PATHFINDER

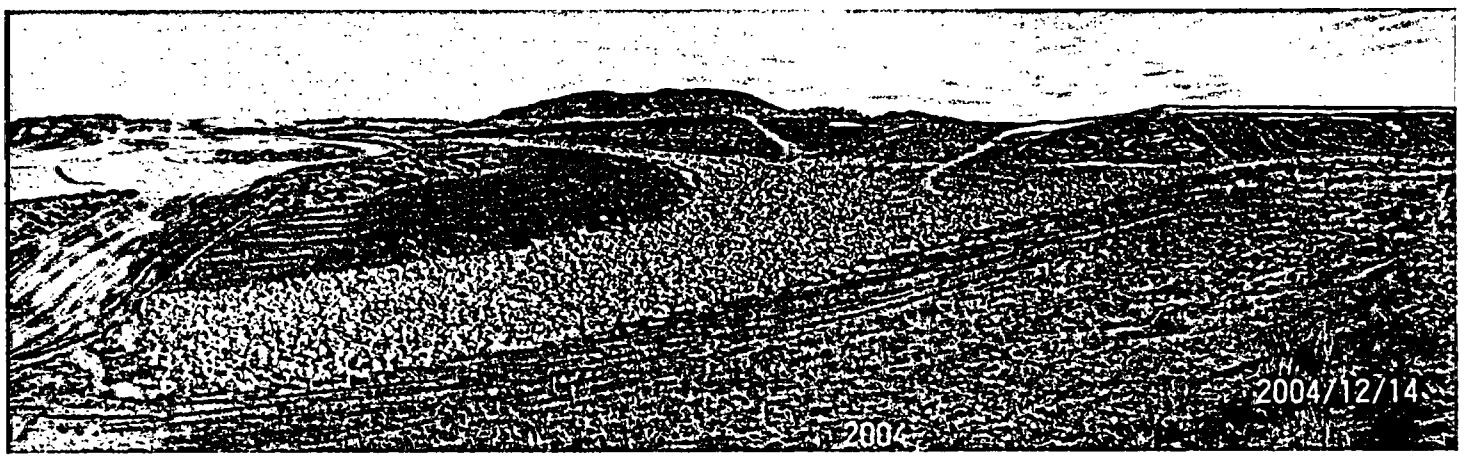
Lucky Mc Mine

Tailings Reclamation Project

Completion Report

Source Material License SUA-672

April, 2005



PATHFINDER Mines Corporation

Mills, Wyoming

Volume 2

APPENDIX

E

TABLE D-1. - Lucky Mc Radon Flux Test Results and Gamma Readings on Completed Radon Barrier 4/12/05

Site #	RnFlux (pCi/m2-sec)	Gamma uR/hr.	Site #	RnFlux (pCi/m2-sec)	Gamma uR/hr.	Site #	RnFlux (pCi/m2-sec)	Gamma uR/hr.	Site #	RnFlux (pCi/m2-sec)	Gamma uR/hr.
1	< 0.5	6	61	off barrier	—	121	< 0.5	9.5	181	not sampled	—
2	< 0.5	5	62	1	15.5	122	0.9	10	182	not sampled	—
3	< 0.5	7	63	not sampled	8	123	1	9.5	183	not sampled	—
4	< 0.5	10	64	< 0.5	10	124	< 0.5	9.5	184	< 0.5	9
5	< 0.5	11	65	0.6	5.5	125	0.9	9	185	not sampled	—
6	< 0.5	5.5	66	0.7	9.5	126	< 0.5	12	186	0.9	8
7	< 0.5	7	67	< 0.5	8	127	< 0.5	9	187	not sampled	—
8	< 0.5	6	68	< 0.5	8	128	< 0.5	9	188	< 0.5	7
9	< 0.5	11	69	< 0.5	8.5	129	0.5	9	189	not sampled	—
10	< 0.5	9.5	70	< 0.5	9	130	< 0.5	11	190	not sampled	—
11	1.3	6	71	< 0.5	10.5	131	< 0.5	12	191	< 0.5	6
12	< 0.5	6.5	72	< 0.5	10	132	< 0.5	14	192	not sampled	—
13	< 0.5	11.5	73	< 0.5	9.5	133	1.1	29	193	< 0.5	10
14	0.9	6	74	< 0.5	7	134	< 0.5	17	194	off barrier	—
15	< 0.5	5	75	< 0.5	8	135	< 0.5	18	195	0.6	9
16	< 0.5	5.5	76	0.7	25	136	10.8	11	196	off barrier	—
17	< 0.5	10	77	< 0.5	8	137	< 0.5	13	197	not sampled	—
18	< 0.5	9.5	78	2.7	10	138	8.6	33	198	not sampled	—
19	< 0.5	10	79	not sampled	6	139	< 0.5	13	199	off barrier	—
20	< 0.5	9.5	80	< 0.5	9	140	< 0.5	10	200	not sampled	—
21	< 0.5	11.5	81	< 0.5	10.5	141	1.7	11	201	< 0.5	7
22	< 0.5	6	82	< 0.5	11.5	142	6.6	12	202	not sampled	—
23	< 0.5	9	83	< 0.5	9	143	0.9	11	203	< 0.5	7
24	< 0.5	12	84	< 0.5	10	144	< 0.5	9	204	evap. pond	—
25	< 0.5	5.5	85	0.8	11.5	145	0.8	21	205	evap. pond	—
26	< 0.5	9.5	86	4.4	20	146	< 0.5	12	206	evap. pond	—
27	< 0.5	10.5	87	< 0.5	10	147	< 0.5	13	207	not sampled	—
28	< 0.5	9	88	< 0.5	8.5	148	5.4	14	208	< 0.5	7
29	0.7	10	89	< 0.5	14	149	< 0.5	9.5	209	< 0.5	7
30	< 0.5	10	90	< 0.5	10.5	150	< 0.5	13	210	not sampled	—
31	< 0.5	10.5	91	< 0.5	10	151	< 0.5	9.5	211	< 0.5	8
32	1.4	13	92	< 0.5	9.5	152	< 0.5	11	212	evap. pond	—
33	< 0.5	7	93	< 0.5	10	153	< 0.5	11.5	213	evap. pond	—
34	< 0.5	5.5	94	0.9	11	154	< 0.5	21	214	evap. pond	—
35	< 0.5	6.5	95	1.3	13	155	< 0.5	8	215	evap. pond	—
36	< 0.5	9	96	1.1	14	156	0.8	12	216	evap. pond	—
37	< 0.5	10.5	97	1.5	11	157	< 0.5	11	217	not sampled	—
38	off barrier	—	98	< 0.5	9	158	1.2	12	218	< 0.5	9
39	off barrier	—	99	1.7	15	159	3.8	13	219	not sampled	—
40	0.7	11	100	< 0.5	11	160	< 0.5	8	220	< 0.5	8
41	0.6	12	101	< 0.5	9	161	< 0.5	8	221	not sampled	—
42	< 0.5	11	102	< 0.5	15	162	< 0.5	8	222	< 0.5	7
43	< 0.5	9.5	103	< 0.5	10	163	1.3	12	223	not sampled	—
44	< 0.5	6.5	104	< 0.5	10	164	1.5	11	224	< 0.5	7
45	< 0.5	6	105	< 0.5	10.5	165	< 0.5	10	225	evap. pond	—
46	< 0.5	5	106	< 0.5	11	166	< 0.5	9	226	evap. pond	—
47	< 0.5	7	107	< 0.5	10	167	< 0.5	8	227	not sampled	—
48	< 0.5	10	108	< 0.5	10	168	< 0.5	10	228	not sampled	—
49	< 0.5	10.5	109	< 0.5	14	169	< 0.5	8	229	< 0.5	8
50	< 0.5	11	110	5	25	170	< 0.5	8	230	not sampled	—
51	< 0.5	9	111	0.6	7.5	171	< 0.5	10	231	not sampled	—
52	< 0.5	10.5	112	< 0.5	22	172	dam outslope	—	232	not sampled	—
53	< 0.5	6.5	113	0.9	9.5	173	dam outslope	—	233	< 0.5	9
54	< 0.5	5.5	114	< 0.5	10.5	174	dam outslope	—	234	not sampled	—
55	< 0.5	5	115	1.5	18.5	175	dam outslope	—	235	< 0.5	6
56	0.6	11	116	0.8	18	176	dam outslope	—	236	< 0.5	8
57	0.8	5.5	117	< 0.5	13	177	dam outslope	—	237	not sampled	—
58	< 0.5	13.5	118	< 0.5	11	178	< 0.5	9	238	not sampled	—
59	1.2	9.5	119	1.1	12	179	not sampled	—	239	< 0.5	8
60	0.7	12	120	3.2	9	180	< 0.5	8			

AVG. Rn FLUX = 0.8 pCi/m2-sec.
AVG. GAMMA = 10 uR/hr.

THIS PAGE IS AN
OVERSIZED DRAWING
OR FIGURE,
THAT CAN BE VIEWED
AT THE RECORD TITLED:

"Exhibit E-1 Radon Flux
Test Program"

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D-01

RADON FLUX ON COMPLETED RADON BARRIER LABORATORY REPORTS

2.182

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November 13, 1998

Mr. Tom Hardgrove
Pathfinder Mines – Lucky McMine
PO Box 730
Mills, WY 82644

Subject: *Large Area Activated Charcoal Canister (LAACC) Report*

Dear Tom:

Enclosed you will find 1998 LAACC information that should be acceptable by U.S. Nuclear Regulatory Commission's (USNRC) technical personnel. Energy Laboratories, Inc.-Casper (ELI) is directly certified by the U.S. Environmental Protection Agency (EPA) Region VIII under the Safe Drinking Water Act. Certification includes regulated bacteriological, inorganic, volatile organic, synthetic organic, and radiochemical parameters. A rigorous Quality Assurance/Quality Control program is maintained which meets or exceeds the requirements of the EPA and the USNRC. In addition, ELI is a listed laboratory under the Radon Proficiency Program (RMP).

Our LAACC data has been accepted by Milt Lammering of the Denver EPA office, USNRC, and the States of Utah and Texas.

If additional information is required by you or other agencies please advise.

Sincerely,

Sheryl Garling

Sheryl Garling
Radiation Safety Officer and Project Manager

SAG:sag

Enclosures

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SAMPLE NARRATIVE

Date:	November 13, 1998
Client:	Pathfinder Mines Corporation
Location:	Lucky McMine
Laboratory Method:	EPA Method 115
Method Name:	Large Area Activated Charcoal Canister (LAACC) Radon Flux Measurement
Sample Numbers:	98-59770 through 98-59791
Prepared By:	Sheryl A. Garling

On September 24, 1998, Pathfinder Mines Corporation's employees placed 17-LAACC units at their Lucky McMine site. No field duplicates or area background units were deployed. Pathfinder established the survey grid with all points identified in the field.. The units were removed September 25, 1998, after 24 hours of exposure.

The following field conditions were reported:

- There was no precipitation within the previous 24 hours prior to September 24, 1998,
- Clear and breezy weather conditions were observed on Thursday, September 24 1998,
- Minimum temperature observed was 49°F,
- There was no precipitation during the measurement period.

PMC employees transported the radon flux charcoal canisters back to the laboratory.

ELI has performed several charcoal can leak test analyses and charcoal loss on the charcoal cans. This data concludes the laboratory procedure that ELI follows for Method 115 provides the desired analytical results without compromising the data, i.e. through radon loss through the cans or seal, excessive charcoal loss during transfer, and gamma counting procedures.

The following is the procedure performed by ELI for the LAACC measurement following Method 115.

Each can was sealed with a minimum of two wraps of elastic electrical tape. ELI has previously performed leak tests on this system and the charcoal measurement was not compromised using this method of sealing.

The radon flux charcoal transfer/counting canisters were transported back to the laboratory for counting.

The LAACCs are constructed to the specifications as identified in document EPA 520/5-85-029, *Radon Flux Measurements On Gardinier And Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida*. The collector gap between charcoal and surface of tailings is between ¼" to ½".

Standard laboratory practices were followed when counting the charcoal canisters:

- Counting efficiencies are recorded for the various standards, laboratory blanks, and equipment operation,
- Section 4.0 E of Method 115 states that the precision, accuracy, and completeness shall be within 10%, ±10%, and 85%, respectively, for samples measuring greater than 1.0 pCi/m^{2}sec.
- Calculations for precision and accuracy follow, with actual calculations included on page 3.

Calculation 1
Accuracy Calculation for Standards as identified by the USNRC:

$$\frac{\text{Measured} - \text{Actual}}{\text{Actual}}$$

Calculation 2
Precision Calculation as identified by the USNRC:
Known as Percent difference:

$$\frac{\text{Duplicate Count \#1} - \text{Duplicate Count \#2}}{\text{Average (Duplicate \#1, Duplicate \#2)}}$$

Calculation 3
Data Counting error 2-sigma as defined by USEPA Standard Operating Procedure for Radon-222 Measurement Using Charcoal Canisters EPA 520/5-87-005is calculated as follows:

@ 95% confidence,
Expressed in decimal percent, or multiply by 100 for %

$$\frac{2 \times \text{square root (Gross Counts + Background Counts)}}{\text{Gross Counts} - \text{Background Counts}}$$

Prepared By: Sheryl Sorling Date: 11-13-98

Supplement to Large Area Activated Charcoal Canisters 1998 Report
Quality Assurance Calculations

Calculation 1 - Standard Accuracy	
Description	**Data**
Equipment Efficiency - cpm/dpm	0.00668
dpm/pCi	2.22
Count Time - minutes	5
Background - gross counts	102
Background - cpm	20.4
Standard 1 - pCi/can, actual	18210
Standard 2 - pCi/can, actual	36420
Standard 1 - average gross counts, measured	1404
Standard 2 - average gross counts, measured	2714
Standard 1 - average gross cpm, measured	280.8
Standard 2 - average gross cpm, measured	542.8
Standard 1 - average net cpm, measured	260.4
Standard 2 - average net cpm, measured	522.4
Standard 1 - average pCi/can, measured	17559
Standard 2 - average pCi/can, measured	35227
Standard 1 - (Measure-Actual)/Actual, %	-3.57
Standard 2 - (Measured-Actual)/Actual, %	-3.28

Calculation 2 - Precision			
Description	**Count Gross Counts**	**Duplicate Gross Counts**	**(Dup1-Dup2)/ Avg(Dup1&Dup2)**
Duplicate 1 - 59778 - <0.5/<0.5 pCi/m2s	170	162	4.82
Duplicate 2 - 59780 - 0.87/0.87 pCi/m2s	303	299	1.33
Average - % Difference			**3.07**

Calculation 3 - Data Counting Error		
Data Precision	**Data**	**Precision, %**
Background gross counts	121	
Count Time - minute	5	
64520 Data 4.66 pCi/m2sec, gross counts	1339	6.27
gross counts + background	1460	
gross counts - background	1218	

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Report

Project:	Pathfinder Mines Corp.	Date Set:	09-24-98
Location:	Gas Hills/Lucky Mc.	Date Remove:	09-25-98
Report Date:	September 28, 1998	Date Counted:	09-26-98
Weather:	Clear,breezy 49 degrees		

Method: Pathfinder's employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Cannister #	Location	09-24-98 Time Set	09-25-98 Time Remove	Radon Flux pCi/m^2s
98- 59770	25	25	LMRF-1	8:39	8:44	<0.5
98- 59771	16	10	LMRF-2	8:41	8:46	<0.5
98- 59772	2	2	LMRF-3	8:44	8:47	<0.5
98- 59773	24	26	LMRF-5	8:46	8:48	<0.5
98- 59774	7	7	LMRF-6	8:48	8:50	<0.5
98- 59775	23	23	LMRF-7	8:50	8:51	<0.5
98- 59776	1	1	LMRF-8	8:52	8:53	<0.5
98- 59777	18	18	LMRF-11	8:54	8:55	1.3
98- 59778	20	20	LMRF-12	8:57	8:58	<0.5
98- 59778	20	20	LMRF-12	8:57	8:58	<0.5
98- 59779	4	11	LMRF-13	9:04	9:05	<0.5
98- 59780	19	19	LMRF-14	9:07	9:09	0.9
98- 59780	19	19	LMRF-14	9:07	9:09	0.9
98- 59781	6	13	LMRF-15	9:09	9:11	<0.5
98- 59782	21	30	LMRF-22	9:12	9:14	<0.5
98- 59783	3	14	LMRF-23	9:15	9:16	<0.5
98- 59784	5	8	LMRF-24	9:17	9:18	<0.5
98- 59785	22	22	#1Tails test pad	9:21	9:22	<0.5
98- 59786	17	17	#2Tails test pad	9:28	9:29	<0.5
98- 59787	TB1	TB1	TB1	9:00	9:00	<0.5
98- 59788	TB2	TB2	TB2	9:00	9:00	<0.5
98- 59789	TB3	TB3	TB3	9:00	9:00	<0.5
98- 59790	TB4	TB4	TB4	9:00	9:00	<0.5
98- 59791	TB5	TB5	TB5	9:00	9:00	<0.5

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project:	Pathfinder Mines Corp.	Date Set:	09-24-98
Location:	Gas Hills/Lucky Mc.	Date Remove:	09-25-98
Report Date:	September 28, 1998	Date Counted:	09-26-98
Weather:	Clear,breezy 49 degrees		

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m^{2}s*
98- 59787	TB1	<0.5
98- 59788	TB2	<0.5
98- 59789	TB3	<0.5
98- 59790	TB4	<0.5
98- 59791	TB5	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
93	1429	2814

Replicate Lab ID	Date Counted	Radon Flux pCi/m^{2}s*	Recovery Decimal
98- 59778	09-27-98	<0.5	1.000
98- 59780	09-26-98	0.9	1.001

Average of recoveries: **1.000**

Minimum Radon Flux for Gas Hills/Lucky Mac: <0.5 pCi/m^{2}s

Maximum Radon Flux for Gas Hills/Lucky Mac: 1.27 pCi/m^{2}s

Average Radon Flux for #25-17: 0.57 pCi/m^{2}s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m^{2}s.

Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: D Blada

Reviewed By: [illegible]

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Starting ID	59770
Starting LAACC	25
Project:	Pathfinder Mines Corp
Location:	Gas Hills/Lucky Mc.
Report date:	September 28, 1998
Weather:	lear,breezy 49 degrees

	Average	Average
Std1	1404	1554
Std2	2714	2914
Bkg	102	84
Instrbkg	117	

Data 1					
Date Set	9/24/98		λ	2.10E-06	
Date Removed	9/25/98		Area	0.051	
Date Counted	9/26/98		K	0.037	
			Eff.	0.00668	
Std Counts	1443				
Bkg Counts	93				
DPM, pCi	18210	2.22	dis/pCi		
Count Time, min	5				

Data 2					
Date Set	9/24/98		λ	2.10E-06	
Date Removed	9/25/98		Area	0.051	
Date Counted	9/26/98		K	0.037	
			Eff.	0.00668	
Std Counts	1443				
Bkg Counts	93				
DPM, pCi	18210	2.22	dis/pCi		
Count Time, min	5				

Lab ID	QA	LAACC #	Can ID	Field ID	Gross Counts	Net Counts	Net CP	Time Set	Time Removed	t1, sec	Time Count Start	t2, sec	t3, sec	pCi 222Rn m-2 s-1	Run #	Count Date	Int 1	Int 2	Int 3	Int 4
59770		25	25	LMRF-1	128	35	7	8:39	8:44	86700	10:35	179760	180060	<0.5	1	09-26-98	0.000	0.17	0.82	0.82
59771		18	10	LMRF-2	153	60	12	8:41	8:46	86700	10:40	179940	180240	<0.5	1	09-26-98	0.000	0.17	0.82	0.82
59772		2	2	LMRF-3	133	40	8	8:44	8:47	86460	10:51	180300	180600	<0.5	1	09-26-98	0.000	0.17	0.82	0.82
59773		24	26	LMRF-5	136	43	9	8:46	8:47	86340	10:57	180540	180840	<0.5	1	09-26-98	0.000	0.17	0.82	0.82
59774		7	7	LMRF-6	127	34	7	8:48	8:50	86400	12:20	185400	185700	<0.5	1	09-26-98	0.000	0.17	0.81	0.81
59775		23	23	LMRF-7	155	62	12	8:50	8:51	86340	12:25	185580	185880	<0.5	1	09-26-98	0.000	0.17	0.81	0.81
59776		1	1	LMRF-8	123	30	6	8:52	8:53	86340	12:34	186000	186300	<0.5	1	09-26-98	0.000	0.17	0.81	0.81
59777		18	18	LMRF-11	401	308	62	8:54	8:55	86280	12:45	186480	186780	1.27	1	09-26-98	0.000	0.17	0.81	0.81
59778	D1	20	20	LMRF-12	170	77	15	8:57	8:58	86460	12:52	186900	187200	<0.5	1	09-26-98	0.000	0.17	0.81	0.81
59778		20	20	LMRF-12	162	69	14	8:57	8:58	86040	11:15	267060	267360	<0.5	1	09-27-98	0.000	0.17	0.68	0.68
59779		4	11	LMRF-13	131	38	8	9:04	9:05	86280	13:56	190140	190440	<0.5	1	09-26-98	0.000	0.17	0.80	0.80
59780	D2	19	19	LMRF-14	303	210	42	9:07	9:09	86520	14:01	190440	190740	0.87	1	09-26-98	0.000	0.17	0.80	0.80
59780		19	19	LMRF-14	299	206	41	9:07	9:09	86400	16:35	199560	199860	0.87	1	09-26-98	0.000	0.17	0.79	0.79
59781		6	13	LMRF-15	131	38	8	9:09	9:11	86340	14:19	191220	191520	<0.5	1	09-26-98	0.000	0.17	0.80	0.80
59782		21	30	LMRF-22	137	44	9	9.12	9:14	86340	14:38	192180	192480	<0.5	1	09-26-98	0.000	0.17	0.80	0.80
59783		3	14	LMRF-23	187	94	19	9:15	9:16	86340	14:43	192360	192660	<0.5	1	09-26-98	0.000	0.17	0.80	0.80
59784		5	8	LMRF-24	132	39	8	9:17	9:18	86220	14:48	192420	192720	<0.5	1	09-26-98	0.000	0.17	0.80	0.80
59785		22	22	#1Tails test pad	119	26	5	9:21	9:22	86040	15:30	194520	194820	<0.5	1	09-26-98	0.000	0.17	0.80	0.80
59786		17	17	#2Tails test pad	160	67	13	9:28	9:29	88140	15:35	196500	196800	<0.5	1	09-26-98	0.000	0.17	0.80	0.80
59787	T1	TB1	TB1	TB1	109	16	3	9.00	9:00	86400	16:00	198000	198300	<0.5	1	09-26-98	0.000	0.17	0.79	0.79
59788	T2	TB2	TB2	TB2	94	1	0	9:00	9.00	86400	16:05	198300	198600	<0.5	1	09-26-98	0.000	0.17	0.79	0.79
59789	T3	TB3	TB3	TB3	95	2	0	9:00	9:00	86400	16:10	198600	198900	<0.5	1	09-26-98	0.000	0.17	0.79	0.79
59790	T4	TB4	TB4	TB4	95	2	0	9.00	9:00	86400	16:15	198900	199200	<0.5	1	09-26-98	0.000	0.17	0.79	0.79
59791	T5	TB5	TB5	TB5	96	3	1	9:00	9:00	118800	16:20	231600	231900	<0.5	1	09-26-98	0.000	0.22	0.79	0.79

F1 ACQUIRE
CTL F2 ERASE PREVIOUS SPECTRUM

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page ____ of ____

Client: Pathfinder Mines Corp. Location: Gas Hills - Lucky Mc

Weather Condition: clear, breezy Precip: none Min Temp: 49°F

Inst.: ____ Eff: ____ Tech: ____
Inst. Back: ~~102 @ 1045~~
Charcoal Back: 102 84 Lot: ____
Standard: 1404, ~~1673~~ 1459 Count: 2714, 2914

LAACC Unit #	Charcoal Can #	Location I.D. / Station	9-24-98 Mo/Day/Yr 24 hr time set	9-25-98 Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
25	25	LMRF-1	0839	0844	TWH	98-59770	9-25-98 1030 ~~1045~~	5	128 ~~102~~	
16	10	LMRF-2	0841	0846	TWH	59771	1035 ~~1045~~	1	153	
2	2	LMRF-3	0844	0847	TWH	59772	1046	all	133	
24	26	LMRF-5	0846	0848	TWH	59773	1052		136	
7	7	LMRF-6	0848	0850	TWH	59774	1215 ~~1209~~		127	
23	23	LMRF-7	0850	0851	TWH	59775	1220		155	
1	1	LMRF-8	0852	0853	TWH	59776	1229		123	
18	18	LMRF-11	0854	0855	TWH	59777	1240 ~~1235~~		401	
20	20	LMRF-12	0857	0858	TWH	59778	1247		170	
4	11	LMRF-13	0904	0905	TWH	59779	1351		131	
19	19	LMRF-14	0907	0909	TWH	59780	1356		303	
6	13	LMRF-15	0909	0911	TWH	59781	1416		131	SITE NOT TO FINAL LIFT-1' COVER
21	30	LMRF-22	0912	0914	TWH	59782	1433		137	
3	14	LMRF-23	0915	0916	TWH	59783	1438		187	
5	8	LMRF-24	0917	0918	TWH	59784	1443		132	
22	22	No. 1 Tails test pad	0921	0922	TWH	59785	1525		119	
17	17	No. 2 TAILS Test pad	0928	0929	TWH	59786	1530		160	

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page ____ Of ____

Client: Pathfinder Mines Corp Location: Gas Hills - Lucky Mc

Weather Condition: Clear, breezy Precip: none Min Temp: 49°F

Inst.: _____ Eff: _____ Tech: _____
Inst. Back: _____
Charcoal Back: _____ Lot: _____
Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
		Trip Blank #1				59787	1536	5 MIN	109	
		#2				59788	1552		094	
		#3				59789	1558		095	
		#4				59790	1603		095	
		#5				59791	1608		096	
					2ND	BLANK	1613		084	
					2ND	STD #1	1619		1454	
					2ND	STD #2	1624		2914	
					1st	BLANK	1005		102	
					1st	STD #1 18210	1013		1404	
					1st	STD 36470	1019		2714	
			DUPLICATES need to be analyzed							
					9-26	#19 DUP	1630		299	
			9-27-98		9-27	20 DUP	1110		162	
					9-27	23 DUP	1128		138	
					9-27	BLANK	1008		100	
					9-27	STAND #1	0944		1386	
					9-27	STAND #2	1141		2688	

ENERGY LABORATORIES, INC. - CASPER, WYOMING

STANDARD OPERATING PROCEDURES

RADON FLUX MEASUREMENT
EPA METHOD 115
LARGE AREA ACTIVATED CHARCOAL COLLECTORS (LAACC)

Approved By:

Originator Sheryl Gerling 4-6-98 *Date*

Technical Reviewer (if applicable) David Blaida 4-6-98 *Date*

ELI Quality Assurance Director [illegible] 4-6-98 *Date*

ELI Laboratory Manager L.A. Gerling 4-6-98 *Date*

Distribution of Official Copies:

ELI Laboratory Manager
ELI Quality Assurance Director
All ELI Staff

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide a general description of the placement, handling, subsequent analytical measurement, and calculation of radon flux measured from Large Area Activated Charcoal Canister (LAACC), also known as EPA Method 115, per 40 Code of Federal Regulations (CFR), *Part 61, Environmental Protection Agency, National Emission Standards for Hazardous Air Pollutants; Radionuclides; Final Rule and Notice of Reconsideration*, December 15, 1989. In addition to the published EPA Method 115, technical information was also taken from EPA's publication 520/5-85-029, *Radon Flux Measurements on Gardinier and Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida*.

Radon flux measurements are performed on uranium mill tailings, phosphogypsum stacks, or on any solids (soil, waste, etc.) in which radon flux measurements are required. The majority of radon flux measurements have been for conventional uranium milling operations.

2.0 SUMMARY

The method used to measure radon flux involves adsorption of radon on activated charcoal in a large area collector (LAACC); diagram located in Section 7.0 Attachments. The collector is placed onto the surface of the material to be measured and is allowed to collect radon for a period of 24 hours. The charcoal is transferred into steel pre-numbered cans then transported to the laboratory for analysis and calculation of radon flux. The radon collected on the charcoal is measured by gamma spectroscopy or equivalent equipment (multi or single channel analyzers). In addition to EPA's Method 115 document, publication EPA 520/5-85-029, *Radon Flux Measurements on Gardinier and Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida, January 1986*, and EPA 520/1-89-009, *Indoor Radon and Radon Decay Product Measurement Protocols*, provides the basic information on design, measurement, and theory related to radon flux measurement and analysis. Partial copies of the publications have been attached in Section 6.0 References.

3.0 NOTES AND PRECAUTIONS

The following areas should be addressed before sampling:

< timing of collection (24 hours sampling or quarterly annual collection),

< regions within the tailings impoundment (quantity and area),

< personnel responsible for placement of collectors,

< EPA notification of intent to proceed with collection,

< current topographical map of tailings impoundments to be sampled,

< sample point locations to be marked in the field prior to collector placement, and

< location of any background samples such as up wind of the impoundment (undisturbed areas) as a point of comparison or field duplicate samples.

Safety precautions that should be observed while performing radon flux measurement in the field and analysis in the laboratory are as follows:

In the field

< Observe all site specific hazard conditions,
< Make sure all paperwork is secured from environmental conditions, and
< Do not open or compromise trip blank charcoal canisters.

In the laboratory

< Observe all laboratory safety procedures as specified in the Chemical Hygiene Plan and/or by the Standard Operating Procedure for the equipment or method.

4.0 DEFINITIONS

None.

5.0 MATERIALS AND PROCEDURES

5.1 Materials

The collector consists of a PVC end cap with handle, screened spacer pads, charcoal distribution grid, screened retainer pad, and a steel-retaining rod. Approximately 180 grams of activated charcoal is spread in the distribution grid. The retainer pad is placed over the charcoal and held in place by the retaining rod. Refer to the diagram of construction located in Section 6.0 References.

5.2 Procedure for Measurement and Calculation of Radon Flux from Uranium Mill Tailings Piles

The following describes the monitoring methods which must be used in determining the ^{222}Rn emissions from underground uranium mines, uranium mill tailings piles, phosphogypsum stacks, and other piles of waste material emitting radon.

The loading process should be done in an enclosed area so adverse wind conditions do not disturb the charcoal (blow it away). To allow for a quick transfer of charcoal into the collectors prior to deployment, LAACC units should be loaded by two or more people. The collectors are loaded with the charcoal by removing the retaining rod and pad, placing the pre-weighed (pre-measured) charcoal into the charcoal support grid, and replacing the pad and rod. The collectors are transported to the field by vehicle and deployed. The LAACC unit, charcoal canister, and tailings grid location should be recorded. Teams of two or more people should begin deployment immediately upon the charcoal transfer. Minimize the time a loaded collector is allowed to sit in ambient atmosphere. Care must be taken to minimize confusion and order of LAACC units and charcoal cans. An organized method of transfer and a large working area assist in minimizing any errors in LAACC/canister mismatching.

The pre-numbered collectors are deployed by carefully positioning the end cap on a flat surface of the material to be measured with soils or tailings used to seal the edge, at the predetermined location. It is imperative that a complete seal is obtained between the collector and the material to be measured. A shovel or a hand trowel may be used to

scoop the material around the edge of the collector, being careful not to scoop material into the vent hole. The location identification, LAACC number, and the set time should be recorded.

After approximately 24 hours (minor time overruns are acceptable) of exposure, the collectors are picked up and the time retrieved is recorded. If any other conditions are observed (such as a broken seal, wind blown conditions, etc.), they should also be recorded. The transfer of the charcoal should begin immediately upon retrieval. The LAACCs are transported to the enclosed work area where a team of two or more personnel are responsible for transferring the charcoal carefully back into the appropriate pre-numbered cans. The time between retrieval and transferring the exposed charcoal should be held to a minimum, however, site and field conditions contribute to the timeliness of the transfer.

The activated charcoal is removed from the collector by removing the retaining rod and pad from the collector and dumping the charcoal into a large funnel which empties into the pre-numbered steel alloy can. The can's lid is placed and a wrap of electrical tape is applied to the can seam to eliminate any charcoal loss due to lid removal or introduction of air and/or radon into the can. The tape also assists in creating a closed system to allow for the radon collected to equilibrate for four (4) hours before counting to allow the ingrowth of the radon daughters.

The cans are transported to the laboratory where they are counted and recorded. The following information pertains to the calculation that will be made to ascertain the radon flux for each specific LAACC location. Due to the near 100% efficiency of the activated charcoal to adsorb and retain radon and its associated particulate daughters from the atmosphere in the LAACC units, no can sealing or seal testing is required. This method of collection and transportation is endorsed by EPA via EPA 402-R-92-004, EPA 402-R-92-004, *Indoor Radon and Radon Decay Products Measurement Device Protocols,* July 1992, and EPA 520/5-87-005, *EERF Standard Operating Procedure for Rn-222 Measurement Using Charcoal Canisters,* June 1987.

5.2.1 Frequency of Flux Measurement

A single set of radon flux measurements may be made, or if the owner or operator chooses, measurements that are more frequent may be made over a one-year period. These measurements may involve quarterly, monthly, or weekly intervals. All radon measurements shall be made as described in paragraphs 5.2.2 through 5.2.6 except that for measurements made over a one-year period, the requirement of paragraph 5.2.4(c) shall not apply. The mean radon flux from the pile shall be the arithmetic mean of the mean radon flux for each measurement period. The weather conditions, moisture content of the tailings and area of the pile covered by water existing at the time of the measurement shall be chosen so as to provide measurements representative of the long term radon flux from the pile and shall be subject to EPA review and approval.

5.2.2 Distribution of Flux Measurements

The distribution and number of radon flux measurements required on a pile will depend on the clearly defined areas of the pile (called regions) that can have significantly different radon fluxes due to surface conditions. The mean radon flux shall be determined for each individual region of the pile. Regions that shall be considered for operating mill-tailing piles are:

< water covered areas;
< water saturated areas (beaches);
< dry top surface areas; and
< sides, except where earthen material is used in dam construction.

For mill tailings after closure the pile shall be considered to consist of only one region.

5.2.3 Number of Radon Flux Measurements

Radon flux measurements shall be made within each region of the pile, except for those areas covered with water. Measurements shall be made at regularly spaced locations across the surface of the region, realizing that surface roughness will prohibit measurements in some areas of a region. The minimum number of flux measurements considered necessary to determine a representative mean radon flux value for each type of region on an operating pile is:

< water saturated area - no measurements required as radon flux is assumed to be zero;

< water saturated beaches - 100 radon flux measurements;

< loose and dry top surface - 100 radon flux measurements; and

< sides - 100 radon flux measurements, except where earthen materials are used in dam construction.

For mill tailings pile after closure which consists of only one region, minimum of 100 measurements are required.

5.2.3.1 Trip and field blanks

ELI prepares a minimum of 10% trip blanks to be sent to the field with the LAACC testing equipment and measurement charcoal containers. The trip blanks travel with the charcoal cans that will be used in the LAACC devices. The trip blanks stay with the unopened charcoal cans

while in storage prior to transfer and deployment. The trip blanks stay in the work area upon deployment of the devices to the field for actual measurement. They are intended to provide information regarding the integrity of the shipping and handling of the measuring equipment to and from the field from the laboratory.

5.2.3.2 Background and field duplicate measurements

Due to the non-homogeneous nature of tailings piles, it is recommended that some duplicate measurements be made in the field. Set two LAACC devices in the field adjacent to each other. In addition to field duplicates, it is recommended that some LAACC devices are deployed in areas of known background conditions (undisturbed field conditions). This data will complement the radon flux measurements as determined on the tailings pile.

5.2.4 Restrictions to Radon Flux Measurements

The following restrictions are placed on making radon flux measurements:

a. measurements shall not be initiated within 24 hours of a rainfall;

b. if a rainfall occurs during the 24 hour measurements period, the measurement is invalid if the seal around the lip of the collector is surrounded by water; and

c. measurements shall not be performed if the ambient temperature is below 35EF or if the ground is frozen. A min/max thermometer may be used if no meteorological data is available.

5.2.5 Areas of Pile Regions

The approximate area of each region of the pile shall be determined in units of square meters.

5.2.6 Radon Flux Measurements

Measuring radon flux involves the adsorption of radon on activated charcoal in a large-area collector. The radon collector is placed on the surface of the pile area to be measured and allowed to collect for a period of 24 hours. The radon collected on the charcoal is measured by gamma-ray spectroscopy. The detailed measurement procedure provided in Appendix A of EPA 520/5-85-0029(1) shall be used to measure the radon flux on uranium mill tailings, *except the surface of the tailings shall not be penetrated by the lip of the*

radon collector as directed in the procedure, rather the collector shall be carefully positioned on a flat surface with soil or tailings used to seal the edge.

