. These samples included one from the Syrena and Abo Formations, one from the Oswaldo Formation, one from the Oswaldo Formation (Parting Shale member), two from the Lake Valley Formation, two from the Percha Shale (one from the Box member and one from the Ready Pay member), one from the Fusselman and Montoya Formations, and one from syenodiorite.

3.2 Analytical Methods

The rock samples collected for ABA were analyzed by two different methods, depending on the sampling period. The 31 samples collected in 1995 to 1996 were analyzed by CORE, following the Sobek method (Sobek and others, 1978) for total sulfur, sulfate-sulfur (HCl-extractable sulfur), sulfide-sulfur (HNO_3-extractable sulfur), residual sulfur, and acid-neutralization potential (CDM, 1997). This method involved an overnight HNO_3 leaching step conducted at room-temperature to determine the sulfide-sulfur content.

In general, the CORE results showed a significant amount of residual sulfur, which is the sulfur that remains after HNO_3-treatment of the sample. The excess residual sulfur can be indicative of an underestimation of the sulfide-sulfur content, hence an underestimation of the AGP. The potential for underestimation of the AGPs of samples analyzed by the CORE procedure is discussed below.

Fifteen of these 31 samples, including all those from Hanover Mountain, were also tested for acidity using a peroxide method. This involved successive leachings with HCl and distilled water to remove carbonates and sulfates followed by a leach with hot H_2O_2 to accelerate pyrite oxidation (CDM, 1997).

The 214 samples collected in 1996 and the samples collected in 1999 were all analyzed by SVL for total sulfur, sulfate-sulfur, sulfide-sulfur, residual sulfur, and acid-neutralization potential, using the modified Sobek method. This method involved a 6-hour leach in hot HNO_3 to determine the sulfide-sulfur content.

Some samples were also tested with Net Acid Generation (NAG) pH analysis. The NAG procedure is a rapid test, with a 24-hour turnaround time, hence can be used during mining for rapid ABA determinations. The NAG data were collected for comparison with the standard test methods to determine whether or not this method could provide reliable ABA results for the mine rocks. This procedure and results are discussed separately in Section 3.4.

3.3 Results

The results of the ABA determinations are provided in Tables D-3 (Continental Pit), Table D-4 (Hanover Mountain), Table D-5 (Waste Rock Facilities and Tailings), and Table D-6 (Humbolt Mountain).

3.3.1 Continental Pit

Results of the ABA analyses show that the majority of the rocks in the Continental Pit are acid-neutralizing, particularly the Paleozoic sedimentary formations (Figure D-8). From oldest to youngest, average NNP values for the Paleozoic formations are +187 T $CaCO_3$/kT for the El Paso formation, +342.7 T $CaCO_3$/kT for the combined Fusselman and Montoya Formations, +60.8 T $CaCO_3$/kT for the Percha Shale, +254.4 T $CaCO_3$/kT for the Lake Valley Limestone, +279.8 T $CaCO_3$/kT for the Oswaldo Formation, and +32.2 T $CaCO_3$/kT for the combined Abo and Syrena Formations. The average ratios of ANP to AGP are also high for the Paleozoic formations, ranging from 5.3 for the Percha Shale to 808.1 for the Fusselman and Montoya Formations (Table D-3). These high average NNP values and ratios are consistent with the presence of significant portions of carbonates, in the form of limestone, dolomite, and marble, in the Paleozoic formations. Surface area estimates for the (1998 proposed)

Continental Pit indicate that 66% of its wallrock will be comprised of the Paleozoic formations with acid-neutralizing properties (i.e., NNP > +20 T $CaCO_3$/kT and ANP/AGP > 3.0, see Table D-1) (BLM, 1996).

The ABA results for the Mesozoic sedimentary formations show lower average NNP values of –10.0 T $CaCO_3$/kT for the Beartooth Quartzite, and -12.2 T $CaCO_3$/kT for the Colorado Formation (Figure D-9). Ratios of ANP to AGP are also low at 0.6 for the Beartooth Quartzite and 1.9 for the Colorado Formation (Table D-3). However, 4 of 7 samples from the Beartooth Quartzite and 10 of 24 samples from the Colorado Formation had sulfide-sulfur contents less than 0.3%. These low levels indicate that large portions of these rock types may have insufficient sulfide-sulfur to generate acidic leachates based on the usual ABA screening criteria (Price and others, 1997).

The remainder of the ABA data for the Beartooth and Colorado Formations show low NNP values and low ratios of ANP to AGP (Figure D-9 and Table D-3), hence a portion of these rock types have the potential to generate acidic leachates. Surface area estimates for the Continental Pit indicate that 20% of its wallrock will be comprised of the Beartooth Quartzite and Colorado Formations (Table D-1).

