Appendix B.4

Cresson Ore Percolation and Consolidation Tests

Golder Associates Inc.

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Golder Associates

October 15, 1999

Our Ref.: 993-2075.003

Cripple Creek & Victor Gold Mining Company
P.O. Box 191
2755 State Highway 67
Victor, Colorado 80860

Attention: Mr. Ron Roberts

RE: PERCOLATION-CONSOLIDATION TESTING RESULTS

Golder Associates Inc. (GAI) is pleased to present the results of testing conducted in support of Cripple Creek & Victor Gold Mining Company's (CC&V) Valley Leach Facility. This report details the results for gradation and percolation versus consolidation testing performed on a sample of Cresson ore.

1.0 MATERIAL DESCRIPTION

A sample of Cresson ore was provided by CC&V and used in the percolation-consolidation testing program. The general ore sample gradation and description is provided below and summarized in Table 1:

U.S. Standard Sieve Size	Percent Passing
3-inch	100
1-1/2 inch	89
3/4 inch	64
3/8-inch	45
No. 4	31
No. 40	11
No. 200	6

The sample classifies as a fine to coarse gravel with some fine to coarse sand with little fines (Figures 1 and 2).

2.0 CONSOLIDATION AND PERCOLATION TESTING

Consolidation and percolation testing was conducted on the Cresson ore sample. The sample was incrementally loaded to a maximum stress of 432 pounds per square inch (psi) consolidation pressure [equivalent to a heap height of 565 feet based on a bulk ore density

of 110 pounds per cubic foot] and measured for compression, settlement and maximum percolation rate at select load increments. The maximum test pressure of 432 psi is the maximum capacity of the testing apparatus.

2.1 Test Apparatus

The testing apparatus consisted of a 12-inch nominal inside diameter (ID) aluminum tube (testing cell), approximately 18 inches in height. Figure 3 shows the assembled testing cell. The cell was clamped to the base plate and the tie-down rods anchored to the cell base plate. A porous loading plate was placed in contact with the material and a hydraulic jack was used to apply the force to the sample against the top plate. A digital pressure transducer was used to monitor the applied load and a dial gauge measured deformation. The load from the hydraulic jack is adjusted to maintain the desired loading stress throughout the test.

2.2 Test Configuration

Figure 4 shows the Cresson ore sample prior to testing. The Cresson ore material was placed into the test testing cell (Figure 5), the initial sample height was recorded and the loading plate was secured. The sample was loaded in five increments to approximately 27, 54, 108, 216, and 432 psi. The load increments correspond to ore depths of 35, 70, 140, 280, and 565 feet, respectively, assuming a bulk ore density of 110 pounds per cubic foot (pcf). Vertical displacement values were recorded at each load increment. The sample was loaded to the next increment only after consolidation had ceased. The sample was saturated with water and allowed to drain prior to the first load being applied.

The percolation rate of the material was measured by applying tap water with an electromagnetic pump to simulate various solution application rates. The initial application rate was 0.0045 gallons per minute per square foot (gpm/sf). At each load increment, the application rate was increased to a maximum rate of 0.045 gpm/sf or until ponding was observed on sample. The application rate of 0.045 gpm/sf is ten times greater than the initial application rate and is the maximum flow rating for the testing frame.

The sample was allowed to equilibrate (i.e. inflow equals outflow) before increasing the application rate. During the entire testing period, the surface of the sample was observed for ponding, which would indicate failure of the sample to percolate water at the given application rate.

2.3 Testing Results

The maximum percolation rates of the material at increasing loads are presented on Table 2. The maximum percolation rate of the material at all loads was measured as 0.045 gpm/sf, ten times the solution application rate used at CC&V. At all tested load increments, no ponding of water was observed.

After the percolation-consolidation tests were completed, the ore sample was tested for gradation to evaluate mechanical degradation under load. The post-test gradation data are presented in Figures 6 and 7. The post-test gradation data indicate an overall decrease in percentage of the fine gravel fraction, with a corresponding increase in percentage of the fine sand fraction. These results indicate that some mechanical degradation of the Cresson ore does occur under loading. The amount of mechanical degradation is considered insignificant. The percolation test data clearly show the ore is capable of supporting high percolation rates, even under an equivalent heap height of 565 feet.

3.0 CLOSURE

If there are any questions or concerns regarding this report or the test data, please call us at (303) 980-0540.

Sincerely,

GOLDER ASSOCIATES INC.

David Hallum for,

David M. Dix
Laboratory Manager

John F. Lupo, Ph.D., P.E.
Sr. Project Manager

DMD/JFL/llr

Attachments: Tables
Figures

TABLES

TABLE 1

SUMMARY OF ORE DATA

BORING NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (ft)	USCS SOIL CLASSIFICATION	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION			DRAIN DOWN MOISTURE	SPECIFIC GRAVITY	ADDITIONAL TESTS COMMENTS (See Notes)
				LL	PL	PI	% FINER 3/4"	% FINER #4	% FINER #200			
BEFORE PERC	CRESSON ORE	--	GP-GC	--	--	--	64	31	6	--	--	
AFTER PERC	CRESSON ORE	--	GP-GC	--	--	--	69	35	6	7.8	--	

NOTES:

TABLE 2

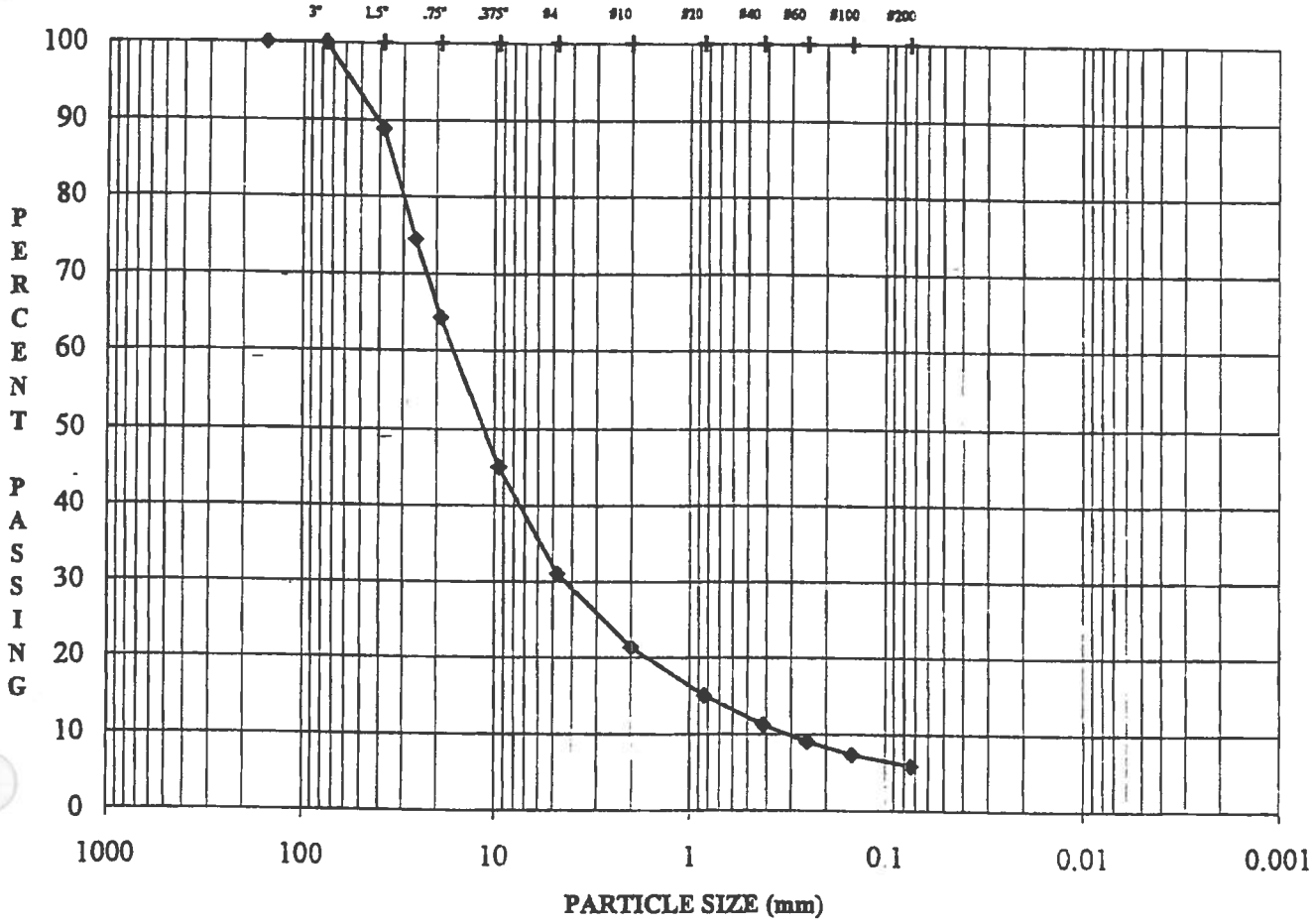
PERCOLATION-CONSOLIDATION TEST SUMMARY

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.1	0	12.2	0.0	97.7	0.045
27	38	11.6	4.9	102.7	0.045
54	76	11.3	7.2	105.3	0.045
108	150	10.9	10.2	108.8	0.045
216	295	10.5	13.5	113.0	0.045
432	578	10.1	17.5	118.4	0.045

1. Ore height calculated using the average bulk density for the applied load.

FIGURES

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CRESSON ORE	MC (As tested):	6.9%
DEPTH (ft):	BEFORE PERC.	LL:	LL
		PL:	PL
DESCRIPTION:	Fine to coarse GRAVEL with some fine to coarse sand, little clay (GP-GC)	PI:	PI
		Gs:	Gs

CC&V/TECHNICAL SUPPORT/CO
993-2075

20-Sep-99
MK
DMD

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FIGURE 1

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM C 117, C 136, D 421, D 422, D 1140, D 2216, D 2217

CC&V/TECHNICAL SUPPORT/CO 993-2075		SAMPLE #: DEPTH (ft):	CRESSON ORE BEFORE PERC.