5.2.7 Calculations

The mean radon flux for reach region on the pile and for the total pile shall be calculated and reported as follows:

a. The individual radon flux calculations shall be made as provided in Appendix A EPA 86 (1). The mean radon flux for each region of the pile shall be calculated by summing all individual flux measurements for the region and dividing by the total number of flux measurements for the region.

b. The mean radon flux for the total uranium mill tailings pile shall be calculated as follows:

$$J_S = \frac{J_1 A_1 + \ldots J_2 A_2 \ldots J_i A_i}{A_t}$$

where:

J_S	=	mean flux for the total pile (pCi/m^2-s),
J_i	=	mean flux measured in region i (pCi/m^2-s),
A_i	=	area of region i (m^2), and
A_t	=	total area of pile (m^2).

5.3 Quality Assurance

ELI is an EPA certified and listed laboratory through the Radon Measurement Proficiency (RMP) Program. Laboratory certification has been maintained in the areas for determination of radiochemical, inorganics, organics, and bacteriological constituents in drinking waters. ELI has been actively participating in EPA's Radon Proficiency Program since its inception for determination of radon concentrations in homes and structures. ELI has two staff members presently accepted by the U. S. Nuclear Regulatory Commission (NRC) as Radiation Safety Officers and have performed radiation surveys for uranium operations since 1980. These surveys include alpha, beta, and gamma emitting radionuclides in air, soil/surface, and water for determination of employee occupational exposure awhile working at mine sites.

5.3.1 Sampling Procedures

Records of field activities and laboratory measurements shall be maintained. The following information shall be recorded for each charcoal canister measurement:

< site,
< name of pile,
< sample location,
< sample ID number,
< date and time on,
< date and time off, and
< observations of meteorological conditions and comments.

Records shall include all applicable information associated with determining the sample measurement, calculations, observations, and comments.

5.3.2 Sample Custody

Custodial control of all charcoal samples exposed in the field shall be maintained in accordance with EPA chain of custody field procedures. A control record shall document all custody changes that occur between the field and laboratory personnel.

5.3.3 Calibration Procedures and Frequency

ELI has two multi-channel gamma spectrometers available at its Casper facility. The radioactivity of two standard charcoal sources, each containing a carefully determined quantity of Radium-226 (^{226}Ra) uniformly distributed through ~180 grams of activated charcoal shall be measured. An efficiency factor is computed by dividing the average measured radioactivity of the two standard charcoal sources, minus the background, in cpm by the known radioactivity of the sources in dpm. The same two standard charcoal sources shall be made, at a minimum, at the beginning and at the end of each day's counting as a check of the radioactivity counting equipment. A background count using unexposed charcoal should be made, at a minimum, at the beginning and at the end of each counting day to check for inadvertent contamination of the detector or other changes affecting the background. The unexposed charcoal comprising the blank is changed with each new batch of charcoal used.

5.3.4 Internal Quality Control Checks and Frequency

The charcoal from every tenth exposed canister shall be recounted. Five percent of the samples analyzed shall be blanks (charcoal having no radioactivity added).

5.3.5 Data Precision, Accuracy, and Completeness

The precision, accuracy, and completeness of measurements and analyses shall be within the following limits for samples measuring greater than 1.0 pCi/m^2-s.

< Precision: 10%

< Accuracy: 10%

< Completeness: At least 85% of the measurements must yield usable results

ELI has performed a method detection limit (MDL) study using EPA's standard MDL definition and procedure. In addition, the following precision calculation is utilized at the laboratory at a 90% (2-sigma) confidence level:

$$\frac{2 \times \sqrt{SampleCount + BackgroundCount}}{SampleCount - BackgroundCount}$$

5.4 Reporting

The results of the individual flux measurements, the approximate locations on the pile, and the mean radon flux for each region and the mean radon flux for the total stack shall be included in the emission test report. Any conditions or unusual event that occurred during the measurements that could significantly affect the results should be reported.

ELI will provide the company with a report that will include a minimum of the following:

< number and laboratory ID of collectors placed;

< date and time of collectors placed, retrieved, and charcoal counted;

< map of location of collectors (provided by company);

< radon flux calculations for each detector, region, and total tailings impoundments;

< spectrum print out for each detector, if requested; and

< quality assurance data will be provided upon request. This data will consist of duplicates, blanks, standards, and geometry verification.

6.0 REFERENCES

6.1 EPA Method 115, per 40 Code of Federal Regulations (CFR), *Part 61, Environmental Protection Agency, National Emission Standards for Hazardous Air Pollutants; Radionuclides; Final Rule and Notice of Reconsideration*, December 15, 1989.

6.2 EPA's publication 520/5-85-029, *Radon Flux Measurements on Gardinier and Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida.*

6.3 EPA publication 520/1-89-009, *Indoor Radon and Radon Decay Product Measurement Protocols,* updated and made into two documents;

6.4 EPA 402-R-92-004, *Indoor Radon and Radon Decay Products Measurement Device Protocols,* July 1992, and

6.5 EPA 402-R-92-003, *Protocols For Radon and Radon Decay Product Measurements In Homes,* June 1993.

6.6 EPA 520/5-87-005, *EERF Standard Operating Procedure for Rn-222 Measurement Using Charcoal Canisters,* June 1987.

6.7. Copies of ELI's Quality Assurance and certifications are available upon request.

7.0 ATTACHMENTS

7.1 Diagram of LAACC device

7.2 Chain of Custody

7.3 Field Notes Form

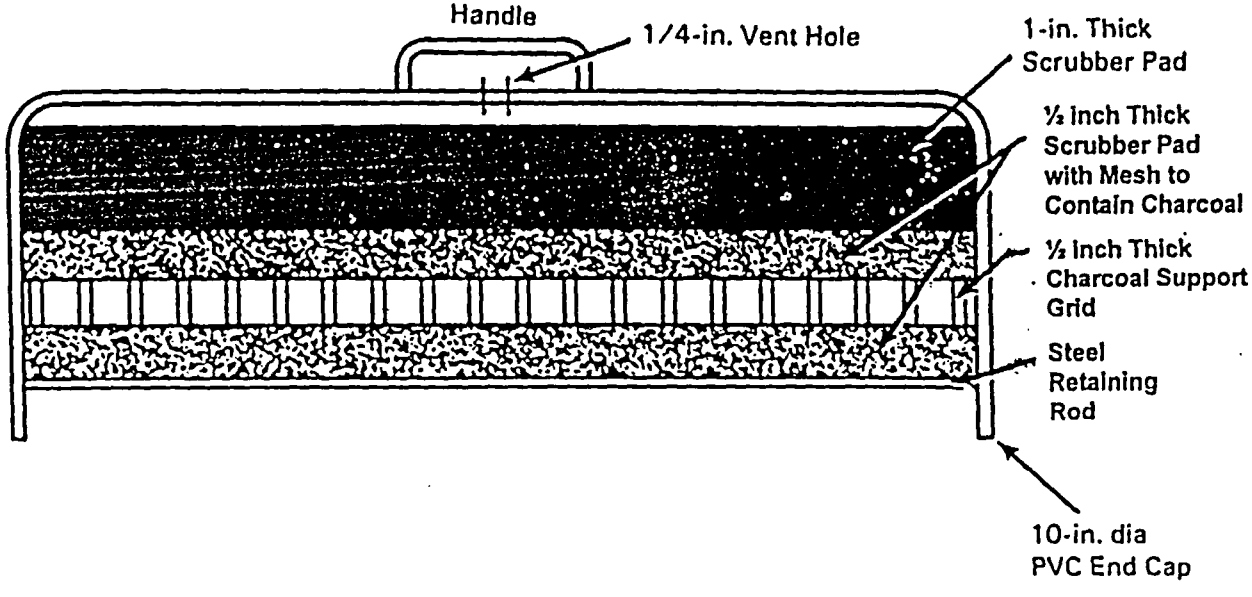
7.4 Example of Report

7.5 Memo to File regarding EPA's informal field and laboratory audit of ELI's LAACC Program.

7.6 Record of Acknowledgment/Signature Page

7.1 DIAGRAM OF LARGE AREA COLLECTOR

SOP ELI-C-50-907-01



Large Area Radon Collector

7.3 F D NOTES FORM

SOP ELI-C-50-907-01

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page ____ Of ____

Client: Location:

Weather Condition: Precip: Min Temp:

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments

Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project:	COMPANY NAME	Date Set:	August 13, 1996
		Date Remove:	August 14, 1996
Location:	Project Name	Weather:	*Fair/Clear/min. temp 50 degrees F.
Report Date:	September 10, 1996	Date Counted:	August 15, 1996

Date Counted	Blank Charcoal cpm	Standard No. 1 cpm	Standard No. 2 cpm
08-15-96	98	1701	3384
08-15-96	94	1618	3421
08-15-96	90	1698	3358
Average	94	1672	3388

TRIP BLANKS		
Date Counted	Canister No.	Radon Flux** pCi/m2s
8-15-96	Trip Blank - 1	<0.5
8-15-96	Trip Blank - 2	<0.5
8-15-96	Trip Blank - 3	<0.5
8-15-96	Trip Blank - 4	<0.5
8-15-96	Trip Blank - 5	<0.5
8-15-96	Trip Blank - 6	<0.5
8-15-96	Trip Blank - 7	<0.5
8-15-96	Trip Blank - 8	<0.5
8-15-96	Trip Blank - 9	<0.5
8-15-96	Trip Blank -10	<0.5
8-15-96	Trip Blank -11	<0.5
8-15-96	Trip Blank -12	<0.5
8-15-96	Trip Blank -13	<0.5
8-15-96	Trip Blank - 14	<0.5
8-15-96	Trip Blank - 15	<0.5
8-15-96	Trip Blank - 16	<0.5
8-15-96	Trip Blank - 17	<0.5
8-15-96	Trip Blank - 18	<0.5
8-15-96	Trip Blank - 19	<0.5
8-15-96	Trip Blank - 20	<0.5
8-15-96	Trip Blank - 21	<0.5
8-15-96	Trip Blank - 22	<0.5
8-15-96	Trip Blank - 23	<0.5
8-15-96	Trip Blank - 24	<0.5
8-15-96	Trip Blank - 25	<0.5

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7.5 MEMO TO FILE REGARDING EPA'S UNOFFICIAL RADON FLUX AUDIT
ELI SOP-50-907-01

MEMORANDUM

Date: *June 10, 1997*

To: *Energy Laboratories, Inc. File*

From: *Sheryl Garling with Energy Laboratories, Inc. - Casper, Wyoming*

Subject: *Summer of 1990 Unofficial Audit of ELI's Large Area Activated Charcoal Canister (LAACC) Program - From the Field to the Laboratory*

To date Energy Laboratories, Inc. (ELI) has not been officially audited by any regulatory agency regarding its Large Area Activated Charcoal Canister (LAACC -radon flux) program. On June 9, 1997 Milt Lammering with U.S. Environmental Protection Agency (EPA) in Denver was contacted to verify if there was any unofficial documentation made to file regarding ELI's radon flux program. His response was that during an unofficial audit no documentation is made if all aspects of the audit are acceptable to the agency.

To clarify the unofficial audit the following background information has been recorded:

Pathfinder Mines Corporation's Shirley Basin Operation scheduled to perform radon flux measurements for their tailings impoundment. They contacted the EPA's representative, Milt Lammering, and requested that he provide an on site audit of the program that ELI proposed. Milt Lammering and Bob Tower, EPA's Certification Officer for radiochemistry from Las Vegas, Nevada, visited the site during the time the collectors were deployed. They observed all aspects of the program from deployment to retrieval, charcoal transfer to and from collectors, and laboratory procedures for accepting samples, logging into laboratory, laboratory equipment, and analysis.

At no time, during the unofficial audit was there any comments or concerns regarding ELI's protocol. ELI designed the radon flux program from all the EPA documentation that was published at the time. The radon flux program has been maintained, since its inception, to the rigorous guidelines published by EPA.

To date, all ELI data submitted by clients, has not been questioned by the regulatory agencies overseeing the program.

For additional information please see SOP Section 6.0, *References*.

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Billings • Casper • Gillette • Rapid City

FAX: CNA

Large Area Activated Charcoal Cannister (LAACC) Radon Flux Report

Project:	Pathfinder Mines Corp.	Date Set:	07-26-99
Location:	Lucky McMine	Date Remove:	07-27-99
Report Date:	July 30, 1999	Date Counted:	07-28-99
Weather:	Clear, dry		

Method: Pathfinder's employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Cannister #	Location	07-26-99 Time Set	07-27-99 Time Remove	Radon Flux pCi/m^2s
99- 36245	46	17	54	9:30	9:30	<0.5
99- 36246	47	18	45	9:34	9:34	<0.5
99- 36246	47	18	45	9:34	9:34	<0.5
99- 36247	48	19	34	9:36	9:36	<0.5
99- 36248	49	21	44	9:39	9:39	<0.5
99- 36249	50	25	35	9:43	9:43	<0.5
99- 36250	TB-3	TB-3	TB-3	12:00	12:00	<0.5

RECEIVED
AUG 03 1999
By TWH

dpb r:\reports\clients.99\pathfinder\36245.xls

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E-mail: energy@trib.com • FAX: (307) 234-1639 • PHONE: (307) 235-0515 • TOLL FREE: (888) 235-0515
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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project:	Pathfinder Mines Corp.	Date Set:	07-26-99
Location:	Lucky McMine	Date Remove:	07-27-99
Report Date:	July 30, 1999	Date Counted:	07-28-99
Weather:	Clear, dry		

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m²s*
99- 36250	TB1	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
109	1398	2673

Replicate Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
99- 36246	07-28-99	<0.5	1.000

Average of recoveries: 1.000

Minimum Radon Flux for Pathfinder:	<0.5 pCi/m²s
Maximum Radon Flux for Pathfinder:	<0.5 pCi/m²s
Average Radon Flux for #17-25	<0.5 pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.

Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: D Blanda

Reviewed By: LAA

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cc. CNA
~~2182~~

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Report

Project:	Pathfinder Mines Corp.	Date Set:	07-28-99
Location:	Lucky McMine	Date Remove:	07-29-99
Report Date:	July 30, 1999	Date Counted:	07-30-99
Weather:	Sunny, hot		

Method: Pathfinder's employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Cannister #	Location	07-28-99 Time Set	07-29-99 Time Remove	Radon Flux pCi/m²s
99- 36481	76	11	55	9:52	9:52	<0.5
99- 36482	77	15	55	9:52	9:52	<0.5
99- 36483	78	16	25	10:09	10:09	<0.5
99- 36484	80	17	21	10:27	10:27	<0.5
99- 36484	80	17	21	10:27	10:27	<0.5
99- 36485	123	18	16	10:43	10:43	<0.5
99- 36486	TB-3	TB-3	TB-3	12:00	12:00	<0.5

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project:	Pathfinder Mines Corp.	Date Set:	07-28-99
Location:	Lucky McMine	Date Remove:	07-29-99
Report Date:	July 30, 1999	Date Counted:	07-30-99
Weather:	Sunny, hot		

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m²s*
99- 36486	TB-3	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
105	1522	2984

Replicate Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
99- 36484	07-30-99	<0.5	1.000

Average of recoveries: 1.000

Minimum Radon Flux for Pathfinder:	<0.5 pCi/m²s
Maximum Radon Flux for Pathfinder:	<0.5 pCi/m²s
Average Radon Flux for #11-18	<0.5 pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.

Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: D Haida

Reviewed By: CAle

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Input

Starting ID	36481
Starting LAACC#	76
Project:	Pathfinder Mines Corp.
Location:	Lucky McMine
Report date:	July 30, 1999
Weather:	Sunny, hot

	Average	Average	Average(1,2)
Std1	1532	1511	1522
Std2	3034	2934	2984
Bkg	106	103	105
Instrbkg			

Data 1					
	Date Set	7/28/99		λ	2.10E-06
	Date Removed	7/29/99		Area	0.051
	Date Counted	7/30/99		K	0.037
				Eff.	0.00694
	Std Counts	1507			
	Bkg Counts	105			
	DPM, pCi	18210	2.22	dis/pCi	
	Count Time, min	5			

Data 2					
	Date Set	7/28/99		λ	2.10E-06
	Date Removed	7/29/99		Area	0.051
	Date Counted	7/30/99		K	0.037
				Eff.	0.00694
	Std Counts	1507			
	Bkg Counts	105			
	DPM, pCi	18210	2.22	dis/pCi	
	Count Time, min	5			

Lab ID	QA	LAACC #	Can ID	Field ID	Gross Counts	Net Counts	Net CP	Time Set	Time Removed	t1, sec	Time Count Start	t2, sec	t3, sec	pCi 222Rn m-2 s-1	Run #	Count Date	int 1	int 2	int 3	int 4
36481		76	11	55	121	17	3	9:52	9:52	86400	14:15	188580	188880	<0.5	1	07-30-99	0.000	0.17	0.81	0.81
36482		77	15	55	129	25	5	9:52	9:52	86400	14:20	188880	189180	<0.5	1	07-30-99	0.000	0.17	0.81	0.81
36483		78	16	25	151	47	9	10:09	10:09	86400	14:25	188160	188460	<0.5	1	07-30-99	0.000	0.17	0.81	0.81
36484	D1	80	17	21	191	87	17	10:27	10:27	86400	14:30	187380	187680	<0.5	1	07-30-99	0.000	0.17	0.81	0.81
36484		80	17	21	149	45	9	10:27	10:27	86400	14:40	187980	188280	<0.5	1	07-30-99	0.000	0.17	0.81	0.81
36485		123	18	16	150	46	9	10:43	10:43	86400	14:35	186720	187020	<0.5	1	07-30-99	0.000	0.17	0.81	0.81
36486		TB-3	TB-3	TB-3	132	28	6	12:00	12:00	86400	12:00	172800	173100	<0.5	1	07-30-99	0.000	0.17	0.83	0.83

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FAX: CNA

Large Area Activated Charcoal Cannister (LAACC) Radon Flux Report

Project:	Pathfinder Mines Corp.	Date Set:	08-23-99
Location:	Lucky McMine	Date Remove:	08-24-99
Report Date:	August 17, 1999	Date Counted:	08-25-99
Weather:	Clear, calm		

Method: Pathfinder's employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Cannister #	Location	08-23-99 Time Set	08-24-99 Time Remove	Radon Flux pCi/m²s
99- 32520-1	47	5	47	10:29	10:29	<0.5
99- 32520-1	47	5	47	10:29	10:29	<0.5
99- 32521-2	TB-17	TB-17	TB-17	16:38	16:38	<0.5

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project:	Pathfinder Mines Corp.	Date Set:	08-23-99
Location:	Lucky McMine	Date Remove:	08-24-99
Report Date:	August 17, 1999	Date Counted:	08-25-99
Weather:	Clear, calm		

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m²s*
99- 32521-2	TB-17	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
87	1344	2550

Replicate Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
99- 32520-1	08-25-99	<0.5	1.000

Average of recoveries: **1.000**

Minimum Radon Flux for Pathfinder:	<0.5 pCi/m²s
Maximum Radon Flux for Pathfinder:	<0.5 pCi/m²s
Average Radon Flux for # 5	<0.5 pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.

Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: **Reviewed By:** RCW

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LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page ____ of ____

Client: Location:

Weather Condition: Clear & Calm Precip: None Min Temp: 51°

Inst.: ____ Eff: ____ Tech: ____

Inst. Back: ____

Charcoal Back: 87 Lot: ____

Standard: 1 1344 Count: ____

Std 2 2550

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time ~~Start~~	Count Min	Gross Counts	Comments
48	5	47	8/23/99 10:29	8/24/99 10:29	[illegible]	32520, 1	13:11	5	152	13:16 155
	TB-17	TRIPBLANK				, 2	—	5	98	

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Report

Project:	Pathfinder Mines Corp.	Date Set:	08-17-99
Location:	Lucky McMine	Date Remove:	08-18-99
Report Date:	August 17, 1999	Date Counted:	08-23-99
Weather:	Mostly clear		

Method: Pathfinder's employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID		LAACC #	Cannister #	Location	08-17-99 Time Set	08-18-99 Time Remove	Radon Flux pCi/m²s
99-	32469-1	46	10	33	8:54	8:54	<0.5
99-	32469-2	47	40	46	8:57	8:57	<0.5
99-	32469-3	48	149	53	9:00	9:00	<0.5
99-	32469-3	48	149	53	9:00	9:00	<0.5
99-	32469-4	TB16	TB16	TB16	12:00	12:00	<0.5

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project:	Pathfinder Mines Corp.	Date Set:	08-17-99
Location:	Lucky McMine	Date Remove:	08-18-99
Report Date:	August 17, 1999	Date Counted:	08-23-99
Weather:	Mostly clear		

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m^{2}s*
99- 32469-4	TB-16	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
86	1285	2565

Replicate Lab ID	Date Counted	Radon Flux pCi/m^{2}s*	Recovery Decimal
99- 32469-3	08-23-99	<0.5	1.000

Average of recoveries: **1.000**

Minimum Radon Flux for Pathfinder:	<0.5 pCi/m^{2}s
Maximum Radon Flux for Pathfinder:	<0.5 pCi/m^{2}s
Average Radon Flux for #10-149	<0.5 pCi/m^{2}s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m^{2}s.

Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: **Reviewed By:**

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Input

Starting ID	32469,1							Data 1	Date Set	8/17/99			λ	2.10E-06		Data 2	Date Set	8/17/99			λ	2.10E-06
Starting LAACC#	46								Date Removed	8/18/99			Area	0.051			Date Removed	8/18/99			Area	0.051
Project:	Pathfinder Mines Corp.								Date Counted	8/23/99			K	0.037			Date Counted	8/23/99			K	0.037
Location:	Lucky McMine					Average	Average	Average(1,2)					Eff.	0.00593							Eff.	0.00593
Report date:	August 17, 1999				Std1	1285	1285	1285	Std Counts	1284							Std Counts	1284				
Weather:	Mostly clear				Std2	2565	2565	2565	Bkg Counts	86							Bkg Counts	86				
					Bkg	86	86	86	DPM, pCi	18210	2.22	dis/pCi					DPM, pCi	18210	2.22	dis/pCi		
					Instrbkg				Count Time, min	5							Count Time, min	5				

Lab ID	QA	LAACC #	Can ID	Field ID	Gross Counts	Net Counts	Net CP	Time Set	Time Removed	t1, sec	Time Count Start	t2, sec	t3, sec	pCi 222Rn m-2 s-1	Run #	Count Date	int 1	int 2	int 3	int 4
32469,1		46	10	33	132	46	9	8:54	8:54	86400	16:09	544500	544800	<0.5	1	08-23-99	0.000	0.17	0.38	0.38
32469,2		47	40	46	136	50	10	8:57	8:57	86400	16:33	545760	546060	<0.5	1	08-23-99	0.000	0.17	0.38	0.38
32469,3	D1	48	149	53	107	21	4	16:38	16:38	86400	16:38	518400	518700	<0.5	1	08-23-99	0.000	0.17	0.40	0.40
32469,3		48	149	53	107	21	4	16:38	16:38	86400	16:43	518700	519000	<0.5	1	08-23-99	0.000	0.17	0.40	0.40
32469,4		TB16	TB16	TB16	80	(6)	(1)	12:00	12:00	86400	17:00	536400	536700	<0.5	1	08-23-99	(0.000)	0.17	0.39	0.39

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page ____ Of ____

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: MOSTLY CLEAR Precip: NONE Min Temp: 43°

Inst.: ____ Eff: ____ Tech: ____

Inst. Back: ____

Charcoal Back: 86 Lot: ____

Standard: 1285 Count: ____

Std 2 2565

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time 8-31-99	Count Min	Gross Counts	Comments
46	10	33	8/17/99 8:54	8/18/99 8:54	CA		16:09	5	132	
47	40	46	8/17/99 8:57	8/18/99 8:57	CA		16:33		136	
48	149	53	8/17/99 9:00	8/18/99 9:00	CA		16:38		107	16:43 124 days
TRIP BLANK #16									50	

tyw/d/data/laacc/fieldnot.frm

June 1996

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Report

Project:	Pathfinder Mines Corp.	Date Set:	09-22-99
Location:	Lucky McMine	Date Remove:	09-23-99
Report Date:	September 29, 1999	Date Counted:	09-27-99
Weather:	Clear and calm		

Method: Pathfinder's employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Cannister #	Location	09-22-99 Time Set	09-23-99 Time Remove	Radon Flux pCi/m²s
99- 33224,1	50	225	56	7:30	7:30	0.6
99- 33224,2	49	128	66	7:37	7:37	0.7
99- 33224,3	48	205	65	7:43	7:43	0.6
99- 33224,4	47	315	57	7:48	7:48	0.8
99- 33224,4	47	315	57	7:48	7:48	0.8
99- 33224,5	TB18	TB18	TB18	12:00	12:00	<0.5

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project:	Pathfinder Mines Corp.	Date Set:	09-22-99
Location:	Lucky McMine	Date Remove:	09-23-99
Report Date:	September 29, 1999	Date Counted:	09-27-99
Weather:	Clear and calm		

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m²s*
99- 33224,5	TB18	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
94	1313	2558

Replicate Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
99- 33224,4	09-27-99	0.8	1.12

Average of recoveries: **1.000**

Minimum Radon Flux for Pathfinder:	0.6 pCi/m²s
Maximum Radon Flux for Pathfinder:	0.8 pCi/m²s
Average Radon Flux for #56-57	0.7 pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.

Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: J Hada **Reviewed By:** EOlr

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Input

Starting ID	33224,1
Starting LAACC#	50
Project:	Pathfinder Mines Corp.
Location:	Lucky McMine
Report date:	September 29, 1999
Weather:	Clear and calm

	Average	Average	Average(1,2)
Std1	1313	1313	1313
Std2	2558	2558	2558
Bkg	94	94	94
Instrbkg			

Data 1						
Date Set	9/22/99		λ	2.10E-06		
Date Removed	9/23/99		Area	0.051		
Date Counted	9/27/99		K	0.037		
			Eff.	0.00595		
Std Counts	1296					
Bkg Counts	94					
DPM, pCi	18210	2.22	dis/pCi			
Count Time, min	5					

Data 2						
Date Set	9/22/99		λ	2.10E-06		
Date Removed	9/23/99		Area	0.051		
Date Counted	9/27/99		K	0.037		
			Eff.	0.00595		
Std Counts	1296					
Bkg Counts	94					
DPM, pCi	18210	2.22	dis/pCi			
Count Time, min	5					

Lab ID	QA	LAACC #	Can ID	Field ID	Gross Counts	Net Counts	Net CP	Time Set	Time Removed	t1, sec	Time Count Start	t2, sec	t3, sec	pCi 222Rn m-2 s-1	Run #	Count Date	int 1	int 2	int 3	int 4
33224,1		50	225	56	169	75	15	7:30	7:30	86400	13:15	452700	453000	0.61	1	09-27-99	0.000	0.17	0.46	0.46
33224,2		49	128	66	177	83	17	7:37	7:37	86400	13:20	452580	452880	0.67	1	09-27-99	0.000	0.17	0.46	0.46
33224,3		48	205	65	168	74	15	7:43	7:43	86400	13:25	452520	452820	0.60	1	09-27-99	0.000	0.17	0.46	0.46
33224,4	D1	47	315	57	198	104	21	7:48	7:48	86400	13:30	452520	452820	0.84	1	09-27-99	0.000	0.17	0.46	0.46
33224,4		47	315	57	187	93	19	7:48	7:48	86400	13:30	452520	452820	0.75	1	09-27-99	0.000	0.17	0.46	0.46
33224,5		TB18	TB18	TB18	99	5	1	12:00	12:00	86400	12:00	432000	432300	<0.5	1	09-27-99	0.000	0.17	0.46	0.46

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page ____ of ____

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: CLEAR & CALM Precip: NONE Min Temp: 43

Inst.: ____ Eff: ____ Tech: ____

Inst. Back: ____

Charcoal Back: 94 Lot: ____

Standard: 1 1313, 2 2558, [redacted] Count: ____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	~~9-27-99~~ Date/Time Start	Count Min	Gross Counts	Comments
50	225	56	9/22/99 7:30 AM	9/23/99 7:30 AM	CA	99-33724-002	13:15	5	169	
49	128	66	9/22/99 7:37	9/23/99 7:37	CA	99-33724-003	13:20		177	
48	205	65	9/22/99 7:43	9/23/99 7:43	CA	99-33724-003	13:25		168	
47	315	57	9/22/99 7:48	9/23/99 7:48	CA	99-33724-004	13:30		198	13:35 187 dup
Trip Blank #18						99-33724-005	—		~~187~~ 99	

[signature] 9/24/99 12:40

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Report

Project:	Pathfinder Mines Corp.	Date Set:	07-17-00
Location:	Lucky McMine	Date Remove:	07-18-00
Report Date:	7/21/00	Date Counted:	07-20-00
Weather:	Mostly clear, 50 degrees, 0.25 inches precipitation		

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Cannister #	Location	07-17-00 Time Set	07-18-00 Time Remove	Radon Flux pCi/m²s
34496- 001	1	1	9	9:09	9:09	<0.5
34496- 002	2	2	10	9:14	9:14	<0.5
34496- 003	3	3	17	9:20	9:20	<0.5
34496- 004	4	4	29	9:24	9:24	0.7
34496- 005	5	5	18	9:29	9:29	<0.5
34496- 005	5	5	18	9:29	9:29	<0.5
34496- 006	TB1	TB1	TB1	12:00	12:00	<0.5

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project:	Pathfinder Mines Corp.	Date Set:	07-17-00
Location:	Lucky McMine	Date Remove:	07-18-00
Report Date:	7/21/00	Date Counted:	07-20-00
Weather:	Mostly clear, 50 degrees, 0.25 inches precipitation		

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m^{2}s*
34496- 6	7	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
127	2185	4344

Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corp.
Location: Lucky McMine
Report Date: 7/21/00
Weather: Mostly clear, 50 degrees, 0.25 inches precipitation

Date Set: 07-17-00
Date Remove: 07-18-00
Date Counted: 07-20-00

Lab ID	Date Counted	Radon Flux pCi/m^2s*	Recovery Decimal
5	07-20-00	<0.5	1.000

Average of recoveries: 1.000

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m^2s
Maximum Radon Flux for Lucky McMine Project:	0.68	pCi/m^2s
Average Radon Flux for #1-5:	0.54	pCi/m^2s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m^2s.
Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: J. Baeda

Reviewed By:

dpb r:\reports\clients.2000\pathfinder\lucky_mcmine\laaccs\rc34496.xls

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34496R00003

7.3 FIE NOTES FORM
SOP ELI-C-50-907-01

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page ____ Of ____

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: MOSTLY CLEAR Precip: .25" Min Temp: 50°

Inst.: ____ Eff: ____ Tech: ____
Inst. Back: ____
Charcoal Back: ____ Lot: ____
Standard: ____ Count: ____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
1	1	9	7/17/00 909	7/18/00 909	CA	34496-1	7-20-00 13:25	5	162	
2	2	10	7/17/00 914	7/18/00 914	CA	34496-2	13:30		144	
3	3	17	7/17/00 920	7/18/00 920	CA	34496-3	13:35		214	
4	4	29	7/17/00 924	7/18/00 924	CA	34496-4	13:40		336	
5	5	18	7/17/00 929	7/18/00 929	CA	34496-5	13:45		150	Bg 147 13:50
		Trip Blank #1				34496-6	13:50		127	
	STD 1	2155								
	2	4344								
	BLANK	127								

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tyw/d/data/laacc/fieldnot.frm

Input

Starting ID	1																				
Starting LAACC#	1																				
Project:	Pathfinder Mines Corp.																				
Location:	Lucky McMine																				
Report date:	7/21/00																				
Weather:	Mostly clear, 50 degrees, 0.25 inches precipitation																				

Data 1						Data 2					
	Date Set	7/17/00	8/10/99	λ	2.10E-06		Date Set	8/10/99	8/10/99	λ	2.10E-06
	Date Removed	7/18/00	8/11/99	Area	0.051		Date Removed	8/11/99	8/11/99	Area	0.051
	Date Counted	7/20/00		K	0.037		Date Counted	8/12/99		K	0.037
				Eff.	0.01015					Eff.	0.00334
2,185.00	Std Counts	2179					Std Counts	778			
4,344.00	Bkg Counts	127					Bkg Counts	102			
127.00	DPM, pCi	18210	2.22	dis/pCi			DPM, pCi	18210	2.22	dis/pCi	
	Count Time, min	5.00					Count Time, min	5.00			

Lab ID	QA	LAACC #	Can ID	Field ID	Gross Counts	Net Counts	Net CPM	Time Set	Time Removed	t1, sec	Time Count Start	t2, sec	t3, sec	pCi 222Rn m-2 s-1	Precision 2 sigma	Run #	Count Date	Int 1	Int 2	Int 3	Int 4
001		1	1	9	162	35	7	9:09	9:09	86400	13:25	274560	274860	<0.5	0.70	1	07-20-00	0.000	0.17	0.67	0.67
002		2	2	10	144	17	3	9:14	9:14	86400	13:30	274560	274860	<0.5	1.09	1	07-20-00	0.000	0.17	0.67	0.67
003		3	3	17	214	87	17	9:20	9:20	86400	13:35	274500	274800	<0.5	0.36	1	07-20-00	0.000	0.17	0.67	0.67
004		4	4	29	336	209	42	9:24	9:24	86400	13:40	274560	274860	0.68	0.19	1	07-20-00	0.000	0.17	0.67	0.67
005	D1	5	5	18	150	23	5	9:29	9:29	86400	13:45	274560	274860	<0.5	0.92	1	07-20-00	0.000	0.17	0.67	0.67
005		5	5	18	147	20	4	9:29	9:29	86400	13:50	274860	275160	<0.5	1.00	1	07-20-00	0.000	0.17	0.84	0.67
006	T1	TB1	TB1	TB1	127	0	0	12:00	12:00	86400	13:55	266100	266400	<0.5	2.49	1	07-20-00	0.000	0.17	0.69	0.69

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Report

Project:	Pathfinder Mines Corp.	Date Set:	07-26-00
Location:	Lucky McMine	Date Remove:	07-27-00
Report Date:	7/31/2000	Date Counted:	07-28-00
Weather:	Partly cloudy, 55 degrees, trace precipitation.		

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Cannister #	Location	07-26-00 Time Set	07-27-00 Time Remove	Radon Flux pCi/m²s
34721- 001	1	6	30	12:51	12:51	<0.5
34721- 001	1	6	30	12:51	12:51	<0.5
34721- 002	2	7	31	12:56	12:56	<0.5
34721- 003	3	8	50	13:15	13:15	<0.5
34721- 004	4	9	72	13:34	13:34	<0.5
34721- 005	5	10	73	13:51	13:51	<0.5
34721- 006	TB1	TB1	TB1	12:00	12:00	<0.5

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34721R00001

Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project:	Pathfinder Mines Corp.	Date Set:	07-26-00
Location:	Lucky McMine	Date Remove:	07-27-00
Report Date:	7/31/2000	Date Counted:	07-28-00
Weather:	Partly cloudy, 55 degrees, trace precipitation.		

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m²s*
34721- 6	TB1	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
126	2199	4449

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34721R00002

Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corp.
Location: Lucky McMine
Report Date: 7/31/2000
Weather: Partly cloudy, 55 degrees, trace precipitation.

Date Set: 07-26-00
Date Remove: 07-27-00
Date Counted: 07-28-00

Lab ID	Date Counted	Radon Flux pCi/m^2s*	Recovery Decimal
34721-1	07-28-00	<0.5	1.000

Average of recoveries: 1.000

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m^2s
Maximum Radon Flux for Lucky McMine Project:	<0.5	pCi/m^2s
Average Radon Flux for #6-10:	<0.5	pCi/m^2s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m^2s.

Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: STEVEN E. CARTER

Reviewed By:

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34721R00003

Input

Starting ID	1
Starting LAACC#	1
Project:	Pathfinder Mines Corp.
Location:	Lucky McMine
Report date:	7/31/2000
Weather:	Partly cloudy, 55 degrees, trace precipitation.