Three samples from the Hanover-Fierro stock have an average NNP of +15.2 T $CaCO_3$/kT, but have an average ratio of ANP to AGP of 25.4 (Figure D-9). This high ratio is caused by the very low sulfide-sulfur contents in the rocks (Table D-3). In fact, all three Hanover-Fierro samples had sulfide-sulfur contents less than 0.3%, indicating that these rocks are unlikely to generate acidic leachates because of a paucity of sulfide-sulfur (Price and others, 1997). Surface area estimates for the Continental Pit indicate that 14% of its wallrock will be comprised of the Hanover-Fierro Formation (Table D-1).

The ABA data for the Continental Pit samples are also shown in a plot of AGP versus ANP (Figure D-10). With the exception of most of the samples from the Beartooth Quartzite, Colorado Formation, and a portion of the samples from the Abo and Syrena Formations, the majority of the data plot below the lines defined by an NNP value of

+20 T $CaCO_3$/kT and an ANP to AGP ratio of 3 to 1. These ABA data imply that most of the rocks in the Continental Pit have acid-neutralizing characteristics.

3.3.2 Hanover Mountain

The surface mine proposed for Hanover Mountain will be predominantly located in the Colorado Formation. Depending on mineralogy and geological structure, the Colorado Formation at Hanover Mountain is split into three major rock types, including the Leach Cap, unoxidized zone, and Barringer Fault zone.

The ABA results for the 74 samples of Colorado Formation Leach Cap show a range in NNP from –31.0 to +12.8 T $CaCO_3$/kT, with an average NNP of –1.3 T $CaCO_3$/kT and average ratio of ANP to AGP of 2.0 (Table D-4 and Figure D-11). These results would suggest that the rocks on average may generate acidic leachates. However, the ABA data show that 29 of the 74 samples had sulfide-sulfur levels less than the detection level 0.01%, and in fact, only 6 of 74 samples had sulfide-sulfur contents greater than 0.3% (Table D-4). Based on the ABA screening criteria of 0.3% sulfide-sulfur developed by Price and others (1997), the majority of the Leach Cap rocks have insufficient sulfide-sulfur to generate acidic leachates. The proposed Hanover Pit is estimated to have about 8% of its wallrock surface area in the Leach Cap portion of the Colorado Formation (Table D-1).

The ABA data for samples of the unoxidized portion of the Colorado Formation show much higher sulfide-sulfur contents and lower NNP values than the Leach Cap samples (Table D-4 and Figure D-11). The unoxidized Colorado Formation samples have an average NNP of –37.7 T $CaCO_3$/kT and average ANP to AGP ratio of 0.3. Most of these samples had sulfide-sulfur contents greater than 0.3%. These data indicate that the majority of the rocks in the unoxidized portion of the Colorado Formation have the potential to generate acidic leachates. Estimates for the proposed Hanover Pit indicate that about 89% of the wallrock will be comprised of the unoxidized Colorado Formation (Table D-1).

Samples from the Barringer Fault zone show a wide variability. Measured NNP values range from –493.9 to +40.4 T $CaCO_3$/kT (Table D-4 and Figure D-11). Examination of the ABA data shows that 12 of the 45 samples had sulfide-sulfur contents less than the detection level of 0.01%. However, 19 of the 45 samples had sulfide-sulfur contents greater than 0.3% and ranged up to 15.83%. These data indicate that portions of the rocks from the Barringer Fault zone may have insufficient sulfide-sulfur to generate acidic leachates, whereas other portions have an excess of sulfide-sulfur and have the potential to generate acidic leachates. The proposed Hanover Pit is estimated to have only about 1% of its wallrock surface area in the Barringer Fault Zone.

The variability of the ABA data for the Hanover Mountain rocks is shown in a plot of AGP versus ANP (Figure D-12). A few samples from the Barringer Fault Zone and show ANP and AGP values below the line defined by an NNP value of +20 T $CaCO_3$/kT and/or the line defined by an ANP to AGP ratio of 3:1, that are indicative of acid-neutralizing character. However, most of the data for the Leach Cap and a substantial portion of the data for the Barringer Fault Zone are clustered near the origin as a result of the high number of these samples having ANP and sulfide-sulfur levels near or below detection levels. In contrast, most of the samples from the Unoxidized Colorado Formation fall above the lines, implying that they have the potential to generate acidic leachates.