MOISTURE CONTENT (As tested)		#200 WASH (Percent Fines)	
Tare	XU	Tare	-
Weight Wet Soil & Tare, g	289.36	Weight Soil & Tare Before Wash, g	-
Weight Dry Soil & Tare, g	272.88	Weight Soil & Tare After Wash, g	-
Weight Tare, g	32.76	Weight Tare, g	-
Weight Water, g	16.48	Weight Fines Lost, g	-
Weight Dry Soil, g	240.12	Weight Dry Soil, g	16,683.94
Moisture, %	6.86%	Fines Lost, %	-

	SIEVE	Wt. Ret.	% Ret.	% Pass.	SIEVE	
	6.000"	0.00	0.00%	100.00%	6.000"	
Coarse Gravel	3.000"	0.00	0.00%	100.00%	3.000"	Coarse Gravel
	1.500"	1,865.70	11.18%	88.82%	1.500"	
	1.000"	4,271.10	25.60%	74.40%	1.000"	
Fine Gravel	0.750"	5,969.00	35.78%	64.22%	0.750"	Fine Gravel
	0.375"	9,175.60	55.00%	45.00%	0.375"	
Coarse Sand	#4	11,509.10	68.98%	31.02%	#4	Coarse Sand
Medium Sand	#10	13,129.88	78.70%	21.30%	#10	Medium Sand
	#20	14,190.57	85.06%	14.94%	#20	
Fine Sand	#40	14,817.38	88.81%	11.19%	#40	Fine Sand
	#60	15,181.78	91.00%	9.00%	#60	
	#100	15,462.78	92.68%	7.32%	#100	
	#200	15,711.91	94.17%	5.83%	#200	
Fines	PAN	16,683.94	0.00%	100.00%	PAN	Fines

% C GRVL:	35.8%		Wet Color:	Fine to coarse GRAVEL	
% F GRVL:	33.2%	69.0%	Description:	with some fine to coarse sand,	
% C SAND:	9.7%			little clay (GP-GC)	
% M SAND:	10.1%		LL:	LL	
% F SAND:	5.4%	25.2%	PL:	PL	DATE: 20-Sep-99
% FINES:	5.8%		PI:	PI	TECH: MK
% TOTAL:	100.0%		Gs:	Gs	REVIEW: DMD

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

FIGURE 2

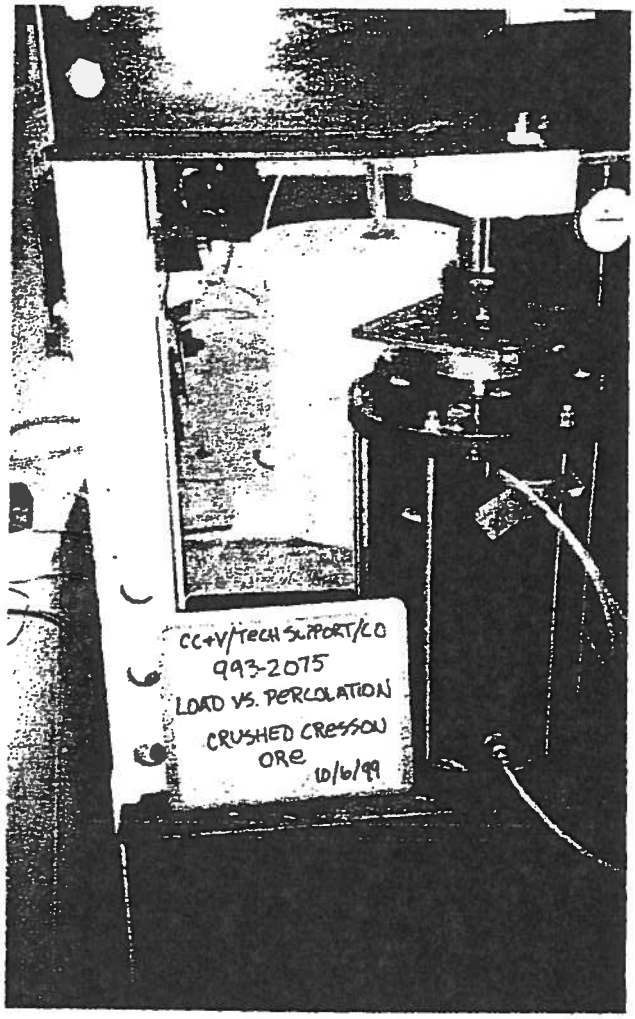


FIGURE 3 – Test Cell Assembly

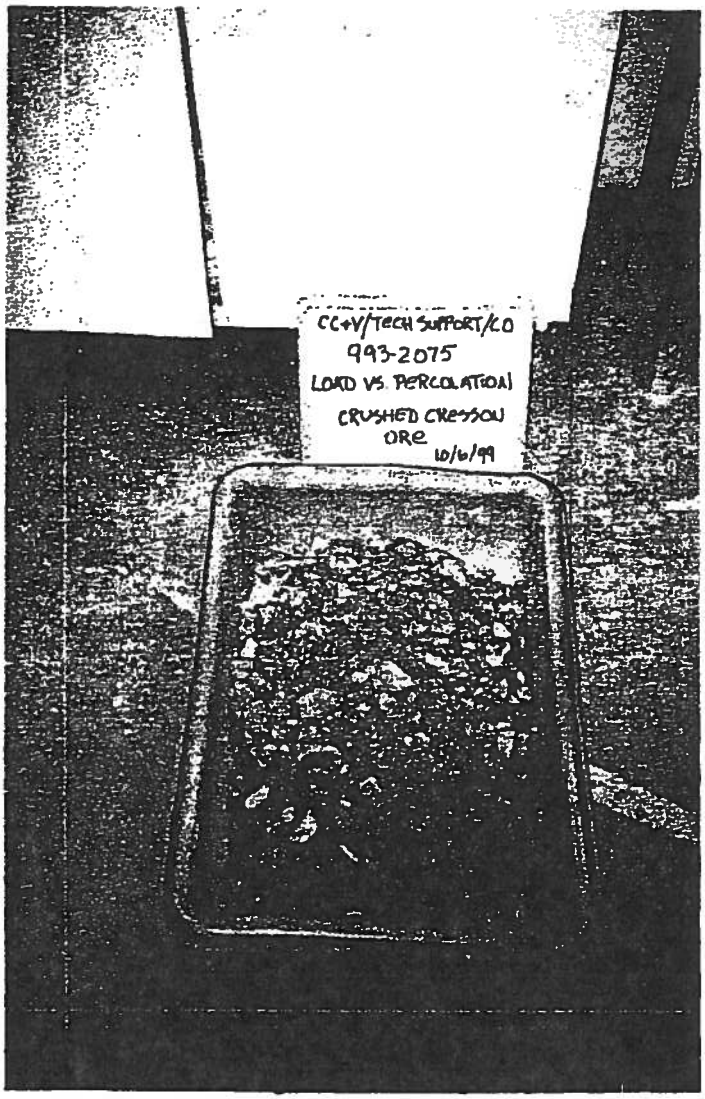


FIGURE 4 – Cresson Ore Test Material

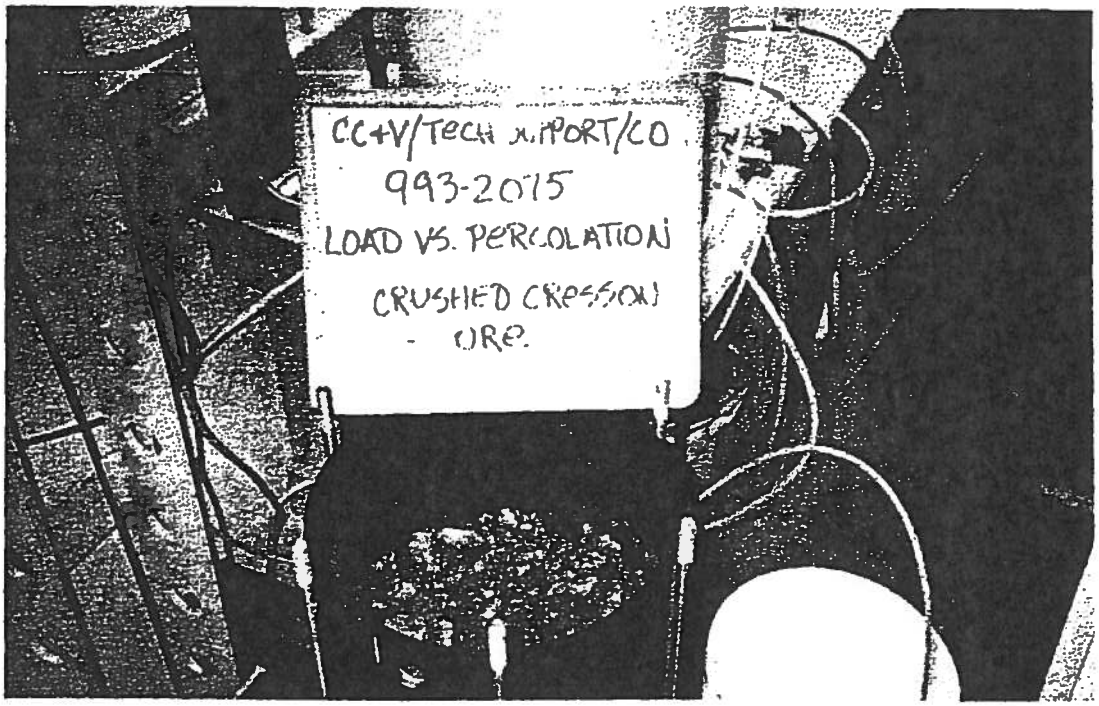
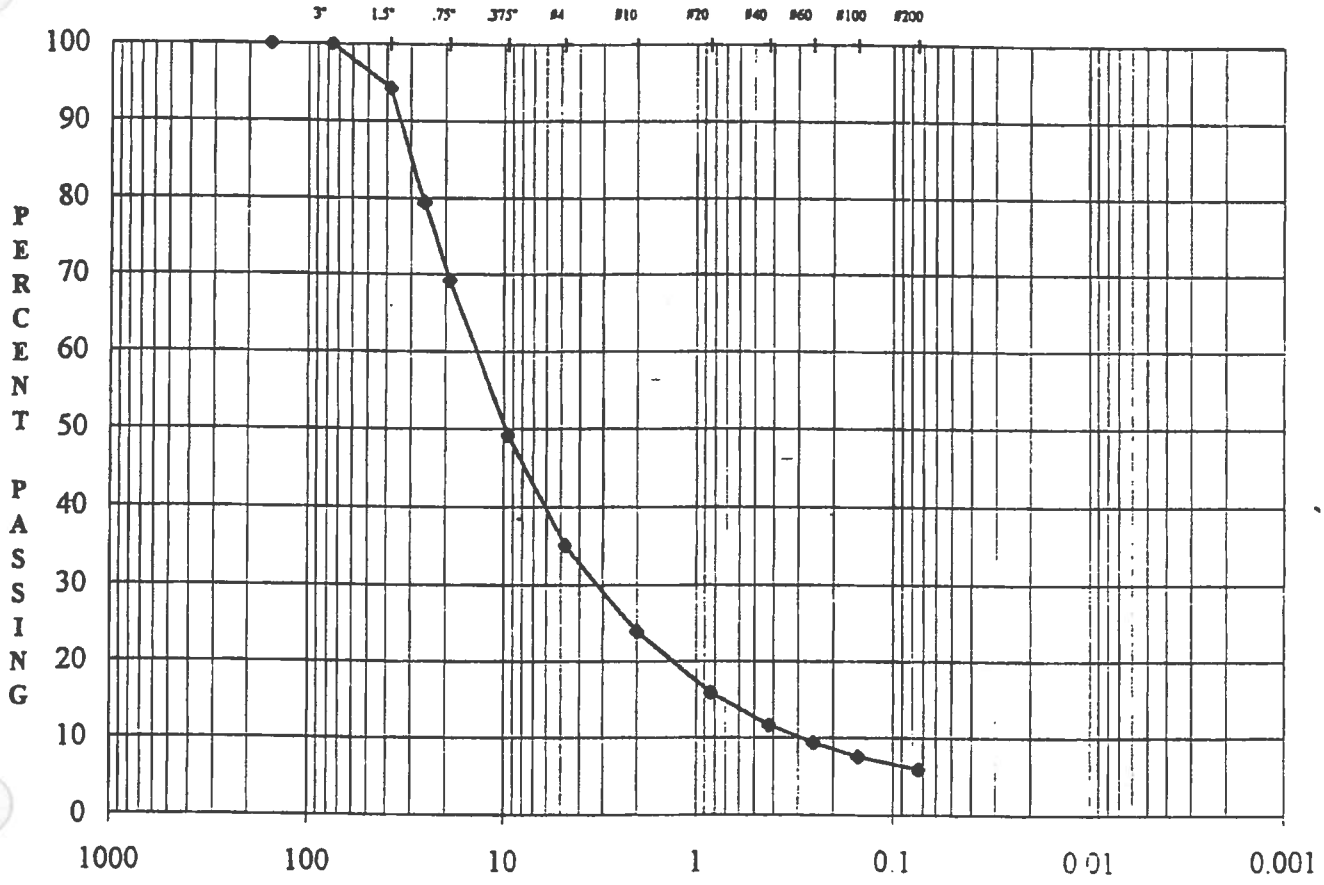


FIGURE 5 – Cresson Ore in Test Cell

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	CRESSON ORE	MC (As tested):	3.3%
DEPTH (ft):	AFTER PERC.	LL:	LL
		PL:	PL
DESCRIPTION:	Fine to coarse GRAVEL with some fine to coarse sand, little clay (GP-GC)	PI:	PI
		Gs:	Gs

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DBM/PLB
DMD

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LAKEWOOD, COLORADO

FIGURE 6

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM C 117, C 136, D 421, D 422, D 1140, D 2216, D 2217

CC&V/TECHNICAL SUPPORT/CO 993-2075	SAMPLE #: CRESSON ORE DEPTH (ft): AFTER PERC.