Data 1				
Date Set	7/26/00	7/26/00	λ	2.10E-06
Date Removed	7/27/00	7/27/00	Area	0.051
Date Counted	7/28/00		K	0.037
			Eff.	0.01032
Std Counts	2212			
Bkg Counts	126			
DPM, pCi	18210	2.22	dis/pCi	
Count Time, mi	5.00			

Data 2				
Date Set	8/10/99	8/10/99	λ	2.10E-06
Date Removed	8/11/99	8/11/99	Area	0.051
Date Counted	8/12/99		K	0.037
			Eff.	0.00334
Std Counts	778			
Bkg Counts	102			
DPM, pCi	18210	2.22	dis/pCi	
Count Time, min	5.00			

Lab ID	QA	LAACC #	Can ID	Field ID	Gross Counts	Net Counts	Net CP	Time Set	Time Removed	t1, sec	Time Count Start	t2, sec	t3, sec	pCi 222Rn m-2 s-1	Precision 2 sigma	Run #	Count Date	Int 1	Int 2	Int 3	Int 4
001	D1	1	6	30	210	84	17	12:51	12:51	86400	15:00	180540	180840	<0.5	0.38	1	07-28-00	0.000	0.17	0.82	0.82
001		1	6	30	202	76	15	12:51	12:51	86400	15:05	180840	181140	<0.5	0.40	1	07-28-00	0.000	0.17	0.82	0.82
002		2	7	31	196	70	14	12:56	12:56	86400	15:10	180840	181140	<0.5	0.43	1	07-28-00	0.000	0.17	0.82	0.82
003		3	8	50	205	79	16	13:15	13:15	86400	15:15	180000	180300	<0.5	0.39	1	07-28-00	0.000	0.17	0.82	0.82
004		4	9	72	222	96	19	13:34	13:34	86400	15:20	179160	179460	<0.5	0.34	1	07-28-00	0.000	0.17	0.82	0.82
005		5	10	73	172	46	9	13:51	13:51	86400	15:25	178440	178740	<0.5	0.58	1	07-28-00	0.000	0.17	0.84	0.82
006	T1	TB1	TB1	TB1	140	14	3	12:00	12:00	86400	15:30	185400	185700	<0.5	1.23	1	07-28-00	0.000	0.17	0.81	0.81

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34721R00006

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page ____ of ____

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: PARTLY CLDY Precip: TRACE Min Temp: 55°

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
1	6	30	7/26/00 1251	7/27 1251	CA		7-27-00 15:00	5	210	202 [redacted] 15:05 change
2	7	31	7/26/00 1256	7/27 1256	CA		15:10		196	
3	8	50	7/26/00 1315	7/27 1315	CA		15:15		205	
4	9	72	7/26/00 1334	7/27 1334	CA		15:20		222	
5	10	73	7/26/00 1351	7/27 1351	CA		15:25		172	
TB-2	→	→							140	
STD	1	2199								
	2	4449								
BLANK		126								

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Large Area Activated Charcoal Cannister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corp. — Date Set: 07-31-00
Location: Lucky McMine — Date Remove: 08-01-00
Report Date: August 2, 2000 — Date Counted: 08-02-00
Weather: Clear, light wind, 61 degrees, no precipitation.

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Cannister #	Location	07-31-00 Time Set	08-01-00 Time Remove	Radon Flux pCi/m²s
34829- 001	1	11	20	11:00	11:00	<0.5
34829- 002	2	12	19	11:04	11:04	<0.5
34829- 003	3	13	27	11:07	11:07	<0.5
34829- 004	4	14	32	11:16	11:16	1.4
34829- 004	4	14	32	11:16	11:16	1.3
34829- 005	5	15	49	11:22	11:22	<0.5
34829- 006	TB1	TB1	TB1	12:00	12:00	<0.5

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ELI

Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corp. — **Date Set: 07-31-00**
Location: Lucky McMine — **Date Remove: 08-01-00**
Report Date: August 2, 2000 — **Date Counted: 08-02-00**
Weather: Clear, light wind, 61 degrees, no precipitation.

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m^{2}s*
34829- 6	TB1	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
165	2231	4210

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34829R00002

ELI

Large Area Activated Charcoal Cannister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corp. **Date Set:** 07-31-00
Location: Lucky McMine **Date Remove:** 08-01-00
Report Date: August 2, 2000 **Date Counted:** 08-02-00
Weather: Clear, light wind, 61 degrees, no precipitation.

Lab ID	Date Counted	Radon Flux pCi/m^2s*	Recovery Decimal
34829-4	08-02-00	1.3	0.928

Average of recoveries: **1.000**

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m^2s
Maximum Radon Flux for Lucky McMine Project:	1.4	pCi/m^2s
Average Radon Flux for #11-15:	0.68	pCi/m^2s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m^2s.
Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: R.A. Gaeling
ROGER GAELING

Reviewed By: Sheryl Gaeling
SHERYL GAELING
ADMINISTRATIVE SUPERVISOR

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34829R00003

7.3 FIELD NOTES FORM
SOP ELI-C-50-907-01

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page 1 of 1

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: CLEAR & LIGHT WIND Precip: NONE Min Temp: 61°

Inst.: _____ Eff: _____ Tech: _____
Inst. Back: _____
Charcoal Back: _____ Lot: _____
Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
1	11	20	7/31/00 1100	8/1/00 1100	CA	34529-1	8-2-00 10:25	5	274	
2	12	19	7/31/00 1104	8/1/00 1104	CA	2	10:30		208	
3	13	27	7/31/00 1107	8/1/00 1107	CA	3	10:35		232	
4	14	32	7/31/00 1116	8/1/00 1116	CA	4	10:40		690	652 10:45
5	15	49	7/31/00 1122	8/1/00 1122	CA	5	10:~~45~~ 50		255	
	TB-3					6	10:~~50~~ 55		133	
	STD	1 2231								
		2 4210								
	BLANK	165								

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: August 17, 2000
Weather: Hazy, hot, no precipitation, min temp 61°F

Date Set: 08-14-00
Date Remove: 08-15-00
Date Counted: 08-17-00

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Cannister #	Location	08-14-00 Time Set	08-15-00 Time Remove	Radon Flux pCi/m²s
34829- 001	1	20	89	13:03	13:03	<0.5
34829- 002	2	21	90	13:15	13:15	<0.5
34829- 003	3	22	91	13:26	13:26	<0.5
34829- 004	4	23	92	13:32	13:32	<0.5
34829- 005	5	24	93	13:43	13:43	<0.5
34829- 005	Laboratory Dup	24	93	13:43	13:43	<0.5
34829- 006	TB1	TB1	TB1	12:00	12:00	<0.5

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: August 17, 2000
Weather: Hazy, hot, no precipitation, min temp 61°F

Date Set: 08-14-00
Date Remove: 08-15-00
Date Counted: 08-17-00

Trip Blank - Lab ID	Cannister #	Radon Flux - pCi/m²s*
34829- 6	TB1	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
128	2207	4195

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35284R00002

Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: August 17, 2000
Weather: Hazy, hot, no precipitation, min temp 61°F

Date Set: 08-14-00
Date Remove: 08-15-00
Date Counted: 08-17-00

Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
35284-5	08-17-00	<0.5	1.000

Average of recoveries: 1.000

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m²s
Maximum Radon Flux for Lucky McMine Project:	<0.5	pCi/m²s
Average Radon Flux for #20-24:	<0.5	pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.
Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: Steven E. Carlson, Chemical Supervisor

Reviewed By:

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: August 28, 2000
Weather: Clear, hot, .02" precipitation, min. temp 54°F

Date Set: 08-17-00
Date Remove: 08-18-00
Date Counted: 08-23-00

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	08-17-00 Time Set	08-18-00 Time Remove	Radon Flux pCi/m²s
35409- 1	1	25	102	12:59	12:59	<0.5
35409- 2	2	26	103	13:06	13:06	<0.5
35409- 3	3	27	104	13:11	13:11	<0.5
35409- 3	Lab Duplicate	27	104	13:11	13:11	<0.5
35409- 4	4	28	105	13:19	13:19	<0.5
35409- 5	5	29	106	13:27	13:27	<0.5
35409- 6	TB1	TB1	TB1	12:00	12:00	<0.5

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ELI

Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: August 28, 2000
Weather: Clear, hot, .02" precipitation, min. temp 54°F

Date Set: 08-17-00
Date Remove: 08-18-00
Date Counted: 08-23-00

Trip Blank - Lab ID	Canister #	Radon Flux - pCi/m²s*
35409- 6	TB1	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
131	2262	4469

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ELI

Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: August 28, 2000
Weather: Clear, hot, .02" precipitation, min. temp 54°F

Date Set: 08-17-00
Date Remove: 08-18-00
Date Counted: 08-23-00

Lab ID	Date Counted	Radon Flux pCi/m^2s*	Recovery Decimal
35409-3	08-23-00	<0.5	1.000

Average of recoveries: **1.000**

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m^2s
Maximum Radon Flux for Lucky McMine Project:	<0.5	pCi/m^2s
Average Radon Flux for #25-29:	<0.5	pCi/m^2s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m^2s.
Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: Steven E. Carlstich, Organics Supervisor

Reviewed By: Roger Gearing, Laboratory Supervisor

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35409R00003

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Page ___ of ___

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: CLEAR & HOT Precip: .02" Min Temp: 54°

Inst.: 1 Eff: ___ Tech: ___

Inst. Back: ___

Charcoal Back: 131 Lot: ___

Standard: 2262 / 4469 Count: ___

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
1	25	102	8/17/00 1259	8/18/00 1259	CA.		8-23-00 11:00	5	195	
2	26	103	8/17/00 1306	8/18/00 1306	CA.		11:05		174	
3	27	104	8/17/00 1311	8/18/00 1311	CA.		11:10		163	11:15 159
4	28	105	8/17/00 1319	8/18/00 1319	CA		11:30		176	
5	29	106	8/17/00 1327	8/18/00 1327	CA.		11:35		159	
	TripBlank #4						11:40		126	

[signature] 8/23/00 0903

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tywd/data/laacc/fieldnot.frm

June 1996

Input

	1
Starting LAACC#	1
Project:	Pathfinder Mines Corporation
Location:	Lucky McMine
Report date:	August 28, 2000
Weather:	Clear, hot, .02" precipitation, min temp 54°F

Data 1				
Date Set	8/17/00	8/17/00	λ	2.10E-06
Date Removed	8/18/00	8/18/00	Area	0.051
Date Counted	8/23/00		K	0.037
			Eff.	0.01048
Std Counts	2249			
Bkg Counts	131			
DPM, pCi	18210	2.22	dis/pCi	
Count Time, ml	5.00			

Data 2				
Date Set	8/10/99	8/10/99	λ	2.10E-06
Date Removed	8/11/99	8/11/99	Area	0.051
Date Counted	8/12/99		K	0.037
			Eff.	0.00334
Std Counts	778			
Bkg Counts	102			
DPM, pCi	18210	2.22	dis/pCi	
Count Time, min	5.00			

Lab ID	QA	LAACC #	Can ID	Field ID	Gross Counts	Net Counts	Net CP	Time Set	Time Removed	t1, sec	Time Count Start	t2, sec	t3, sec	pCi 222Rn m-2 s-1	Precision 2 sigma	Run #	Count Date	Int 1	Int 2	Int 3	Int 4
001		1	25	102	195	64	13	12:59	12:59	86400	11:00	511260	511560	<0.5	0.45	1	08-23-00	0.000	0.17	0.41	0.41
002		2	26	103	174	43	9	13:06	13:06	86400	11:05	511140	511440	<0.5	0.59	1	08-23-00	0.000	0.17	0.41	0.41
003	D1	3	27	104	163	32	6	13:11	13:11	86400	11:10	511140	511440	<0.5	0.72	1	08-23-00	0.000	0.17	0.41	0.41
003		3	27	104	159	28	6	13:11	13:11	86400	11:15	511440	511740	<0.5	0.78	1	08-23-00	0.000	0.17	0.41	0.41
004		4	28	105	176	45	9	13:19	13:19	86400	11:30	511860	512160	<0.5	0.57	1	08-23-00	0.000	0.17	0.41	0.41
005		5	29	106	159	28	6	13:27	13:27	86400	11:35	511680	511980	<0.5	0.78	1	08-23-00	0.000	0.17	0.84	0.41
006	T1	TB1	TB1	TB1	126	(5)	(1)	12:00	12:00	86400	11:40	517200	517500	<0.5	3.28	1	08-23-00	(0.000)	0.17	0.41	0.40

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 11, 2000
Weather: Mostly clear, no precipitation, min temp 37°F

Date Set: 09-06-00
Date Remove: 09-07-00
Date Counted: 09-08-00

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	09-06-00 Time Set	09-07-00 Time Remove	Radon Flux pCi/m^{2}s
35876- 001	1	30	71	10:36	10:36	<0.5
35876- 002	2	31	64	10:53	10:53	<0.5
35876- 003	3	32	82	11:27	11:27	<0.5
35876- 004	4	33	81	11:36	11:36	<0.5
35876- 004	Laboratory dup	33	81	11:36	11:36	<0.5
35876- 005	5	34	80	11:46	11:46	<0.5
35876- 006	TB5	TB5	TB5	12:00	12:00	<0.5

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 11, 2000
Weather: Mostly clear, no precipitation, min temp 37°F

Date Set: 09-06-00
Date Remove: 09-07-00
Date Counted: 09-08-00

Trip Blank - Lab ID	Canister #	Radon Flux - pCi/m^{2}s*
35876- 6	TB5	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
116	802	1435

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35876R00002

Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 11, 2000
Weather: Mostly clear, no precipitation, min temp 37°F

Date Set: 09-06-00
Date Remove: 09-07-00
Date Counted: 09-08-00

Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
35876-4	09-08-00	<0.5	1.000

Average of recoveries: 1.000

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m²s
Maximum Radon Flux for Lucky McMine Project:	<0.5	pCi/m²s
Average Radon Flux for #30-34	<0.5	pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.
Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: R.A. Leahy
ROGER GRIGGS
LABORATORY SUPERVISOR

Reviewed By: Cathy [illegible]
PROJECT MANAGER

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35876R00003

Input

	1
Starting LAACC#	1
Project:	Pathfinder Mines Corporation
Location:	Lucky McMine
Report date:	September 11, 2000
Weather:	Mostly clear, no precipitation, min temp 37°F

Data 1					
	Date Set	9/6/00	9/6/00	λ	2.10E-06
	Date Removed	9/7/00	9/7/00	Area	0.051
	Date Counted	9/8/00		K	0.037
				Eff.	0.01001
	Std Counts	2152			
	Bkg Counts	128			
	DPM, pCi	18210	2.22	dis/pCi	
	Count Time, mi	5.00			

Data 2					
	Date Set	9/6/00	9/6/00	λ	2.10E-06
	Date Removed	9/7/00	9/7/00	Area	0.051
	Date Counted	9/8/00		K	0.037
				Eff.	0.00319
	Std Counts	760			
	Bkg Counts	116			
	DPM, pCi	18210	2.22	dis/pCi	
	Count Time, min	5.00			

Lab ID	QA	LAACC #	Can ID	Field ID	Gross Counts	Net Counts	Net CP	Time Set	Time Removed	t1, sec	Time Count Start	t2, sec	t3, sec	pCi 222Rn m-2 s-1	Precision 2 sigma	Run #	Count Date	Int 1	Int 2	Int 3	Int 4
001		1	30	71	159	43	9	10:36	10:36	86400	20:20	207840	208140	<0.5	0.91	2	09-08-00	0.000	0.17	0.78	0.77
002		2	31	64	140	24	5	10:53	10:53	86400	20:25	207120	207420	<0.5	1.80	2	09-08-00	0.000	0.17	0.78	0.78
003		3	32	82	155	39	8	11:27	11:27	86400	20:30	205380	205680	<0.5	1.01	2	09-08-00	0.000	0.17	0.78	0.78
004	D1	4	33	81	285	169	34	11:36	11:36	86400	20:35	205140	205440	<0.5	0.25	2	09-08-00	0.000	0.17	0.78	0.78
004		4	33	81	248	132	26	11:36	11:36	86400	20:40	205440	205740	<0.5	0.31	2	09-08-00	0.000	0.17	0.78	0.78
005		5	34	80	145	29	6	11:46	11:46	86400	20:45	205140	205440	<0.5	1.42	2	09-08-00	0.000	0.17	0.84	0.78
006	T1	TB5	TB5	TB5	130	14	3	12:00	12:00	86400	20:50	204600	204900	<0.5	3.97	2	09-08-00	0.000	0.17	0.78	0.78

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LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY Mc MINE

Weather Condition: MOSTLY CLEAR Precip: NONE Min Temp: 37° F

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: 116 Lot: _____

Standard: 1 802 2 1435 Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
1	30	71	9/6 1036	9/7 1036	CL	35876 - 1	9-8-00 20:20		159	
2	31	64	9/6 1053	9/7 1053	CL	2	25		140	
3	32	82	9/6 1127	9/7 1127	CL	3	30		155	
4	33	81	9/6 1136	9/7 1136	CL	4	35		285	248 20:40 dup
5	34	80	9/6 1146	9/7 1146	CL	5	40		145	~~dup~~
TB-5						TB-5	—		130	

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 20, 2000
Weather: Partly cloudy, no precipitation, min temp 47°F

Date Set: 09-12-00
Date Remove: 09-13-00
Date Counted: 09-14-00

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	09-12-00 Time Set	09-13-00 Time Remove	Radon Flux pCi/m²s
36026- 1	1	280	78	12:43	12:43	2.7
36026- 2	2	281	94	12:48	12:48	0.9
36026- 3	3	282	95	12:53	12:53	1.3
36026- 4	4	283	96	12:56	12:56	1.1
36026- 5	5	284	97	13:02	13:02	1.5
36026- 6	86	285	98	13:06	13:06	<0.5
36026- 7	87	286	99	13:12	13:12	1.7
36026- 8	88	287	40	13:20	13:20	0.7
36026- 8	Laboratory dup	287	40	13:20	13:20	0.7
36026- 9	89	288	41	13:24	13:24	0.6
36026- 10	90	289	58	13:29	13:29	<0.5
36026- 11	91	290	59	13:33	13:33	1.2
36026- 12	92	291	60	13:36	13:36	0.7
36026- 13	93	292	62	13:41	13:41	1.0
36026- 14	94	293	85	13:45	13:45	0.8
36026- 15	95	294	86	13:52	13:52	4.4
36026- 16	96	295	110	13:55	13:55	5.0
36026- 16	Laboratory dup	295	110	13:55	13:55	4.9
36026- 17	97	296	111	13:59	13:59	0.6
36026- 18	98	297	113	14:03	14:03	0.9
36026- 19	99	298	114	14:06	14:06	<0.5
36026- 20	100	299	115	14:09	14:09	1.5
36026- 21	TB1	TB1	TB1	12:00	12:00	<0.5

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36026R00001

Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 20, 2000
Weather: Partly cloudy, no precipitation, min temp 47°F

Date Set: 09-12-00
Date Remove: 09-13-00
Date Counted: 09-14-00

Trip Blank - Lab ID	Canister #	Radon Flux - pCi/m^{2}s*
36026- 21	TB1	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
130	2403	4473

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ELI

Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation — Date Set: 09-12-00

Location: Lucky McMine — Date Remove: 09-13-00

Report Date: September 20, 2000 — Date Counted: 09-14-00

Weather: Partly cloudy, no precipitation, min temp 47°F

Lab ID	Date Counted	Radon Flux, pCi/m²s*	Recovery, Decimal
36026-8	09-14-00	0.7	0.940
36026-16	09-14-00	4.9	0.980

Average of recoveries: **0.960**

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m²s
Maximum Radon Flux for Lucky McMine Project:	5.00	pCi/m²s
Average Radon Flux for #280-299	1.51	pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.

Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: R. A. Gearing — Roger Gearing, Laboratory Supervisor

Reviewed By: Cathy Forsythe — Cathy Forsythe, Project Manager

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36026R00003

Input

	1
Starting LAACC#	1
Project:	Pathfinder Mines Corporation
Location:	Lucky McMine
Report date:	September 20, 2000
Weather:	Partly cloudy, no precipitation, min temp 47°F

Data 1				
Date Set	9/12/00	9/12/00	λ	2.10E-06
Date Removed	9/13/00	9/13/00	Area	0.051
Date Counted	9/14/00		K	0.037
			Eff.	0.01063
Std Counts	2320			
Bkg Counts	130			
DPM, pCi	18210	2.22	dis/pCi	
Count Time, ml	5.00			

Data 2				
Date Set	9/6/00	9/6/00	λ	2.10E-06
Date Removed	9/7/00	9/7/00	Area	0.051
Date Counted	9/8/00		K	0.037
			Eff.	0.00319
Std Counts	760			
Bkg Counts	116			
DPM, pCi	18210	2.22	dis/pCi	
Count Time, min	5.00			

Lab ID	QA	LAACC #	Can ID	Field ID	Gross Counts	Net Counts	Net CP	Time Set	Time Removed	t1, sec	Time Count Start	t2, sec	t3, sec	pCi 222Rn m-2 s-1	Precision 2 sigma	Run #	Count Date	Int 1	Int 2	Int 3	Int 4
001		1	280	78	221	105	21	12:43	12:43	86400	15:15	700320	700620	2.67	0.38	2	09-14-00	0.000	0.17	0.28	0.28
002		2	281	94	241	125	25	12:48	12:48	86400	15:20	700320	700620	0.93	0.32	2	09-14-00	0.000	0.17	0.28	0.28
003		3	282	95	286	170	34	12:53	12:53	86400	15:25	700320	700620	1.27	0.25	2	09-14-00	0.000	0.17	0.28	0.28
004		4	283	96	258	142	28	12:56	12:56	86400	15:30	700440	700740	1.06	0.29	2	09-14-00	0.000	0.17	0.28	0.28
005		5	284	97	317	201	40	13:02	13:02	86400	15:35	700380	700680	1.50	0.22	2	09-14-00	0.000	0.17	0.28	0.28
006		86	285	98	255	139	28	13:06	13:06	86400	15:40	700440	700740	<0.5	0.29	2	09-14-00	0.000	0.17	0.84	0.28
007		87	286	99	347	231	46	13:12	13:12	86400	15:45	700380	700680	1.73	0.19	2	09-14-00	0.000	0.17	0.28	0.28
008	D1	88	287	40	215	99	20	13:20	13:20	86400	15:50	700200	700500	0.74	0.40	2	09-14-00	0.000	0.17	0.28	0.28
008		88	287	40	209	93	19	13:20	13:20	86400	15:55	700500	700800	0.70	0.42	2	09-14-00	0.000	0.17	0.28	0.28
009		89	288	41	191	75	15	13:24	13:24	86400	18:00	707760	708060	0.57	0.52	2	09-14-00	0.000	0.17	0.27	0.27
010		90	289	58	175	59	12	13:29	13:29	86400	8:25	759360	759660	<0.5	0.66	2	09-15-00	0.000	0.17	0.24	0.24
011		91	290	59	262	146	29	13:33	13:33	86400	8:30	759420	759720	1.24	0.28	2	09-15-00	0.000	0.17	0.24	0.24
012		92	291	60	194	78	16	13:36	13:36	86400	8:35	759540	759840	0.66	0.50	2	09-15-00	0.000	0.17	0.24	0.24
013		93	292	62	237	121	24	13:41	13:41	86400	8:40	759540	759840	1.02	0.33	2	09-15-00	0.000	0.17	0.24	0.24
014		94	293	85	206	92	18	13:45	13:45	86400	8:45	759600	759900	0.78	0.43	2	09-15-00	0.000	0.17	0.24	0.24
015		95	294	86	641	525	105	13:52	13:52	86400	8:50	759480	759780	4.44	0.11	2	09-15-00	0.000	0.17	0.24	0.24
016	D2	96	295	110	704	588	118	13:55	13:55	86400	8:55	759600	759900	4.96	0.10	2	09-15-00	0.000	0.17	0.24	0.24
016		96	295	110	692	576	115	13:55	13:55	86400	9:00	759900	760200	4.88	0.10	2	09-15-00	0.000	0.17	0.24	0.24
017		97	296	111	187	71	14	13:59	13:59	86400	9:05	759960	760260	0.60	0.55	2	09-15-00	0.000	0.17	0.24	0.24
018		98	297	113	225	109	22	14:03	14:03	86400	9:10	760020	760320	0.92	0.37	2	09-15-00	0.000	0.17	0.24	0.24
019		99	298	114	173	57	11	14:06	14:06	86400	9:15	760140	760440	<0.5	0.69	2	09-15-00	0.000	0.17	0.24	0.24
020		100	299	115	297	181	36	14:09	14:09	86400	9:20	760260	760560	1.53	0.24	2	09-15-00	0.000	0.17	0.24	0.24
021	T1	TB1	TB1	TB1	147	31	6	12:00	12:00	86400	9:25	768300	768600	<0.5	1.37	2	09-15-00	0.000	0.17	0.24	0.24

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360250005

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: PARTLY CLDY Precip: NONE Min Temp: 47°

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: 180 Lot: _____

Standard: 1 2403 2 4473 Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
1	280	78	9/12 1243	9/13 1243	CA	36026-1	9-14-00 15:15	5	221	
2	281	94	9/12 1248	9/13 1248	CA	2	20		241	
3	282	95	9/12 1253	9/13 1253	CA	3	25	all	286	
4	283	96	9/12 1256	9/13 1256	CA	4	30		258	
5	284	97	9/12 1302	9/13 1302	CA	5	35		317	
86	285	98	9/12 1306	9/13 1306	CA	6	40		255	
87	286	99	9/12 1312	9/13 1312	CA	7	45		347	
88	287	40	9/12 1320	9/13 1320	CA	8	50		215	209 15:55 Dup.
89	288	41	9/12 1324	9/13 1324	CA	9	18:00		191	
90	289	58	9/12 1329	9/13 1329	CA	10	9-15-00 8:25		175	
91	290	59	9/12 1333	9/13 1333	CA	11	30		262	
92	291	60	9/12 1336	9/13 1336	CA	12	35		194	
93	292	62	9/12 1341	9/13 1341	CA	13	40		237	
94	293	85	9/12 1345	9/13 1345	CA	14	45		208	
95	294	86	9/12 1352	9/13 1352	CA	15	50		646 [redacted]	
96	295	110	9/12 1355	9/13 1355	CA	16	55		704 [redacted]	692 9:00 Dup
97	296	111	9/12 1359	9/13 1359	CA	17	9:05		187	

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36026-1

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: PARTLY CLDY Precip: NONE Min Temp: 47

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
98	297	113	9/12 1403	9/13 1403	CL	36026-18	9:10		225	
99	298	114	9/12 1406	9/13 1406	CL	19	45		173	
100	299	115	9/12 1409	9/13 1409	CL	20	20		297	
TB	-1				i	21			147	

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Rn Flux Testing

Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 18, 2001
Weather: Clear, calm, no precipitation, min temp 46°F

Date Set: 09-10-01
Date Removed: 09-11-01
Date Counted: 09-12-01

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Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	09-10-01 Time Set	09-11-01 Time Remove	Radon Flux pCi/m²s
C01090283 1	1	121	4	10:17	10:17	<0.5
C01090283 2	2	122	28	10:29	10:29	<0.5
C01090283 3	3	123	26	10:34	10:34	<0.5
C01090283 4	4	124	37	10:40	10:40	<0.5
C01090283 5	5	125	36	10:44	10:44	<0.5
C01090283 6	6	126	43	10:48	10:48	<0.5
C01090283 7	7	127	42	10:51	10:51	<0.5
C01090283 8	8	128	48	11:01	11:01	<0.5
C01090283 9	9	129	51	11:10	11:10	<0.5
C01090283 10	10	130	52	11:15	11:15	<0.5
C01090283 10	Laboratory dup	130	52	11:15	11:15	<0.5
C01090283 11	11	131	70	11:22	11:22	<0.5
C01090283 12	12	132	69	11:28	11:28	<0.5
C01090283 13	13	133	68	11:36	11:36	<0.5
C01090283 14	14	134	67	11:42	11:42	<0.5
C01090283 15	16	136	74	12:48	12:48	<0.5
C01090283 16	17	137	75	13:00	13:00	<0.5
C01090283 17	18	138	76	13:07	13:07	0.7
C01090283 18	19	139	77	13:14	13:14	<0.5
C01090283 19	20	140	83	13:23	13:23	<0.5
C01090283 19	Laboratory dup	140	83	13:23	13:23	<0.5
C01090283 20	21	141	83DUP	13:23	13:23	<0.5
C01090283 21	22	142	84	13:27	13:27	<0.5

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 18, 2001
Weather: Clear, calm, no precipitation, min temp 46°F

Date Set: 09-10-01
Date Removed: 09-11-01
Date Counted: 09-12-01

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	09-10-01 Time Set	09-11-01 Time Remove	Radon Flux pCi/m²s
C01090283 022	23	143	87	13:31	13:31	<0.5
C01090283 023	24	144	88	13:34	13:34	<0.5
C01090283 024	25	145	107	13:39	13:39	<0.5
C01090283 025	26	146	108	13:43	13:43	<0.5
C01090283 026	27	147	109	13:47	13:47	<0.5
C01090283 027	28	148	112	13:52	13:52	<0.5
C01090283 028	29	149	100	14:05	14:05	<0.5
C01090283 029	30	150	101	14:09	14:09	<0.5
C01090283 029	Laboratory dup	150	101	14:09	14:09	<0.5
C01090283 030	31	151	125	7:41	7:41	0.9
C01090283 031	32	152	124	7:47	7:47	<0.5
C01090283 032	33	153	123	7:52	7:52	1.0
C01090283 033	34	154	122	8:01	8:01	0.9
C01090283 034	35	155	121	8:07	8:07	<0.5
C01090283 035	36	156	121DUP	8:07	8:07	<0.5
C01090283 036	37	157	120	8:20	8:20	3.2
C01090283 037	38	158	119	8:35	8:35	1.1
C01090283 038	39	159	118	8:39	8:39	<0.5
C01090283 039	40	160	117	8:43	8:43	<0.5
C01090283 039	Laboratory dup	160	117	8:43	8:43	<0.5
C01090283 040	41	161	116	8:47	8:47	0.8
C01090283 041	42	162	138	8:55	8:55	8.6
C01090283 042	43	163	135	9:01	9:01	<0.5
C01090283 043	44	164	134	9:05	9:05	<0.5
C01090283 044	45	165	133	9:08	9:08	1.1
C01090283 045	T1	T1	T1	12:43	12:43	<0.5
C01090283 046	T2	T2	T2	12:43	12:43	<0.5
C01090283 047	T3	T3	T3	12:43	12:43	<0.5

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 18, 2001
Weather: Clear, calm, no precipitation, min temp 46°F

Date Set: 09-10-01
Date Removed: 09-11-01
Date Counted: 09-12-01

Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
C01090283-010	09-12-01	<0.5	1.000
C01090283-019	09-12-01	<0.5	1.000
C01090283-029	09-12-01	<0.5	1.000
C01090283-039	09-12-01	<0.5	1.000

Average of recoveries:	1.000

Trip Blank - Lab ID		Canister #	Radon Flux - pCi/m²s*
C01090283	45	T1	<0.5
C01090283	46	T2	<0.5
C01090283	47	T3	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
119	1825	3634

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m²s
Maximum Radon Flux for Lucky McMine Project:	8.57	pCi/m²s
Average Radon Flux for #120-165	<=0.83	pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.
Minimum temperature under 35 degrees Fahrenheit not acceptable.

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: Lucky Mc Mine

Weather Condition: CLEAR & CALM Precip: NONE Min Temp: 46° F

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
1	121	4	9/10/01 1017	9/11/01 1017	CA	C01090283-1				
2	122	28	" 1029	1029	CA	2				
3	123	26	1034	1034	CA	3				
4	124	37	1040	1040	CA	4				
5	125	36	1044	1044	CA	5				
6	126	43	1048	1048	CA	6				
7	127	42	1051	1051	CA	7				
8	128	48	1101	1101	CA	8				
9	129	51	1110	1110	CA	9				
10	130	52	1115	1115	CA	10				
11	131	70	1122	1122	CA	11				
12	132	69	1128	1128	CA	12				
13	133	68	1136	1136	CA	13				
14	134	67	1142	1142	CA	C01090283-14				
~~15~~	~~135~~	~~63~~	~~1147~~	~~1147~~	~~CA~~	DESTROYED				
16	136	74	1248	1248	CA	C01090283-15				
17	137	75	1300	1300	CA	C01090283-16				

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: CLEAR & COLD Precip: NONE Min Temp: 46° F

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
18	138	76	9/10/01 1307	9/11/01 1307	CL	C0109283-17				
19	139	77	1314	1314	CL	18				
20	140	83	1323	1323	CL	19				
21	141	83 (DUP)	1323	1323	CL	20				
22	142	84	1327	1327	CL	21				
23	143	87	1331	1331	CL	22				
24	144	88	1334	1334	CL	23				
25	145	107	1339	1339	CL	24				
26	146	108	1343	1343	CL	25				
27	147	109	1347	1347	CL	26				
28	148	112	1352	1352	CL	27				
29	149	100	1405	1405	CL	28				
36	150	101	1409	1409	CL	C0109283-29				

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: CLEAR & COLD Precip: NONE Min Temp: 45° F

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
31	151	125	9/11/01 741	9/12/01 741	CL	301090283-30				
32	152	124	747	747	CL	31				
33	153	123	752	752	CL	32				
34	154	122	801	801	CL	33				
35	155	121	807	807	CL	34				
36	156	121 (DUP)	807	807	CL	35				
37	157	120	820	820	CL	36				
38	158	119	835	835	CL	37				
39	159	118	839	839	CL	38				
40	160	117	843	843	CL	39				
41	161	116	847	847	CL	40				
42	162	138	855	855	CL	41				
43	163	135	901	901	CL	42				
44	164	134	905	905	CL	43				
45	165	133	908	908	CL	C01090283-44				

Rn Flux Testing

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation — **Date Set:** 09-12-01
Location: Lucky McMine — **Date Removed:** 09-13-01
Report Date: September 19, 2001 — **Date Counted:** 09-14-01
Weather: Overcast, calm, trace precipitation, min temp 45°F

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	09-12-01 Time Set	09-13-01 Time Remove	Radon Flux pCi/m²s
C01090344 1	46	166	132	10:14	10:14	<0.5
C01090344 2	47	167	131	10:20	10:20	<0.5
C01090344 3	48	168	130	10:25	10:25	<0.5
C01090344 4	49	169	130DUP	10:25	10:25	<0.5
C01090344 5	50	170	129	10:30	10:30	0.5
C01090344 5	Laboratory dup	170	129	10:30	10:30	<0.5
C01090344 6	51	171	128	10:33	10:33	<0.5
C01090344 7	52	172	127	10:39	10:39	<0.5
C01090344 8	53	173	126	10:43	10:43	<0.5
C01090344 9	54	174	150	10:47	10:47	<0.5
C01090344 10	55	175	149	10:51	10:51	<0.5
C01090344 11	56	176	148	11:02	11:02	5.4
C01090344 12	57	177	147	11:07	11:07	<0.5
C01090344 13	58	178	146	11:12	11:12	<0.5
C01090344 14	59	179	145	11:19	11:19	0.8
C01090344 15	60	180	139	11:29	11:29	<0.5
C01090344 15	Laboratory dup	180	139	11:29	11:29	<0.5
C01090344 16	1	181	153	13:00	13:00	<0.5
C01090344 17	2	182	152	13:05	13:05	<0.5
C01090344 18	3	183	151	13:08	13:08	<0.5
C01090344 19	T3	T3	T3	13:08	13:08	<0.5
C01090344 20	T4	T4	T4	13:08	13:08	<0.5

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation — **Date Set:** 09-12-01
Location: Lucky McMine — **Date Removed:** 09-13-01
Report Date: September 19, 2001 — **Date Counted:** 09-14-01
Weather: Overcast, calm, trace precipitation, min temp 45°F

Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
C01090344-005	09-14-01	<0.5	1.000
C01090344-015	09-14-01	<0.5	1.000

Average of recoveries: 1.000

Trip Blank - Lab ID	Canister #	Radon Flux - pCi/m²s*
C01090344-010	T3	<0.5
C01090344-010	T4	<0.5

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
109	1740	3396

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m²s
Maximum Radon Flux for Lucky McMine Project:	5.37	pCi/m²s
Average Radon Flux for #166-183	<= 0.79	pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.
Minimum temperature under 35 degrees Fahrenheit not acceptable.