3.3.3 Waste Rock Disposal Facilities and Tailings

Samples from the South and West WRDFs were collected in 1995 and 1996 for ABA analyses. Four tailings samples were also collected in 1996 for ABA analyses. The results of these analyses are provided in Table D-5.

Results of ABA analyses of four composite samples from the South WRDF showed high NNP values, with an average of +171.0 T $CaCO_3$/kT, and high ratios of ANP to AGP, with an average of 30.7 (Table D-5, Figure D-13). The South WRDF is comprised of predominantly Pennsylvanian and pre-Pennsylvanian sedimentary rocks from the Continental Pit (Cobre, 1997a). Carbonates are common in these formations, resulting in the high acid-neutralizing capacities measured in the composite samples from the South WRDF.

The ABA results for the South WRDF indicate that the rocks are unlikely to generate acidic leachates. In agreement with this conclusion, samples of seep water collected from the northeast side of the South WRDF have near-neutral pH values. Additionally, waste rock samples collected from the toe of the South WRDF have been found to have paste pH values between 6.5 and 7.6 (Cobre, 1997a).

The West WRDF consists of overburden material removed from the Pearson and Barnes workings in the 1950s and 1960s and a push-back from the Continental Pit started in the late 1970s. The West WRDF was created by a previous operator of the mine. It consists of post-Pennsylvanian rocks (Abo, Beartooth, and Colorado Formations).

In general, the results of individual samples from the West WRDF analyzed by SVL show that there is significantly less carbonate than those in the South WRDF (Cobre, 1997a) (Table D-5). Consequently, there is substantial variability in the ABA results. Eight of 20 SVL samples (excluding duplicates) had NNP values less than + 20 T $CaCO_3$/kT and 12 of 20 SVL samples (excluding duplicates) had ratios of ANP to AGP less than 3.

In contrast to the above results for the individual samples from the West WRDF, the results for four composite samples indicate relatively high NNP values and high ratios of ANP to AGP (Table D-5). However, the four composite samples of West WRDF had high residual sulfur contents, implying that the sulfide-sulfur content was probably under-determined. For example, if the total-sulfur contents are assumed to be sulfide-sulfur, then recalculation of the NNP values indicates that 3 of the 4 composite samples for the West WRDF have negative values, which is more consistent with the results from individual samples determined by SVL.

Two intermittent seeps are present along the southeastern perimeter of the West WRDF. Water samples from these seeps have been determined to have pH values of about 3.0. Overall, the observed low pH for the seeps indicates that the West WRDF contains acid-generating rocks, in agreement with the majority of the ABA data.

Four composite samples of rocks that represent an estimated composition for future waste rock from the Continental Pit were also collected and analyzed by the CORE procedure for ABA in 1996 (CDM, 1997). The results of these analyses indicate high NNP values and high ratios of ANP to AGP. Because these samples were analyzed by the CORE procedure and had high residual sulfur contents, the sulfide-sulfur contents were probably under-determined. However, if the total sulfur content of these samples is assumed to be all sulfide-sulfur, then recalculation of the NNPs yields values from +122.6 to +152.9 T $CaCO_3$/kT. These high values indicate that ANP is still much greater than AGP for the future Continental waste rock even for the potential maximum error in the CORE analyses. Thus, the rocks would still be characterized as acid-neutralizing.

Four samples of tailings were also analyzed in 1996 by the CORE procedure (CDM, 1997). The results show high NNP and high ratios of ANP to AGP for the tailings samples. Similar to the other CORE analyses discussed above, the results show high residual sulfur values. A recalculation of the NNPs, assuming that sulfide-sulfur is equal to total sulfur, yields values from +105.8 to +136.7 T $CaCO_3$/kT. Thus, given the maximum uncertainty in the CORE procedure, the tailings would still be characterized as acid-neutralizing.

3.3.4 Humbolt Mountain

Nine samples from Humbolt Mountain were analyzed for ABA because it is a potential site for a future copper ore leaching operation (Table D-6). The samples included one from the Syrena and Abo Formations, one from the Oswaldo Formation, one from the Oswaldo Formation (Parting Shale member), two from the Lake Valley Formation, two from the Percha Shale (one from the Box member, one from the

Ready Pay member), one from the Fusselman and Montoya Formations, and one from syenodiorite.

Two samples had ANP/AGP ratios below 3.0; the Oswaldo Formation (Parting Shale member) and the Percha Shale (Box member) had ANP/AGP ratios of 1.8 and 2.1. However, all of the samples from Humbolt Mountain had NNP values greater than +20 T $CaCO_3$/kT. The average NNP of the Humbolt Mountain samples is +400.6 T $CaCO_3$/kT. Based on this set of data, the majority of the rock at Humbolt Mountain can be expected to have a significant potential to neutralize acid.