MOISTURE CONTENT (As tested)

Tare	4A
Weight Wet Soil & Tare, g	266.97
Weight Dry Soil & Tare, g	259.47
Weight Tare, g	32.96
Weight Water, g	7.50
Weight Dry Soil, g	226.51
Moisture, %	3.31%

#200 WASH (Percent Fines)

Tare	-
Weight Soil & Tare Before Wash, g	-
Weight Soil & Tare After Wash, g	-
Weight Tare, g	-
Weight Fines Lost, g	-
Weight Dry Soil, g	17,357.02
Fines Lost, %	-

	SIEVE	Wt. Ret.	% Ret.	% Pass.	SIEVE	
	6.000"	0.00	0.00%	100.00%	6.000"	
Coarse Gravel	3.000"	0.00	0.00%	100.00%	3.000"	Coarse Gravel
	1.500"	992.30	5.72%	94.28%	1.500"	
	1.000"	3,577.00	20.61%	79.39%	1.000"	
Fine Gravel	0.750"	5,343.20	30.78%	69.22%	0.750"	Fine Gravel
	0.375"	8,825.70	50.85%	49.15%	0.375"	
Coarse Sand	#4	11,278.10	64.98%	35.02%	#4	Coarse Sand
Medium Sand	#10	13,204.06	76.07%	23.93%	#10	Medium Sand
	#20	14,597.15	84.10%	15.90%	#20	
Fine Sand	#40	15,330.45	88.32%	11.68%	#40	Fine Sand
	#60	15,734.95	90.65%	9.35%	#60	
	#100	16,040.60	92.42%	7.58%	#100	
	#200	16,328.41	94.07%	5.93%	#200	
Fines	PAN	17,357.02	0.00%	100.00%	PAN	Fines

% C GRVL:	30.8%		Wet Color:	Fine to coarse GRAVEL	
% F GRVL:	34.2%	65.0%	Description:	with some fine to coarse sand,	
% C SAND:	11.1%			little clay (GP-GC)	
% M SAND:	12.3%		LL:	LL	
% F SAND:	5.7%	29.1%	PL:	PL	DATE: 14-Oct-99
% FINES:	5.9%		PI:	PI	TECH: DBM/PLB
% TOTAL:	100.0%		Gs:	Gs	REVIEW: DMD

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

FIGURE 7

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Golder Associates

February 25, 2000

Our Ref.: 993-2075

Cripple Creek & Victor Gold Mining Company
P.O. Box 191
2755 State Highway 67
Victor, Colorado 80860

Attention: Mr. Ron Roberts

RE: PERCOLATION-CONSOLIDATION TESTING RESULTS
ROM AND MINUS 7/8 ORE

Dear Ron:

Golder Associates Inc. (GAI) is pleased to present the results of testing conducted in support of Cripple Creek & Victor Gold Mining Company's (CC&V) Valley Leach Facility. This report details the results for gradation and percolation versus consolidation testing performed on samples of Run of Mine (ROM) and crushed minus 7/8 inch Cresson ore.

1.0 MATERIAL DESCRIPTION

Samples of Cresson ore were provided by CC&V and used in the percolation-consolidation testing program. The general ore sample gradations and description are summarized on Table 1. Detailed gradations are presented in Attachments A and B. Both samples classify as a fine to coarse gravel with some fine to coarse sand with little fines.

2.0 CONSOLIDATION AND PERCOLATION TESTING

Consolidation and percolation tests were conducted on the Cresson ore samples. Each sample was prepared and incrementally loaded to a maximum stress of 432 pounds per square inch (psi) consolidation pressure [equivalent to a heap height of 565 feet based on a bulk ore density of 110 pounds per cubic foot] and measured for compression, settlement and maximum percolation rate at select load increments. The maximum test pressure of 432 psi is the maximum capacity of the testing apparatus.

2.1 Test Apparatus

The testing apparatus consisted of a 12-inch nominal inside diameter (ID) aluminum tube (testing cell), approximately 18 inches in height. Figure 1 shows the assembled testing cell. The cell was clamped to the base plate and the tie-down rods anchored to the cell base plate. A porous loading plate was placed in contact with the material and a hydraulic jack was used to apply the force to the sample against the top plate. A digital pressure transducer was used to

monitor the applied load and a dial gauge measured deformation. The load from the hydraulic jack is adjusted to maintain the desired loading stress throughout the test.

2.2 Test Configuration

ROM Cresson Ore

For the ROM Cresson Ore sample test, the ore material was first screened to remove material larger than 2 inches. The screening was done to keep the ratio of the test vessel diameter to the maximum particle size to around six, thereby minimizing any scaling effects. In addition, a study of ore permeability conducted by Lupo (2000[1]) has shown that ore permeability is generally governed by material smaller than 1 to 1 ½ inches. Figure 2 shows the ROM Cresson ore sample prior to testing. The Cresson ore material was placed into the test cell, the initial sample height was recorded and the loading plate was secured. The sample was loaded in five increments to approximately 27, 54, 108, 216, and 432 psi. The load increments correspond to ore depths of 35, 70, 140, 280, and 565 feet, respectively, assuming a bulk ore density of 110 pounds per cubic foot (pcf). Vertical displacement values were recorded at each load increment. The sample was loaded to the next increment only after consolidation had ceased. The sample was saturated with water and allowed to drain prior to the first load being applied.

The percolation rate of the material was measured by applying tap water with an electromagnetic pump to simulate various solution application rates. The initial application rate was 0.0045 gallons per minute per square foot (gpm/sf). At each load increment, the application rate was increased to a maximum rate of 0.045 gpm/sf or until ponding was observed on sample. The application rate of 0.045 gpm/sf is ten times greater than the initial application rate and is the maximum flow rating for the testing frame.

The sample was allowed to equilibrate (i.e. inflow equals outflow) before increasing the application rate. During the entire testing period, the surface of the sample was observed for ponding, which would indicate failure of the sample to percolate water at the given application rate.

Crushed Minus 7/8 Cresson Ore

The crushed minus 7/8 inch Cresson Ore sample was not screened prior to testing. Figure 3 presents condition of the crushed ore prior to testing. The crushed ore was placed into the test cell, the initial sample height was recorded and the loading plate was secured. The sample was loaded in five increments to approximately 27, 54, 108, 216, and 432 psi. The load increments correspond to ore depths of 35, 70, 140, 280, and 565 feet, respectively, assuming a bulk ore density of 110 pounds per cubic foot (pcf). Vertical displacement values were recorded at each load increment. The sample was loaded to the next increment only after

[1] Lupo, John, 2000. Hydraulic Considerations for Leaching Operations, to be presented at the Society of Mining Engineering (AIME) conference, February 28 - March 1, Salt Lake City, Utah.

consolidation had ceased. The sample was saturated with water and allowed to drain prior to the first load being applied.

The crushed ore was then tested for percolation rate, following the same methodology as that used for the ROM ore sample.

2.3 Testing Results

The maximum percolation rates for the ROM and minus 7/8 inch Cresson Ore samples all measured 0.045 gpm/sf under the incremental loads. This percolation rate is ten times the solution application rate used at CC&V. At all tested load increments, no ponding of water was observed. The percolation test data clearly show the ore is capable of supporting high percolation rates, even under an equivalent heap height of 565 feet.

In addition, the test results show the ROM Cresson Ore will strain approximately 10 percent under the load of 432 psi, while the crushed ore will strain approximately 16 percent under the same loading.

After the percolation-consolidation tests were completed, the ore samples were tested for gradation to evaluate mechanical degradation under load. The post-test gradation data and the consolidation data are presented in Attachments A and B. The ROM Cresson Ore sample did not show any appreciable change in gradation due to the consolidation under load. The minus 7/8 inch ore did show a small increase (about 3 percent) in fines resulting from the consolidation under load.

3.0 CLOSURE

If there are any questions or concerns regarding this report or the test data, please call us at (303) 980-0540.

Sincerely,

GOLDER ASSOCIATES INC.

for David M. Dix
Laboratory Manager

John F. Lupo, Ph.D., P.E.
Sr. Project Manager

DMD/JFL/ljd

Attachments: Tables
Figures
Attachment A – ROM Cresson Ore
Attachment B – Crushed Minus 7/8 inch Cresson Ore

TABLES

TABLE 1
SUMMARY OF SOIL DATA

BORING NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (ft)	USCS SOIL CLASSI-FICATION	DELIVERED MOISTURE (%)	ATTERBERG LIMITS			GRAIN SIZE DISTRIBUTION			DRAIN DOWN MOISTURE	SPECIFIC GRAVITY	ADDITIONAL TESTS COMMENTS (See Notes)
					LL	PL	PI	% FINER 3/4"	% FINER #4	% FINER #200			
BEFORE PERC.	-7/8 INCH CRESSON ORE	--	GW	--	--	--	--	93	38	6	--	--	
AFTER PERC.	-7/8 INCH CRESSON ORE	--	GW	--	--	--	--	96	48	9	--	--	
BEFORE PERC.	-2 INCH CRESSON ORE	--	GW	--	--	--	--	43	13	1	--	--	
AFTER PERC.	-2 INCH CRESSON ORE	--	GW	--	--	--	--	48	16	2	--	--	

NOTES:

LL = LIQUID LIMIT
PL = PLASTIC LIMIT
PI = PLASTIC INDEX
SL = SHRINKAGE LIMIT

T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST

DIRECT SHEAR TEST
PERM = PERMEABILITY
IP = IN PROGRESS

FIGURES

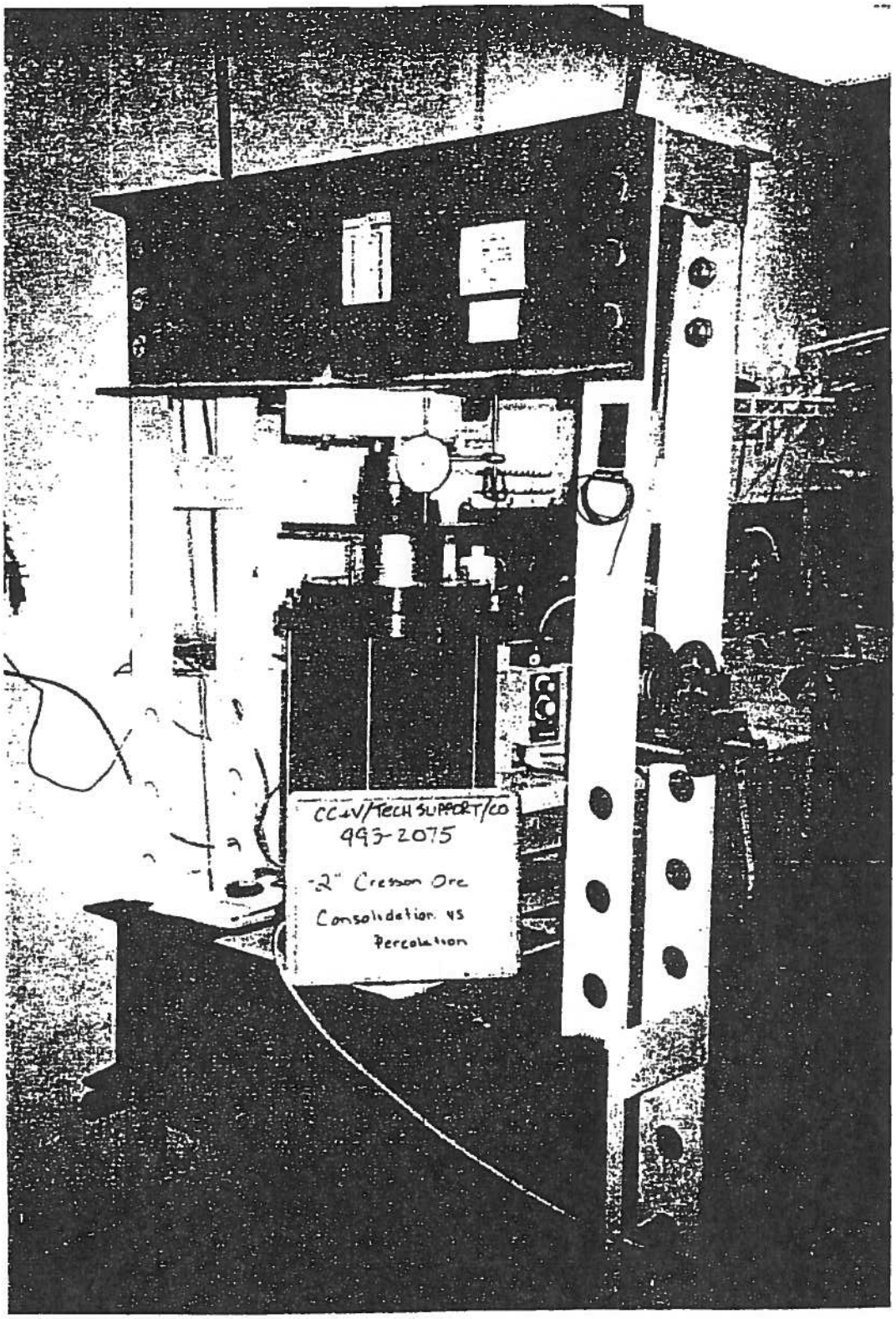


FIGURE 1: TESTING APPARATUS

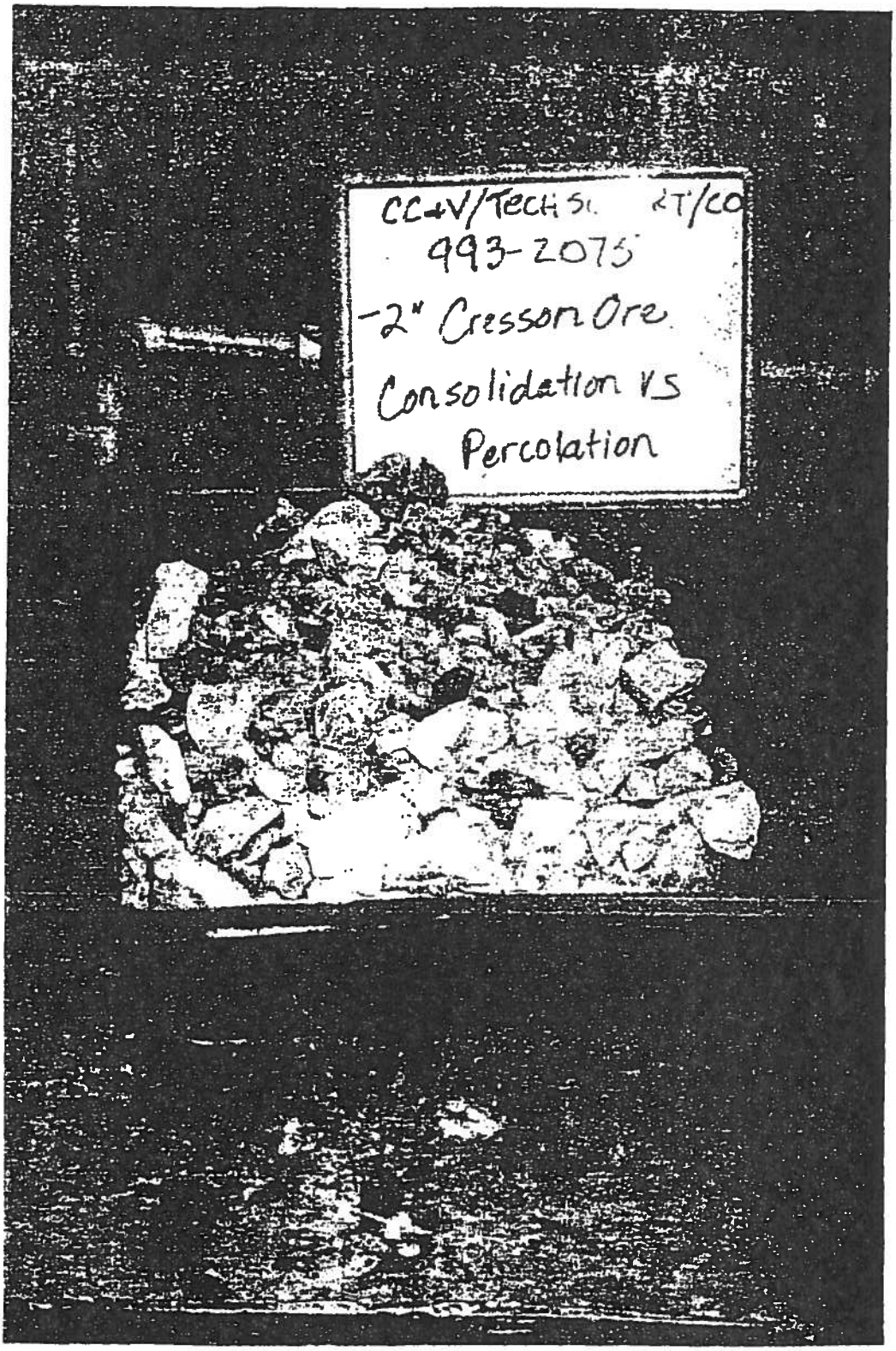


FIGURE 2: ROM CRESSON ORE

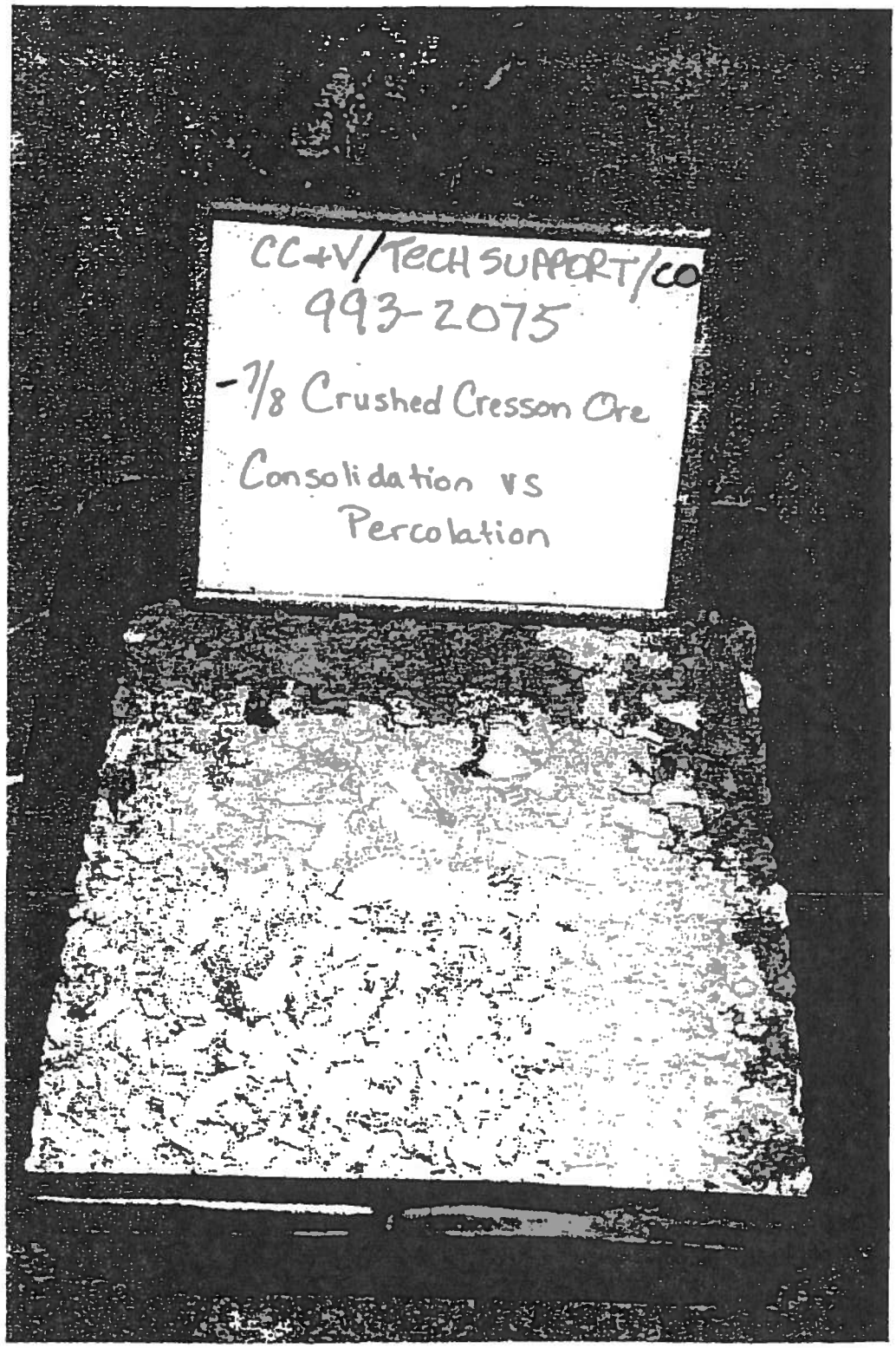


FIGURE 3: CRUSHED MINUS 7/8 CRESSON ORE

ATTACHMENT A

ROM CRESSON ORE

Compression Leach Testing
Deformation vs. Load

Project: CC&V/TECHNICAL SUPPORT/CO
Project Number: 998-2075
Date: FEBRUARY 15-22, 2000
Sample: -2 inch Cresson Ore

Initial Conditions:

Height of Sample =	11.615	inches
Diameter of Sample =	11.91	inches
Area of Sample =	0.77	sq-ft.
Volume of Sample =	0.75	cu.-ft.
Volume of Sample =	21190.9	cc
Wet Weight of Sample =	32272.8	grams
Moisture Content =	0.0%	
Dry Weight of Sample =	32272.8	grams
Specific Gravity =	2.58	
Wet Density =	1.52	g/cc
Dry Density =	1.52	g/cc
Wet Density =	95.03	lbs/sf-ft.
Dry Density =	95.03	lbs/sf-ft.