Report Approved By: **Reviewed By:** Steven E. Carlston, Organics Supervisor

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LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: OVERCAST & CALM Precip: TRACE Min Temp: 45° F

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
46	166	132	9/12/01 1014	9/13/01 1014	CL	C01090344	-001A			
47	167	131	1020	1020	CL	"	-002A			
48	168	130	1025	1025	CL	"	-003A			
49	169	130 (DUP)	1025	1025	CL	"	-004A			
50	170	129	1030	1030	CL	"	-005A			
51	171	128	1033	1033	CL	"	-006A			
52	172	127	1039	1039	CL	"	-007A			
53	173	126	1043	1043	CL	"	-008A			
54	174	150	1047	1047	CL	"	-009A			
55	175	149	1051	1051	CL	"	-010A			
56	176	148	1102	1102	CL	"	-011A			
57	177	147	1107	1107	CL	"	-012A			
58	178	146	1112	1112	CL	"	-013A			
59	179	145	1119	1119	CL	"	-014A			
60	180	139	1129	1129	CL	"	-015A			
1	181	153	1300	1300	CL	"	-016A			
2	182	152	1305	1305	CL	"	-017A			

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: OVERCAST & CALM Precip: TRACE Min Temp: 45°

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
3	183	151	9/12/01 1308	9/13/01 1308	CA	C01D40344-018A				

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation — Date Set: 09-16-02
Location: Lucky McMine — Date Removed: 09-17-02
Report Date: September 17, 2002 — Date Counted: 09-18-02
Weather: Partly cloudy, windy, no precipitation, min temp 48°F

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	09-16-02 Time Set	09-17-02 Time Remove	Radon Flux pCi/m²s
C02090637 001	1	1	136	8:11	8:11	10.8
C02090637 001	Laboratory dup	1	136	8:11	8:11	10.5
C02090637 002	2	2	137	8:16	8:16	<0.5
C02090637 003	3	3	140	8:19	8:19	<0.5
C02090637 004	4	4	141	8:23	8:23	1.7
C02090637 005	5	5	142	8:27	8:27	6.6
C02090637 006	6	6	143	8:31	8:31	0.9
C02090637 007	7	7	144	8:36	8:36	<0.5
C02090637 008	8	8	144DUP	8:37	8:37	<0.5
C02090637 009	9	9	154	8:42	8:42	<0.5
C02090637 010	10	10	155	8:46	8:46	<0.5
C02090637 010	Laboratory dup	10	155	8:46	8:46	<0.5
C02090637 011	11	11	156	8:50	8:50	0.8
C02090637 012	12	12	157	8:53	8:53	<0.5
C02090637 013	13	13	158	8:57	8:57	1.2
C02090637 014	14	14	159	9:00	9:00	3.8
C02090637 015	15	15	160	9:04	9:04	<0.5
C02090637 016	16	16	161	9:11	9:11	<0.5
C02090637 017	17	17	161DUP	9:12	9:12	<0.5
C02090637 018	18	18	162	9:15	9:15	<0.5
C02090637 019	19	19	163	9:19	9:19	1.3
C02090637 020	20	20	164	9:23	9:23	1.5
C02090637 020	Laboratory dup	20	164	9:23	9:23	1.5

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 17, 2002
Weather: Partly cloudy, windy, no precipitation, min temp 48°F

Date Set: 09-16-02
Date Removed: 09-17-02
Date Counted: 09-18-02

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	09-16-02 Time Set	09-17-02 Time Remove	Radon Flux pCi/m²s
C02090637 021	21	21	165	9:27	9:27	<0.5
C02090637 022	22	22	166	9:32	9:32	<0.5
C02090637 023	23	23	167	9:38	9:38	<0.5
C02090637 024	24	24	168	9:42	9:42	<0.5
C02090637 025	25	25	169	9:46	9:46	<0.5
C02090637 026	26	26	170	9:52	9:52	<0.5
C02090637 027	27	27	171	9:56	9:56	<0.5
C02090637 028	28	28	178	10:06	10:06	<0.5
C02090637 029	29	29	180	10:11	10:11	<0.5
C02090637 030	30	30	184	10:17	10:17	<0.5
C02090637 031	TB1	TB1	TB1	12:00	12:00	<0.5
C02090637 032	TB2	TB2	TB2	12:00	12:00	<0.5
C02090637 033	TB3	TB3	TB3	12:00	12:00	<0.5
C02090637 034	TB4	TB4	TB4	12:00	12:00	<0.5
C02090637 035	TB5	TB5	TB5	12:00	12:00	<0.5

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation — **Date Set: 09-16-02**
Location: Lucky McMine — **Date Removed: 09-17-02**
Report Date: September 17, 2002 — **Date Counted: 09-18-02**
Weather: Partly cloudy, windy, no precipitation, min temp 48°F

Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
C02090637-001	09-18-02	10.5	0.966
C02090637-010	09-18-02	<0.5	1.000
C02090637-020	09-18-02	1.5	1.023

Average of recoveries:	0.995

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
126	2077	4205
110	808	1479

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m²s
Maximum Radon Flux for Lucky McMine Project:	10.83	pCi/m²s
Average Radon Flux for #1-30	1.30	pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.
Minimum temperature under 35 degrees Fahrenheit not acceptable.

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: PARTLY CLDY WINDY Precip: NONE Min Temp: 48°

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
1	1	136	9/16/02 8:11	9/17/02 811	CA					
2	2	137	816	816	CA					
3	3	140	819	819	CA					
4	4	141	823	823	CA					
5	5	142	827	827	CA					
6	6	143	831	831	CA					
7	7	144	836	836	CA					
8	8	144 (DUP)	837	837	CA					
9	9	154	842	842	CA					
10	10	155	846	846	CA					
11	11	156	850	850	CA					
12	12	157	853	853	CA					
13	13	158	857	857	CA					
14	14	159	900	900	CA					
15	15	160	904	904	CA					
16	16	161	911	911	CA					
17	17	161 (DUP)	912	912	CA					

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LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY MC MINE

Weather Condition: PARTLY CLOUDY & WINDY Precip: Min Temp:

Inst.: Eff: Tech:
Inst. Back:
Charcoal Back: Lot:
Standard: Count:

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
18	18	162	9/16/02 915	9/17/02 915	CA					
19	19	163	919	919	CA					
20	20	164	923	923	CA					
21	21	165	927	927	CA					
22	22	166	932	932	CA					
23	23	167	938	938	CA					
24	24	168	942	942	CA					
25	25	169	946	946	CA					
26	26	170	952	952	CA					
27	27	171	956	956	CA					
28	28	178	1006	1006	CA					
29	29	180	1011	1011	CA					
30	30	184	1017	1017	CA					

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation — **Date Set:** 09-23-02
Location: Lucky McMine — **Date Removed:** 09-24-02
Report Date: September 24, 2002 — **Date Counted:** 09-25-02
Weather: Clear, calm, no precipitation, 37°F

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	09-23-02 Time Set	09-24-02 Time Remove	Radon Flux pCi/m²s
C02090836 001	1	166	186	8:50	8:50	0.9
C02090836 001	Laboratory dup	166	186	8:50	8:50	0.8
C02090836 002	2	167	186DUP	8:51	8:51	<0.5
C02090836 003	3	168	188	8:58	8:58	<0.5
C02090836 004	4	169	191	9:01	9:01	<0.5
C02090836 005	5	170	193	9:03	9:03	<0.5
C02090836 006	6	171	195	9:08	9:08	0.6
C02090836 007	7	172	201	9:12	9:12	<0.5
C02090836 008	8	173	203	9:15	9:15	<0.5
C02090836 009	9	174	203DUP	9:16	9:16	0.5
C02090836 010	10	175	208	9:22	9:22	<0.5
C02090836 010	Laboratory dup	175	208	9:22	9:22	<0.5
C02090836 011	11	176	211	9:26	9:26	<0.5
C02090836 012	12	177	222	9:29	9:29	<0.5
C02090836 013	13	178	224	9:32	9:32	<0.5
C02090836 014	14	179	229	9:36	9:36	<0.5
C02090836 015	15	180	233	9:40	9:40	<0.5
C02090836 016	16	181	235	9:43	9:43	<0.5
C02090836 017	17	182	236	9:47	9:47	<0.5
C02090836 018	18	183	236DUP	9:48	9:48	<0.5
C02090836 019	19	184	239	9:51	9:51	<0.5
C02090836 020	20	185	220	9:56	9:56	<0.5
C02090836 020	Laboratory dup	185	220	9:56	9:56	<0.5

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 24, 2002
Weather: Clear, calm, no precipitation, 37°F

Date Set: 09-23-02
Date Removed: 09-24-02
Date Counted: 09-25-02

Method: Pathfinder Mine employees placed and retrieved LAACC units. EPA Method 115 per 40 CFR 61 (NESHAPs). Radon Flux results have been corrected for instrument & charcoal background counts.

Lab ID	LAACC #	Canister #	Location	09-23-02 Time Set	09-24-02 Time Remove	Radon Flux pCi/m²s
C02090836 021	21	186	218	9:59	9:59	<0.5
C02090836 022	22	187	209	10:02	10:02	<0.5
C02090836 023	TB7	TB7	TB7	12:00	12:00	<0.5
C02090836 024	TB8	TB8	TB8	12:00	12:00	<0.5
C02090836 025	TB9	TB9	TB9	12:00	12:00	<0.5
C02090836 026	TB10	TB10	TB10	12:00	12:00	<0.5
C02090836 027	TB6	TB6	TB6	12:00	12:00	<0.5

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Large Area Activated Charcoal Canister (LAACC) Radon Flux Quality Assurance Report

Project: Pathfinder Mines Corporation
Location: Lucky McMine
Report Date: September 24, 2002
Weather: Clear, calm, no preciptation, 37°F

Date Set: 09-23-02
Date Removed: 09-24-02
Date Counted: 09-25-02

Lab ID	Date Counted	Radon Flux pCi/m²s*	Recovery Decimal
C02090836-001	09-25-02	0.8	0.894
C02090836-010	09-25-02	<0.5	1.000
C02090836-020	09-25-02	<0.5	1.000

Average of recoveries:	0.960

Blank Charcoal cpm	Standard Number 1 cpm	Standard Number 2 cpm
138	2176	4185

Minimum Radon Flux for Lucky McMine Project:	<0.5	pCi/m²s
Maximum Radon Flux for Lucky McMine Project:	0.85	pCi/m²s
Average Radon Flux for #1-27	0.52	pCi/m²s

* Note: ELI's Radon Flux Practical Quantitative Limit (PQL) is 0.5 pCi/m²s.
Minimum temperature under 35 degrees Fahrenheit not acceptable.

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: CLEAR / CALM Precip: NONE Min Temp: 37°

Inst.: _____ Eff: _____ Tech: _____
Inst. Back: _____
Charcoal Back: _____ Lot: _____
Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
1	166	186	9/23/02 850	9/24/02 850	CA	102090836-001A				
2	167	186 (DUP)	851	851	CA	002A				
3	168	188	858	858	CA	003A				
4	169	191	901	901	CA	004A				
5	170	193	903	903	CA	005A				
6	171	195	908	908	CA	006A				
7	172	201	912	912	CA	007A				
8	173	203	915	915	CA	008A				
9	174	203 (DUP)	916	916	CA	009A				
10	175	208	922	922	CA	010A				
11	176	211	926	926	CA	011A				
12	177	222	929	929	CA	012A				
13	178	224	932	932	CA	013A				
14	179	229	936	936	CA	014A				
15	180	233	940	940	CA	015A				
16	181	235	943	943	CA	016A				
17	182	236	947	947	CA	017A				

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June 1996

LARGE AREA ACTIVATED CHARCOAL CANISTER (LAACC) FIELD NOTES

Client: PATHFINDER MINES CORP. Location: LUCKY McMINE

Weather Condition: CLEAR & CALM Precip: NONE Min Temp: 37°

Inst.: _____ Eff: _____ Tech: _____

Inst. Back: _____

Charcoal Back: _____ Lot: _____

Standard: _____ Count: _____

LAACC Unit #	Charcoal Can #	Location I.D. / Station	Mo/Day/Yr 24 hr time set	Mo/Day/Yr 24 hr time removed	Site Personnel Initials	Lab Sample Number	Date/Time Start	Count Min	Gross Counts	Comments
18	183	236 (DUP)	9/23/02 948	9/24/02 948	CL	018A				
19	184	239	951	951	CL	019A				
20	185	220	956	956	CL	020A				
21	186	218	959	959	CL	021A				
22	187	209	1002	1002	CL	022A				
	7	TripBlank				023A				
	8	" "				024A				
	9	" "				025A				
	10	" "				026A				
	6	" "				027A				

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RADON BARRIER CLAY MATERIAL ANALYSES FOR RA-226 LABORATORY REPORTS

cc JDW
CNA

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine	
Sample ID:	RS1	RS2
Laboratory ID:	99-30081	99-30082
Sample Matrix:	Soil	
Sample Date/Time:	06-10-99	
Date Received:	06-14-99	
Report Date:	July 2, 1999	

Radiometric		Method	Detection Limit	Units	Results	
Radium-226	^{226}Ra	903.0	0.01	pCi/g	1.24	1.70
Radium Precision ±					0.12	0.14

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Note: Radon barrier composite samples analyzed to confirm the barrier clay did not make a significant contribution to radon flux. Samples were taken from completed barrier over mill ore pad and mill site south end.

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ELI

RADIOCHEMICAL QUALITY ASSURANCE REPORT - PATHFINDER MINES CORPORATION

Laboratory ID Range:	99-30081-30082
Sample Matrix:	Soil
Sample Date / Time:	06-10-99
Date Received:	06-14-99
Report Date:	July 2, 1999

	Method	Duplicate Precision (Percent)	Spike Recovery (Percent)	LCS Recovery (Percent)	Method Blank (pCi/L)	Date Analyzed	Analyst
Laboratory #:		99-29880	99-29509	RA-128	RA-128		
Radium-226:	903.0	96	99	106	<0.01	06-29-99	RS

Report Approved By: J. Kaela

Reviewed By: Rab

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine			
Sample ID:	RS-3	RS-4	RS-5	West Barrow
Laboratory ID:	99-35302	99-35303	99-35304	99-35305
Sample Matrix:	Water			
Sample Date/Time:	06-23-99	07-02-99	07-02-99	06-15-99
Date Received:	07-15-99			
Report Date:	August 5, 1999 (Revised 10-13-99)			

Radiometric		Method	Detection Limit	Units	Results			
Radium-226	^{226}Ra	903.0	0.01	pCi/g	1.11	4.01	1.23	1.21
Radium Precision ±					0.07	0.12	0.07	0.07

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine
Sample ID:	RS-6
Laboratory ID:	32268-001
Sample Matrix:	Soil
Sample Date:	08-12-99
Date Received:	08-13-99
Report Date:	September 3, 1999

Radiometric		Method	Reporting Limit	Units	Results
Radium-226	^{226}Ra	903.0	0.01	pCi/g	0.97
Radium Precision ±					0.11

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine
Sample ID:	RS-7
Laboratory ID:	32268-002
Sample Matrix:	Soil
Sample Date:	08-12-99
Date Received:	08-13-99
Report Date:	September 3, 1999

Radiometric		Method	Reporting Limit	Units	Results
Radium-226	^{226}Ra	903.0	0.01	pCi/g	0.96
Radium Precision ±					0.11

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine
Sample ID:	RS-8
Laboratory ID:	32268-003
Sample Matrix:	Soil
Sample Date:	08-12-99
Date Received:	08-13-99
Report Date:	September 3, 1999

Radiometric		Method	Reporting Limit	Units	Results
Radium-226	^{226}Ra	903.0	0.01	pCi/g	1.29
Radium Precision ±					0.13

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine
Sample ID:	East Barrow
Laboratory ID:	32268-004
Sample Matrix:	Soil
Sample Date:	06-21-99 to 07-23-99
Date Received:	08-13-99
Report Date:	September 3, 1999

Radiometric		Method	Reporting Limit	Units	Results
Radium-226	^{226}Ra	903.0	0.01	pCi/g	0.94
Radium Precision ±					0.11

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Project:	Lucky McMine
Sample ID:	West Barrow
Laboratory ID:	32268-005
Sample Matrix:	Soil
Sample Date:	07-12-99 to 08-06-99
Date Received:	08-13-99
Report Date:	September 3, 1999

Radiometric		Method	Reporting Limit	Units	Results
Radium-226	^{226}Ra	903.0	0.01	pCi/g	0.95
Radium Precision ±					0.11

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RADIOCHEMICAL QUALITY ASSURANCE REPORT - PATHFINDER MINES CORPORATION

Laboratory ID Range:	32268-001-005
Sample Matrix:	Soil
Date Received:	08-13-99
Report Date:	September 3, 1999

	Method	Relative Percent Difference[1]	Spike Recovery (Percent)[2]	LCS Recovery (Percent)	Method Blank (pCi/g)	Date Analyzed	Analyst
Laboratory #:		32421-001	32325-001		RA-179		
Radium-226:	903.0	26.5	89	94	<0.01	08-30-99	RS

(1) These values are an assessment of analytical precision. The acceptance range is 0-20% for sample results above 10 times the reporting limit. This range is not applicable to samples with results below 10 times the reporting limit.

(2) These values are an assessment of analytical accuracy. They are a percent recovery of the spike addition. ELI performs a matrix spike on 10 percent of all samples for each analytical method.

Report Approved By: D Baida

Reviewed By: LAb

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine
Sample ID:	East Barrow
Laboratory ID:	33073-001
Sample Matrix:	Soil
Sample Date:	08-27-99
Date Received:	09-20-99
Report Date:	October 7, 1999

Radiometric		Method	Reporting Limit	Units	Results
Radium-226	^{226}Ra	903.0	0.01	pCi/g	1.55
Radium Precision ±					0.13

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine
Sample ID:	West Barrow
Laboratory ID:	33073-002
Sample Matrix:	Soil
Sample Date:	09-03-99
Date Received:	09-20-99
Report Date:	October 7, 1999

Radiometric		Method	Reporting Limit	Units	Results
Radium-226	^{226}Ra	903.0	0.01	pCi/g	1.15
Radium Precision ±					0.12

RADIOCHEMICAL QUALITY ASSURANCE REPORT - PATHFINDER MINES CORPORATION

Laboratory ID Range:	33073-001-002
Sample Matrix:	Soil
Date Received:	09-20-99
Report Date:	October 7, 1999

	Method	Relative Percent Difference[1]	Spike Recovery (Percent)[2]	LCS Recovery (Percent)	Method Blank (pCi/g)	Date Analyzed	Analyst
Laboratory #:		33000-001	33001-004		RA-211		
Radium-226:	903.0	17.0	92	110	<0.01	10-04-99	RS

(1) These values are an assessment of analytical precision. The acceptance range is 0-20% for sample results above 10 times the reporting limit. This range is not applicable to samples with results below 10 times the reporting limit.

(2) These values are an assessment of analytical accuracy. They are a percent recovery of the spike addition. ELI performs a matrix spike on 10 percent of all samples for each analytical method.

Report Approved By: D Baida

Reviewed By: EDH

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine
Sample ID:	East Barrow
Laboratory ID:	34046-001
Sample Matrix:	Soil
Sample Date/Time:	09-24-99
Date Received:	10-28-99
Report Date:	November 19, 1999

Radiometric		Method	Reporting Limit	Units	Results
Radium-226	^{226}Ra	903.0	0.01	pCi/g	0.90
Radium Precision ±					0.10

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION

Project:	Lucky McMine
Sample ID:	West Barrow
Laboratory ID:	34046-002
Sample Matrix:	Soil
Sample Date/Time:	10-01-99
Date Received:	10-28-99
Report Date:	November 19, 1999

Radiometric		Method	Reporting Limit	Units	Results
Radium-226	^{226}Ra	903.0	0.01	pCi/g	1.20
Radium Precision ±					0.11

rs r:\Reports\Clients.99\Pathfinder\Lucky_mcMine\Soil\rc34046-002.xls

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34046R00002

RADIOCHEMICAL QUALITY ASSURANCE REPORT - PATHFINDER MINES

Laboratory ID Range:	34046-001-002
Sample Matrix:	Soil
Sample Date / Time:	09-24-99
Date Received:	10-28-99
Report Date:	November 19, 1999

	Method	Relative Percent Difference[1]	Spike Recovery (Percent)[2]	LCS Recovery (Percent)	Method Blank (pCi/g)	Date Analyzed	Analyst
Laboratory #:		33972-001	33972-002		RA-253		
Radium-226:	903.0	15.1	101	109	<0.01	11-15-99	RS

		Volume	Units	Grams			
Digestion:	SW3050	0.95	Liter	20		11-08-99	RCB

(1) These values are an assessment of analytical precision. The acceptance range is 0-20% for sample results above 10 times the reporting limit. This range is not applicable to samples with results below 10 times the reporting limit.

(2) These values are an assessment of analytical accuracy. They are a percent recovery of the spike addition. ELI performs a matrix spike on 10 percent of all samples for each analytical method.

Report Approved By:

rs r:\reports\clients.99\Pathfinder\Lucky_McMine\Soil\Qa\rc34046-001-002.xls

Reviewed By:

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34046R00003

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LABORATORY ANALYSIS REPORT

RECEIVED
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By TWH

Client: PATHFINDER MINES CORPORATION - Lucky McMine
Project: None
Contact: Tom Hardgrove
Sample Matrix: Solid, soil
Report Date: August 14, 2000

Laboratory ID	Sample Date	Sample ID	Radium-226, pCi/g	Radium-226 Precision ±	Digestion
34492-1	09-27-99 to 10-22-99	East Barrow	0.79	0.05	-
34492-2	10-03-99 to 10-22-99	West Barrow	0.98	0.06	-
34492-3	05-01-00 to 06-02-00	West Barrow	1.05	0.06	-
34492-4	06-12-00 to 07-14-00	East Barrow	1.03	0.06	-
34492-5	06-05-00 to 07-14-00	West Barrow	1.00	0.06	-

Rn barrier clay - routine composite samples

Quality Assurance Data		
Method	903.0	SW 3050
Reporting Limit	0.01	-
Duplicate[1]	4.7	-
Spike[2]	97	-
Batch ID	RA-190	-
Analyst	rs	dj
Date Analyzed	08-07-00	07-24-00

NOTES:

(1) These values are an assessment of analytical precision. The acceptance range is 0-20% for sample results above 10 times the reporting limit. This range is not applicable to samples with results below 10 times the reporting limit.

(2) These values are an assessment of analytical accuracy. They are a percent recovery of the spike addition. ELI performs a matrix spike on 10 percent of all samples for each analytical method.

Report Approved By: D Baida

Reviewed By:

lmh r\reports\clients2000\pathfinder\lucky_mcmine\solid\soil\rc34492-1.xls

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34492R00001

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

RECEIVED NOV 2 8 2001 By TWH

Lab Order: C01100685
Report Date: 11/19/01

Lab ID: C01100685-001
Client Sample ID: East Barrow 7/15/00 to 9/29/00

Collection Date: 07/15/00
DateReceived: 10/23/01
Matrix: SOIL

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES							
Radium 226	1.0	pCi/g		0.10		E903.0	11/12/01 11:36 / rs
Radium 226 precision	0.10	±				E903.0	11/12/01 11:36 / rs

Lab ID: C01100685-002
Client Sample ID: West Barrow 7/15/00 to 9/29/00

Collection Date: 07/15/00
DateReceived: 10/23/01
Matrix: SOIL

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES							
Radium 226	0.80	pCi/g		0.10		E903.0	11/12/01 12:36 / rs
Radium 226 precision	0.10	±				E903.0	11/12/01 12:36 / rs

Lab ID: C01100685-003
Client Sample ID: West Barrow 5/1/01 to 6/29/01

Collection Date: 07/15/00
DateReceived: 10/23/01
Matrix: SOIL

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES							
Radium 226	1.0	pCi/g		0.10		E903.0	11/12/01 13:37 / rs
Radium 226 precision	0.10	±				E903.0	11/12/01 13:37 / rs

Lab ID: C01100685-004
Client Sample ID: East Barrow 10/18/01

Collection Date: 10/18/01
DateReceived: 10/23/01
Matrix: SOIL

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES							
Radium 226	0.90	pCi/g		0.10		E903.0	11/12/01 14:37 / rs
Radium 226 precision	0.10	±				E903.0	11/12/01 14:37 / rs

Report Definitions:
ND - Not detected at the reporting limit
MCL - Maximum contaminant level
RL - Analyte reporting level
QCL - Quality control limit

Note: Borrow and Placed Clay Source Term for Ra-226

TRACKING NO. PAGE NO.
10685R00002

ENERGY LABORATORIES

LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C01100685
Report Date: 11/19/01

Lab ID: C01100685-005
Client Sample ID: West Barrow 10/18/01

Collection Date: 10/18/01
DateReceived: 10/23/01
Matrix: SOIL

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES							
Radium 226	0.90	pCi/g		0.10		E903.0	11/12/01 15:37 / rs
Radium 226 precision	0.10	±				E903.0	11/12/01 15:37 / rs

Lab ID: C01100685-006
Client Sample ID: #1 Basin 10/18/2001

Collection Date: 10/18/01
DateReceived: 10/23/01
Matrix: SOIL

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES							
Radium 226	1.0	pCi/g		0.10		E903.0	11/12/01 16:38 / rs
Radium 226 precision	0.10	±				E903.0	11/12/01 16:38 / rs

Lab ID: C01100685-007
Client Sample ID: #2 Basin 10/18/2001

Collection Date: 10/18/01
DateReceived: 10/23/01
Matrix: SOIL

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES							
Radium 226	1.0	pCi/g		0.10		E903.0	11/12/01 17:38 / rs
Radium 226 precision	0.10	±				E903.0	11/12/01 17:38 / rs

Lab ID: C01100685-008
Client Sample ID: #2A Basin 10/18/2001

Collection Date: 10/18/01
DateReceived: 10/23/01
Matrix: SOIL

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES							
Radium 226	0.90	pCi/g		0.10		E903.0	11/12/01 18:38 / rs
Radium 226 precision	0.10	±				E903.0	11/12/01 18:38 / rs

Report Definitions:
ND - Not detected at the reporting limit
MCL - Maximum contaminant level
RL - Analyte reporting level
QCL - Quality control limit

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10685R00003

ENERGY LABORATORIES

LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C01100685
Report Date: 11/19/01

Lab ID: C01100685-009
Client Sample ID: #3 Basin 10/18/2001

Collection Date: 10/18/01
DateReceived: 10/23/01
Matrix: SOIL

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES							
Radium 226	1.0	pCi/g		0.10		E903.0	11/12/01 19:39 / rs
Radium 226 precision	0.10	±				E903.0	11/12/01 19:39 / rs

Report Definitions:
ND - Not detected at the reporting limit
MCL - Maximum contaminant level
RL - Analyte reporting level
QCL - Quality control limit

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10685R00004

LIMESTONE ANALYSIS
FOR RA-226
LABORATORY REPORT

2.182

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LABORATORY ANALYSIS REPORT - PATHFINDER MINES CORPORATION - LUCKY MCMINE

	LIMESTONE
Sample ID:	Filter Bed
Laboratory ID:	98-45488
Sample Matrix:	Soil
Sample Date/Time:	07-24-98
Report Date:	August 17, 1998

Radiometrics		Method	Units	Reporting Limit	Results
Radium 226	^{226}Ra	EPA 903.0	pCi/g	0.01	0.90
Precision ±					0.10

Quality Assurance	
Matrix Duplicate[1]:	103
Matrix Spike[2]:	98
Analyst:	RS
Date Analyzed:	08/12/98

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APPENDIX

F

			Rock Mulch d50 (Inches)		
Point #	Point ID	Comment	1.000	1.630	2.170
1	N 784200 E 804800		0.200		
2	N 784400 E 804800		0.360		
3	N 784400 E 805000		0.260		
4	N 784400 E 805200		0.300		
5	N 784400 E 805400		0.350		
6	N 784400 E 805600			0.370	
7	N 784400 E 805800			0.360	
8	N 784600 E 805000		0.290		
9	N 784600 E 805200		0.500		
10	N 784600 E 805400				0.340
11	N 784600 E 805600	Edge of 1ft rock			
12	N 784800 E 805000		0.400		
13	N 784800 E 805200		0.470		
14	N 784800 E 805400		0.200		
15	N 784800 E 805600			0.200	
16	N 784800 E 805800			1.400	
17	N 785000 E 805000		0.370		
18	N 785000 E 805200		0.250		
19	N 785000 E 805400			0.108	
20	N 785000 E 805600			0.420	
21	N 785200 E 805000			0.310	
22	N 785200 E 805200			0.650	
23	N 785200 E 805400			0.550	
24	N 785200 E 805600			0.550	
25	N 785200 E 805800			0.250	
26	N 785400 E 805000	Road			
27	N 785400 E 805200			0.350	
28	N 785400 E 805400			0.280	
29	N 785400 E 805600			0.300	
30	N 785400 E 805800			2.083	
31	N 785400 E 806000			0.720	
32	N 785600 E 805200			0.470	
33	N 785600 E 805400	Road			
34	N 785600 E 805600			0.400	
35	N 785600 E 805800			0.550	
36	N 785600 E 806000			0.340	
37	N 785600 E 806200			0.370	
38	N 785600 E 806400			1.150	
39	N 785800 E 805200			0.460	
40	N 785800 E 805400	Edge			
41	N 785800 E 805600	Edge			
42	N 785800 E 805800	Edge			
43	N 785800 E 806000			0.370	
44	N 785800 E 806200			0.380	
45	N 785800 E 806400			0.230	
46	N 785800 E 806600			0.450	
47	N 785800 E 806800		0.450		
48	N 786000 E 805200			0.400	
49	N 786000 E 805400	Edge			
50	N 786000 E 805600			0.260	
51	N 786000 E 805800			0.225	
52	N 786000 E 806000			0.300	
53	N 786000 E 806200			0.370	

			Rock Mulch d50 (Inches)		
Point #	Point ID	Comment	1.000	1.630	2.170
54	N 786000 E 806400			0.570	
55	N 786000 E 806600	Heap Leach Sump			
56	N 786000 E 807000		0.380		
57	N 786200 E 805400			0.300	
58	N 786200 E 805600			0.420	
59	N 786200 E 805800			0.230	
60	N 786200 E 806000			0.480	
61	N 786200 E 806200			0.270	
62	N 786200 E 806400			0.420	
63	N 786200 E 806600	Heap Leach Sump			
64	N 786200 E 806800			0.310	
65	N 786200 E 807000		0.500		
66	N 786200 E 807200		0.500		
67	N 786400 E 804800		0.360		
68	N 786400 E 805000	Marked as fill			
69	N 786400 E 805200			0.300	
70	N 786400 E 805400			0.180	
71	N 786400 E 805600			0.400	
72	N 786400 E 805800			0.380	
73	N 786400 E 806000			0.460	
74	N 786400 E 806200			0.300	
75	N 786400 E 806400			0.280	
76	N 786400 E 806600			0.330	
77	N 786400 E 807000		0.270		
78	N 786400 E 807200		0.500		
79	N 786600 E 804400	Off Rock			
80	N 786600 E 804600				0.750
81	N 786600 E 804800	Off Rock			
82	N 786600 E 805000				0.450
83	N 786600 E 805200			0.470	
84	N 786600 E 805400			0.600	
85	N 786600 E 805600			0.430	
86	N 786600 E 805800			0.470	
87	N 786600 E 806000			0.370	
88	N 786600 E 806200			0.330	
89	N 786600 E 806400			0.330	
90	N 786600 E 806600			0.440	
91	N 786600 E 806800			0.480	
92	N 786600 E 807200		0.270		
93	N 786800 E 804200	Off Rock			
94	N 786800 E 804400				0.430
95	N 786800 E 804600	Rock @ Top of Hub			0.308
96	N 786800 E 804800				0.450
97	N 786800 E 805000		0.330		
98	N 786800 E 805200		0.270		
99	N 786800 E 805400		0.250		
100	N 786800 E 805600			0.500	
101	N 786800 E 805800			0.330	
102	N 786800 E 806000			0.410	
103	N 786800 E 806200			0.440	
104	N 786800 E 806400			0.450	
105	N 786800 E 806600			0.390	
106	N 786800 E 807000			0.217	

			Rock Mulch d50 (Inches)		
Point #	Point ID	Comment	1.000	1.630	2.170
107	N 787000 E 804000	Swamp			
108	N 787000 E 804200				0.490
109	N 787000 E 804400				0.500
110	N 787000 E 804600				0.420
111	N 787000 E 804800	No Rock			
112	N 787000 E 805000		0.270		
113	N 787000 E 805200		0.360		
114	N 787000 E 805400			0.360	
115	N 787000 E 805600			0.310	
116	N 787000 E 805800		0.150		
117	N 787000 E 806000		0.380		
118	N 787000 E 806200			0.380	
119	N 787000 E 806400			0.350	
120	N 787000 E 806600				0.450
121	N 787000 E 806800		0.320		
122	N 787000 E 807000			0.240	
123	N 787200 E 804000	No Rock			
124	N 787200 E 804200				0.590
125	N 787200 E 804400				0.260
126	N 787200 E 804600	No Rock			
127	N 787200 E 804800			0.400	
128	N 787200 E 805000		0.320		
129	N 787200 E 805200		0.300		
130	N 787200 E 805400	Thin Area	0.100		
131	N 787200 E 805600			0.450	
132	N 787200 E 805800		0.500		
133	N 787200 E 806000		0.350		
134	N 787200 E 806200				0.450
135	N 787200 E 806400		0.280		
136	N 787200 E 806600		0.340		
137	N 787200 E 806800		0.390		
138	N 787200 E 807000			0.300	
139	N 787400 E 804000				0.242
140	N 787400 E 804200				0.260
141	N 787400 E 804400	No Rock			
142	N 787400 E 804600			0.200	
143	N 787400 E 804800			0.500	
144	N 787400 E 805000		0.250		
145	N 787400 E 805200		0.200		
146	N 787400 E 805400		0.170		
147	N 787400 E 805600	FB no Rock	0.500		
148	N 787400 E 805800		0.158		
149	N 787400 E 806000		0.330		
150	N 787400 E 806200		0.210		
151	N 787400 E 806400	Offset	0.192		
152	N 787400 E 806600		0.183		
153	N 787400 E 806800		0.210		
154	N 787400 E 807000			0.540	
155	N 787600 E 803800	Hub @ top of Rock			0.250
156	N 787600 E 804000				0.420
157	N 787600 E 804200				0.330
158	N 787600 E 804400	Thin Area	0.100		
159	N 787600 E 804600		0.270		

			Rock Mulch d50 (Inches)		
Point #	Point ID	Comment	1.000	1.630	2.170
160	N 787600 E 804800			0.450	
161	N 787600 E 805000		0.320		
162	N 787600 E 805200		0.210		
163	N 787600 E 805400	Rock Pile			
164	N 787600 E 805600		0.300		
165	N 787600 E 805800		0.330		
166	N 787600 E 806000		0.217		
167	N 787600 E 806600		0.250		
168	N 787600 E 806800		0.210		
169	N 787600 E 807000		0.290		
170	N 787600 E 807200			0.550	
171	N 787800 E 803200	Thin Area			0.225
172	N 787800 E 803800				0.400
173	N 787800 E 804000				0.360
174	N 787800 E 804200				0.400
175	N 787800 E 804400		0.330		
176	N 787800 E 804600		0.650		
177	N 787800 E 804800		0.290		
178	N 787800 E 805000		0.430		
179	N 787800 E 805200		0.420		
180	N 787800 E 805400	Road			
181	N 787800 E 805600		0.280		
182	N 787800 E 805800		0.290		
183	N 787800 E 806000		0.300		
184	N 787800 E 806200	Topsoil			
185	N 787800 E 806800		0.340		
186	N 787800 E 807000		0.400		
187	N 787800 E 807200			0.550	
188	N 788000 E 803200	Topsoil			
189	N 788000 E 803800			0.290	
190	N 788000 E 804000			0.350	
191	N 788000 E 804200				0.267
192	N 788000 E 804400		0.480		
193	N 788000 E 804600		0.400		
194	N 788000 E 804800		0.540		
195	N 788000 E 805000			0.250	
196	N 788000 E 805200		0.290		
197	N 788000 E 805400	Road			
198	N 788000 E 805600		0.410		
199	N 788000 E 805800		0.280		
200	N 788000 E 806000		0.280		
201	N 788000 E 806200				0.380
202	N 788000 E 806600				0.300
203	N 788200 E 803200			0.180	
204	N 788200 E 803400			0.570	
205	N 788200 E 803600	Topsoil			
206	N 788200 E 803800			0.350	
207	N 788200 E 804000			0.450	
208	N 788200 E 804200			0.330	
209	N 788200 E 804400				0.550
210	N 788200 E 804800			0.490	
211	N 788200 E 805000			0.250	
212	N 788200 E 805200			0.300	