3.4 Determination of AGP by the Peroxide Method

Fifteen samples from Hanover Mountain that were analyzed for AGP by standard methods were also analyzed for AGP by the peroxide-sulfur method (Table D-4). The AGP values determined by the peroxide method generally correlated with the AGP values determined from the sulfide-sulfur content from the standard methods, although differences between the two methods appears to increase at low AGP (Figure D-15). Regression analysis of the AGP data yielded a "coefficient of determination" (R^2) of 0.83, indicating that the peroxide method could be a useful screening tool in estimating ABA properties of rocks during mine operation. Further testing and regression analysis will be conducted to strengthen the certainty in this relationship.

3.5 Net Acid Generation (NAG) pH Analysis

The Net Acid Generation (NAG) pH analysis is a method that allows a rapid decision as to whether or not a waste rock needs selective handling. This method is useful because it is a simple test that can be conducted on site and in 24 hours. The NAG procedure is based on a 24-hour oxidation of the sample with hydrogen peroxide and subsequent measurement of the pH of the sample. This pH measurement is called the "NAG-pH" value. The 24-hour interval provides time for production of sulfuric acid by oxidation of pyrite in the sample, followed by dissolution and neutralization of the acid by carbonates and other rapidly neutralizing minerals present in the sample.

If the NAG-pH is greater than an empirically-determined critical value (generally pH 4.0), the sample is considered a non-acid generator. If the pH is less than the critical value, then the sample is assumed to have the potential to generate acid, and the sample is further tested to determine the degree of acid-producing potential by titrating the sample with sodium hydroxide to pH 4.5 and pH 7.0. The NAG potential is then determined by multiplying the volume of titrant by the molarity of the titrant and by a constant, and dividing by the sample weight. The NAG potential is an indicator of the capacity of a sample to generate acid, similar to the AGP. The exact relationship between NAG-pH and potential acid generation should be determined individually for each rock type at the mine site, based on comparison to results of ABA and kinetic tests for each rock type.

Fourteen samples that had been analyzed for ABA were also analyzed with the NAG test by SVL (Table D-7). These samples were obtained from bench shots in the Continental Pit (Syrena Formation) and drill holes in Hanover Mountain (Colorado Formation Leach Cap and unoxidized rock). The Syrena Formation samples, which had NNPs from +11 to +86 T $CaCO_3$/kT, all had NAG-pH values above 7.

Six of the seven Colorado Formation Leach Cap samples, which had NNP values from -6 to +3 T $CaCO_3$/kT, had NAG-pH values between 4.0 and 6.0; the remaining Leach Cap sample, which had an NNP of -31 T $CaCO_3$/kT, had a NAG pH value of 2.86 (Table D-7). This Leach Cap sample had NAG potentials of 10.60 and 14.24 T $CaCO_3$/kT when titrated to pH values of 4.5 and 7.0, respectively.

The two samples from the unoxidized Colorado Formation, which had NNP values of -15 and -66 T $CaCO_3$/kT, had NAG-pH values between 3 and 4, and generated NAG potentials of 1.62 and 6.36 T $CaCO_3$/kT (pH 4.5) and 6.10 and 14.68 T $CaCO_3$/kT (pH 7.0) (Table D-7).

The NAG pH values of these samples are plotted against the NNP values of the samples in Figure D-16. In general, the data show an approximately linear relationship between NAG-pH and NNP when the NAG-pH is less than 7.0. When the NAG-pH is greater than 7.0, the data do not show a linear relationship. These results suggest that the NAG- pH should be a useful indicator of the acid generating potential for of waste rock.

4.0 HUMIDITY CELL TESTING

Humidity cell tests (HCTs) are used to determine the probability that a rock type with ABA characteristics of NNP between 0 and +20 T $CaCO_3$/kT and ANP/AGP between 1 and 3 will produce acidic leachates. Rocks with ABA characteristics outside these limits can generally be expected to produce either acidic leachates (NPP less than 0 T $CaCO_3$/kT) or alkaline leachates (NNP greater than +20 T $CaCO_3$/kT). The HCTs results can also be used to determine the masses of leachable constituents for use in predictive models of waste rock leaching and pit lake chemistry.

A total of 21 HCTs were conducted on samples collected from the Continental Pit and Hanover Mountain (Figure D-17). The HCTs were conducted in two sets. The experimental procedures for the HCTs differ between the two sets of tests, hence are discussed separately below.