Note: The load shown as 0.1 psi is in reality 0 psi, but for graphing purposes is reported as 0.1 psi.

Applied Load (psi)	Equivalent Ore Height (ft)	Equivalent Ore Height (m)	Sample Height (inches)	Strain (%)	Unit Weight (pcf)
0.1	0	0	11.615	0.0%	95.0
27.0	41	12	11.572	0.4%	95.4
54.0	82	25	11.413	1.7%	96.7
108.0	164	50	11.218	3.4%	98.4
216.0	327	100	10.880	6.3%	101.5
432.0	655	200	10.463	9.9%	105.5

FIGU

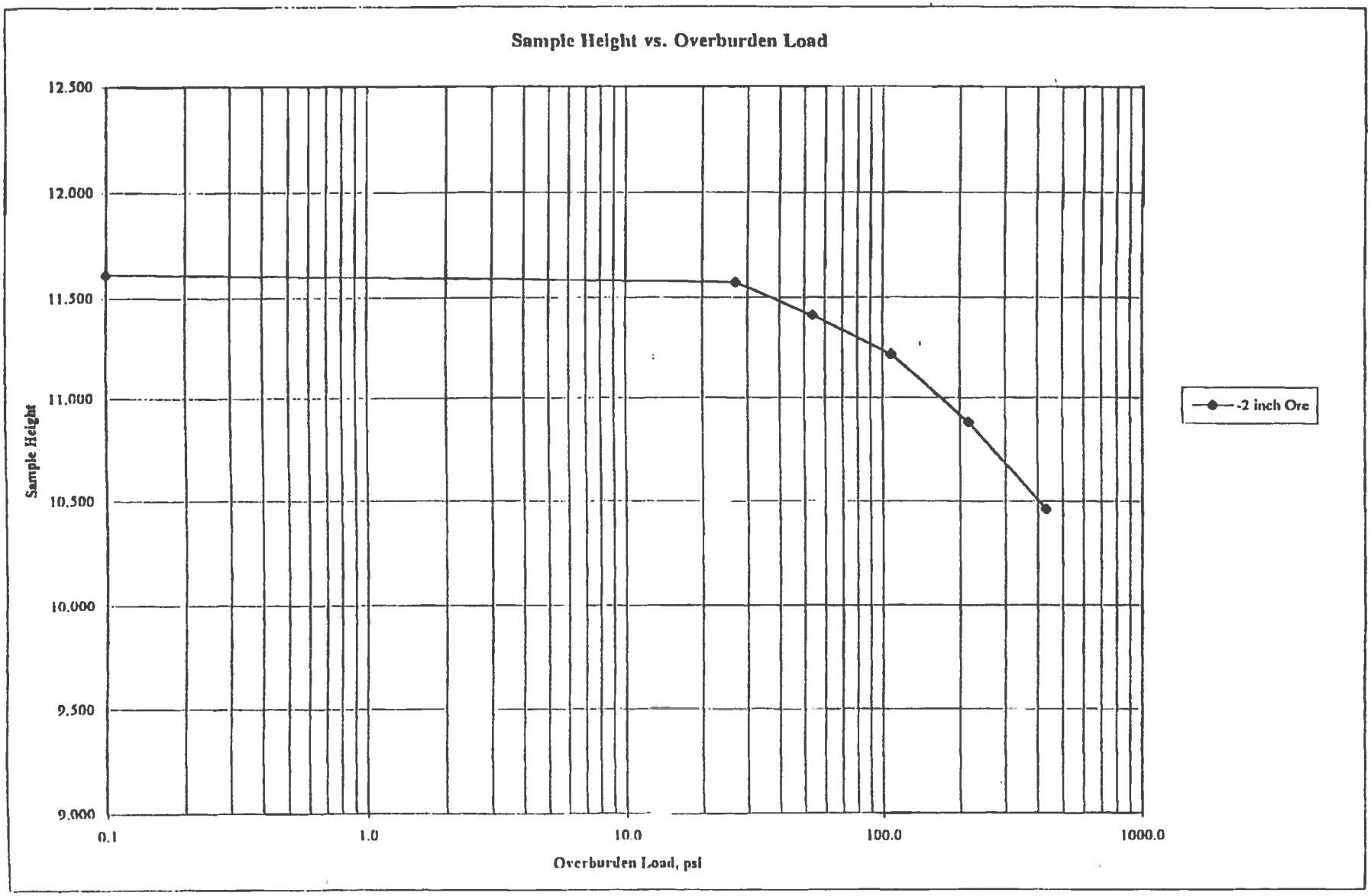
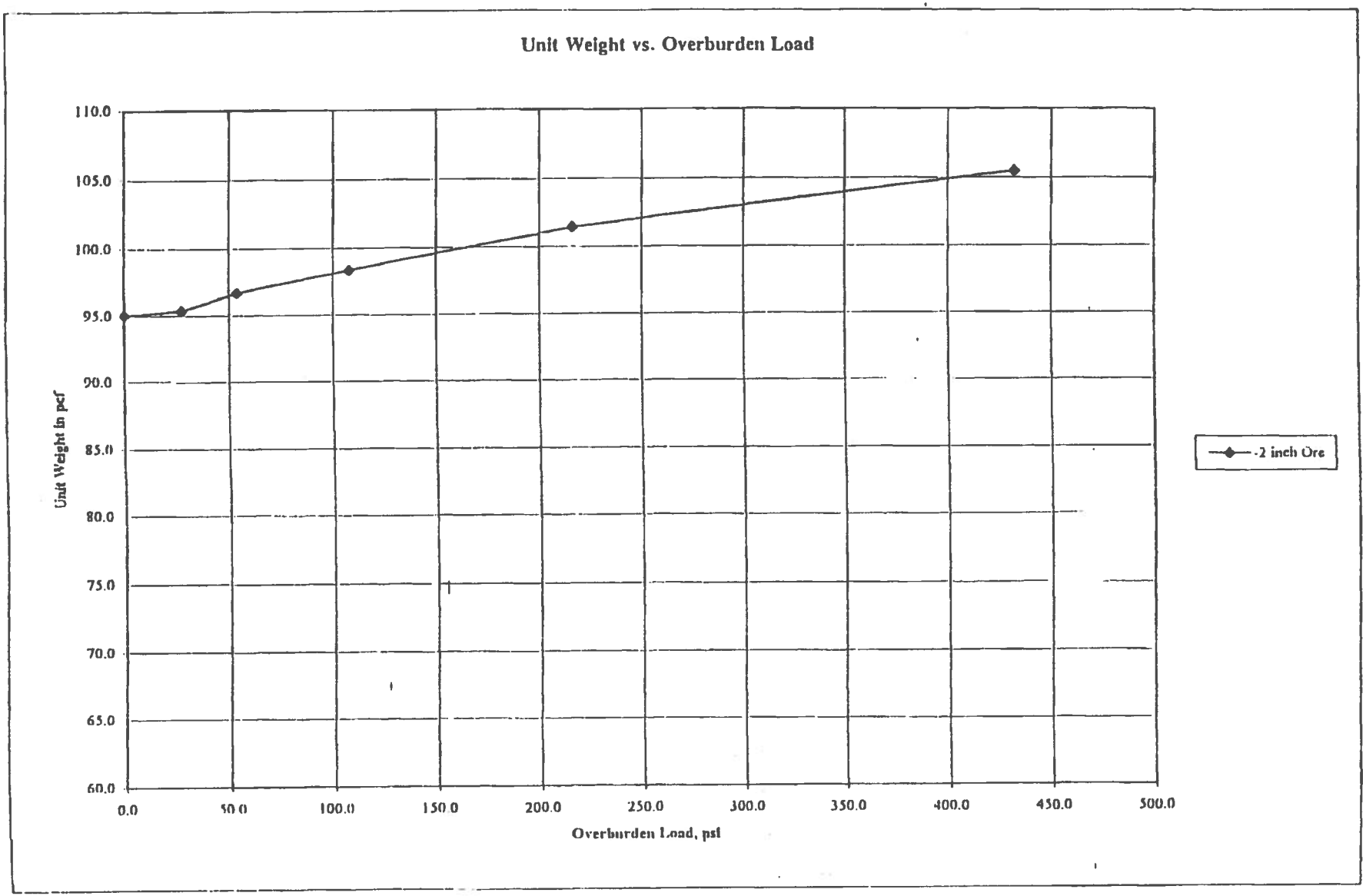

Sample Height vs. Overburden Load
12.500
12.000
11.500
11.000
10.500
10.000
9.500
9.000
Sample Height
0.1
1.0
10.0
100.0
1000.0
Overburden Load, psi
-2 inch Ore

FIGURE 5


Unit Weight vs. Overburden Load
110.0
105.0
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
Unit Weight in pcf
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
500.0
Overburden Load, psf
-2 inch Ore

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM C 117, C 136, D 421, D 422, D 1140, D 2216, D 2217