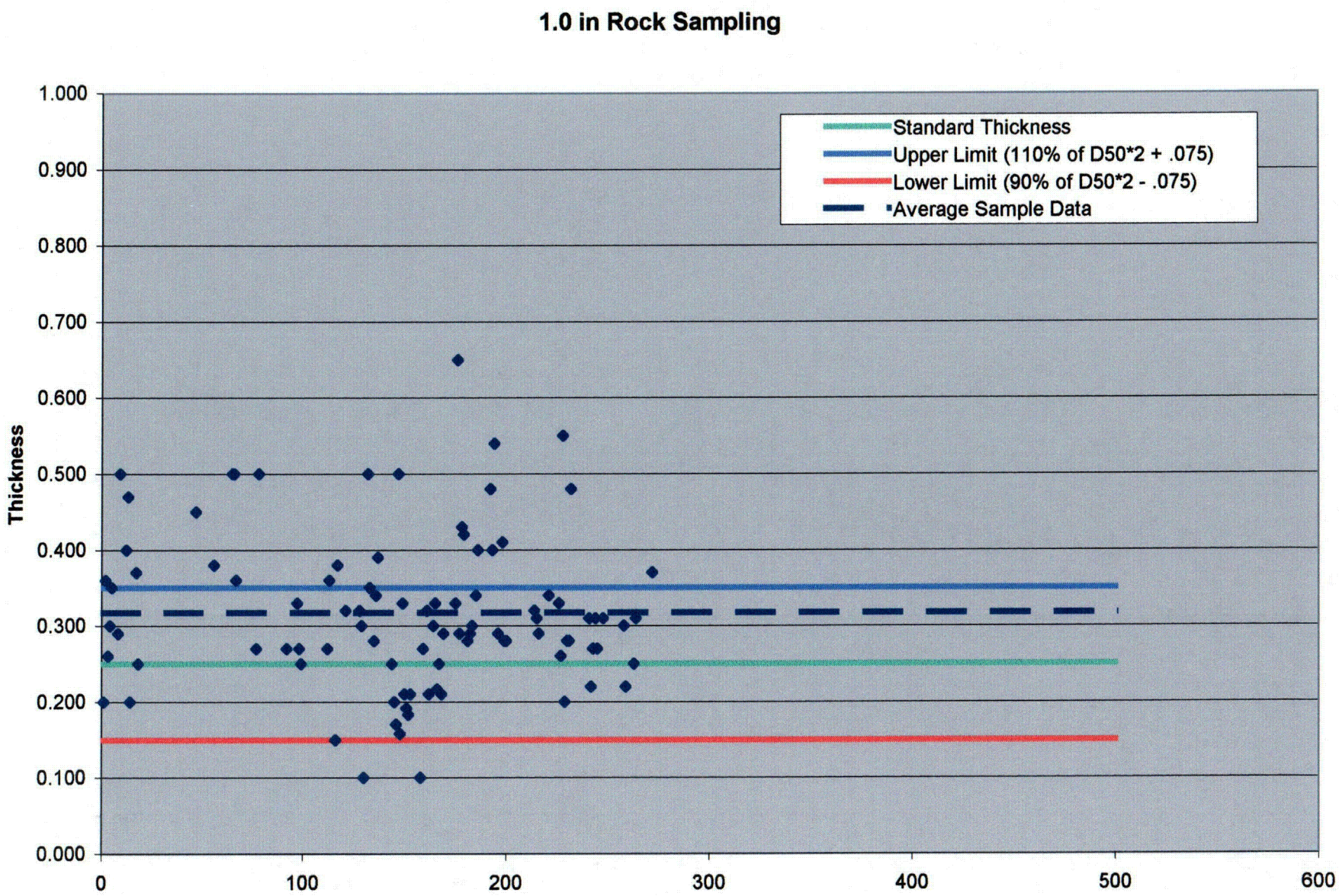
			Rock Mulch d50 (Inches)		
Point #	Point ID	Comment	1.000	1.630	2.170
213	N 788200 E 805400	Road			
214	N 788200 E 805600		0.320		
215	N 788200 E 805800		0.310		
216	N 788200 E 806000		0.290		
217	N 788400 E 803800				0.480
218	N 788400 E 804000			0.300	
219	N 788400 E 804200			0.310	
220	N 788400 E 804400				0.520
221	N 788400 E 804600		0.340		
222	N 788400 E 804800			0.350	
223	N 788400 E 805000			0.350	
224	N 788400 E 805200			0.460	
225	N 788400 E 805400			0.250	
226	N 788400 E 805600		0.330		
227	N 788400 E 805800		0.260		
228	N 788400 E 806000		0.550		
229	N 788400 E 806200		0.200		
230	N 788400 E 806400		0.280		
231	N 788400 E 806600		0.280		
232	N 788400 E 806800		0.480		
233	N 788600 E 803000	Lots of dirt			0.350
234	N 788600 E 803800			0.260	
235	N 788600 E 804000			0.220	
236	N 788600 E 804200			0.250	
237	N 788600 E 804400			0.280	
238	N 788600 E 804600				0.290
239	N 788600 E 805400			0.220	
240	N 788600 E 805600			0.330	
241	N 788600 E 805800		0.310		
242	N 788600 E 806000		0.220		
243	N 788600 E 806200		0.270		
244	N 788600 E 806400		0.310		
245	N 788600 E 806600		0.270		
246	N 788800 E 803000	No Rock			
247	N 788800 E 803200	.5 RR			
248	N 788800 E 803400		0.310		
249	N 788800 E 803800	Topsoil			
250	N 788800 E 804000	Thin Area		0.200	
251	N 788800 E 804200			0.350	
252	N 788800 E 804400			0.330	
253	N 788800 E 804600			0.460	
254	N 788800 E 804800	Thin Area		0.192	
255	N 788800 E 805600				0.350
256	N 788800 E 805800			0.400	
257	N 788800 E 806000			0.330	
258	N 788800 E 806200		0.300		
259	N 788800 E 806400		0.220		
260	N 789000 E 803000				0.650
261	N 789000 E 803200	Topsoil			
262	N 789000 E 804200	Topsoil			
263	N 789000 E 804400		0.250		
264	N 789000 E 804600		0.310		
265	N 789000 E 805000			0.460	

			Rock Mulch d50 (Inches)		
Point #	Point ID	Comment	1.000	1.630	2.170
266	N 789000 E 806200	Submerged			
267	N 789200 E 803000	Windblown Fill			0.342
268	N 789200 E 803200				0.300
269	N 789200 E 804200			0.200	
270	N 789200 E 804400	Topsoil			
271	N 789200 E 804600	Topsoil			
272	N 789200 E 804800		0.370		
273	N 789200 E 805000			0.200	
274	N 789200 E 805200			0.330	
275	N 789200 E 806000			0.300	
276	N 789200 E 806200	Off Rock			
277	N 789400 E 803200				0.400
278	N 789400 E 803400	Lots of dirt			0.350
279	N 789400 E 804800	Topsoil			
280	N 789400 E 805000			0.340	
281	N 789400 E 805200			0.320	
282	N 789400 E 805400			0.350	
283	N 789400 E 805600			0.330	
284	N 789400 E 805800			0.370	
285	N 789400 E 806000	Off Rock			
286	N 789600 E 803200				0.310
287	N 789600 E 803400				0.330
288	N 789600 E 803600				0.380
289	N 789600 E 804200	Topsoil			
290	N 789600 E 804400	Topsoil			
291	N 789600 E 804600	Topsoil			
292	N 789600 E 804800	Topsoil			
293	N 789600 E 805000			0.240	
294	N 789600 E 805200			0.310	
295	N 789800 E 803400				0.350
296	N 789800 E 803600				0.460
297	N 789800 E 803800				0.317
298	N 789800 E 805000	Topsoil			
299	N 789800 E 805200			0.230	
300	N 790000 E 803400	Off Rock			
301	N 790000 E 803600				0.480
302	N 790000 E 803800				0.290
303	N 790000 E 804000				0.550
304	N 790000 E 804200				0.340
305	N 790000 E 804400				0.380
306	N 790000 E 804600				0.580
307	N 790000 E 804800				0.360
308	N 790000 E 805000				0.450
309	N 790200 E 803400			0.320	
310	N 790200 E 803600	RB at low spot			0.275
311	N 790200 E 803800				0.300
312	N 790200 E 804000				0.370
313	N 790200 E 804200				0.350
314	N 790200 E 804400				0.550
315	N 790200 E 804600				0.258
316	N 790200 E 804800				0.400
317	N 790400 E 803400			0.250	
318	N 790400 E 803600	Thin Spots		0.225	

			Rock Mulch d50 (Inches)		
Point #	Point ID	Comment	1.000	1.630	2.170
319	N 790400 E 803800				0.340
320	N 790400 E 804000				0.330
321	N 790400 E 804200				0.317
322	N 790400 E 804400				0.300
323	N 790400 E 804600				0.320
324	N 790600 E 803600			0.200	
325	N 790600 E 803800			0.220	
326	N 790600 E 804000			0.220	
327	N 790600 E 804200			0.220	
328	N 790600 E 804400				0.300
329	N 790800 E 803600			0.250	
330	N 790800 E 803800			0.200	
331	N 790800 E 804000			0.200	
332	N 790800 E 804200			0.217	
333	N 790800 E 804400				0.350
334	N 790800 E 804600			0.260	
335	N 791000 E 803600			0.250	
336	N 791000 E 803800			0.250	
337	N 791000 E 804000			0.220	
338	N 791000 E 804200			0.280	
339	N 791000 E 804400			0.300	
340	N 791200 E 803600			0.200	
341	N 791200 E 803800			0.260	
342	N 791200 E 804000			0.190	
343	N 791200 E 804200			0.500	
344	N 791200 E 804400			0.300	
345	N 791400 E 804000			0.300	
346	N 791400 E 804200			0.330	
347	N 791400 E 804400			0.260	
348	N 791600 E 804200			0.260	
349	N 791600 E 804400			0.500	
350	N 791600 E 804600	Off Rock			
351	N 792000 E 804800	Off Rock			
352	N 792400 E 804600	Off Rock			
353	N 792400 E 805000			0.300	
354	N 792600 E 803800			0.350	
355	N 792600 E 804000			0.200	
356	N 792600 E 804400			0.200	
357	N 792600 E 804600	Channel			
358	N 792600 E 805000			0.225	
359	N 792600 E 805200			0.550	
360	N 792800 E 803800			0.350	
361	N 792800 E 804000			0.320	
362	N 792800 E 804400			0.270	
363	N 792800 E 804600			0.200	
364	N 792800 E 805000			0.250	
365	N 793000 E 804400			0.250	
366	N 793000 E 804600			0.300	
367	N 793000 E 804800			0.360	
368	N 793200 E 804000			0.400	
369	N 793200 E 804400			0.240	
370	N 793400 E 804000			0.350	
371	N 793400 E 804200			0.200	

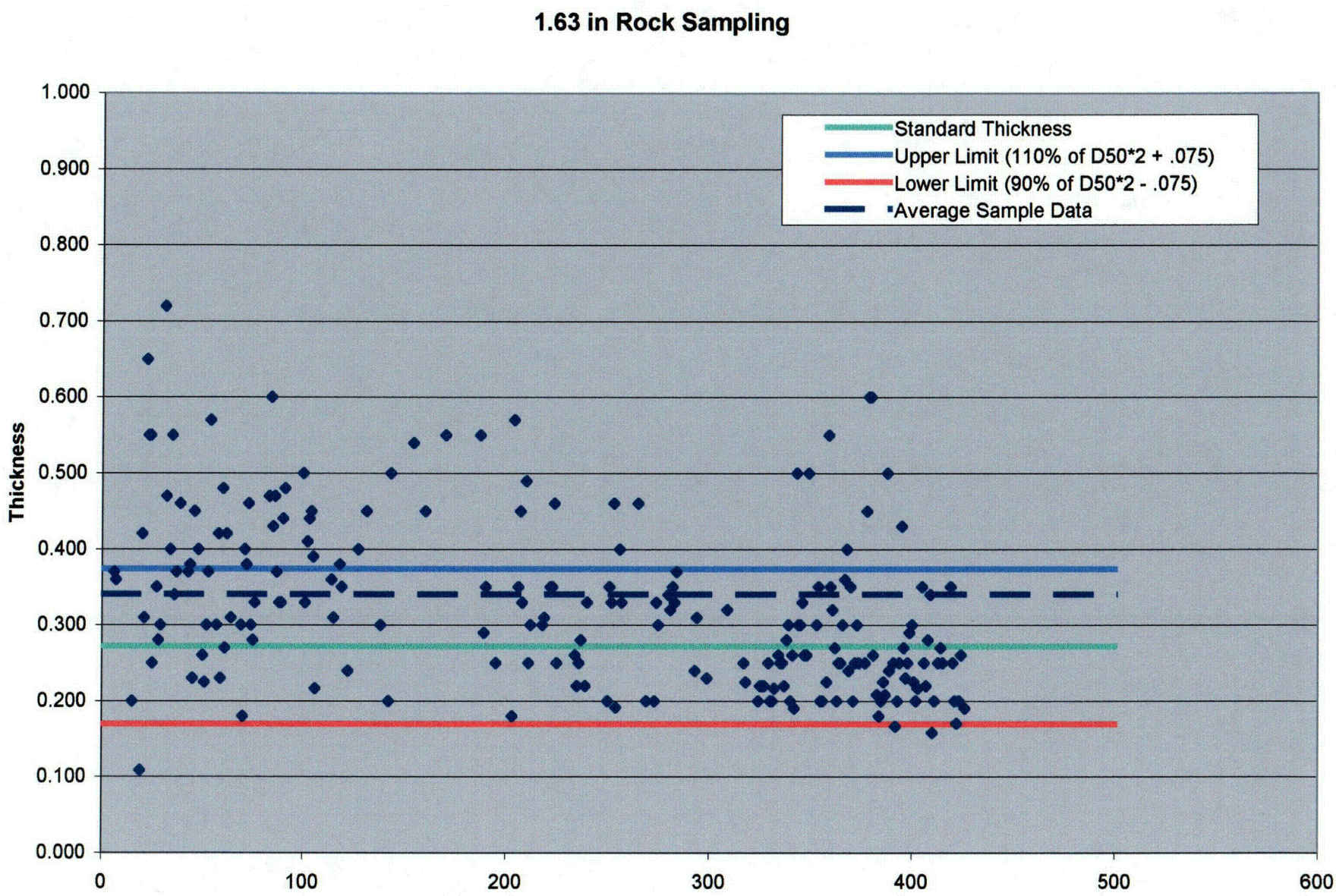
			Rock Mulch d50 (Inches)		
Point #	Point ID	Comment	1.000	1.630	2.170
372	N 793400 E 804400			0.250	
373	N 793400 E 804600			0.300	
374	N 793400 E 804800			0.250	
375	N 793600 E 803200	Off Rock			
376	N 793600 E 803400	Off Rock			
377	N 793600 E 804000			0.250	
378	N 793600 E 804200			0.450	
379	N 793600 E 804400			0.600	
380	N 793600 E 804600			0.600	
381	N 793600 E 804800			0.260	
382	N 793800 E 803200	Off Rock			
383	N 793800 E 803400	Offset		0.208	
384	N 793800 E 803600			0.180	
385	N 793800 E 804000			0.200	
386	N 793800 E 804200	Hub BELOW Rock		0.225	
387	N 793800 E 804400			0.208	
388	N 793800 E 804600			0.500	
389	N 793800 E 804800			0.240	
390	N 794000 E 803200	Off Rock			
391	N 794000 E 803400			0.250	
392	N 794000 E 803600	Rock @ top of Hub		0.167	
393	N 794000 E 803800			0.200	
394	N 794000 E 804000			0.250	
395	N 794000 E 804200			0.430	
396	N 794000 E 804600			0.270	
397	N 794000 E 804800			0.230	
398	N 794200 E 803000			0.250	
399	N 794200 E 803200			0.290	
400	N 794200 E 803400			0.300	
401	N 794200 E 803600	RB Thin Area		0.225	
402	N 794200 E 803800	Rock @ top of Hub		0.200	
403	N 794200 E 804000	Rock @ top of Hub		0.217	
404	N 794200 E 804200				0.350
405	N 794200 E 804400			0.350	
406	N 794200 E 804600			0.250	
407	N 794200 E 804800			0.220	
408	N 794400 E 803400			0.280	
409	N 794400 E 803600			0.340	
410	N 794400 E 803800	Rock @ top of Hub		0.158	
411	N 794400 E 804000			0.200	
412	N 794400 E 804200				0.350
413	N 794400 E 804400			0.250	
414	N 794400 E 804600			0.270	
415	N 794400 E 804800			0.250	
416	N 794600 E 803600	Off Rock			
417	N 794600 E 803800				0.300
418	N 794600 E 804000				0.400
419	N 794600 E 804200			0.350	
420	N 794600 E 804400			0.250	
421	N 794600 E 804600			0.200	
422	N 794800 E 804200			0.170	
423	N 794800 E 804400			0.200	
424	N 795000 E 804200			0.260	

			Rock Mulch d50 (Inches)		
Point #	**Point ID**	**Comment**	**1.000**	**1.630**	**2.170**
425	N 795000 E 804600	Off Rock			
426	N 795200 E 804400			0.190	
		Count	95	211	68
		Max	0.650	2.083	0.750
		Min	0.100	0.108	0.225
		Average Sample Data	0.318	0.340	0.383
		Standard Thickness	0.250	0.272	0.362
		Average % of Standard	**127%**	**125%**	**106%**
	Upper Limit (110% of D50*2 + .075)		0.350	0.374	0.473
		Count Above Limit	29	57	12
		% Above Limit	**30.5%**	**27.0%**	**17.6%**
	Lower Limit (90% of D50*2 - .075)		0.150	0.170	0.251
		Count Below Limit	2	3	3
		% Below Limit	**2.1%**	**1.4%**	**4.4%**



4/19/2005 2:41 PM
Rock Mulch Verification.xls 1.0 in Rock Chart

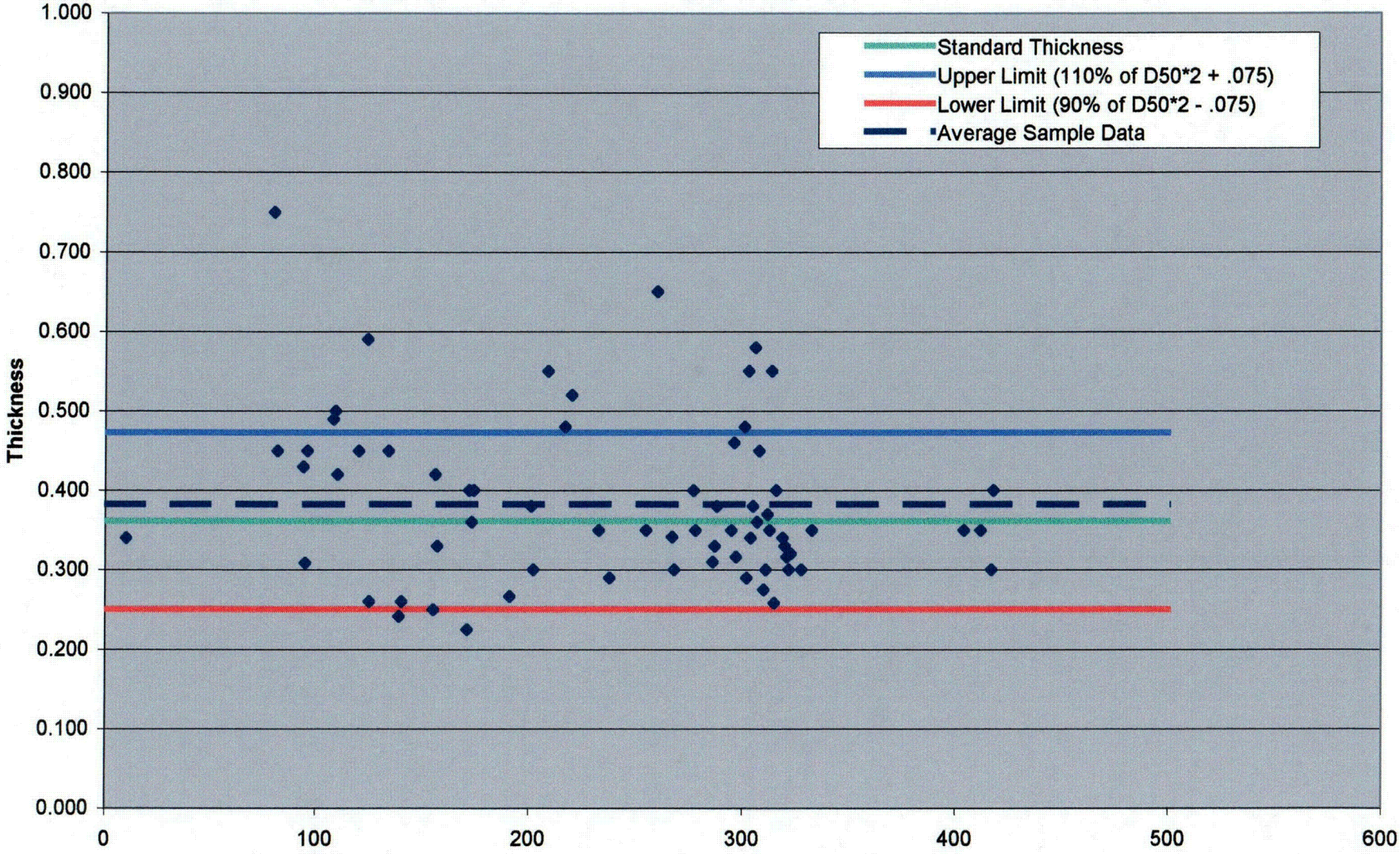
C01
Figure F-1.1



4/19/2005 2:41 PM
Rock Mulch Verification.xls 1.63 in Rock Chart

C02
Figure F-1.2

2.17 in Rock Sampling



4/19/2005 2:41 PM
Rock Mulch Verification.xls 2.17 in Rock Chart

C03

Figure F-1.3

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE, THAT CAN BE VIEWED AT THE RECORD TITLED:

"Exhibit F-1
Rock Mulch Verification
Sample Location"

WITHIN THIS PACKAGE OR BY SEARCHING USING

D- 02

APPENDIX

G

LIMESTONE SIZE TESTING

1998

FILTER BED MATERIAL

1998

SUBJECT Rock gradation samples - Filter PROJECT NO. 815 2km PAGE

CLIENT Pathfinder DATE 2-27-98 BY

PROJECT Limestone Testing CHECKED BY

Pink #1 D_{50} 2.17" sample wt. 250.16

	3.47"	3"	2½"	2"	1.5"	pan
wt. ret	Ø	6.66	91.11	93.46	43.11	15.72
% ret	Ø	2.7	36.4	37.4	17.2	6.3
% pass	100	97.3	60.9	23.5	6.3	

Red #1 D_{50} 1.63" sample wt. 169.40

	2½"	2"	1½"	pan
wt. ret	Ø	17.87	85.31	66.22
% ret.	Ø	10.5	50.4	39.1
% pass	100	89.5	39.1	

Blue #1 D_{50} 1" sample wt. 56.18

	1½"	1¼"	1"	¾"	pan
wt. ret.	Ø	4.92	14.93	21.58	14.75
% ret.	Ø	8.8	26.6	38.4	26.2
% pass	100	91.2	64.6	26.2	

Crushed Limestone filter (Nom. max. part. size = 1")

#1 Sample size = 27.58

	1"	pan
wt. ret	Ø	27.58
% pass	100%	

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SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 5-11-98 BY JCB

PROJECT Limestone Test CHECKED BY

Sample # 1 total sample wt. 50.35

#1
50.35

	1"	pan
wt. retained	0	100
% retained	0	100
% passing	100	0

INBERG-MILLER ENGINEERS

SUBJECT Crushed Limestone Filter PROJECT NO. 8152Rm PAGE

CLIENT Pathfinder DATE 5-11-96 BY JLB

PROJECT Limestone Test CHECKED BY

Sample # 3 total sample wt. 54.60

	1"	pan
wt. retained	0	100
% retained	0	100
% passing	100	0

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 6-26-98 BY

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 4 Total Sample Wt. _____

	1 5/8"	Pan
Weight Retained	0	100
% Retained	0	100
% Passing	100	0

SUBJECT Crushed Limestone Filter PROJECT NO. 8152Rm PAGE

CLIENT Pathfinder DATE 7-16 98 BY JPM

PROJECT Limestone Test CHECKED BY

Sample # 5 total sample wt. 57 lbs

	1"	pan
wt. retained	0	57.0
% retained	0	100
% passing	100	0

SUBJECT Crushed Limestone Filter PROJECT NO. 8152Rm PAGE

CLIENT Pathfinder DATE 7-29 BY JPM

PROJECT Limestone Test CHECKED BY

Sample # 10 total sample wt. 32.5

	1"	pan
wt. retained	-0-	32.5
% retained	-0-	100%
% passing	100.0%	

SUBJECT Crushed Limestone Filter PROJECT NO. 8152Rm PAGE

CLIENT Pathfinder DATE 8-5-98 BY JPM

PROJECT Limestone Test CHECKED BY

Sample # 7 total sample wt. 33.7

	1"	pan
wt. retained		
% retained	0%	100%
% passing	100%	0%

SUBJECT Crushed Limestone Filter PROJECT NO. 8152Rm PAGE

CLIENT Pathfinder DATE 8-14-98 BY JPM

PROJECT Limestone Test CHECKED BY

Sample # 8 total sample wt. 28.0

	1"	pan
wt. retained		
% retained	0%	100%
% passing	100%	0%

SUBJECT Crushed Limestone Filter PROJECT NO. 8152Rm PAGE

CLIENT Pathfinder DATE 9-23-98 BY JPM

PROJECT Limestone Test CHECKED BY

Sample # 9 (stockpile) total sample wt. 37.6

	1½"	pan
wt. retained		
% retained	0	100
% passing	100	0

SUBJECT Crushed Limestone Filter PROJECT NO. 815-2Rm PAGE

CLIENT Pathfinder DATE 10-12-98 BY JPM

PROJECT Limestone Test CHECKED BY

Sample # 10 total sample wt. 45

	1½"	pan
wt. retained	-0-	45.0
% retained	-0-	100.0
% passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152Rm PAGE

CLIENT Pathfinder DATE 10-26-98 BY JPM

PROJECT Limestone Test CHECKED BY

Sample # 11 (Stockpile) total sample wt. 51.0

	1½"	pan
wt. retained	-0-	51.0
% retained	-0-	100.0
% passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152Rm PAGE

CLIENT Pathfinder DATE 10-26-98 BY JPM

PROJECT Limestone Test CHECKED BY

Sample # 12 total sample wt. 37.3

	1½"	pan
wt. retained		
% retained	0	100%
% passing	100%	0

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 11-3-98 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 13 Total Sample Wt. 58.45

	1 5/8"	Pan
Weight Retained	-0-	58.45
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter Breakdown PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 11-9-98 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 14 Total Sample Wt. 50.95

	1 5/8	1.5	1.25	1.00	.75	.50	.25	Pan
wt. retained	0	0	.85	5.25	7.1	8.95	8.55	20.25
% Passing	100.0	100.0	98.3	89.0	74.1	56.5	39.7	-0-
% Retained	-0-	-0-	1.7	10.3	13.9	17.6	16.8	39.7

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 11-9-98 BY JFM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 15 Total Sample Wt. 53.6

	1 5/8"	Pan
Weight Retained	-0-	53.6
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 11-12-98 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 16 Total Sample Wt. 56.0

	1 5/8"	Pan
Weight Retained	-0-	56.0 ~~100.0~~
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 11-18-98 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 17 Total Sample Wt. 44.0

	1 5/8"	Pan
Weight Retained	-0-	44.0
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 11-20-98 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 18 Total Sample Wt. 39.0

	1 5/8"	Pan
Weight Retained	-0-	39.0
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 12-2-98 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 19 Total Sample Wt. 52.0

	1 5/8"	Pan
Weight Retained	-0-	52.0
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 12-21-98 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 20 Total Sample Wt. 56.25

	1 5/8"	Pan
Weight Retained	-0-	56.25
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Rock gradation samples - Filter PROJECT NO. 8152 PAGE

CLIENT Pathfinder DATE 2-27-98 BY

PROJECT Limestone Testing CHECKED BY

Pink #1 D_{50} 2.17" sample wt. 250.16

	3.47"	3"	2½"	2"	1.5"	pan
wt. ret	Ø	6.66	91.11	93.46	43.11	15.82
% ret	Ø	2.7	36.4	37.4	17.2	6.3
% pass	100	97.3	60.9	23.5	6.3	

Red #1 D_{50} 1.63" sample wt. 169.40

	2½"	2"	1½"	pan
wt. ret	Ø	17.87	85.31	66.22
% ret.	Ø	10.5	50.4	39.1
% pass	100	89.5	39.1	

Blue #1 D_{50} 1" sample wt. 56.18

	1½"	1¼"	1"	¾"	pan
wt. ret.	Ø	4.92	14.93	21.58	14.75
% ret.	Ø	8.8	26.6	38.4	26.2
% pass	100	91.2	64.6	26.2	

Crushed Limestone filter (Nom. max. part. size = 1")

#1 Sample size = 27.58

	1"	pan
wt. ret	Ø	27.58
% pass	100%	

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D_{50} 1" ROCK MULCH

1998

SUBJECT ROCK TESTING PROJECT NO. 8152 RM PAGE

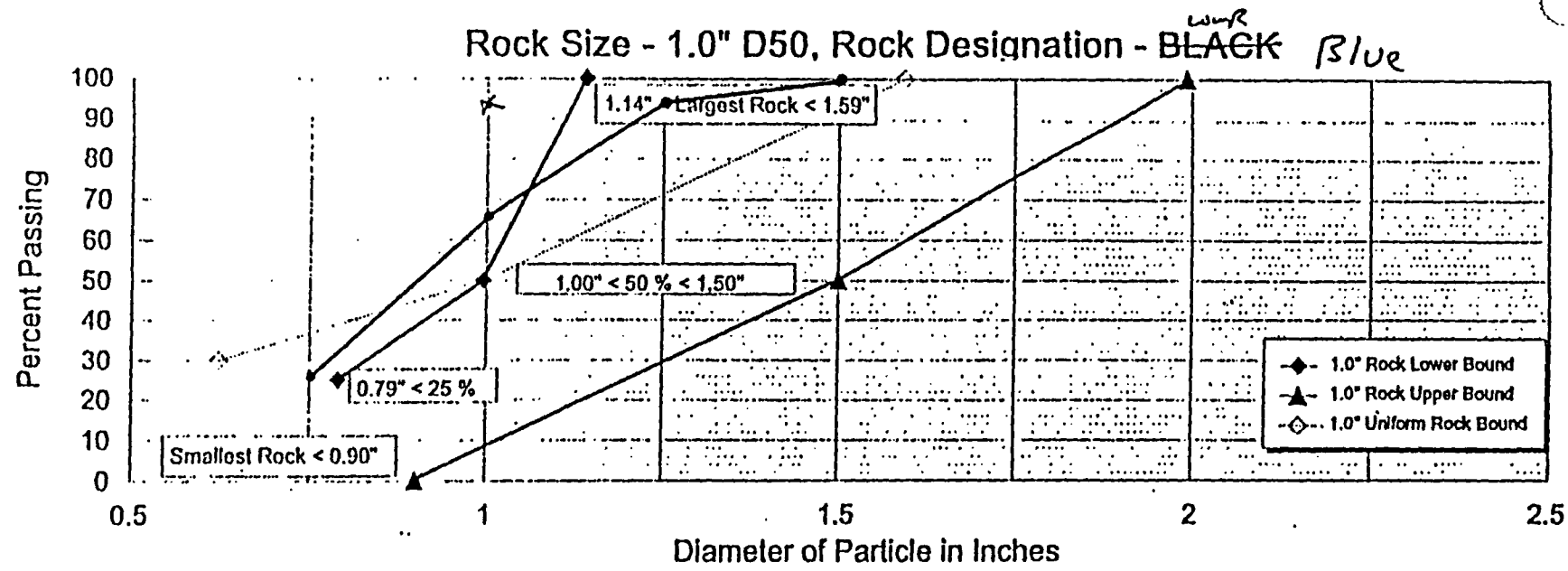
CLIENT Pathfinder mines DATE 3-2-98 BY

PROJECT CHECKED BY

TOTAL WT 55.15

	Weight	% retained	% Passing
1 1/2	.55	~~.55~~ 1 ~~2.2~~	~~99~~
1 1/4	2.20	~~2.2~~ ~~4.5~~	96.01 95.0
1	10.5	~~10.5~~ ~~19.03~~ 24.02	~~80.96~~ 75.97
3/4	16.5	~~16.5~~ ~~29.92~~ 53.94	~~70.08~~ 46.06
Pan	25.15	~~25.15~~ 45.6	~~25.40~~ 54.20

test # 1 R


Rock Size - 1.0" D50, Rock Designation - BLACK
Blue
Percent Passing
Diameter of Particle in Inches
1.14" < Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

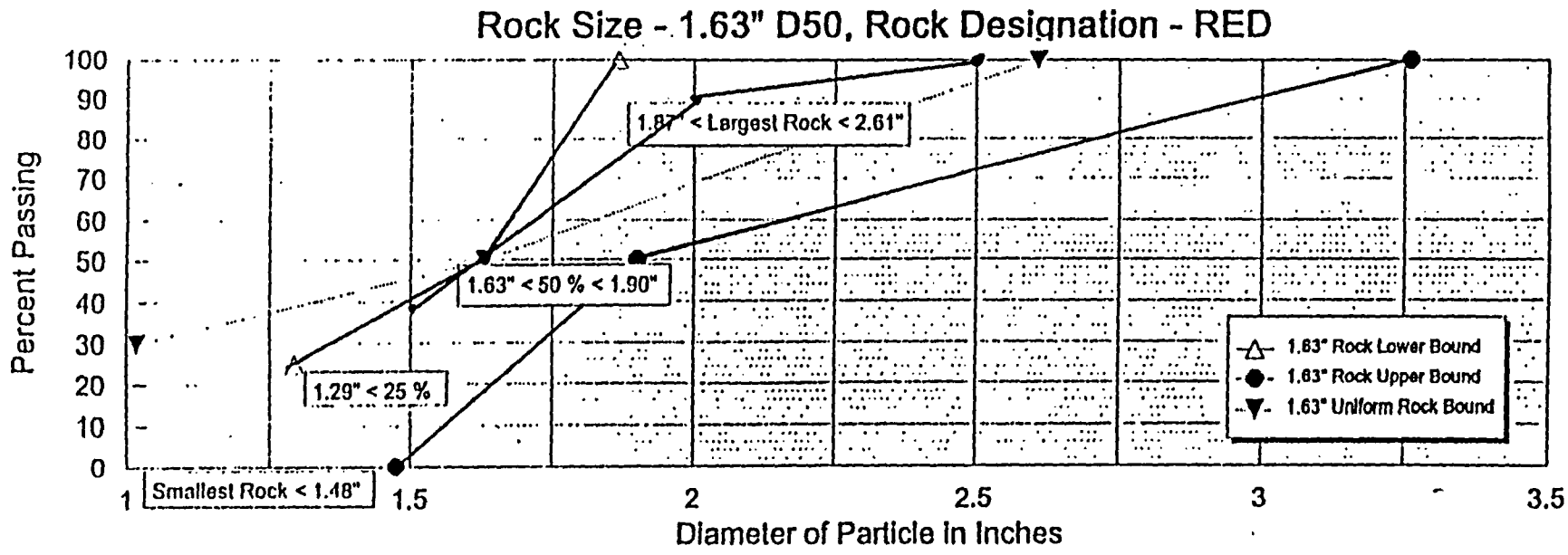
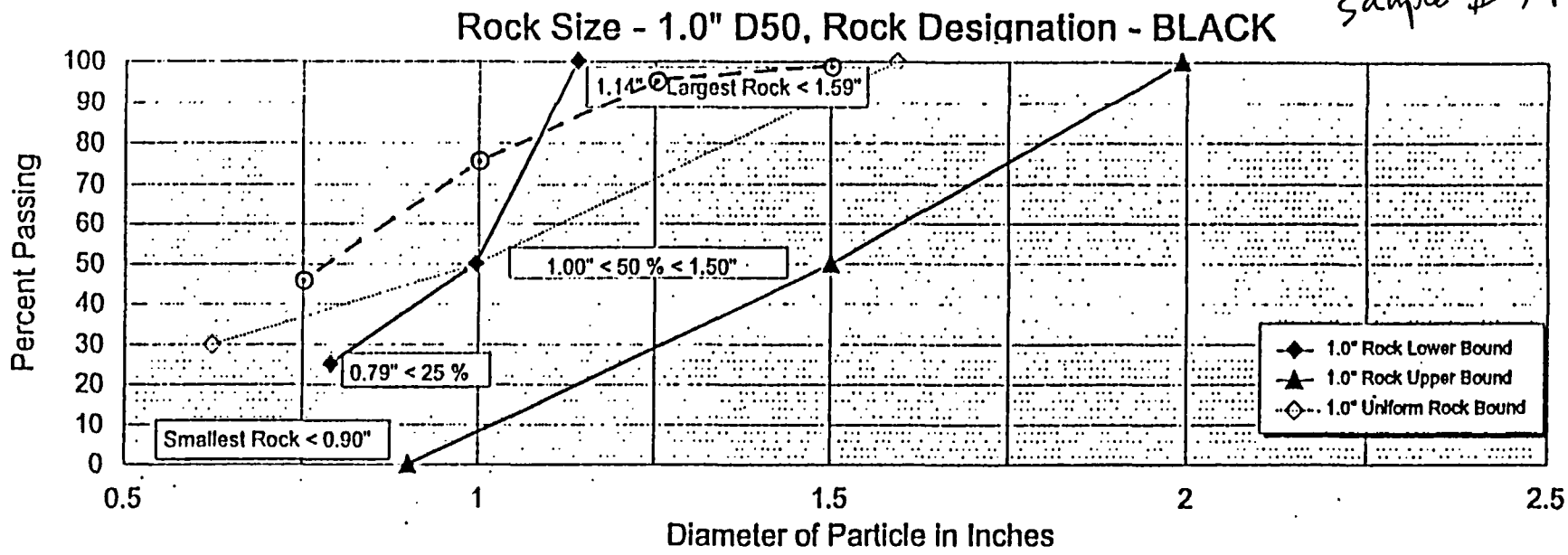

Rock Size - 1.63" D50, Rock Designation - RED
Percent Passing
Diameter of Particle in Inches
1.87" < Largest Rock < 2.61"
1.63" < 50 % < 1.90"
1.29" < 25 %
Smallest Rock < 1.48"
1.63" Rock Lower Bound
1.63" Rock Upper Bound
1.63" Uniform Rock Bound