4.1 CORE-Procedure Humidity Cell Tests

In the first set of eight samples from the prospective mine area at Hanover Mountain were subjected to HCTs (CDM, 1997). Five of these samples were from the Colorado Formation Leach Cap and three samples were from the Unoxidized Colorado Formation. The specific NNP values of the eight HCT samples are compared to the overall range of NNP values determined for the entire population of rocks in Figure D-18.

The HCTs on these eight samples were conducted by CORE following procedures detailed by Sobek and others (1978), as modified by CORE (CDM, 1997). Briefly, the CORE procedure involved air-drying samples, crushing the samples to less than 10 mesh (less than 2 mm), and blending the crushed samples. Samples with a mass of 250 grams were placed in test cells constructed of plastic containers with tight-fitting lids. Testing consisted of a 7-day cycle in which dry air and then humidified air were successively fed through the cell for 3 days each. On the seventh day, 250 mL of deionized water were added to each cell and allowed to soak for 1 hour. The sample leachate was then drained into a collection beaker. Sample leachates were filtered through a 0.45-um filter and analyzed for pH, conductivity, sulfate, iron, acidity, and alkalinity. The leachates were not analyzed for metal concentrations. The testing results are summarized in Table D-8, and complete analytical results are provided in Attachment D.2.

Kinetic testing of four (CF163, CF175, CF161, and CF183) of the Colorado Formation Leach Cap samples was terminated at Week 10 because of the extremely low rates of acid or alkalinity production, low sulfate values, and near-neutral leachate pH (Table D-8). These samples had sulfide-sulfur contents less than 0.01%, hence had very little potential to produce acidity (Price and others, 1997). They also generally produced very small amounts of alkalinity, indicating that these rocks are largely unreactive in terms of acid or base generation.

The HCT for a fifth sample of Colorado Leach Cap sample (CF164) was carried out for 40 weeks. The pH values of the leachate of this sample ranged from 4.2 to 6.0 over the 40-week interval, generally showing an upward trend. Over the 40-week period, sample CF164 released a small amount of acidity at 35.8 mg/kg, most of which was released in the first 27 weeks (Attachment D.2). Sulfate concentrations in the leachates from CF164 gradually decreased from 570 to less than 10 mg/L by Week 40. Sample CF164 had a very low sulfide-sulfur content of less than 0.01%, but contained 0.28% of sulfate-sulfur. Consequently, the small amount of acid released and related sulfate concentrations was likely caused by the dissolution of sulfate minerals, such as jarosite, alunite, and/or gypsum, present as secondary oxidation products in sample CF164.

The three samples of the Unoxidized Colorado Formation from Hanover Mountain were subject to 30 to 40-week HCTs (Table D-8). For sample CF172, the pH of the leachate ranged from 4.7 to 5.8 and the sample released 59.4 T $CaCO_3$/kT acidity over the first 32 weeks. After 32 weeks, sample CF172 was inoculated with an acidic solution containing iron-oxidizing bacteria. The pH of the leachate then decreased significantly to between from 3.1 to 3.9, and the rates of acid and sulfate production also increased significantly. Sulfate concentrations in the leachate increased from less than 10 mg/L before the inoculation to 580 mg/L after the inoculation, but gradually decreased to 85 mg/L at Week 40.

Kinetic testing results for samples CF144 and CF177 were similar to the results obtained for CF172 prior to bacteria inoculation. The pH values of the leachates from CF144 and CF177 ranged from 4.5 to 5.9, and cumulative amounts of acid production were 54 and 15 mg/kg, respectively (Table D-5).

4.2 McClelland/SVL-Procedure Humidity Cell Tests

In 1999, 13 more HCTs were conducted, including six samples from the Continental Pit and seven samples from Hanover Mountain (Table D-8). The specific NNP values of the eight HCT samples are compared to the overall range of NNP values determined for the entire population of rocks in Figure D-18.

The procedure for these HCTs was different from that used earlier because of the need to obtain leaching rates for a full suite of constituents that could be used for the pit lake modeling. The method employed was similar to that described in ASTM (1996). Briefly, 1.2 kg of sample with a particle size less than 10 mesh was placed in a cylindrical vessel. The sample was initially saturated with deionized water and allowed to drain. Then, dry air was circulated through the sample for three days followed by 3 more days of humid air (created by passage of an airstream through deionized water at 30°C). On the seventh day, 500 ml of deionized water was added to the samples, allowed to sit for one hour, and then drained. A split was analyzed immediately for pH, sulfate, total iron, ferrous iron, total acidity, and alkalinity. A second split was frozen for later compositing with other samples. The composite samples consisted of equal portions of the frozen splits from each of five consecutive weeks of testing. The composite samples were analyzed for a full suite of constituents by SVL Analytical. The testing results for weekly analyzed constituents are summarized in Table D-8. Complete analytical results for the weekly and 5-week composite samples are provided in Attachment D.2.