CC&V/TECHNICAL SUPPORT/CO 993-2075	SAMPLE #: -2 INCH ORE DEPTH (ft): BEFORE PERC

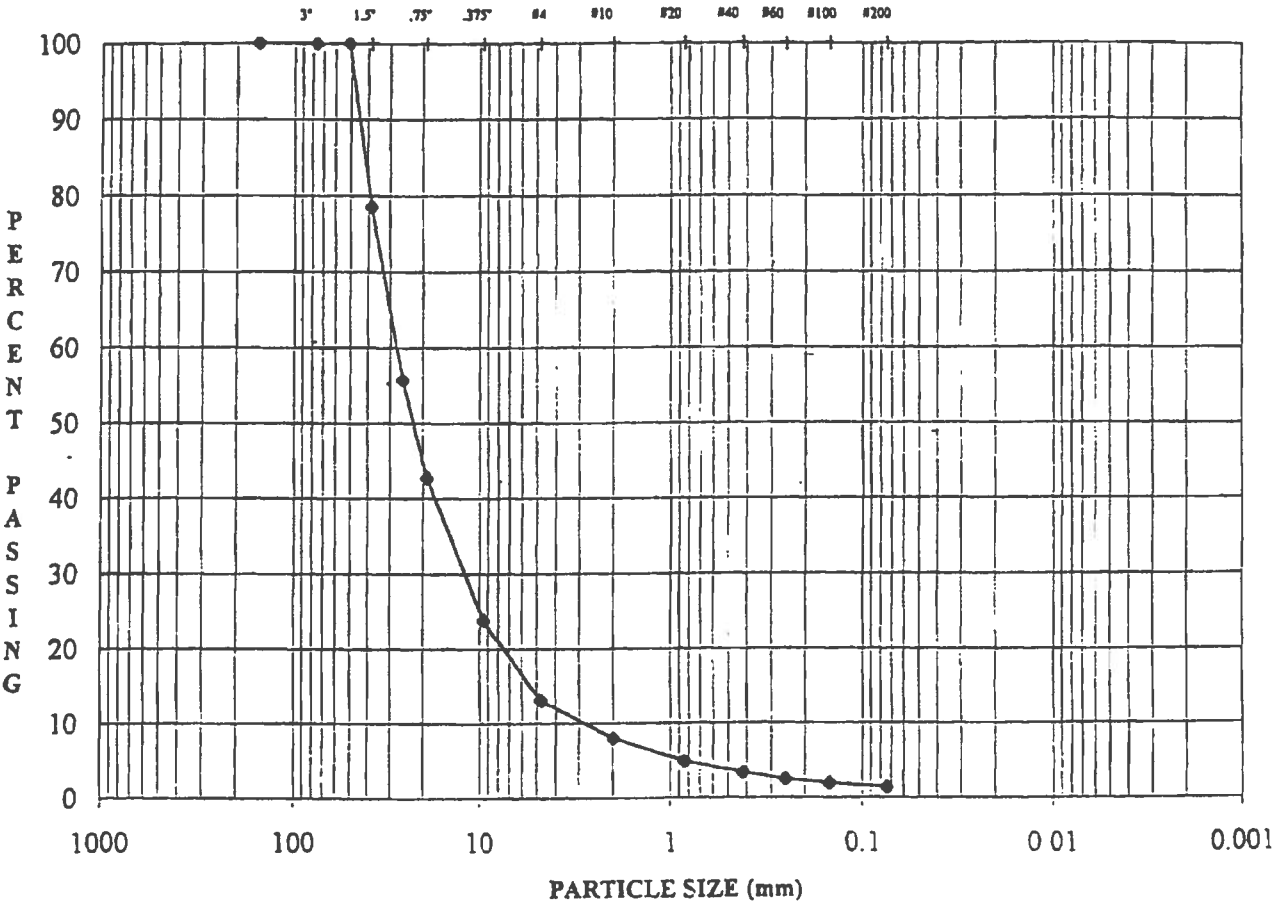
MOISTURE CONTENT (As tested)		#200 WASH (Percent Fines)	
Tare	M8	Tare	-
Weight Wet Soil & Tare, g	195.56	Weight Soil & Tare Before Wash, g	-
Weight Dry Soil & Tare, g	187.10	Weight Soil & Tare After Wash, g	-
Weight Tare, g	25.40	Weight Tare, g	-
Weight Water, g	8.46	Weight Fines Lost, g	-
Weight Dry Soil, g	161.70	Weight Dry Soil, g	58,988.27
Moisture, %	5.23%	Fines Lost, %	-

	SIEVE	Wt. Ret.	% Ret.	% Pass.	SIEVE	
	6.000"	0.00	0.00%	100.00%	6.000"	
Coarse Gravel	3.000"	0.00	0.00%	100.00%	3.000"	Coarse Gravel
	2.000"	0.00	0.00%	100.00%	2.000"	
	1.500"	12,635.50	21.42%	78.58%	1.500"	
	1.000"	26,096.40	44.24%	55.76%	1.000"	
Fine Gravel	0.750"	33,807.90	57.31%	42.69%	0.750"	Fine Gravel
	0.375"	44,968.60	76.23%	23.77%	0.375"	
Coarse Sand	#4	51,258.20	86.90%	13.10%	#4	Coarse Sand
Medium Sand	#10	54,271.06	92.00%	8.00%	#10	Medium Sand
	#20	56,103.27	95.11%	4.89%	#20	
Fine Sand	#40	57,037.29	96.69%	3.31%	#40	Fine Sand
	#60	57,544.30	97.55%	2.45%	#60	
	#100	57,869.95	98.10%	1.90%	#100	
	#200	58,163.95	98.60%	1.40%	#200	
Fines	PAN	58,988.27	0.00%	100.00%	PAN	Fines

% C GRVL:	57.3%		Wet Color:	Fine to coarse GRAVEL	
% F GRVL:	29.6%	86.9%	Description:	with little fine to coarse	
% C SAND:	5.1%			sand, trace clay (GW)	
% M SAND:	4.7%		LL:	NA	
% F SAND:	1.9%	11.7%	PL:	NA	DATE: 14-Feb-00
% FINES:	1.4%		PI:	NA	TECH: TM
% TOTAL:	100.0%		Gs:	-	REVIEW: DMD

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	-2 INCH ORE
DEPTH (ft):	BEFORE PERC
DESCRIPTION:	Fine to coarse GRAVEL with little fine to coarse sand, trace clay (GW)

MC (As tested):	5.2%
LL:	NA
PL:	NA
PI:	NA
Gs:	-

CC&V/TECHNICAL SUPPORT/CO
993-2075

14-Feb-00
TM
DMD

GOLDER ASSOCIATES INC.
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PARTICLE-SIZE ANALYSIS OF SOILS

ASTM C 117, C 136, D 421, D 422, D 1140, D 2216, D 2217

CC&V/TECHNICAL SUPPORT/CO 993-2075	SAMPLE #: -2 INCH ORE DEPTH (ft): POST PERC

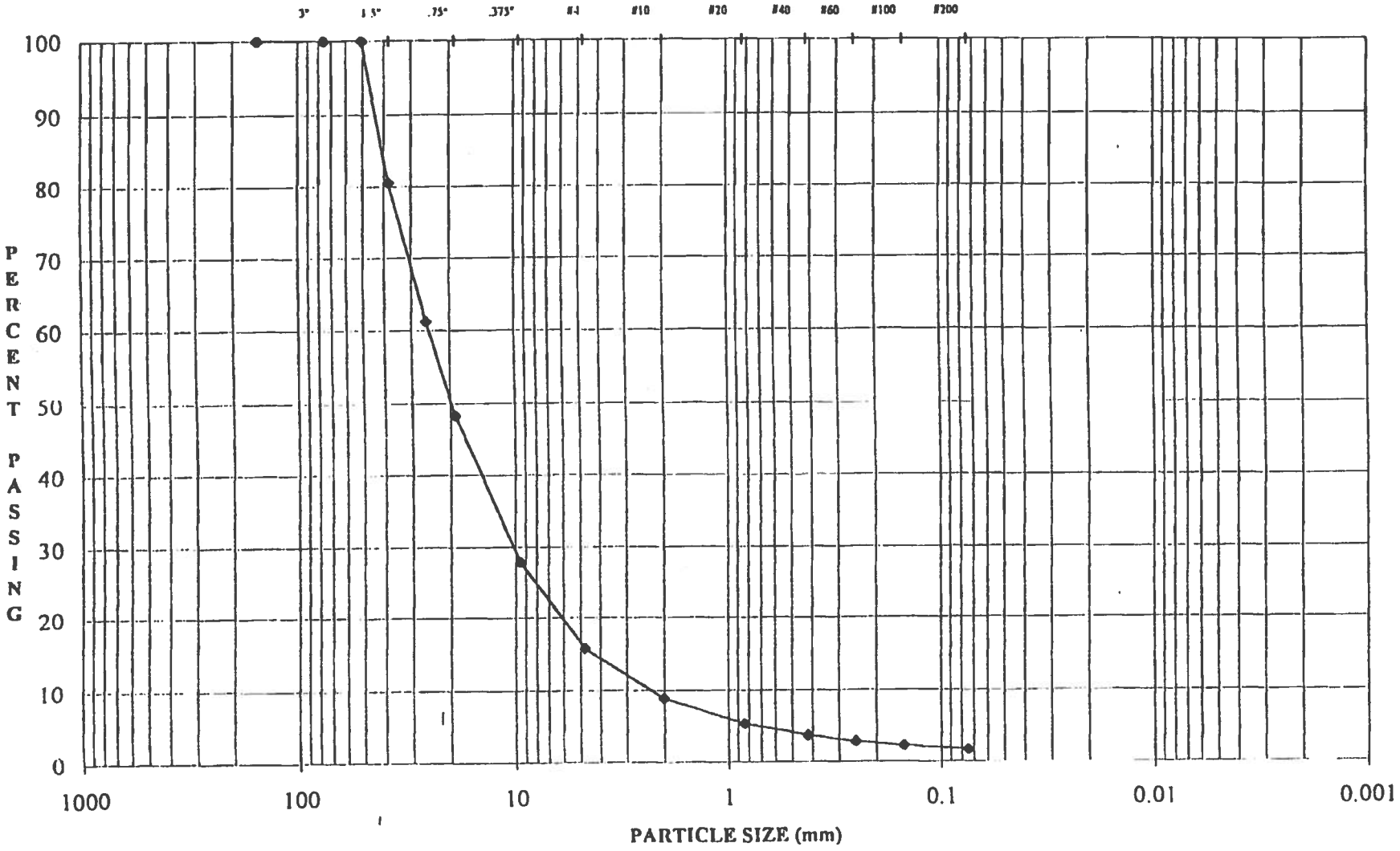
MOISTURE CONTENT (As tested)		#200 WASH (Percent Fines)	
Tare	F27	Tare	-
Weight Wet Soil & Tare, g	312.11	Weight Soil & Tare Before Wash, g	-
Weight Dry Soil & Tare, g	310.58	Weight Soil & Tare After Wash, g	-
Weight Tare, g	33.41	Weight Tare, g	-
Weight Water, g	1.53	Weight Fines Lost, g	-
Weight Dry Soil, g	277.17	Weight Dry Soil, g	31,672.79
Moisture, %	0.55%	Fines Lost, %	-

	SIEVE	Wt. Ret.	% Ret.	% Pass.	SIEVE	
	6.000"	0.00	0.00%	100.00%	6.000"	
Coarse Gravel	3.000"	0.00	0.00%	100.00%	3.000"	Coarse Gravel
	2.000"	0.00	0.00%	100.00%	2.000"	
	1.500"	6,163.30	19.46%	80.54%	1.500"	
	1.000"	12,259.90	38.71%	61.29%	1.000"	
Fine Gravel	0.750"	16,380.10	51.72%	48.28%	0.750"	Fine Gravel
	0.375"	22,834.20	72.09%	27.91%	0.375"	
Coarse Sand	#4	26,688.60	84.26%	15.74%	#4	Coarse Sand
Medium Sand	#10	28,866.68	91.14%	8.86%	#10	Medium Sand
	#20	29,986.32	94.68%	5.32%	#20	
Fine Sand	#40	30,508.77	96.32%	3.68%	#40	Fine Sand
	#60	30,780.65	97.18%	2.82%	#60	
	#100	30,963.51	97.76%	2.24%	#100	
	#200	31,141.91	98.32%	1.68%	#200	
Fines	PAN	31,672.79	0.00%	100.00%	PAN	Fines

% C GRVL:	51.7%		Wet Color:	Fine to coarse GRAVEL	
% F GRVL:	32.5%	84.3%	Description:	with some fine to coarse	
% C SAND:	6.9%			sand, trace clay (GW)	
% M SAND:	5.2%		LL:	NA	
% F SAND:	2.0%	14.1%	PL:	NA	DATE: 24-Feb-00
% FINES:	1.7%		PI:	NA	TECH: TM
% TOTAL:	100.0%		Gs:	-	REVIEW: MK

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



ATTACHMENT B

CRUSHED MINUS 7/8 INCH CRESSON ORE

TABLE 3

Compression Leach Testing
Deformation vs. Load

Project: CC&V/TECHNICAL SUPPORT/CO
Project Number: 998-2075
Date: FEBRUARY 9-14, 2000
Sample: -7/8 inch Cresson Ore

Initial Conditions:

Height of Sample =	11.420	inches
Diameter of Sample =	11.91	inches
Area of Sample =	0.77	sq-ft.
Volume of Sample =	0.74	cu.-ft.
Volume of Sample =	20835.1	cc
Wet Weight of Sample =	33018.4	grams
Moisture Content =	0.0%	
Dry Weight of Sample =	33018.4	grams
Specific Gravity =	2.58	
Wet Density =	1.58	g/cc
Dry Density =	1.58	g/cc
Wet Density =	98.89	lbs/sf-ft.
Dry Density =	98.89	lbs/sf-ft.