FIGURE 3

3-2-98
sample # 5, R(1)



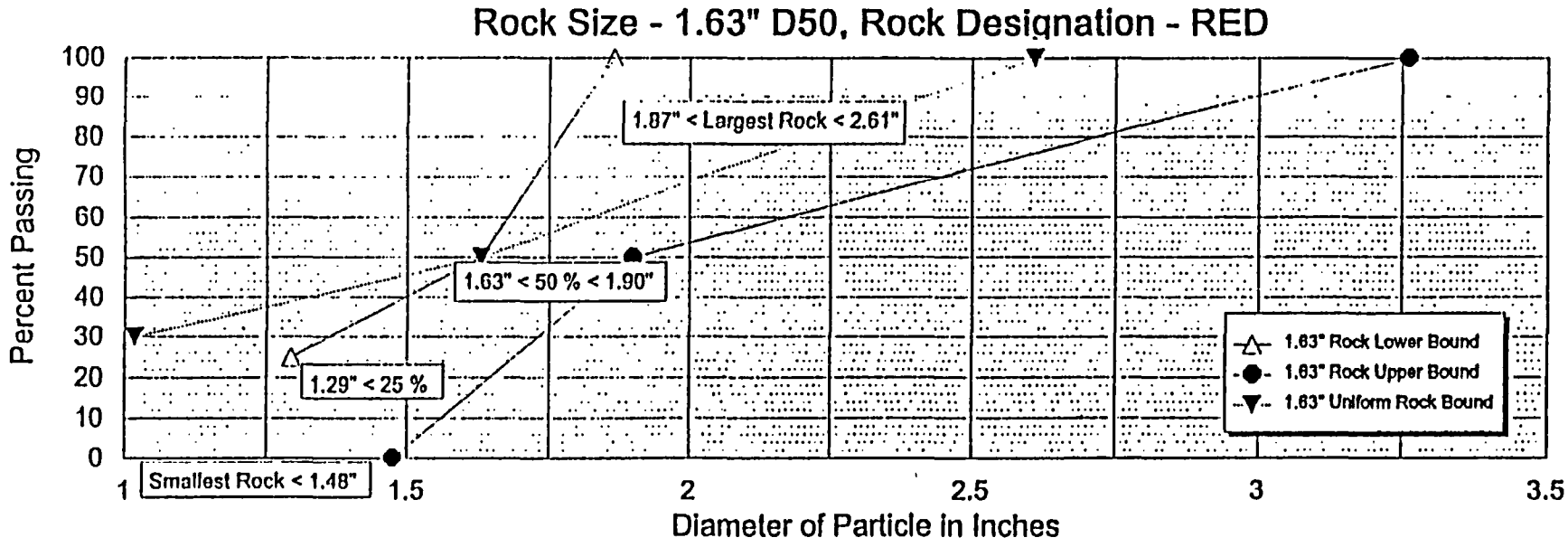


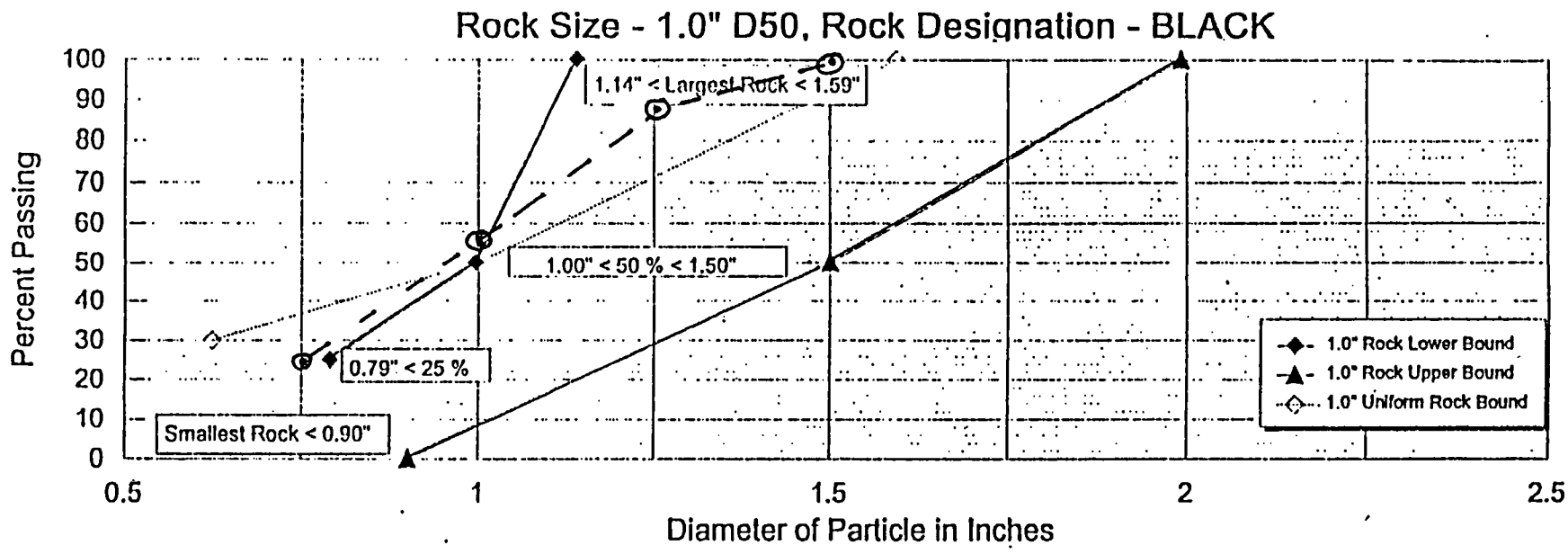
FIGURE 3

SUBJECT D_{50} 1" Retest #2 PROJECT NO. 8152Rm PAGE 1/1

CLIENT Path Finder DATE 3-3-78 BY Wme

PROJECT Limestone Testing CHECKED BY

	1½"	1¼"	1"	¾"	pan	
wt. ret.	Ø	5.55	17.51	15.44	12.16	50.64
% ret.	0	11.0	34.5	30.5	24.0	
% pass.	100	89.0	54.5	24.0		


Rock Size - 1.0" D50, Rock Designation - BLACK
Percent Passing
Diameter of Particle in Inches
1.14" < Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

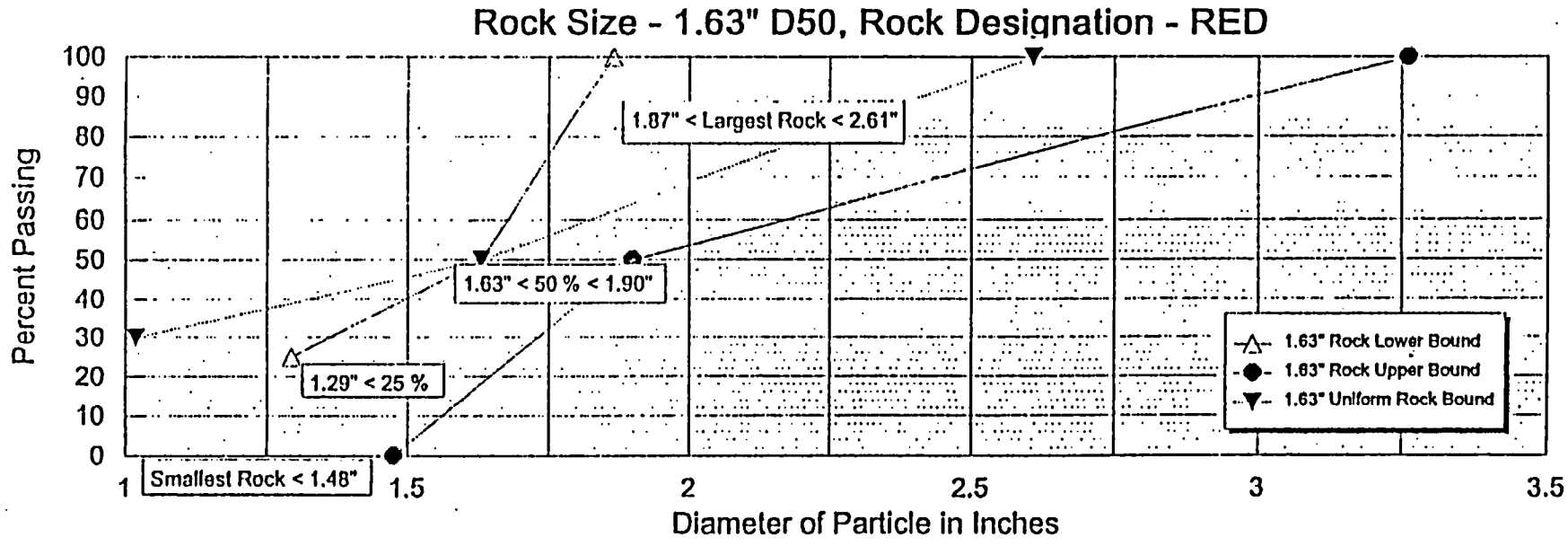

Rock Size - 1.63" D50, Rock Designation - RED
Percent Passing
Diameter of Particle in Inches
1.87" < Largest Rock < 2.61"
1.63" < 50 % < 1.90"
1.29" < 25 %
Smallest Rock < 1.48"
1.63" Rock Lower Bound
1.63" Rock Upper Bound
1.63" Uniform Rock Bound

FIGURE 3

SUBJECT D50 1" Black PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-4-98 BY

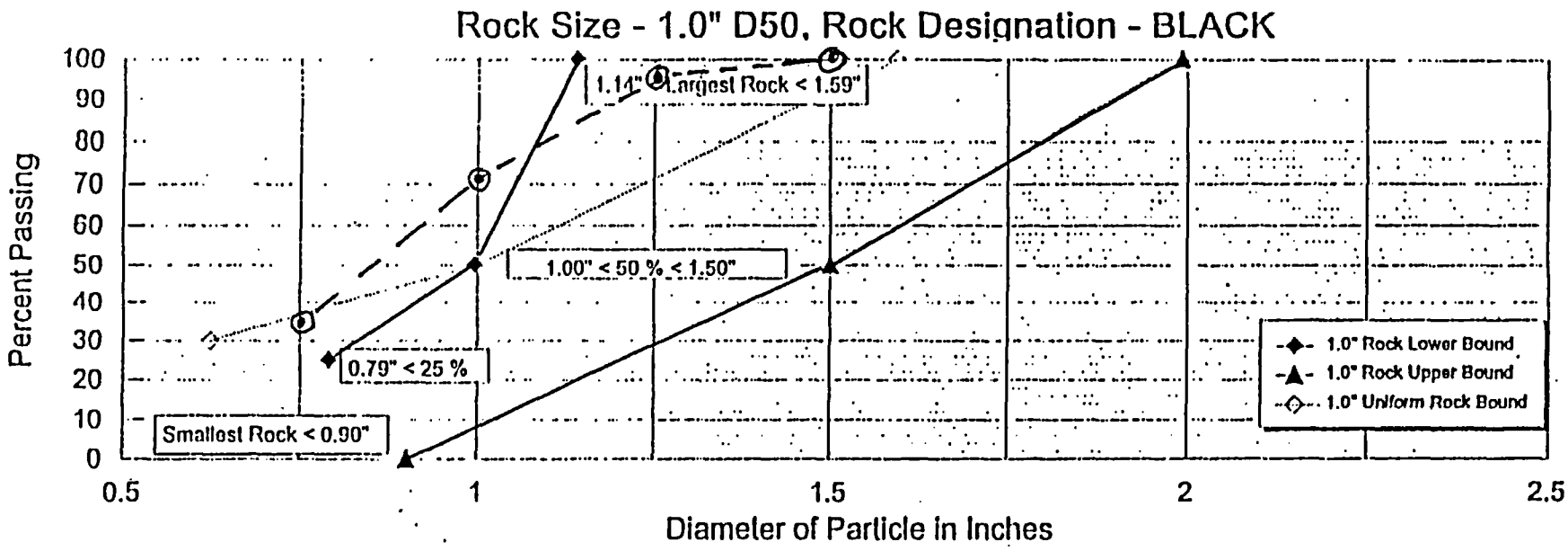
PROJECT Limestone Rock Testing CHECKED BY

Sample # 1 R(3) Total Sample wt. 46.95

wt. retained

Screen size	1½"	1¼"	1"	¾"	pan
	Ø	2.29	11.66	17.00	16.00
Sheet total					
TOTAL	Ø	2.29	11.66	17.00	16.00
% Retained	Ø	4.9	24.8	36.2	34.1
% Passing	100	95.1	70.3	34.1	

INBERG-MILLER ENGINEERS


Rock Size - 1.0" D50, Rock Designation - BLACK
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
0.5
1
1.5
2
2.5
Diameter of Particle in Inches
1.14" Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

SUBJECT D_{50} 1" Black PROJECT NO. 8152 Rm PAGE

CLIENT Path Finder DATE 3-5-98 BY

PROJECT Limestone Rock Testing CHECKED BY

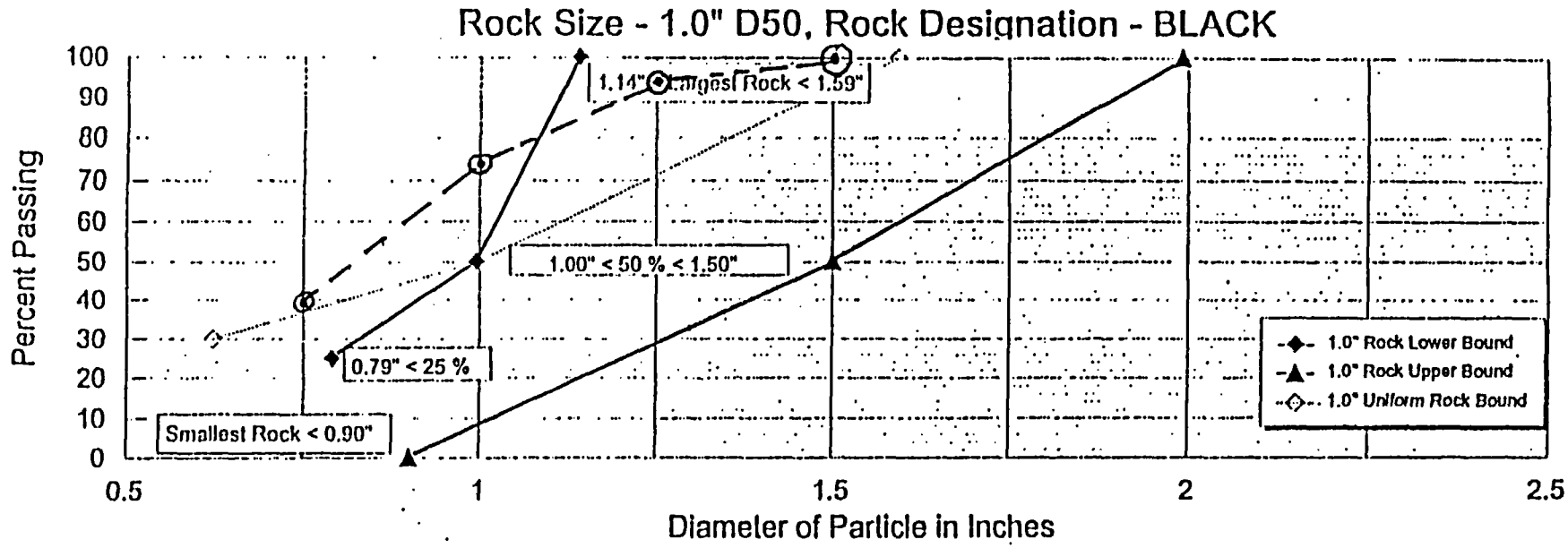
Sample # 1R(4) Total Sample wt. 55.32

wt. retained

Screen size	1½"	1¼"	1"	¾"	pan
	Ø	3.57	11.43	18.32	22.00
Sheet total					
TOTAL	Ø	3.57	11.43	18.32	22.00
% Retained	Ø	6.4	20.7	33.1	39.8
% Passing	100	93.6	72.9	39.8	

INBERG-MILLER ENGINEERS

Sample # 1 R(4) 3-5-9



SUBJECT D50 1" ~~Pitrock~~ Lime Blue PROJECT NO. 8152 Run PAGE

CLIENT Path finder DATE 3-11-98 BY

PROJECT Limestone Rock Testing CHECKED BY

Sample # 1R(5) Total Sample wt. 51.71 ✓

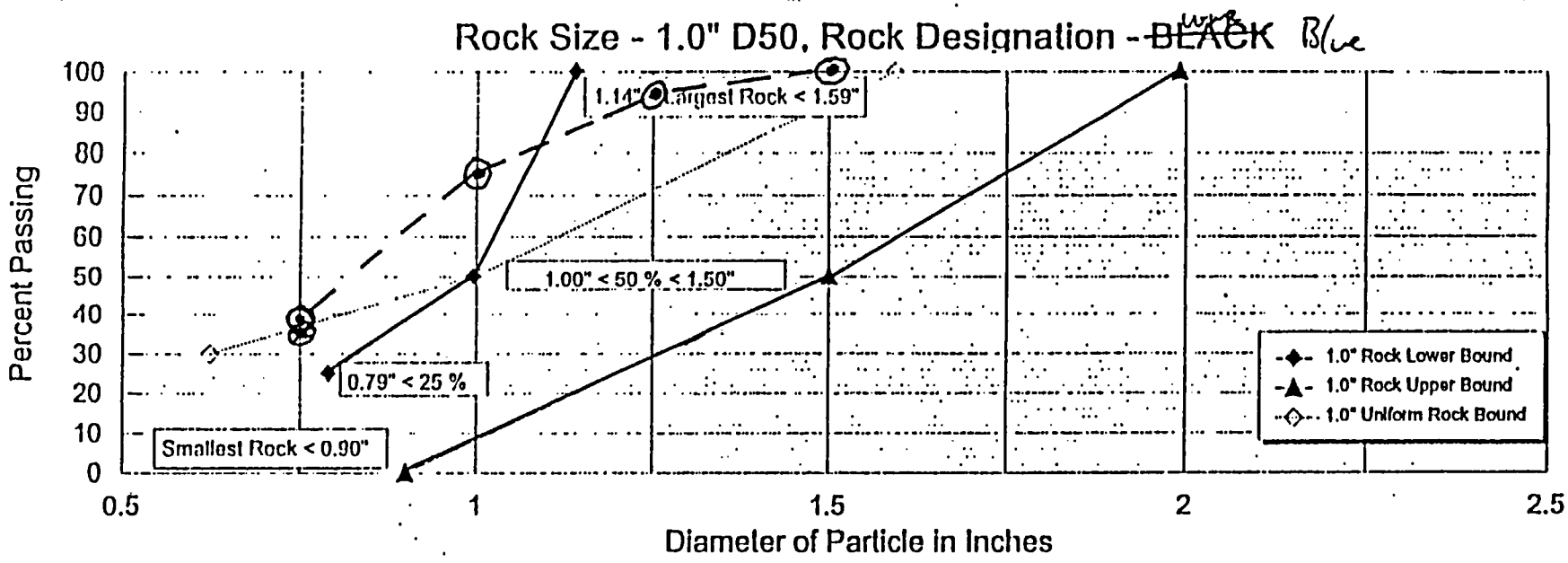
wt. retained

Screen SIZE	1½"	1¼"	1"	¾"	pan
	Ø	2.65	10.82	18.08	20.16
Sheet total					
TOTAL	Ø	2.65	10.82	18.08	20.16
% Retained	Ø	5.1	20.9 ✓	35.0 ✓	39.0 ✓
% Passing	100	94.9	74.0	39.0	

INBERG-MILLER ENGINEERS

3-11-98

Sample # 1R (5)



SUBJECT D50 1" Black PROJECT NO. 8152 Rm PAGE 1/1

CLIENT Pathfinder DATE 3-12-98 BY WMR

PROJECT Limestone Rock Testing CHECKED BY

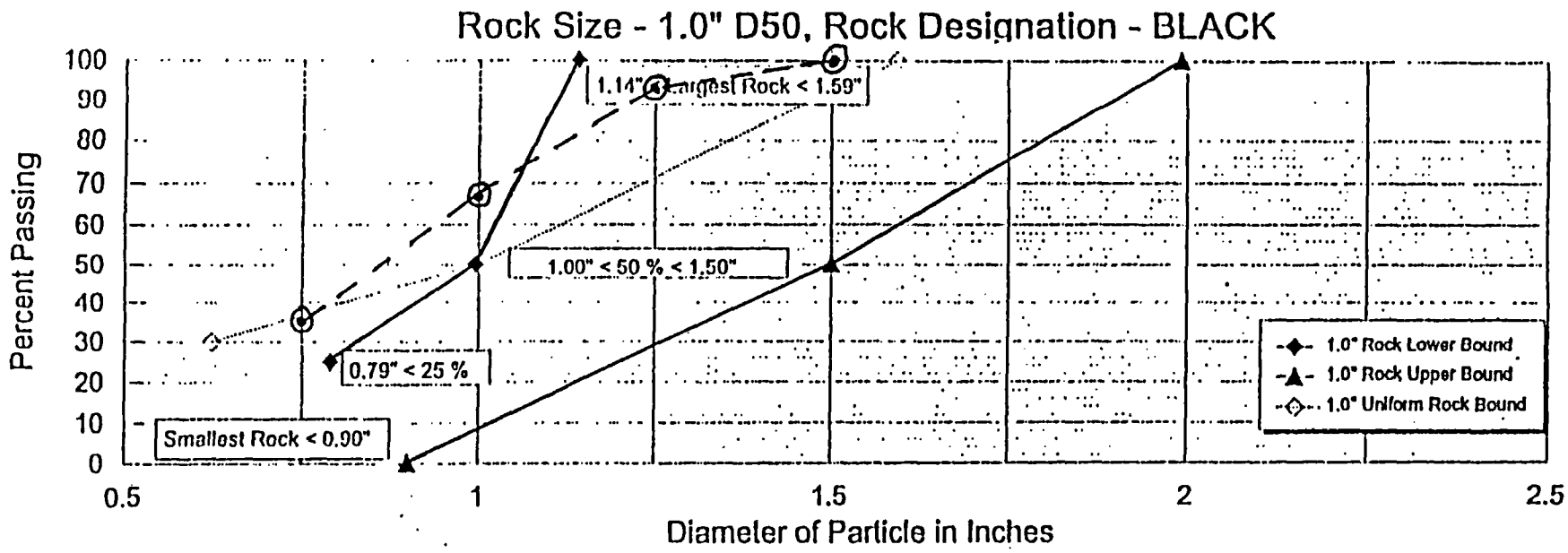
Sample # 1R(6) Total Sample wt. 47.80

wt. retained

Screen Size	1½"	1¼"	1"	¾"	pan
	Ø	3.10	12.65	15.18	16.87
Sheet total					
TOTAL	Ø	3.10	12.65	15.18	16.87
% Retained	Ø	6.5	26.5	31.7	35.3
% Passing	100	93.5	67.0	35.3	

INBERG-MILLER ENGINEERS

Sample # (6) 3-12-98



3.06

SUBJECT D50 1" Black PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-13-98 BY

PROJECT Limestone Rock Testing CHECKED BY

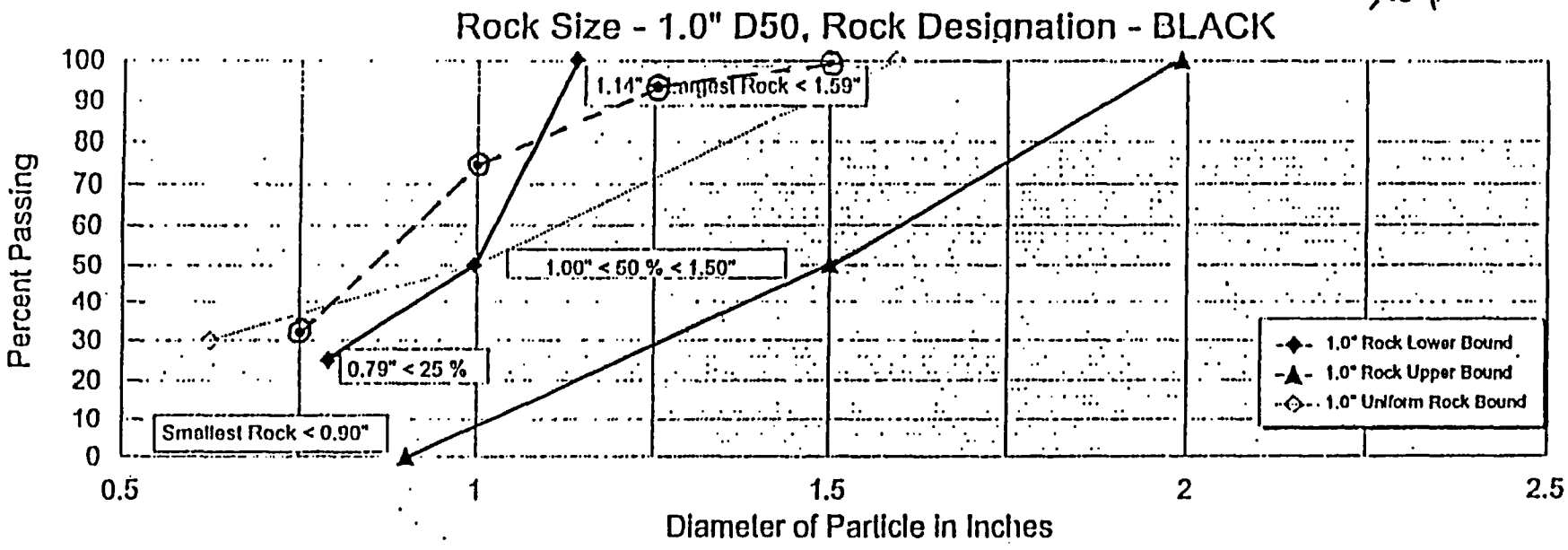
Sample # 1R(7) Total Sample wt. 50.67

wt. retained

Screen Size	1½"	1¼"	1"	¾"	pan
	0.09	3.08	9.72	21.84	15.94
Sheet total					
TOTAL	0.09	3.08	9.72	21.84	15.94
% Retained	0.2	6.1	19.2	43.1	31.4
% Passing	99.8	93.7	74.5	31.4	—

INBERG-MILLER ENGINEERS

3-13-98 Sample # (.7)



SUBJECT D50 1" Black PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-16-98 BY WWR

PROJECT Limestone Rock Testing CHECKED BY

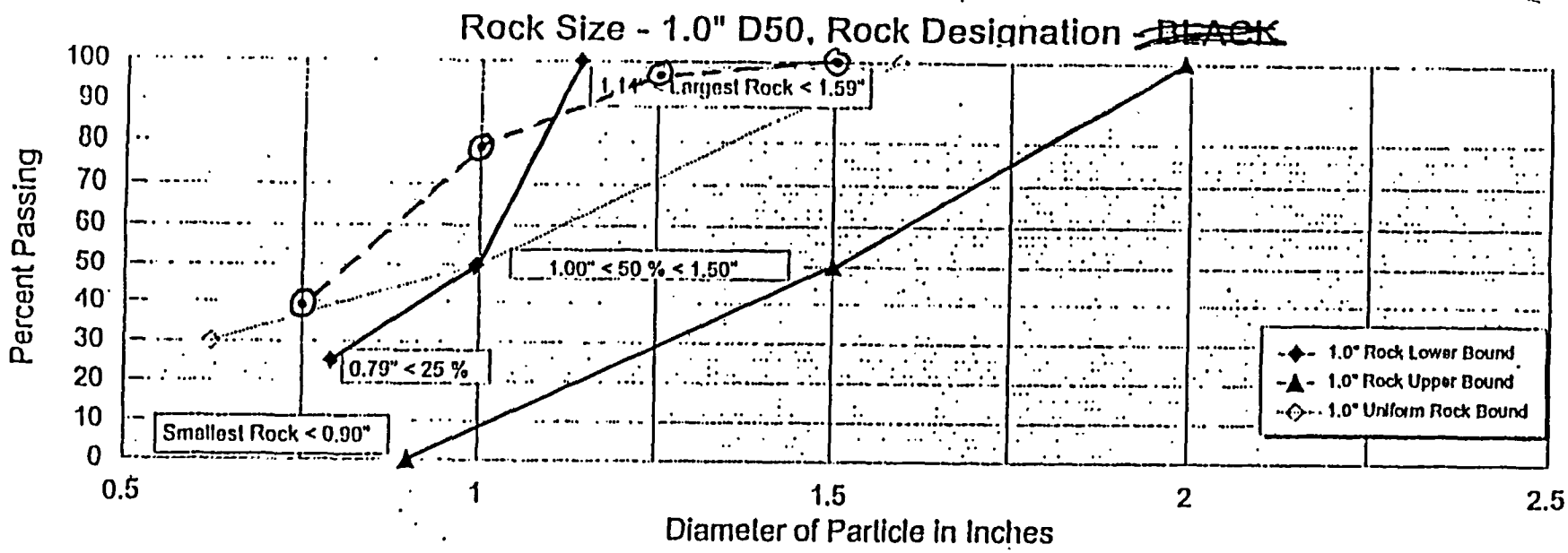
Sample # 1R(8) Total Sample wt. 56.88

wt. retained

Screen Size	1½"	1¼"	1"	¾"	pan
	Ø	1.58	10.29	22.35	22.66
Sheet total					
TOTAL	Ø	1.58	10.29	22.35	22.66
% Retained	Ø	2.8%	18.1%	39.3%	39.8%
% Passing	100	97.2%	79.1%	39.8%	—

INBERG-MILLER ENGINEERS

3-16-98


Rock Size - 1.0" D50, Rock Designation ~~BLACK~~
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
0.5
1
1.5
2
2.5
Diameter of Particle in Inches
1.14" Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

SUBJECT D50 1" Black PROJECT NO. 8152 Rm PAGE 1/1

CLIENT Path Finder DATE 3-17-98 BY WWR

PROJECT Limestone Rock Testing CHECKED BY

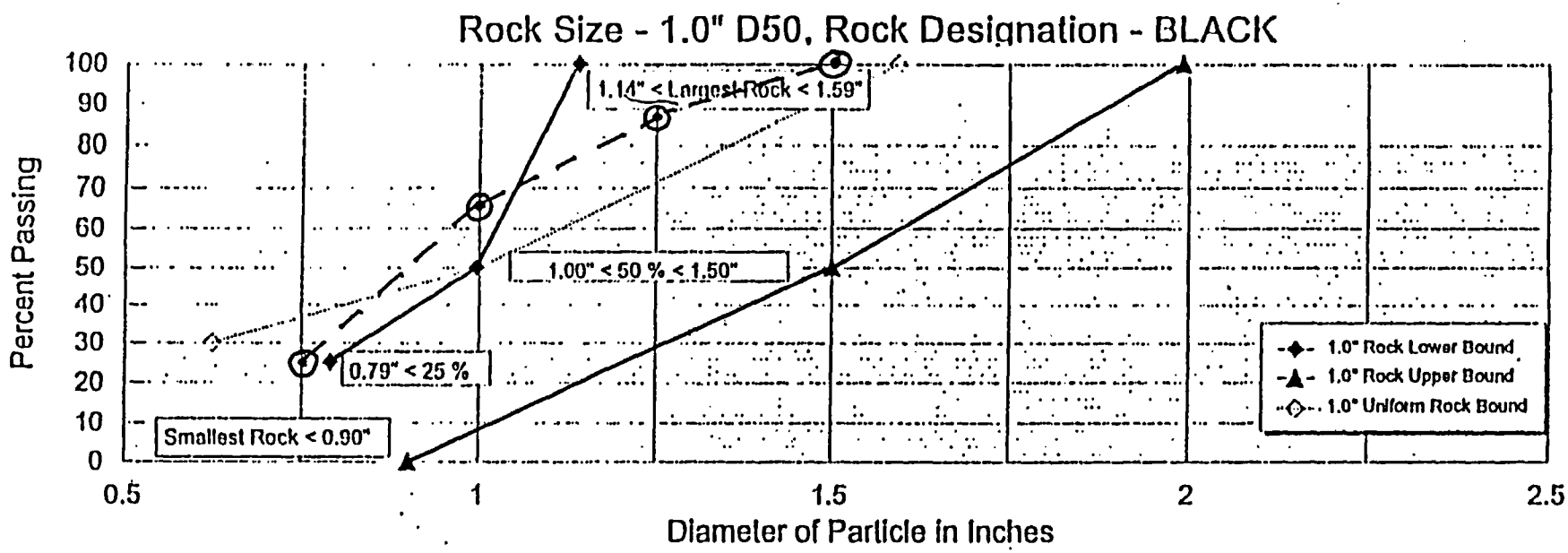
Sample # 1R (9) Total Sample wt. 56.10

wt. retained

Screen SIZE	1½"	1¼"	1"	¾"	pan
	Ø	6.69	12.85	22.02	14.54
Sheet total					
TOTAL	Ø	6.69	12.85	22.02	14.54
% Retained	Ø	11.9	22.9	39.3	25.9
% Passing	100	88.1	65.2	25.9	

INBERG-MILLER ENGINEERS

3-17-98


Rock Size - 1.0" D50, Rock Designation - BLACK
Percent Passing
Diameter of Particle in Inches
100
90
80
70
60
50
40
30
20
10
0
0.5
1
1.5
2
2.5
1.14" < Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

SUBJECT D50 1" Black PROJECT NO. 8152 Run PAGE

CLIENT Path finder DATE 3-17-98 p.m. BY WMR

PROJECT Limestone Rock Testing CHECKED BY

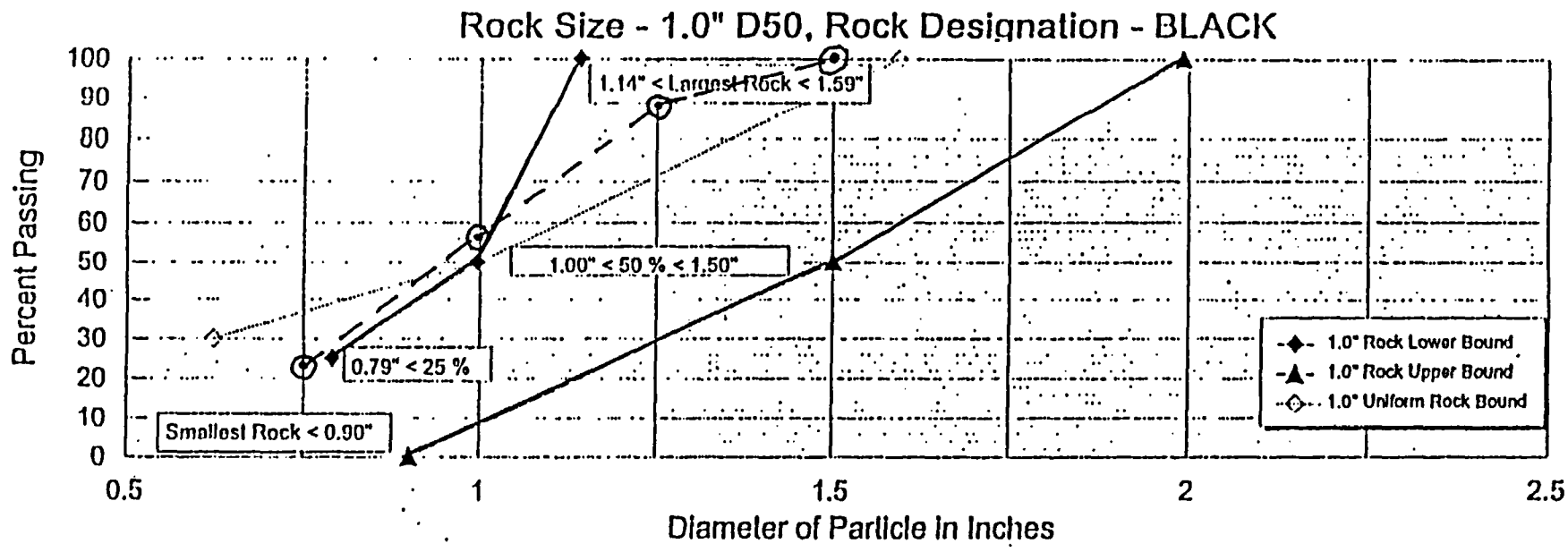
Sample # 1R (10) Total Sample wt. 56.82

wt. retained

Screen size	1½"	1¼"	1"	¾"	pan
	Ø	5.88	18.96	19.38	12.60
Sheet total					
TOTAL	Ø	5.88	18.96	19.38	12.60
% Retained	Ø	10.3	33.4	34.1	22.2
% Passing	100	89.7	56.3	22.2	—

INBERG-MILLER ENGINEERS

3-17-98 p.m.