In general, samples from the Continental Pit did not generate acidic leachates in the HCTs. These samples generally had positive NNP values and ratios of ANP/AGP greater than 1.7 (Table D-8), which is characteristic of the Paleozoic carbonate rocks found in the Continental Pit. These results indicate that the Continental Pit rocks can generally be expected to produce neutral to alkaline leachates with low metal concentrations (Attachment D.2).

The Hanover Mountain samples, which include those from the Unoxidized Colorado Formation (WRC-07, WRC-08, WRC-99-2, and WRC-99-03) and Colorado Formation Leach Cap (WRC-09), had sulfide-sulfur contents up to 2.31%, negative NNP values, and ANP to AGP ratios less than 2.1, indicating a potential for acid generation. In confirmation of this observation, the HCTs on Hanover Mountain samples generally produced acidic leachates with two exceptions. The minimum pH values of leachates from these samples ranged from 2.52 to 4.07. The maximum pH values of leachates from these samples ranged from 4.27 to 5.36. Accompanying the low pH values in these leachates were comparatively elevated concentrations of sulfate and metals (for example, aluminum, cobalt, copper, iron, nickel, and zinc) (Attachment D.2).

The two exceptions noted above include sample WRC-11 from the Barringer Fault Zone and WRC-99-1 from the Syrena Formation, which comprises a very minor portion of the prospective Hanover Pit. Sample WRC-11 produced a near-neutral leachate but had elevated sulfate concentrations (Table D-8). This suggests that it had soluble sulfate-bearing minerals possibly present as secondary oxidation products from original sulfide minerals. Sample WRC-99-1 had a negative NNP (-32.4 T $CaCO_3$/kT) and low ratio of ANP to AGP (0.6) but produced neutral leachates over its 22-week testing period. The lack of acid generation by WRC-99-1 may be due to an unreactive sulfide mineral content or slow initial rate of oxidation. However, given its ABA characteristics, this sample may be expected to produce acidic leachates eventually.

Overall, the HCT results (McClelland/SVL Procedure) show that the rocks from the Continental Pit generally do not produce acidic leachates. This general observation is consistent with the predominance of Paleozoic carbonate units that comprise the majority of the pit walls in the Continental Pit.

The HCT results (CORE and McClelland/SVL Procedure) show that rocks from the Colorado Formation Leach Cap at Hanover Mountain are relatively unreactive because of very low sulfide-sulfur contents. However, a portion of this rock has the potential to release small amounts of acidity and sulfate, depending on the alteration mineralogy. In contrast, the Unoxidized Colorado Formation at Hanover Mountain has significantly higher sulfide-sulfur contents and generally produces mildly acidic to acidic leachates. These observations are likely due to the lack of carbonate units at Hanover Mountain that would provide neutralizing capacity and generally higher sulfide-sulfur contents.

5.0 WHOLE ROCK CHEMICAL COMPOSITIONS

Ten samples for whole rock analyses were collected in 1994 and 1995 from the Continental Pit, Hanover Mountain, and Magnetite Tailings Facility. In 1999, an additional 13 samples for whole rock analyses were collected from the Continental Pit and Hanover Mountain (Table D-9). Sampling locations are shown in Figure D-19.

The 1994 and 1995 samples were collected by Cobre personnel. Eight were analyzed by CORE and two were analyzed by Chemax Labs, Inc., Sparks, Nevada (Table D-9). Four of the CORE samples were composites of Continental Pit samples, that were also analyzed for acid-base accounting, including: (1) the West WRDF (composite of WD-1, WD-2, WD-3, and WD-4), (2) the South WRDF (composite of ED-1, ED-2, ED-3, and ED-4), (3) the future waste rock from the Continental Pit (composite of OP-1, OP-2, OP-3, and OP-4), and (4) the final tailings (composite of FTJ, FTF, FTM, and FTA).

The other four samples analyzed by CORE were the same Hanover Mountain samples that were also analyzed for ABA, including sample LC-1 from the Colorado Formation Leach Cap, samples Waste-1 and Waste-3 from the Unoxidized Colorado Formation, and sample Waste-4 from the Barringer Fault Zone (Table D-9). The final two samples, which were analyzed by Chemax, consisted of composite grab samples of magnetite tailings.

The 13 samples collected in 1999 were analyzed by SVL for whole rock compositions, according to method prescribed by ASTM D-3683 (Table D-9). These samples were splits from the same samples that were used in the 1999 humidity cell tests (see Table D-8).