Note: The load shown as 0.1 psi is in reality 0 psi, but for graphing purposes is reported as 0.1 psi.

Applied Load (psi)	Equivalent Ore Height (ft)	Equivalent Ore Height (m)	Sample Height (inches)	Strain (%)	Unit Weight (pcf)
0.1	0	0	11.420	0.0%	98.9
27.0	39	12	11.160	2.3%	101.2
54.0	79	24	10.790	5.5%	104.7
108.0	157	48	10.410	8.8%	108.5
216.0	315	96	9.980	12.6%	113.2
432.0	629	192	9.530	16.5%	118.5

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM C 117, C 136, D 421, D 422, D 1140, D 2216, D 2217

CC&V TECH SUPPORT	SAMPLE #: -7/8 CRUSHED ORE
993-2075	DEPTH (ft): BEFORE PERC

MOISTURE CONTENT (As tested)

Tare	F13
Weight Wet Soil & Tare, g	171.10
Weight Dry Soil & Tare, g	166.35
Weight Tare, g	34.19
Weight Water, g	4.75
Weight Dry Soil, g	132.16
Moisture, %	3.59%

#200 WASH (Percent Fines)

Tare	5-9
Weight Soil & Tare Before Wash, g	632.57
Weight Soil & Tare After Wash, g	539.58
Weight Tare, g	158.54
Weight Fines Lost, g	-
Weight Dry Soil, g	3,624.27
Fines Lost, %	-

	SIEVE	Wt. Ret.	% Ret.	% Pass.	SIEVE	
	6.000"	0.00	0.00%	100.00%	6.000"	
Coarse Gravel	3.000"	0.00	0.00%	100.00%	3.000"	Coarse Gravel
	1.500"	0.00	0.00%	100.00%	1.500"	
	1.000"	0.00	0.00%	100.00%	1.000"	
Fine Gravel	0.750"	250.10	6.90%	93.10%	0.750"	Fine Gravel
	0.375"	1,612.40	44.49%	55.51%	0.375"	
Coarse Sand	#4	2,254.60	62.21%	37.79%	#4	Coarse Sand
Medium Sand	#10	2,697.60	74.43%	25.57%	#10	Medium Sand
	#20	2,995.43	82.65%	17.35%	#20	
Fine Sand	#40	3,158.27	87.14%	12.86%	#40	Fine Sand
	#60	3,252.26	89.74%	10.26%	#60	
	#100	3,321.70	91.65%	8.35%	#100	
	#200	3,391.14	93.57%	6.43%	#200	
Fines	PAN	3,624.27	0.00%	100.00%	PAN	Fines

% C GRVL:	6.9%		Wet Color:	Fine to coarse GRAVEL	
% F GRVL:	55.3%	62.2%	Description:	and fine to coarse	
% C SAND:	12.2%			sand with little clay (GW)	
% M SAND:	12.7%		LL:		
% F SAND:	6.4%	31.4%	PL:	DATE:	10-Feb-00
% FINES:	6.4%		PI:	TECH:	NG
% TOTAL:	100.0%		Gs: -	REVIEW:	DMD

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LAKEWOOD, COLORADO

FIGURE 4

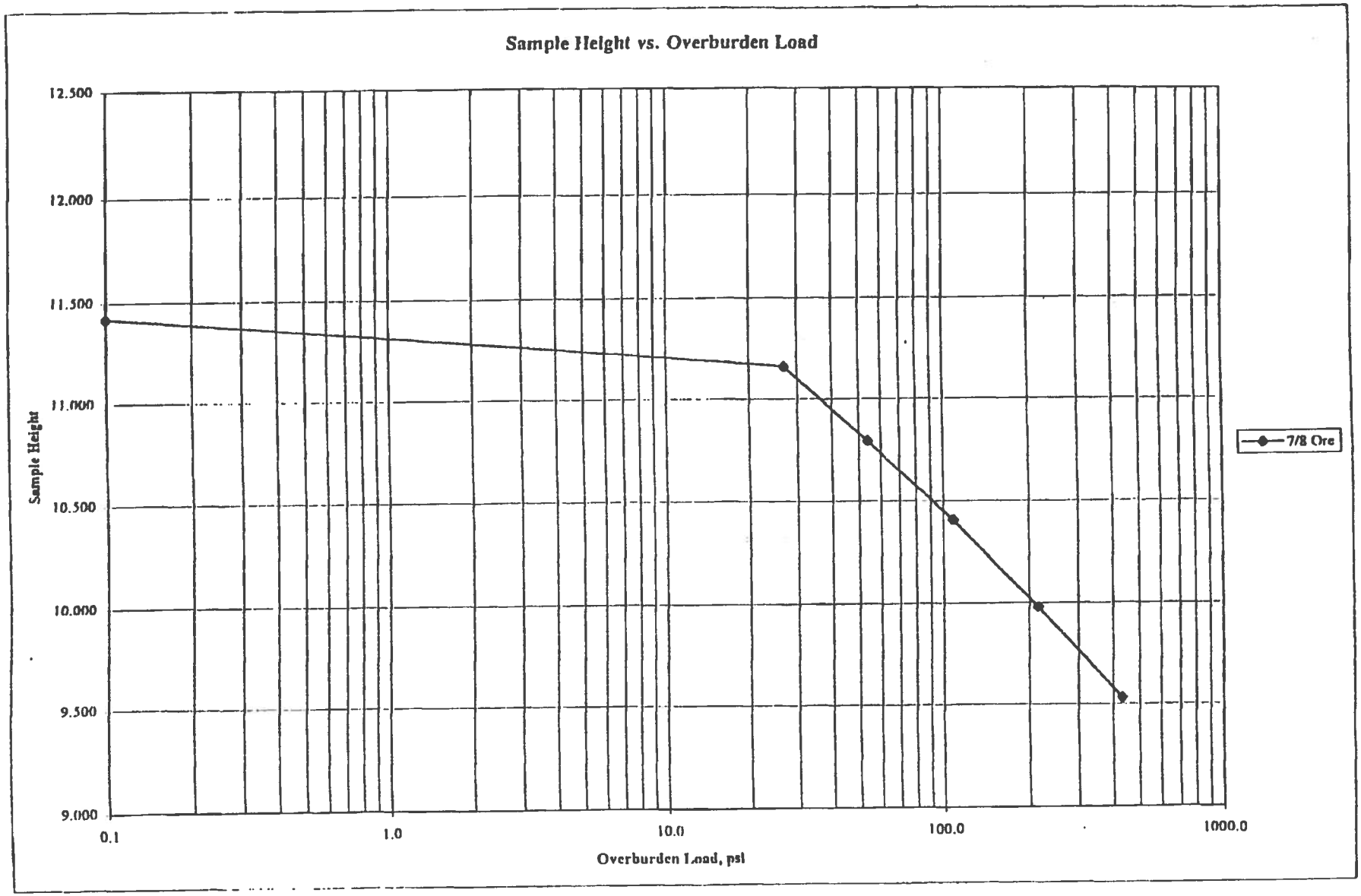
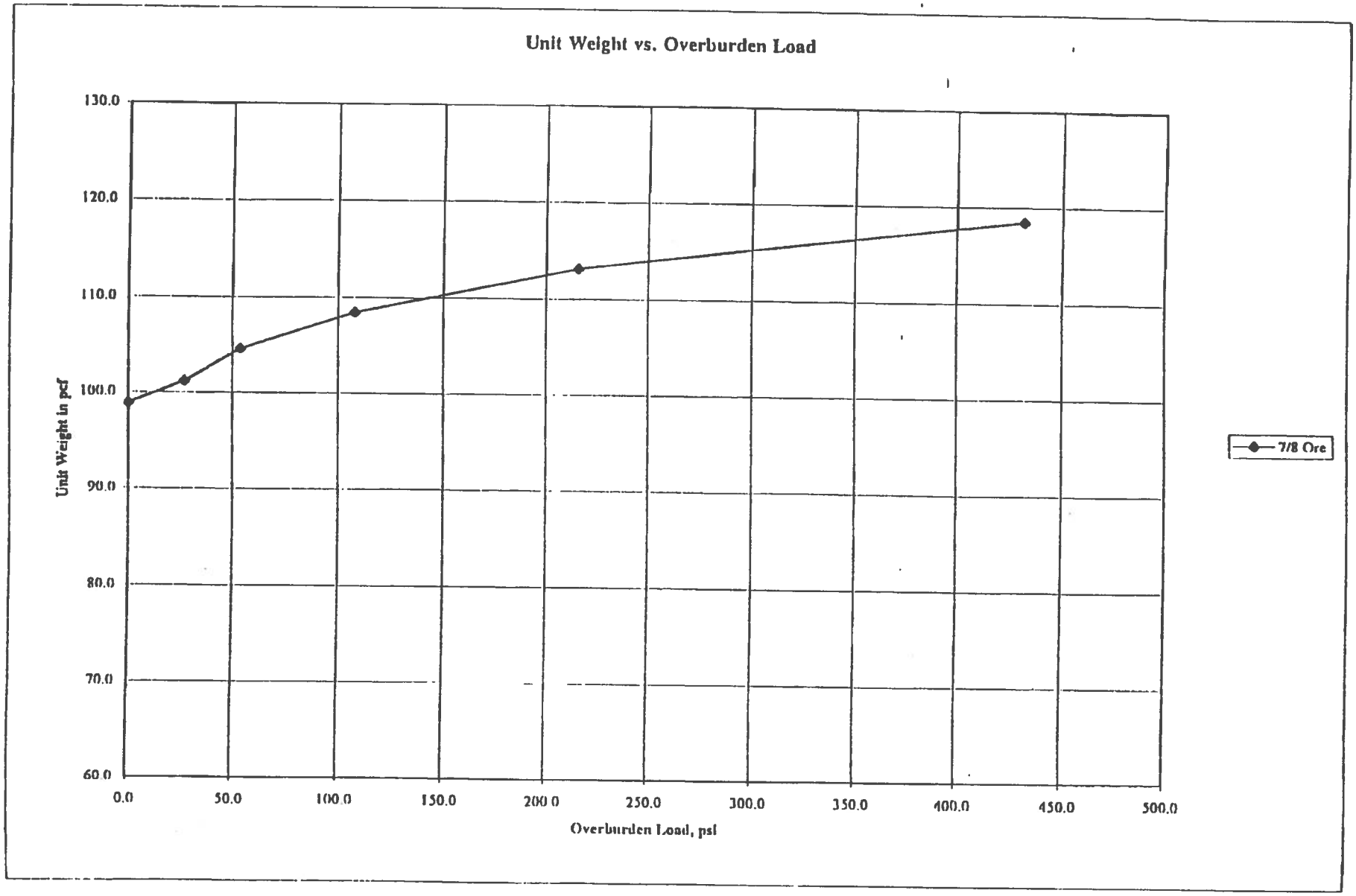