Rock Size - 1.0" D50, Rock Designation - BLACK
Percent Passing
Diameter of Particle in Inches
100
90
80
70
60
50
40
30
20
10
0
0.5
1
1.5
2
2.5
1.14" < Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

SUBJECT D50 1" Black PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-20-98 BY

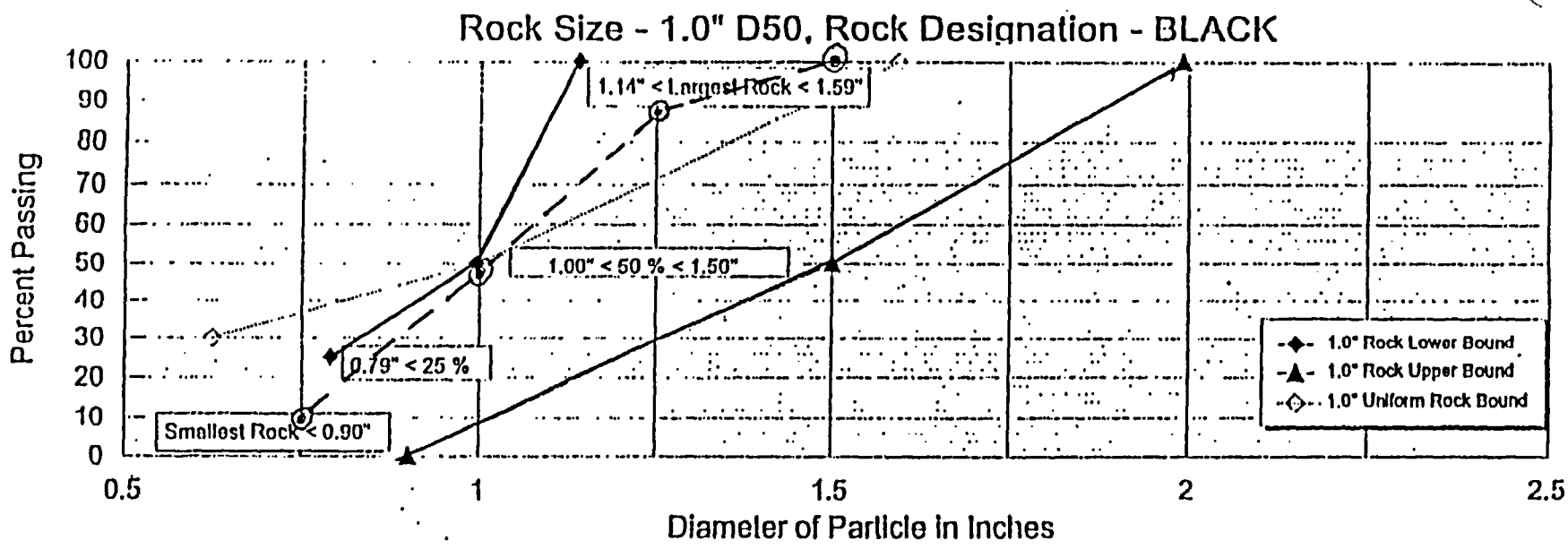
PROJECT Limestone Rock Testing CHECKED BY

Sample # 1R (11) Total Sample wt. 47.43

wt. retained

Screen SIZE	1½"	1¼"	1"	¾"	pan
		5.05	18.85	18.97	4.56
Sheet total					
TOTAL	Ø	5.05	18.85	18.97	4.56
% Retained	Ø	10.7	39.7	40.0	9.6
% Passing	100	89.3	49.6	9.6	—

INBERG-MILLER ENGINEERS


Rock Size - 1.0" D50, Rock Designation - BLACK
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
0.5
1
1.5
2
2.5
Diameter of Particle in Inches
1.14" < Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

SUBJECT D50 1" Black PROJECT NO. 8152 Rm PAGE 1/1

CLIENT Pathfinder DATE 3-26-98 BY Wme

PROJECT Limestone Rock Testing CHECKED BY

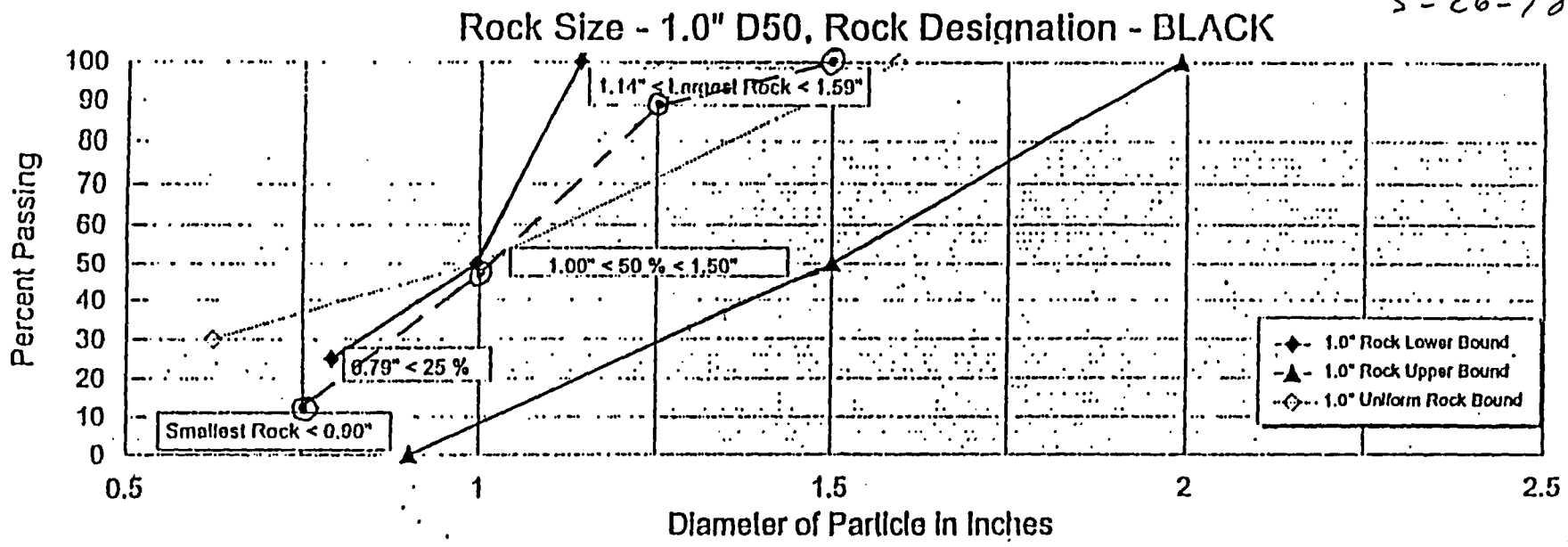
Sample # 2 Total Sample wt. 49.00

wt. retained

Screen Size	1½"	1¼"	1"	¾"	pan
	Ø	5.14	19.91	18.86	5.09
Sheet total					
TOTAL	Ø	5.14	19.91	18.86	5.09
% Retained	Ø	10.5	40.6	38.5	10.4
% Passing	100	89.5	48.9	10.4	—

INBERG-MILLER ENGINEERS

Sample #2
3-26-98



SUBJECT D50 1" Black PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 6-8 BY

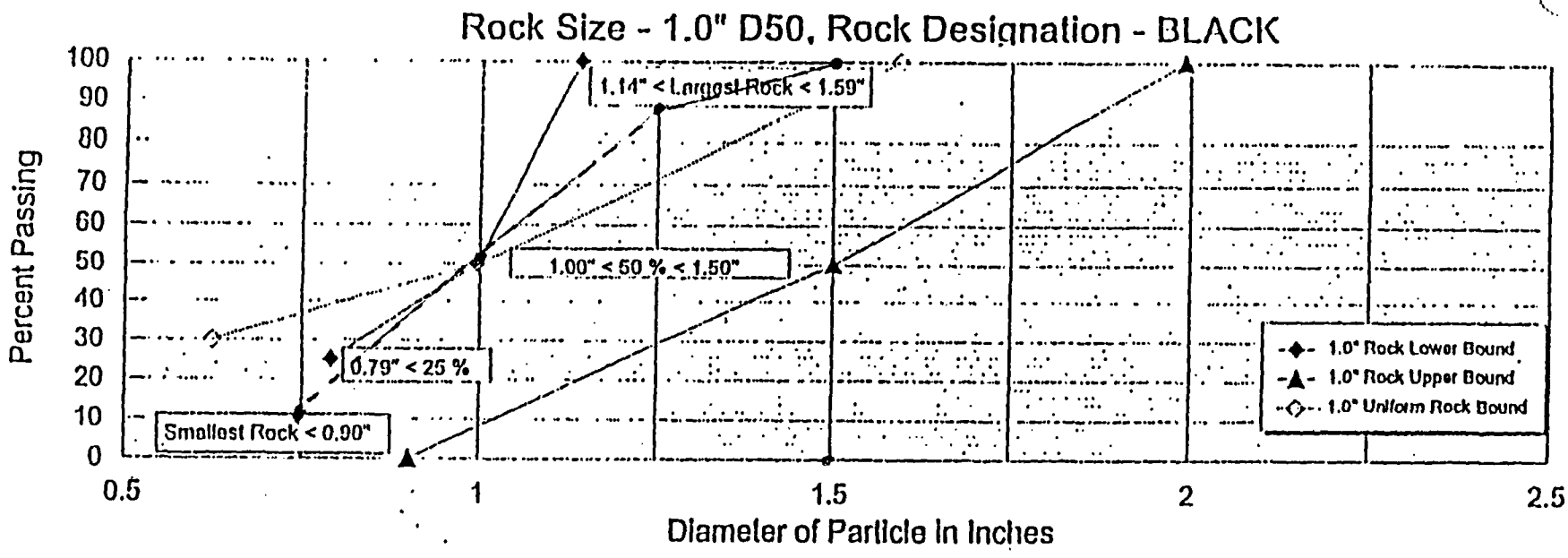
PROJECT Limestone Rock Testing CHECKED BY

Sample # 3 Total Sample wt. 56.05

wt. retained

Screen Size	1½"	1¼"	1"	¾"	pan
	0	5.6	21.0	23.90	5.45
Sheet total					
TOTAL					
% Retained	0	9.99	37.47	42.64	9.72
% Passing	100	90.01	52.54	9.90	

INBERG-MILLER ENGINEERS


Rock Size - 1.0" D50, Rock Designation - BLACK
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
0.5
1
1.5
2
2.5
Diameter of Particle in Inches
1.14" < Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

SUBJECT D_{50} 1" Black PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 10/26 BY

PROJECT Limestone Rock Testing CHECKED BY

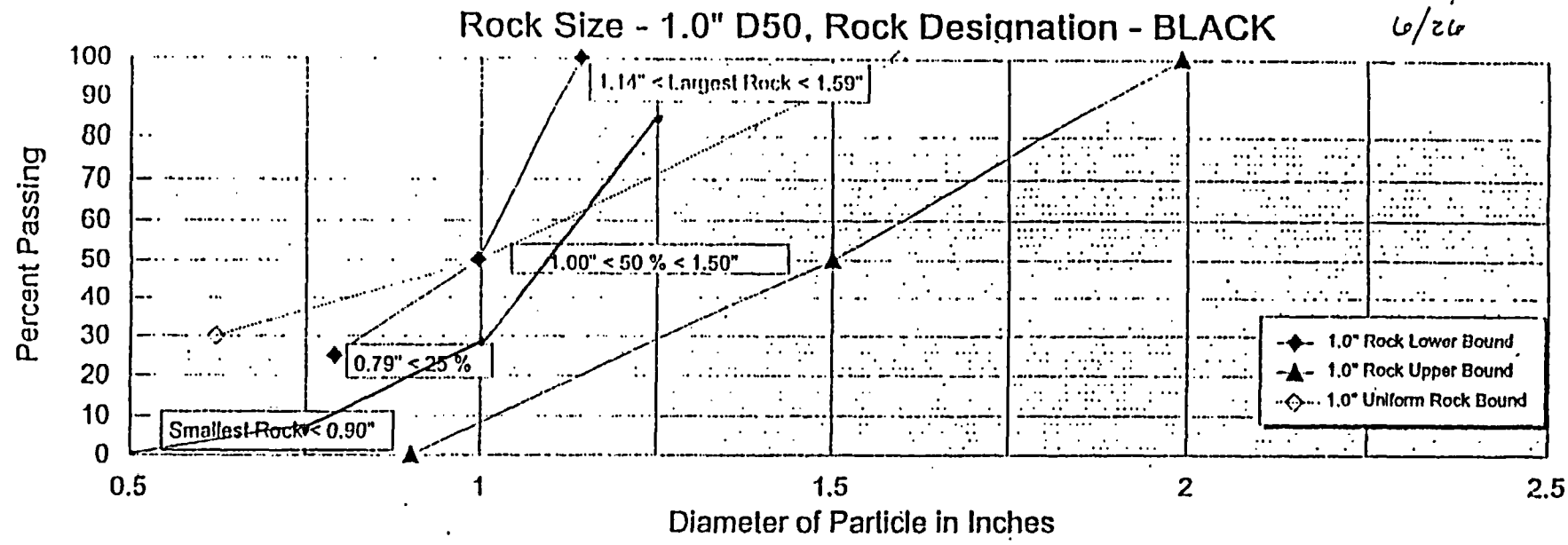
Sample # 64 Total Sample wt. 58.4

wt. retained

Screen size	1½"	1¼"	1"	¾"	pan
	0	9.0	32.4	13.5	3.4
Sieve total					
TOTAL					
% Retained		15.41	55.48	23.12	5.82
% Passing		84.59	29.11	5.99	.17

INBERG-MILLER ENGINEERS

Sample #3
6/26



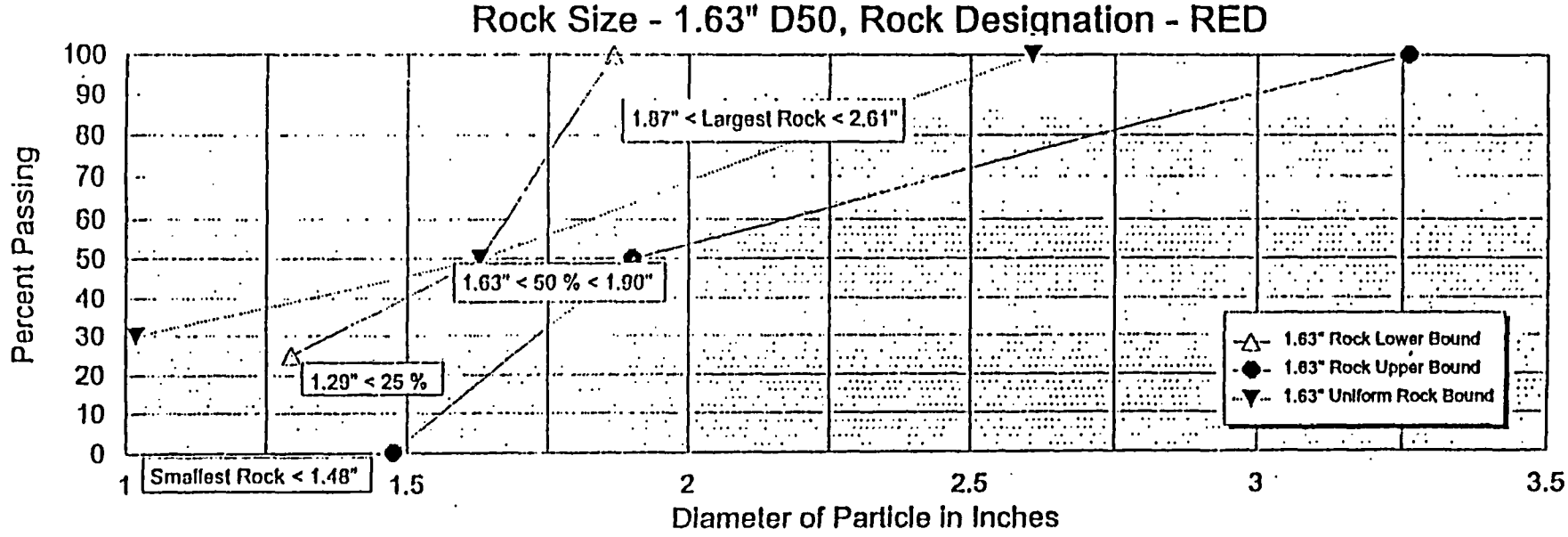


FIGURE 3

SUBJECT D50 1" Black PROJECT NO. 8152 Run PAGE

CLIENT Path finder DATE 10-1-98 BY JPM

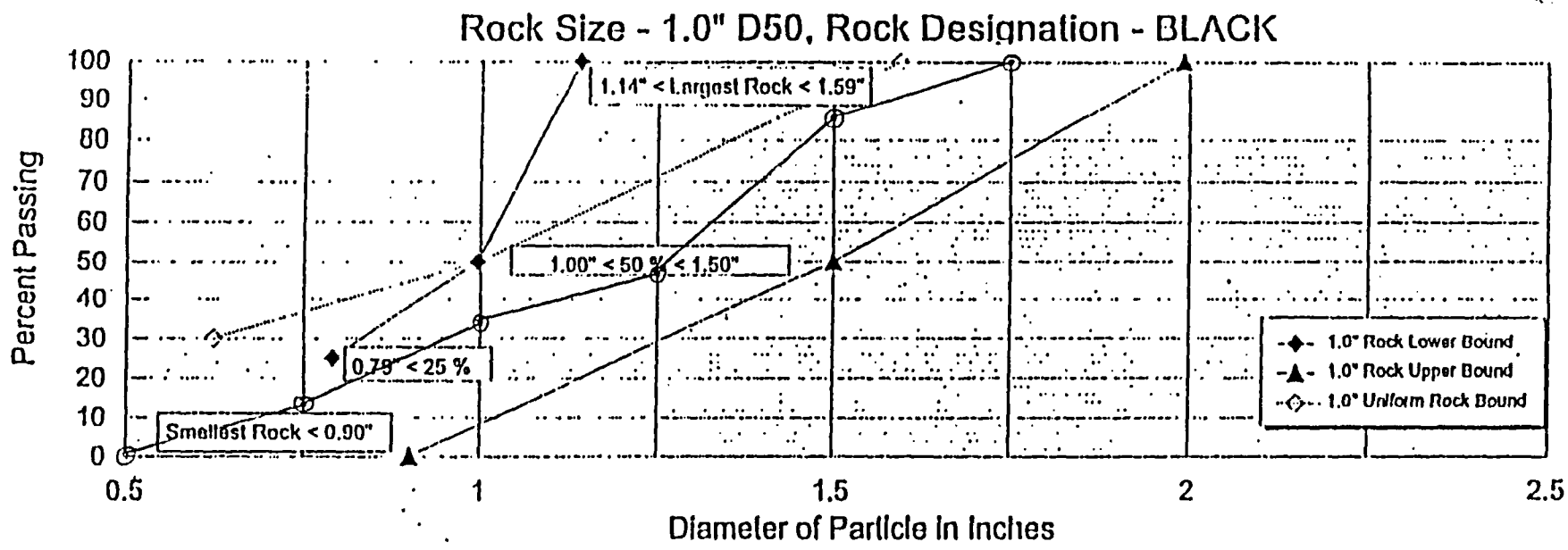
PROJECT Limestone Rock Testing CHECKED BY

Sample # 5 Total Sample wt. 76.3

wt. retained

Screen SIZE	1 1/2"	1 1/4"	1"	3/4"	pan
	10.5	27.25	12.2	16.1	10.25
Sheet total					
TOTAL					
% Retained	13.8	35.7	16.0	21.1	13.4
% Passing	86.2	50.5	34.5	13.4	-0-

INBERG-MILLER ENGINEERS


Rock Size - 1.0" D50, Rock Designation - BLACK
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
0.5
1
1.5
2
2.5
Diameter of Particle in Inches
1.14" < Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

D_{50} 1.63" ROCK MULCH

1998

SUBJECT Rock gradation samples PROJECT NO. 8152 PAGE

CLIENT Pathfinder DATE 2-27-98 BY

PROJECT Limestone Testing CHECKED BY

Pink #1 D_{50} 2.17" sample wt. 250.16

	3.47"	3"	2½"	2"	1.5"	pan
wt. ret	Ø	6.66	91.11	93.46	43.11	15.82
% ret	Ø	2.7	36.4	37.4	17.2	6.3
% pass	100	97.3	60.9	23.5	6.3	

Red #1 D_{50} 1.63" sample wt. 169.40

	2½"	2"	1½"	pan
wt. ret	Ø	17.87	85.31	66.22
% ret.	Ø	10.5	50.4	39.1
% pass	100	89.5	39.1	

Blue #1 D_{50} 1" sample wt. 56.78

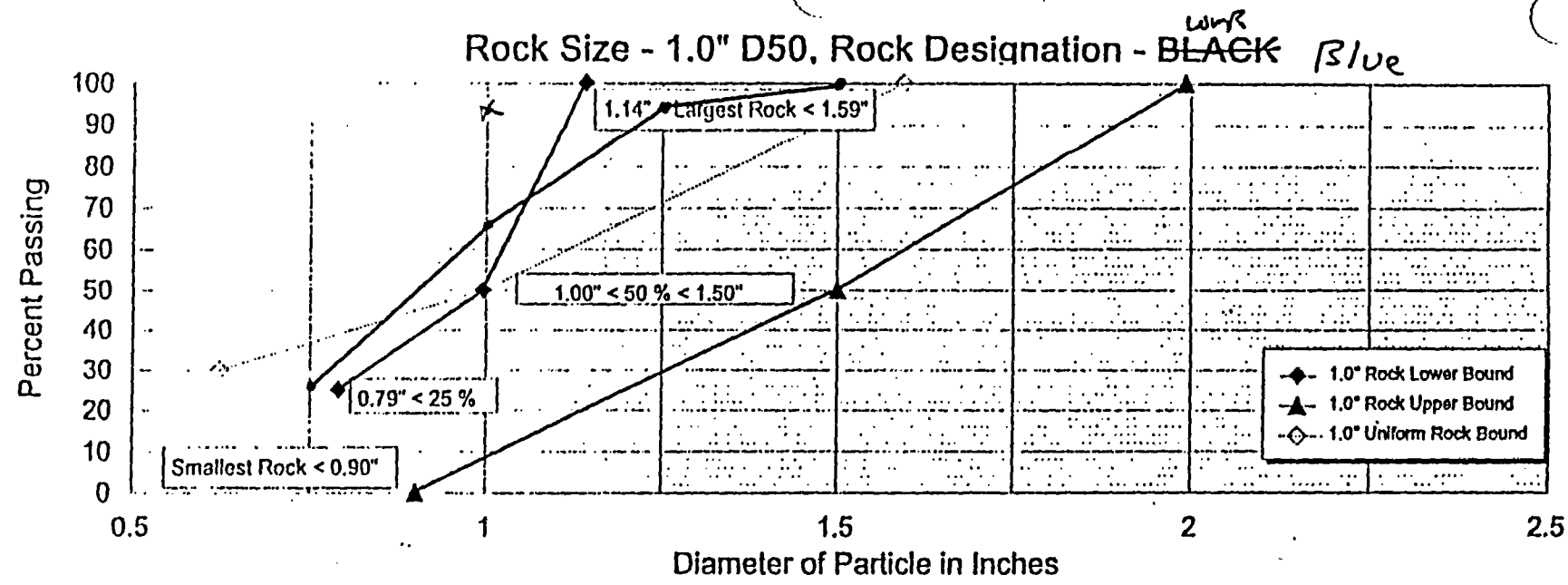
	1½"	1¼"	1"	¾"	pan
wt. ret.	Ø	4.92	14.93	21.58	14.75
% ret.	Ø	8.8	26.6	38.4	26.2
% pass	100	91.2	64.6	26.2	

Crushed Limestone fines (Nom. max. part. size = 1")

#1 Sample size = 27.58

	1"	pan
wt. ret	Ø	27.58
% pass	100%	

INBERG-MILLER ENGINEERS


Rock Size - 1.0" D50, Rock Designation - BLACK
Percent Passing
Diameter of Particle in Inches
1.14" < Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

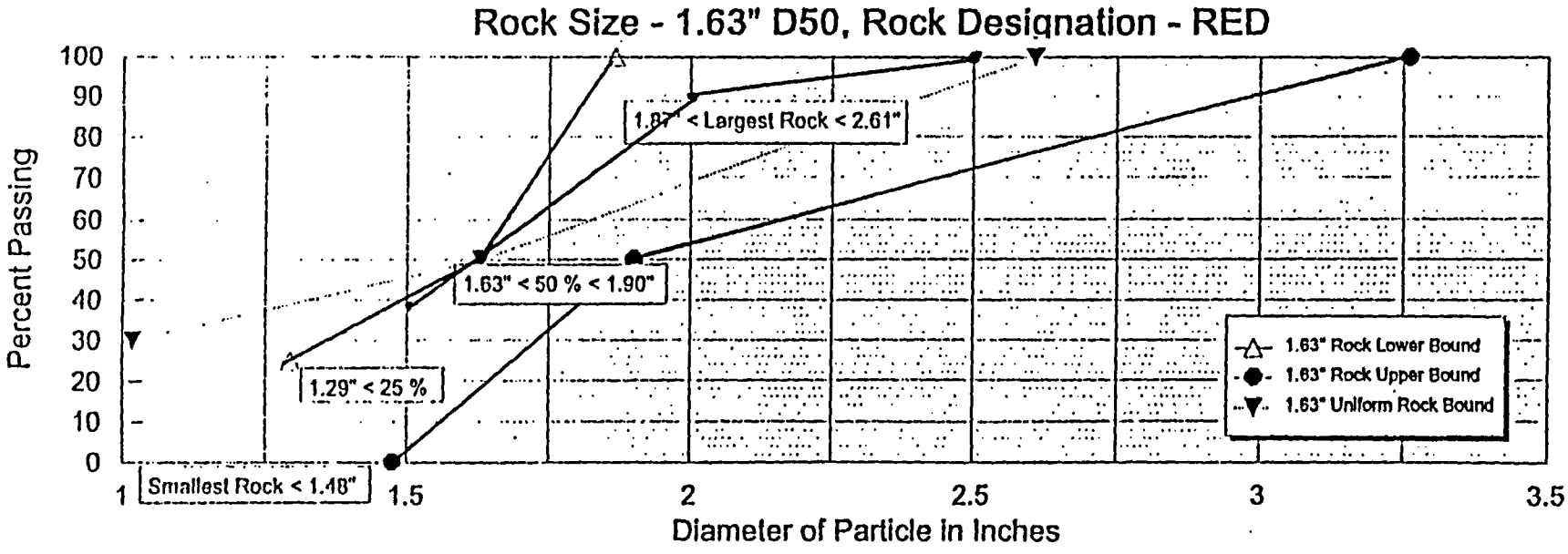

Rock Size - 1.63" D50, Rock Designation - RED
Percent Passing
Diameter of Particle in Inches
1.87" < Largest Rock < 2.61"
1.63" < 50 % < 1.90"
1.29" < 25 %
Smallest Rock < 1.48"
1.63" Rock Lower Bound
1.63" Rock Upper Bound
1.63" Uniform Rock Bound

FIGURE 3

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-17-98 BY LWMR

PROJECT Limestone Rock Testing CHECKED BY

Sample # 2 Total Sample wt. 167.23 ✓

Wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
	Ø	33.12	42.16	3.57	
			45.51		
			42.87		
Sheet total					
TOTAL	Ø	33.12 ✓	130.54 ✓	3.57 ✓	
% Retained	Ø	19.8	78.1	2.1	
% Passing	100	80.2 ✓	2.1 ✓		

INBERG-MILLER ENGINEERS

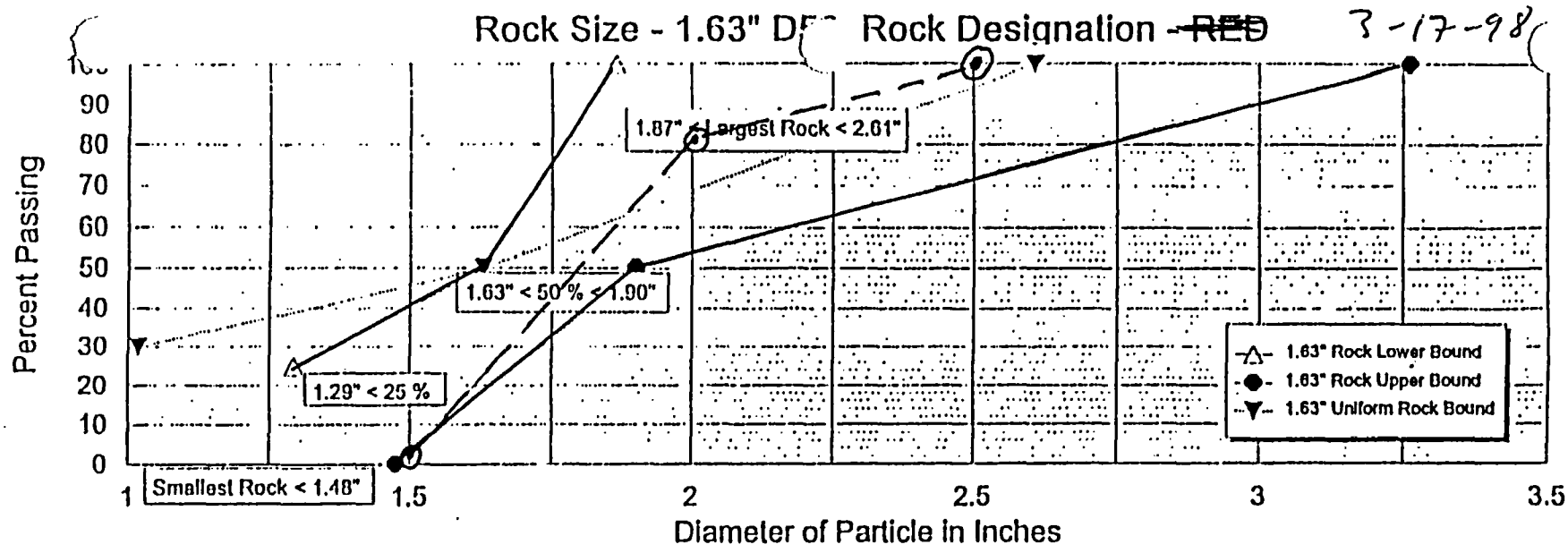

Rock Size - 1.63" D
Rock Designation - ~~RED~~
3-17-98
Percent Passing
90
80
70
60
50
40
30
20
10
0
1.87" < Largest Rock < 2.01"
1.63" < 50 % < 1.90"
1.29" < 25 %
Smallest Rock < 1.48"
1
1.5
2
2.5
3
3.5
Diameter of Particle in Inches
1.63" Rock Lower Bound
1.63" Rock Upper Bound
1.63" Uniform Rock Bound

FIGURE 3

SUBJECT D50 1.63" Red PROJECT NO. 8152 Rm PAGE

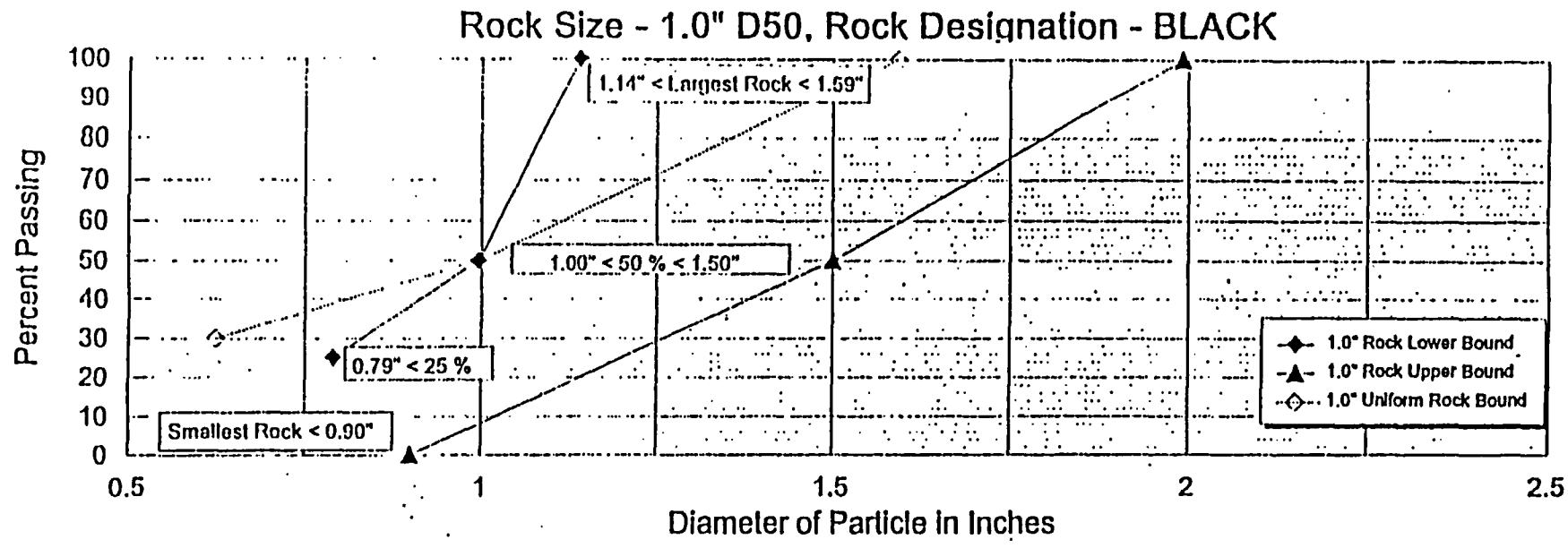
CLIENT Pathfinder DATE BY

PROJECT Limestone Rock Testing CHECKED BY

Sample # 2 Total Sample wt. 136.00 lbf

wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
63.80 lbs	0	500	44.70	40.65 44.75	
60.35 lbs					
11.85 lbs					
136.00 lbf					
Sheet total					
TOTAL	0	5.00	44.70	85.40	135.10
% Retained	0	3.68	32.87	62.79	
% Passing	100	96.3	63.4	63	


Rock Size - 1.0" D50, Rock Designation - BLACK
Percent Passing
Diameter of Particle in Inches
1.14" < Largest Rock < 1.59"
1.00" < 50 % < 1.50"
0.79" < 25 %
Smallest Rock < 0.90"
1.0" Rock Lower Bound
1.0" Rock Upper Bound
1.0" Uniform Rock Bound

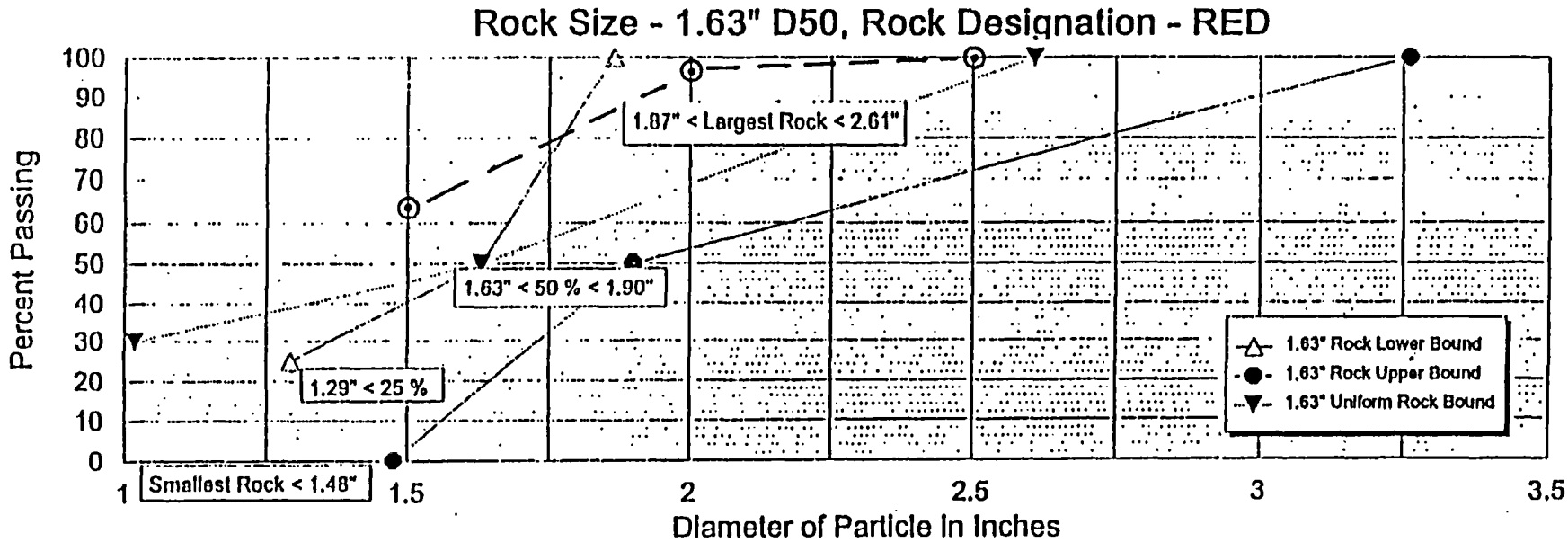

Rock Size - 1.63" D50, Rock Designation - RED
Percent Passing
Diameter of Particle in Inches
1.87" < Largest Rock < 2.61"
1.63" < 50 % < 1.90"
1.29" < 25 %
Smallest Rock < 1.48"
1.63" Rock Lower Bound
1.63" Rock Upper Bound
1.63" Uniform Rock Bound