The results of the whole rock analyses were compared to average crustal values (Table D-10) to provide a relative scale for comparative purposes. Several constituents were analyzed using methods with detection limits that were above average crustal values (antimony, arsenic, cadmium, molybdenum, selenium, silver, thallium, and tin). Consequently, these constituents could not be directly compared to crustal values in samples for which these constituents were not detected. A comparison shows that the following constituents were elevated relative to average crustal values in one or more waste rock samples: antimony, cadmium, copper, iron, lead, manganese, molybdenum, selenium, tin, and zinc (Tables D-9 and D-10). One or both of the magnetite tailings samples contained elevated levels of arsenic, copper, iron, manganese, and zinc.

The determination of elevated levels of some constituents in samples from the existing mining facilities and proposed mine at Hanover Mountain is consistent with ore mineralization in an area that has been the target of historic mining activities. The ore mineralization occurs primarily in the contact metamorphic zone adjacent to the Hanover-Fierro Stock. Here, metal sulfide and oxide minerals have been concentrated by ore-forming processes resulting in generally elevated levels of metals in the rocks and soils observed in the whole rock analytical data.

6.0 METEORIC WATER MOBILITY PROCEDURE TESTS

The Meteoric Water Mobility Procedure (MWMP) is a leaching test designed by the Nevada Department of Environmental Protection (NDEP) for investigating the mobility of potentially toxic constituents in samples of mine soils and wastes (NDEP, 1996).

A total of 35 MWMP tests were conducted on samples from the mining areas, including 27 samples (including two duplicates) from the Continental Pit, 4 samples from Hanover Mountain, and 4 samples from the existing Tailings Pond. The results from these tests are provided in Table D-11. Sampling locations are shown in Figure D-20.

The MWMP leachates generated from testing of samples from the Continental Pit generally had near-neutral to alkaline pH values, ranging from about 6.5 to 9.8, and low metal concentrations (Table D-11). Similarly, the MWMP leachates obtained from testing of the four samples from the Tailings Pond also had pH values from about 7 to 7.5 and low metal concentrations. In contrast, three of four samples from the Leach Cap and Unoxidized Colorado Formation at from Hanover Mountain produced MWMP leachates with acidic pH values and elevated metal concentrations. The fourth sample from the Barringer Fault Zone at Hanover Mountain had a near-neutral pH of 7.90 and low metal concentrations.

The pH has a strong effect on the solubilities of many secondary alteration minerals of metal sulfide oxidation. This effect can be seen in a plot of cumulative metals (aluminum, copper, iron, manganese, and zinc) as a function of the pH of the MWMP leachates (Figure D-21a). These five were the metals most commonly elevated in the leachates. The three samples from the Leach Cap and Unoxidized Colorado Formation at Hanover Mountain produced the most acidic leachates and also the highest metal concentrations. This result indicates that the sulfide minerals at Hanover Mountain release acidity and metals upon oxidation and subsequent inundation with water.

Plotting sulfate concentrations as a function of pH for the MWMP leachates shows that the same three samples from Hanover Mountain that produced acidic leachates also produced elevated sulfate levels relative to the Continental Pit samples (Figure D-18b). Additionally, the four samples from the Tailings Pond and the single sample from the Barringer Fault Zone at Hanover Mountain produced elevated sulfate concentrations ranging from 330 to 1260 mg/L in MWMP leachates. These results indicate that oxidation of sulfides in the Hanover Mountain samples has produced soluble sulfate-bearing minerals that dissolve readily in water releasing acidity, metals, and sulfate. In the case of the Barringer Fault Zone sample, oxidation of sulfides may have occurred during or after ore formation producing elevated sulfate levels, but acidity has not developed because of an excess amount of neutralizing capacity (the NNP for the Barring Fault Zone sample (WRC-11) is +40.4 T $CaCO_3$/kT.). Hence, the pH of the MWMP leachates remained near neutral and metal concentrations were low. This sample also produced high sulfate concentrations in HCTs (see Table D-8). The MWMP results also show that soluble sulfate minerals are also present in the Tailings Pond samples, presumably as a result of ore processing.

7.0 BULK WASTE ROCK TEST FACILITY

Seven bulk field test pads were constructed by Cobre in cooperation with the New Mexico Bureau of Mines and Mineral Resources (NMBMMR). The bulk testing program was established to provide a large-scale representation of the effects of waste rock leaching on the quality of storm water under normal precipitation conditions. The field testing program is intended to continue for several years to help evaluate any potential long-term effects of waste rock on surface water quality (Cobre, 1997b).