Sample Height vs. Overburden Load
12.500
12.000
11.500
11.000
10.500
10.000
9.500
9.000
Sample Height
0.1
1.0
10.0
100.0
1000.0
Overburden Load, psi
7/8 Ore

FIGURE 5


Unit Weight vs. Overburden Load
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
Unit Weight in pcf
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
500.0
Overburden Load, psi
7/8 Ore

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM C 117, C 136, D 421, D 422, D 1140, D 2216, D 2217

CC&V TECH SUPPORT 993-2075	SAMPLE #: -7/8 CRUSHED ORE DEPTH (ft): POST PERC

MOISTURE CONTENT (As tested)

Tare	X5
Weight Wet Soil & Tare, g	258.30
Weight Dry Soil & Tare, g	249.00
Weight Tare, g	32.93
Weight Water, g	9.30
Weight Dry Soil, g	216.07
Moisture, %	4.30%

#200 WASH (Percent Fines)

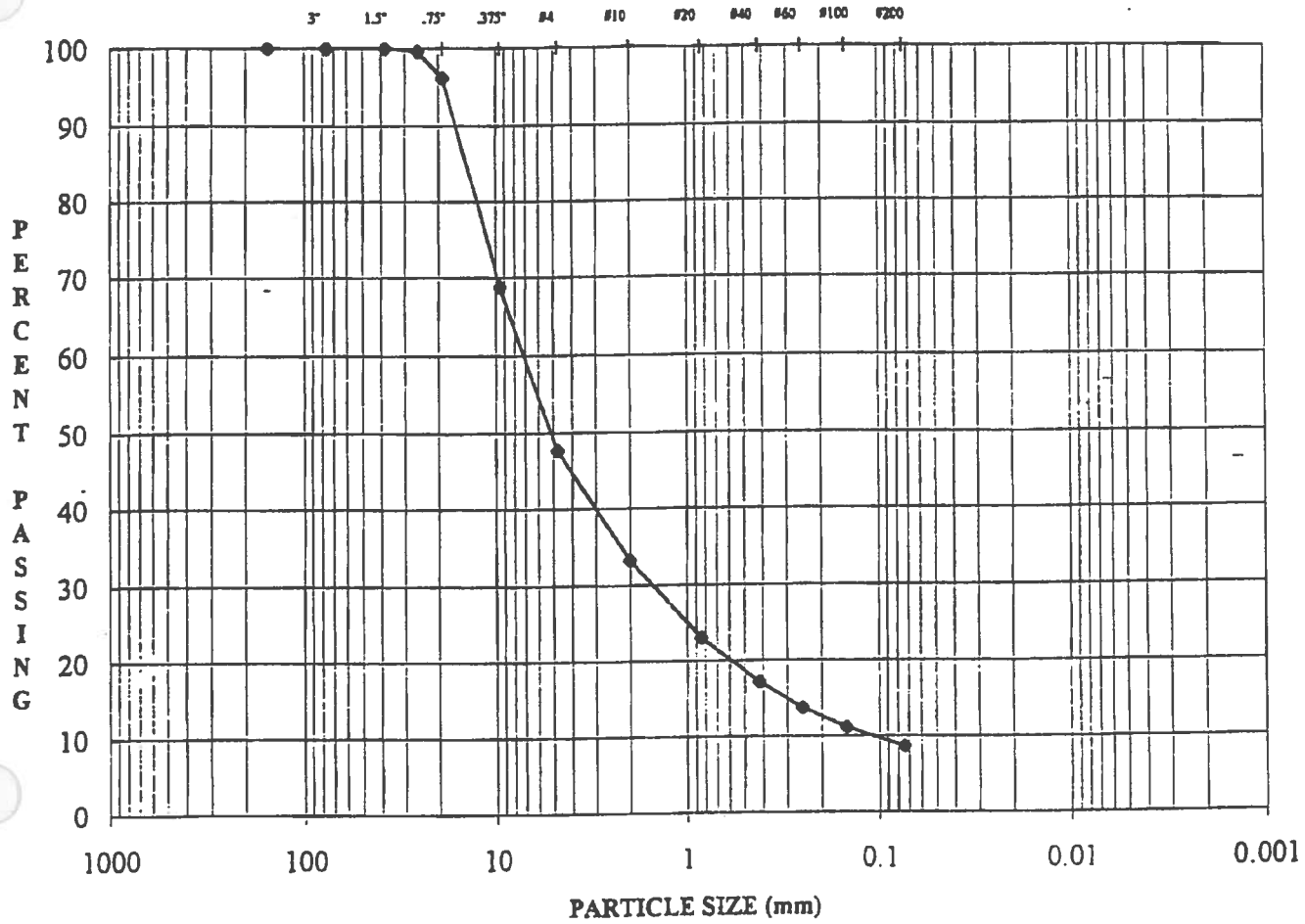
Tare	5-9
Weight Soil & Tare Before Wash, g	632.57
Weight Soil & Tare After Wash, g	539.58
Weight Tare, g	158.54
Weight Fines Lost, g	-
Weight Dry Soil, g	7,785.07
Fines Lost, %	-

	SIEVE	Wt. Ret.	% Ret.	% Pass.	SIEVE	
	6.000"	0.00	0.00%	100.00%	6.000"	
Coarse Gravel	3.000"	0.00	0.00%	100.00%	3.000"	Coarse Gravel
	1.500"	0.00	0.00%	100.00%	1.500"	
	1.000"	29.00	0.37%	99.63%	1.000"	
Fine Gravel	0.750"	297.30	3.82%	96.18%	0.750"	Fine Gravel
	0.375"	2,431.40	31.23%	68.77%	0.375"	
Coarse Sand	#4	4,074.00	52.33%	47.67%	#4	Coarse Sand
Medium Sand	#10	5,200.18	66.80%	33.20%	#10	Medium Sand
	#20	5,992.34	76.97%	23.03%	#20	
Fine Sand	#40	6,446.58	82.81%	17.19%	#40	Fine Sand
	#60	6,720.74	86.33%	13.67%	#60	
	#100	6,918.08	88.86%	11.14%	#100	
	#200	7,114.14	91.38%	8.62%	#200	
Fines	PAN	7,785.07	0.00%	100.00%	PAN	Fines

% C GRVL:	3.8%		Wet Color:	Fine to coarse GRAVEL
% F GRVL:	48.5%	52.3%	Description:	and fine to coarse
% C SAND:	14.5%			sand with little clay (GW)
% M SAND:	16.0%		LL:	
% F SAND:	8.6%	39.1%	PL:	DATE: 17-Feb-00
% FINES:	8.6%		PI:	TECH: MK
% TOTAL:	100.0%		Gs: -	REVIEW: DMD

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
COBBLES	GRAVEL		SAND			FINES

SAMPLE #:	-7/8 CRUSHED ORE
DEPTH (ft):	POST PERC
DESCRIPTION:	Fine to coarse GRAVEL and fine to coarse sand with little clay (GW)

MC (As tested):	4.3%
LL:	0
PL:	0
PI:	0
Gs:	-

CC&V TECH SUPPORT
993-2075

17-Feb-00
MK
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GOLDER ASSOCIATES INC.
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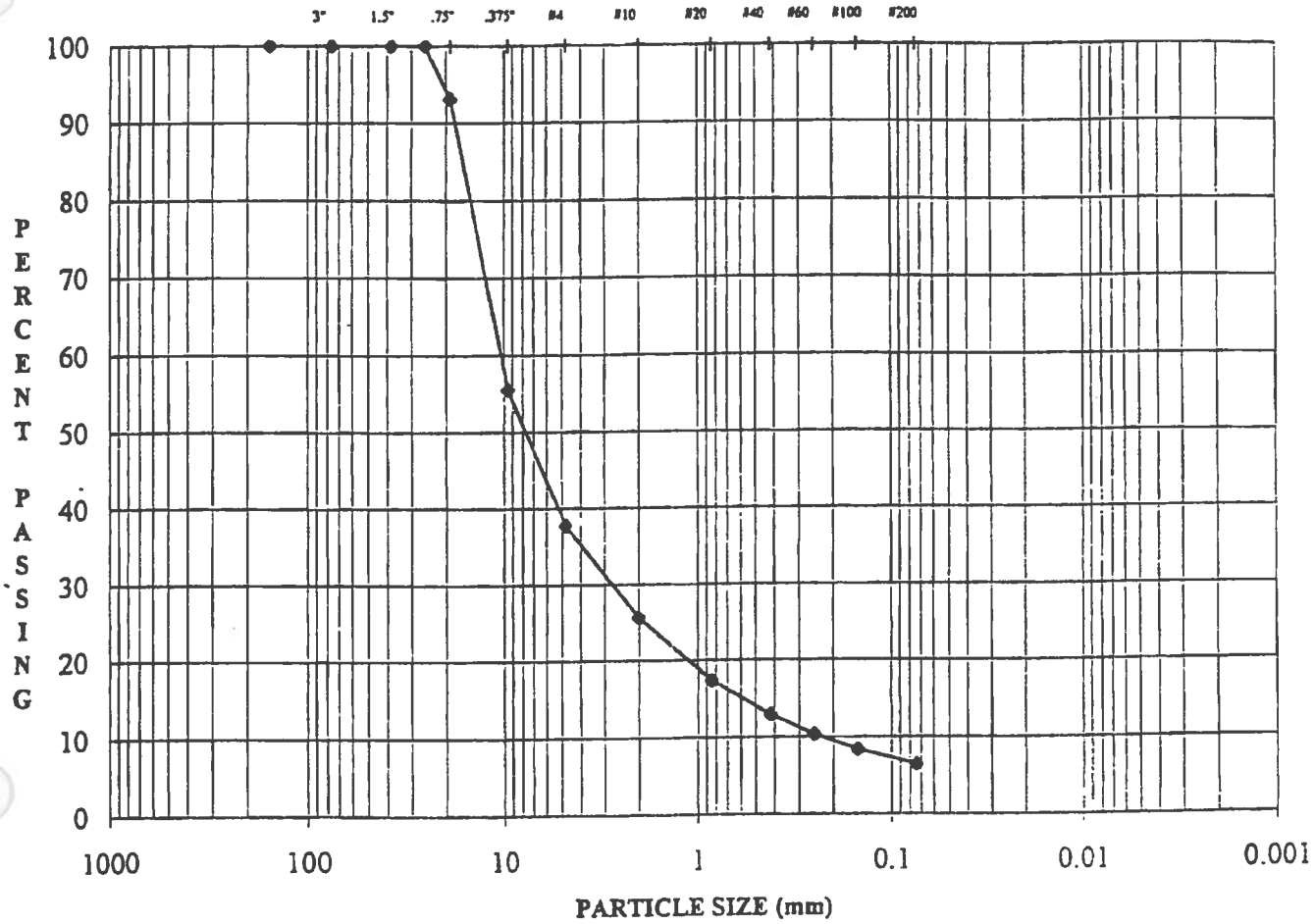
PARTICLE-SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



COBBLES	Coarse	Fine	Cor	Med	Fine	Silt or Clay Size
	GRAVEL		SAND			FINES

SAMPLE #:	-7/8 CRUSHED ORE
DEPTH (ft):	BEFORE PERC
DESCRIPTION:	Fine to coarse GRAVEL and fine to coarse sand with little clay (GW)

MC (As tested):	3.6%
LL:	0
PL:	0
PI:	0
Gs:	-

CC&V TECH SUPPORT
993-2075

10-Feb-00
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