Seven test pads were constructed utilizing discrete blends of Hanover Mountain Leach Cap and Continental Pit waste rock (Figure D-22). Six of the seven pads were constructed in December 1996 and the seventh pad (Pad 4) was completed in August 1997. Pad 4 was added to include relatively unoxidized sulfidic Colorado Formation from the northwest extension of the Continental Open Pit. This material is similar to a portion of the waste rock expected to be encountered in lenses beneath the Hanover Mountain Leach Cap (Cobre, 1997b). There was no blending involved for Pad 4.

The test pads were constructed in north-south trending rows. The dimensions and loading plan of the pads are shown in Figure D-22. Weight estimates are based on the capacity of the Caterpillar® 992 that was used to load the pads (one load equals approximately 25 tons). The first six test pads consisted of piled waste mixtures placed approximately 12 feet high on a base consisting of high density polyethylene (HDPE) liners and used conveyor belt material. The belt material overlies the HDPE liner and provides protection from puncture during emplacement of waste rock.

The waste rock on pad #4 was placed approximately 7 feet high on a base of HDPE liners. The seven test pads were constructed on a 1- to 2-foot-thick bed of fine sandy material. The base of each test pad has a southwest gradient, providing for the drainage of precipitation (Cobre, 1997b).

Test materials were sampled by NMBMMR staff from which hand-specimen-scale samples prepared for polished and thin-section study. According to NMBMMR, initial mineralogical results indicate that most of the sulfide surfaces are exposed as free surfaces or as sulfide-silicate grain contacts. These results suggest that percolation of precipitation-derived solutions should provide ample water-sulfide contact and consequent initiation of sulfide oxidation for study (Cobre, 1997b).

Solutions draining from the pads are collected in polyethylene sumps installed at the southwest corner of each pad. A rain gauge located at the facility is checked daily, and the sample sumps are checked after significant storm events. Experience at the mine has demonstrated that 0.2 to 0.3 inches of precipitation are required to generate sufficient runoff for sampling. Sump sampling procedure includes: collection of two 500-mL samples, filtering in the field with 0.45-micron filters, storage during transit in a cooler, and submission to NMBMMR for analysis. One sample is preserved for dissolved metals analysis by adding sufficient nitric acid resulting in a pH less than 2. The other sample is unpreserved and used for anion determinations. Analytical parameters measured include pH, temperature, conductivity, iron, zinc, copper, lead, cadmium, arsenic, sulfate, and bicarbonate (Cobre, 1997b).

The chemical compositions of five of the bulk test pad leachates for the first two sampling events, in January and March 1997, are shown in Table D-12. There was no sample available for testing from Pad 1, and Pad 4 had not yet been built when the January and March 1997 samples were collected. The pH values of leachates from Pads 2, 3, 5, 6, and 7 ranged from 6.5 to 8.0, with slightly higher pH values in the March samples. Conductivity ranged from less than 100 to 660 µS/cm. Sulfate concentrations in these samples ranged from 9.7 to 243 mg/L, and decreased significantly in the March sampling. The concentrations of metals analyzed (arsenic, cadmium, copper, iron, lead, and zinc) were low (Table D-12).

8.0 CONCLUSIONS

The majority of the rock in the Continental Pit is comprised of Paleozoic-age formations with high carbonate contents in the form of calcite and dolomite. Consequently, these rocks generally have high NNP values indicating that they are unlikely to produce acidic leachates due to weathering processes (oxidation and dissolution) with few exceptions. This conclusion is corroborated by the results of HCTs and MWMP tests on rocks from the Continental Pit that produced near-neutral to slightly alkaline leachates with low metal concentrations. The potential exceptions include the Mesozoic and younger rocks of the Beartooth and Colorado Formations that generally have lower carbonate contents and lower NNP values than the older formations.

In contrast to the Continental Pit, nearly all of the rock tested from Hanover Mountain has negligible carbonate content and negative NNP values. Based on these data, there is a potential for the generation of acidic leachates in the waste rock and pit walls. HCTs and MWMP test results showed that a proportion of Hanover Mountain rock samples with negative NNP values produced acidic leachates corroborating this conclusion.

NAG pH analysis and peroxide sulfur determinations suggest that these methods are useful for rapidly estimating the acid production probability from waste rock. These testing procedures should provide reliable methods for determining waste rock handling and storage.

Leaching tests conducted on tailings samples indicate that they are non-acid-generating but can release high concentrations of sulfate. These results are consistent with observations of neutral-pH water, containing sulfate concentrations from about 800 to 2430 mg/L, in the Tailings Pond and Magnetite Tailings facilities.

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