FIGURE 3

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE BY

PROJECT Limestone Rock Testing CHECKED BY

Sample # 3+R (1) Total Sample wt. 234.7 lbs.

wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
50.05		16.85	47.15	45.70	
54.50			40.45	54.10	
49.55			29.95		
52.50					
28.10					
234.70					
Sheet total		16.85	117.55	99.80	
TOTAL	0	16.85	117.55	99.80	234.2
% Retained	0	7.19	50.19	42.62	
% Passing	100	92.8	42.7	0	

INBERG-MILLER ENGINEERS

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE BY

PROJECT Limestone Rock Testing CHECKED BY

Sample # 2A-(2) Total Sample wt. 122.4

wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
61.6 60.8	0	15.05	64.4	42.45	
Sheet total	0				
TOTAL	0	15.05	64.4	42.45	
% Retained	0	12.3	52.6	34.7	
% Passing	100	87.7	35.1	0.4	

INBERG-MILLER ENGINEERS

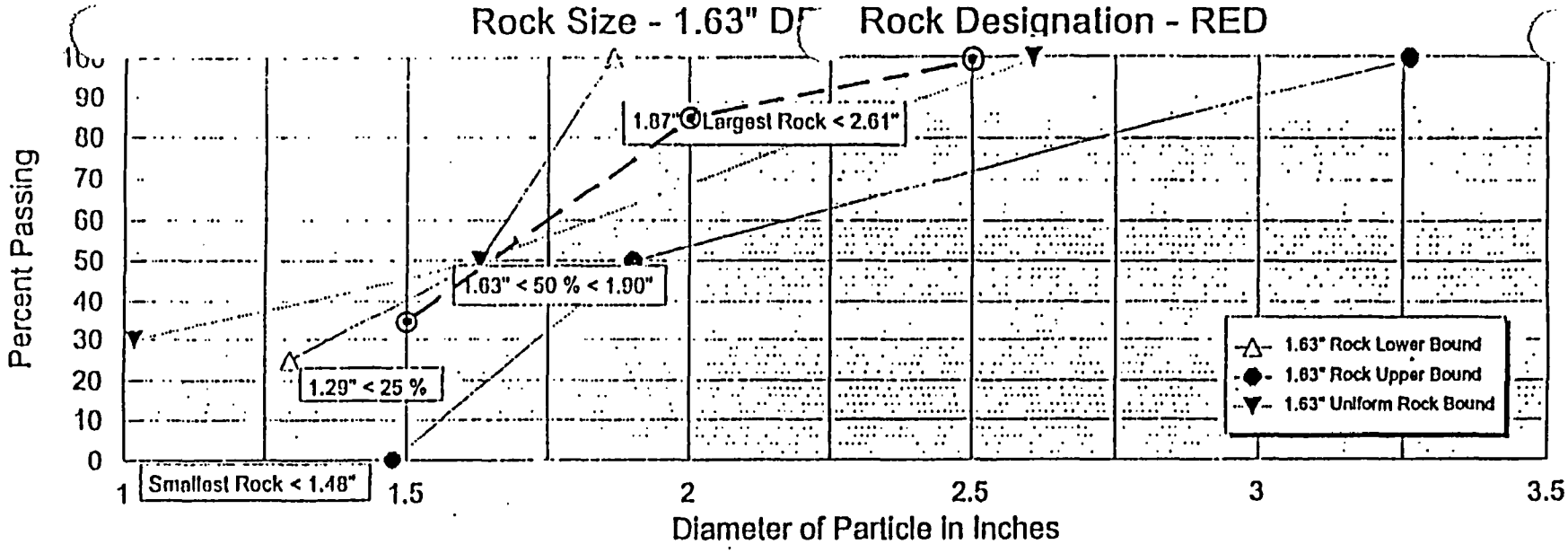


FIGURE 3

3-R-2

5-13-99

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 8-5-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 4 Total Sample wt. 94.6

wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	2.45	2.15	58.6	31.4	
Sheet total					
TOTAL	2.45	2.15	58.6	31.4	
% Retained	2.59	2.27	61.95	33.19	
% Passing	97.4	95.13	33.18	0	

INBERG-MILLER ENGINEERS

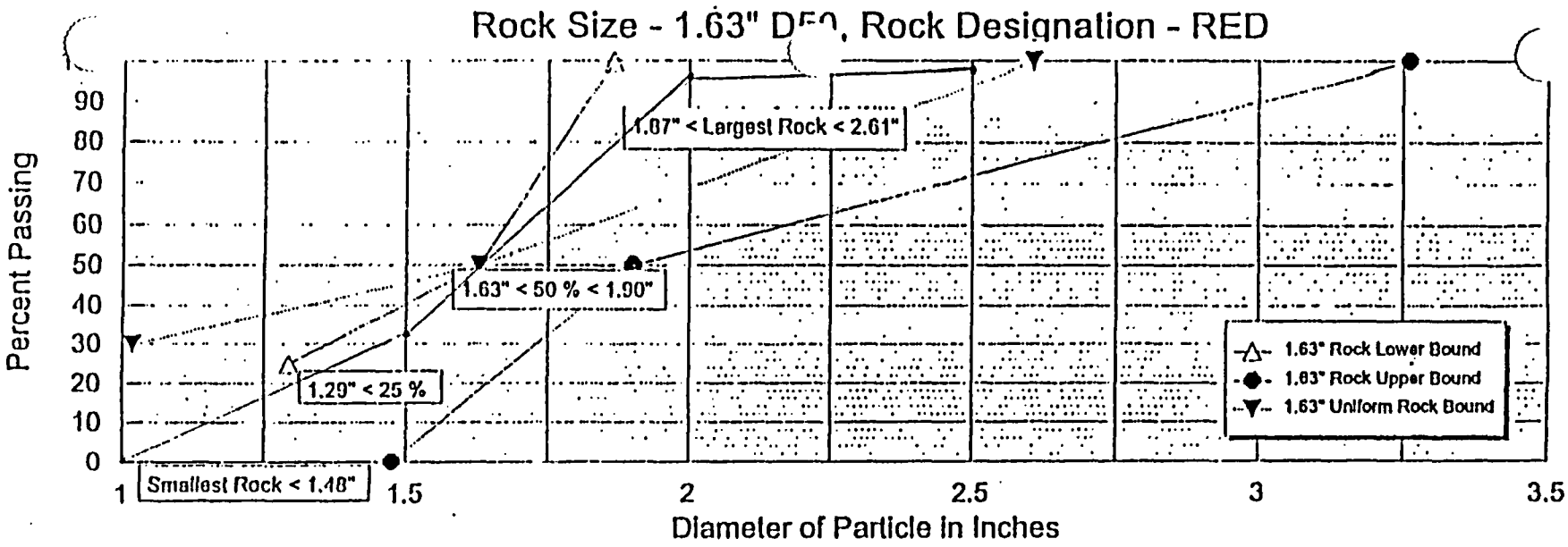

Rock Size - 1.63" D50, Rock Designation - RED
Percent Passing
90
80
70
60
50
40
30
20
10
0
1
1.5
2
2.5
3
3.5
Diameter of Particle in Inches
1.07" < Largest Rock < 2.61"
1.63" < 50 % < 1.90"
1.29" < 25 %
Smallest Rock < 1.48"
1.63" Rock Lower Bound
1.63" Rock Upper Bound
1.63" Uniform Rock Bound

FIGURE 3

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 10-8-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 5 Total Sample wt. 93.45

wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	0	6.6	45.0	41.85	
Sheet total					
TOTAL	0	6.6	45.0	41.85	
% Retained	0	7.06	48.15	44.78	
% Passing	100.0	93.0	44.8	0	

INBERG-MILLER ENGINEERS

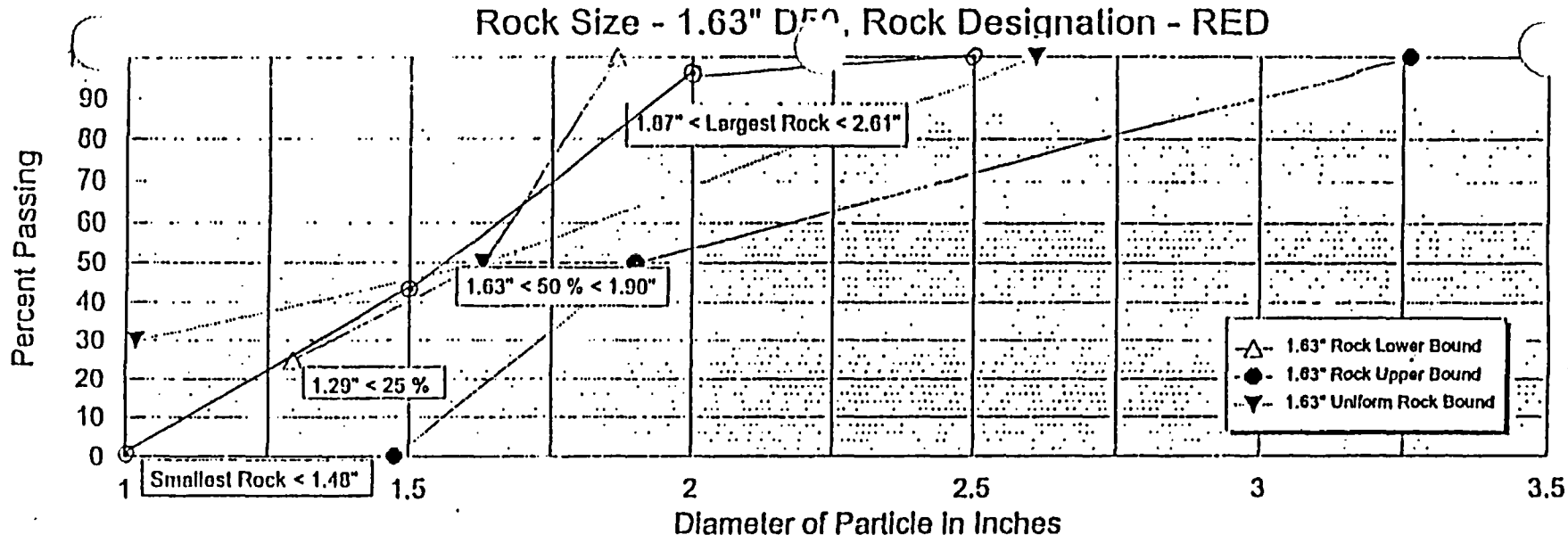

Rock Size - 1.63" D50, Rock Designation - RED
Percent Passing
90
80
70
60
50
40
30
20
10
0
1
1.5
2
2.5
3
3.5
Diameter of Particle In Inches
Smallest Rock < 1.48"
1.29" < 25 %
1.63" < 50 % < 1.90"
1.87" < Largest Rock < 2.61"
1.63" Rock Lower Bound
1.63" Rock Upper Bound
1.63" Uniform Rock Bound

FIGURE 3

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 10-12-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 5(R) Total Sample wt. 87.2

Wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
	-0-	12.5	33.0	41.7	
Sheet total					
TOTAL	-	12.5	33.0	41.7	
% Retained	-0-	14.3	37.8	47.8	
% Passing	100.0	85.6	47.8	-0-	

INBERG-MILLER ENGINEERS

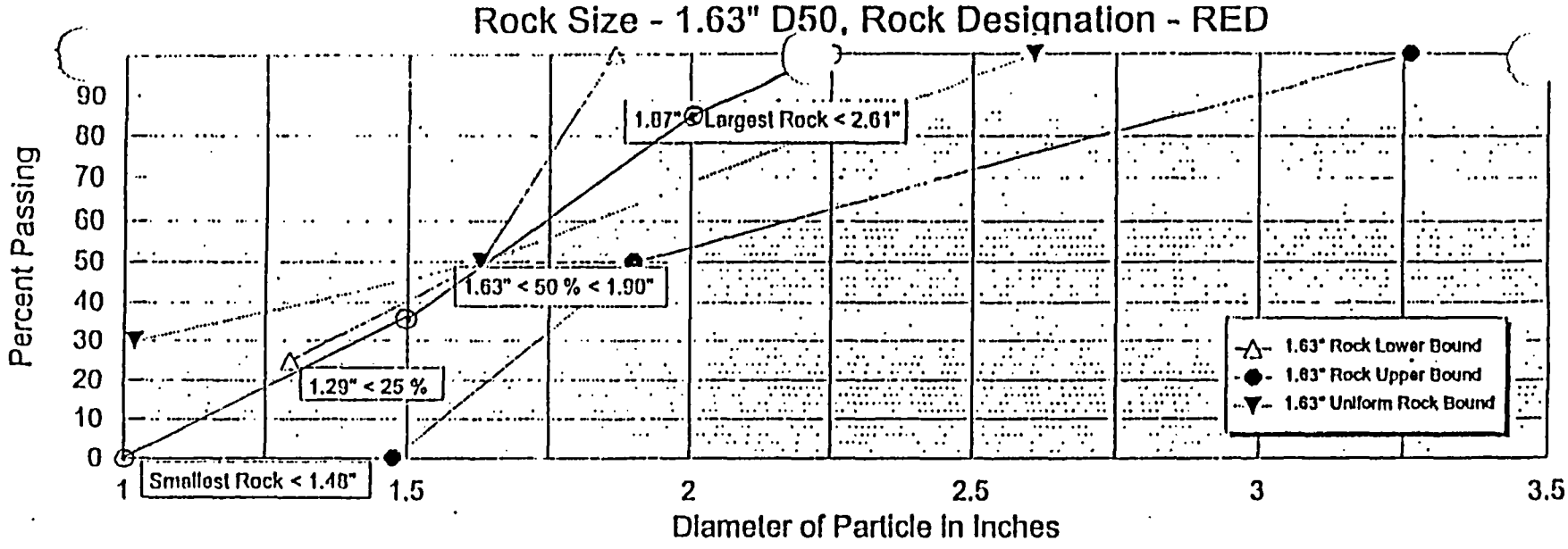

Rock Size - 1.63" D50, Rock Designation - RED
Percent Passing
90
80
70
60
50
40
30
20
10
0
1
1.5
2
2.5
3
3.5
Diameter of Particle In Inches
Smallest Rock < 1.48"
1.29" < 25 %
1.63" < 50 % < 1.90"
1.87" Largest Rock < 2.61"
1.63" Rock Lower Bound
1.63" Rock Upper Bound
1.63" Uniform Rock Bound

FIGURE 3

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 11-9 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 6 Total Sample wt. 89.15

wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	0	10.85	32.5	45.8	
Sheet total					
TOTAL					
% Retained	-0-	12.17	36.46	51.37	
% Passing	100.0	87.83	51.37	-0-	

INBERG-MILLER ENGINEERS

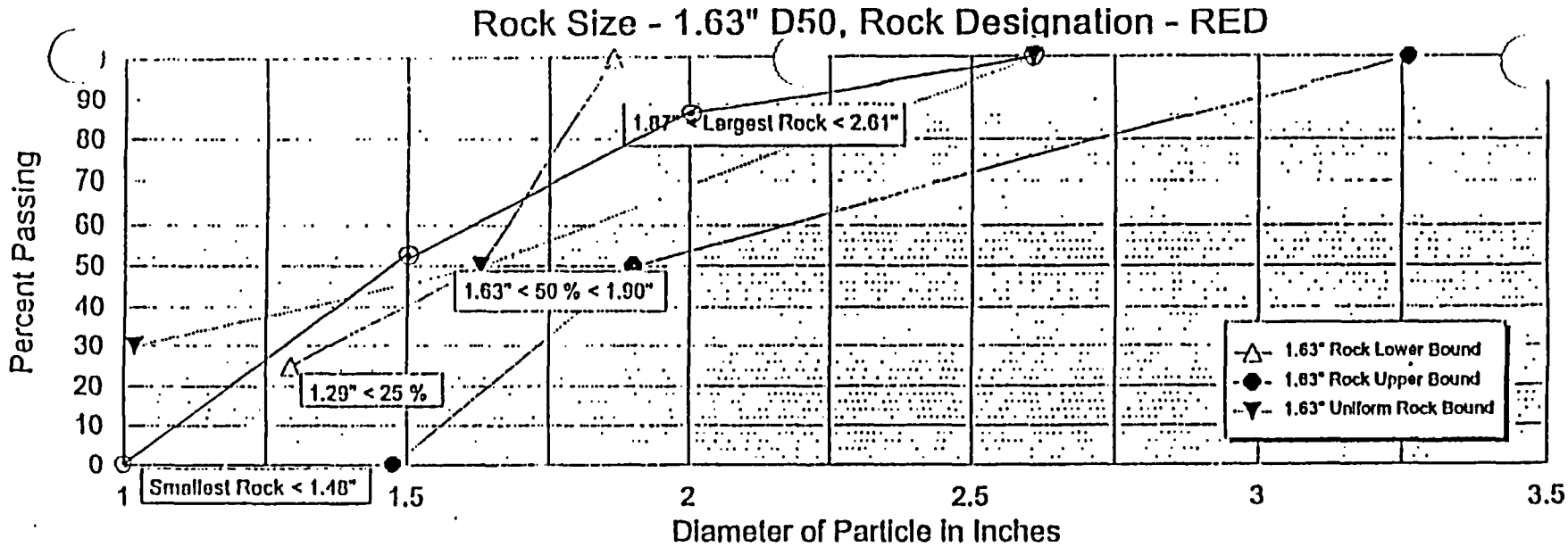

Rock Size - 1.63" D50, Rock Designation - RED
Percent Passing
90
80
70
60
50
40
30
20
10
0
1
1.5
2
2.5
3
3.5
Diameter of Particle in Inches
Smallest Rock < 1.48"
1.29" < 25 %
1.63" < 50 % < 1.90"
1.87" < Largest Rock < 2.61"
1.63" Rock Lower Bound
1.63" Rock Upper Bound
1.63" Uniform Rock Bound

FIGURE 3

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 11-12-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 6(R) Total Sample wt. 107.25

Wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	-0-	19.0	28.75	54.5	
Sheet total					
TOTAL	-0-	19.0	28.75	54.5	
% Retained	-0-	18.6	28.1	53.3	
% Passing	100.0	81.4	53.3	0	

INBERG-MILLER ENGINEERS

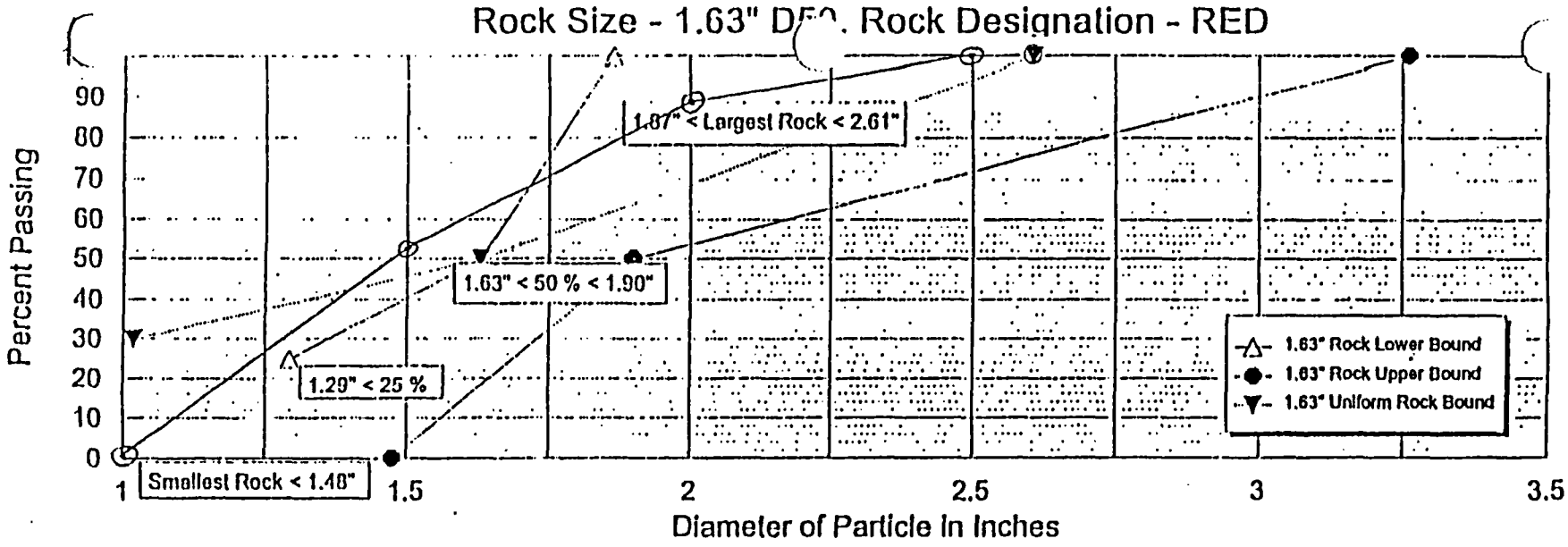


FIGURE 3

Kevin

2.17 Passed + I'll be out on Friday to retest 1.63.

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 11-17-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 6R(2) Total Sample wt. 99.1

Wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
	-0-	15.2	37.15	46.75	
Sheet total					
TOTAL	-0-	15.2	37.15	46.75	
% Retained	-0-	15.3	37.5	47.2	
% Passing	100.0	84.7	47.2	-0-	

INBERG-MILLER ENGINEERS

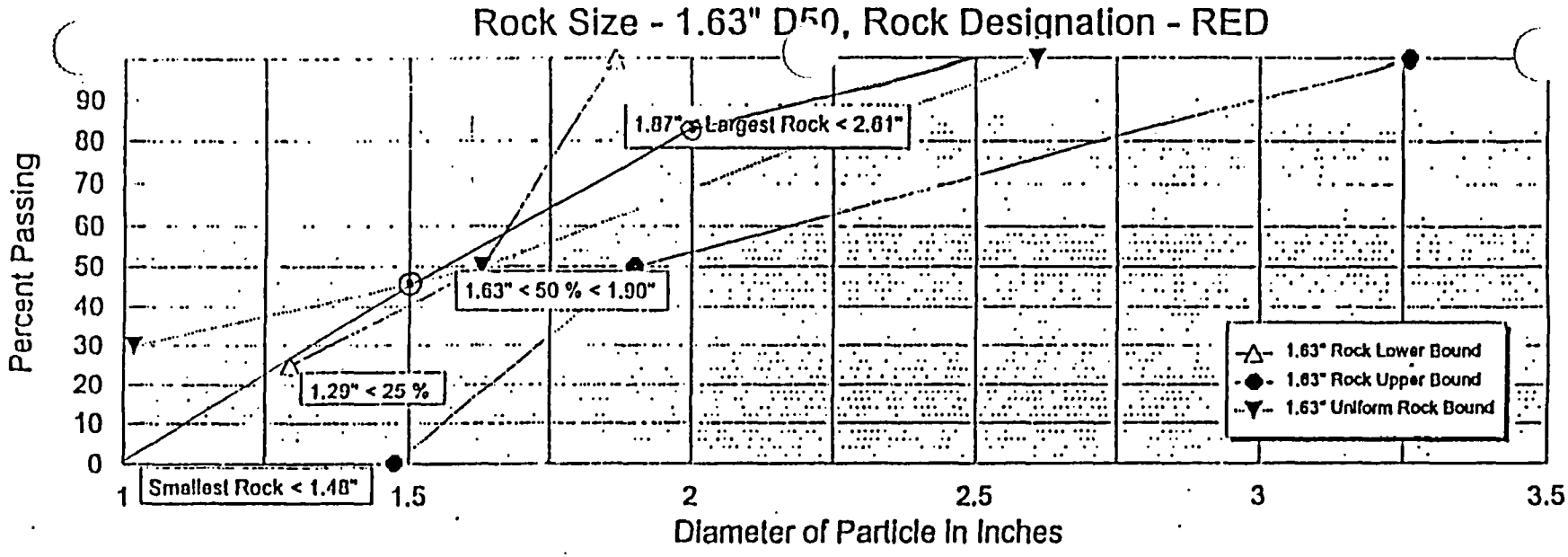


FIGURE 3

Kevin,

I'll sample again later today

-Justin

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 11-18-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 6R(3) Total Sample wt. 135.3

wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	-0-	21.95	55.55	57.8	
Sheet total					
TOTAL	-0-	21.95	55.55	57.8	
% Retained	-0-	16.2	41.1	42.7	
% Passing	100.0	83.8	42.7	-0-	

INBERG-MILLER ENGINEERS

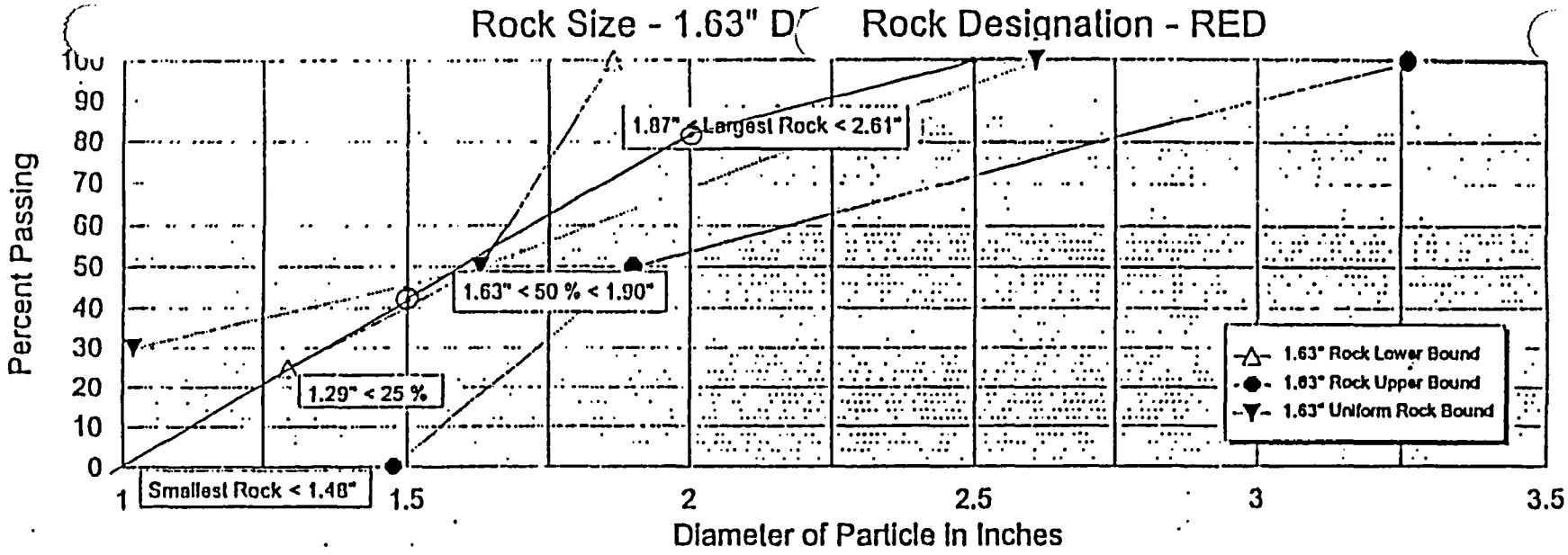


FIGURE 3

Kevin,
I'll be out later today to resample.
- Justin

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 11-20-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 6R(4) Total Sample wt. 155.85

wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	.9	33.65	60.6	61.3	
Sheet total					
TOTAL	.9	33.05	60.6	61.3	
% Retained	6	21.2	38.9	39.3	
% Passing	99.4	78.2	39.3	0	

INBERG-MILLER ENGINEERS

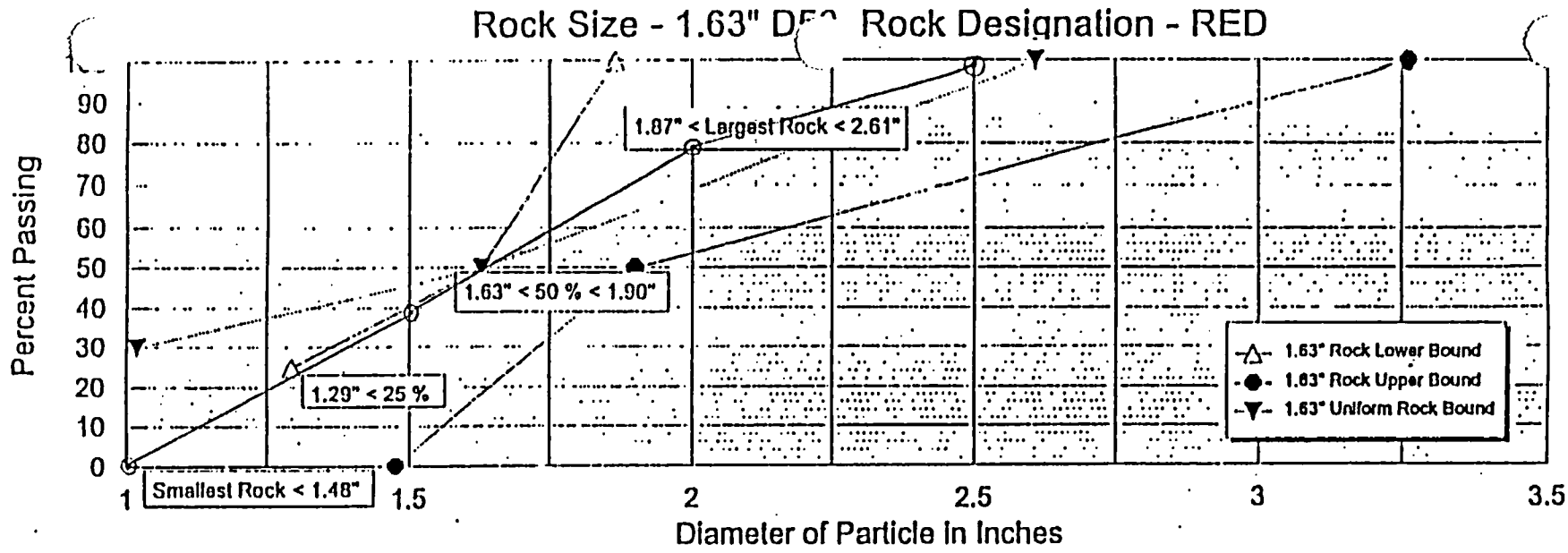


FIGURE 3

D50 = 1.66

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 11-20-98 BY JPM

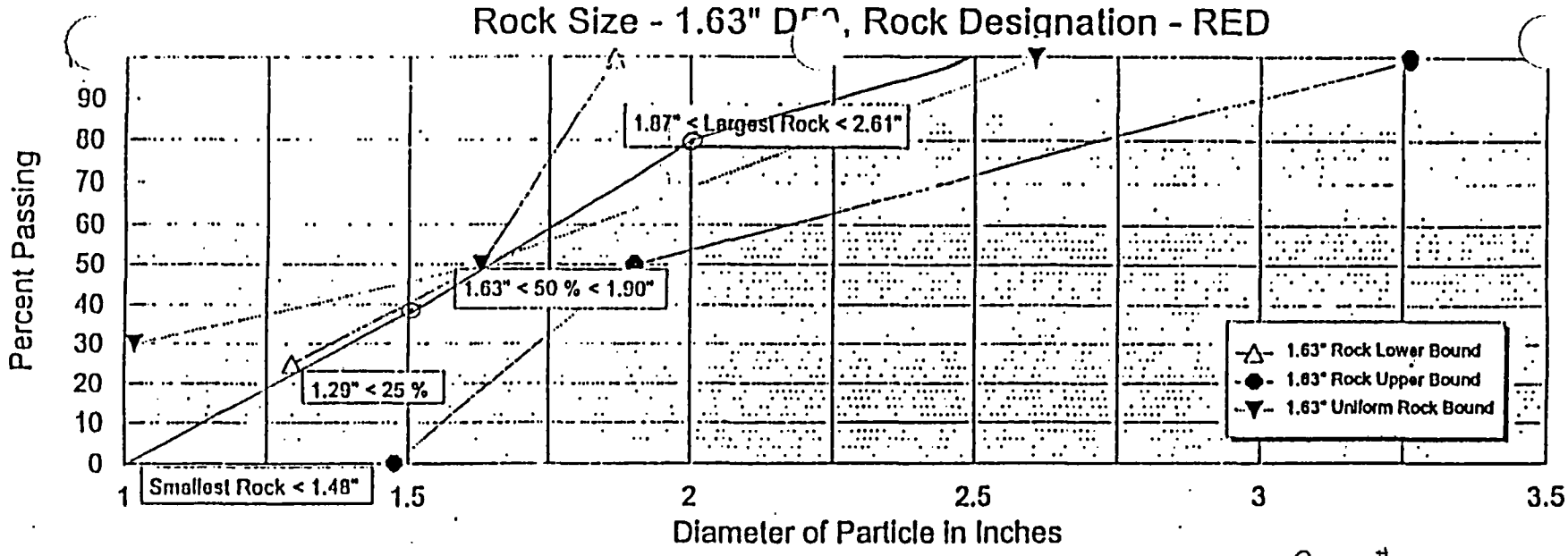
PROJECT Limestone Rock Testing CHECKED BY

Sample # 7 Total Sample wt. 166.7

Wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	-0-	34.2	67.5	65.0	
Sheet total					
TOTAL	-0-	34.2	67.5	65.0	
% Retained	-0-	20.5	40.5	39.0	
% Passing	100.0	79.5	39.0	-0-	

INBERG-MILLER ENGINEERS



Page #7

FIGURE 3

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 12-2-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 8 Total Sample wt. 1210.7

Wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
	-0-	23.95	49.45	53.3	
Sheet total					
TOTAL	-0-	23.95	49.45	53.3	
% Retained	-0-	18.9	39.03	42.07	
% Passing	100.0	81.1	42.1	-0-	

INBERG-MILLER ENGINEERS

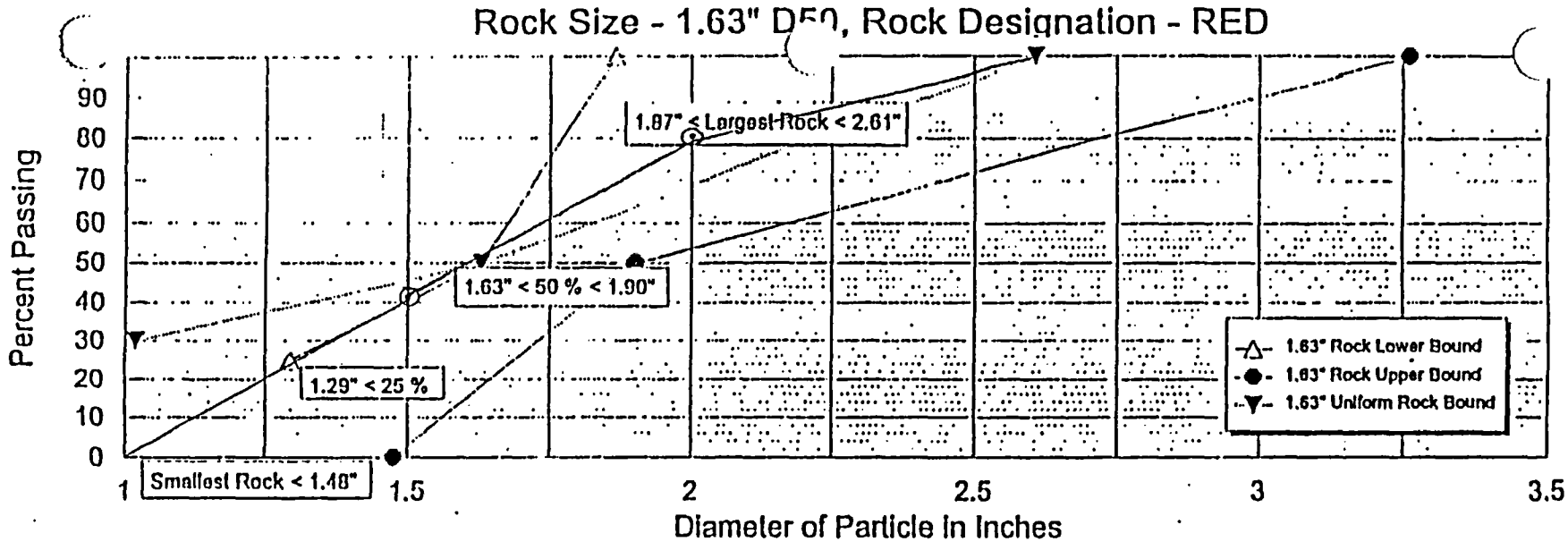


FIGURE 3

Kevin, it was a little bit out. I'll resample tomorrow.

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 12-4-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 8(R) Total Sample wt. 148.65

wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
	-0-	33.95	62.5	52.2	
Sheet total					
TOTAL	-0-	33.95	62.5	52.2	
% Retained	-0-	22.8	42.1	35.1	
% Passing	100.0	77.2	35.1	0	

INBERG-MILLER ENGINEERS

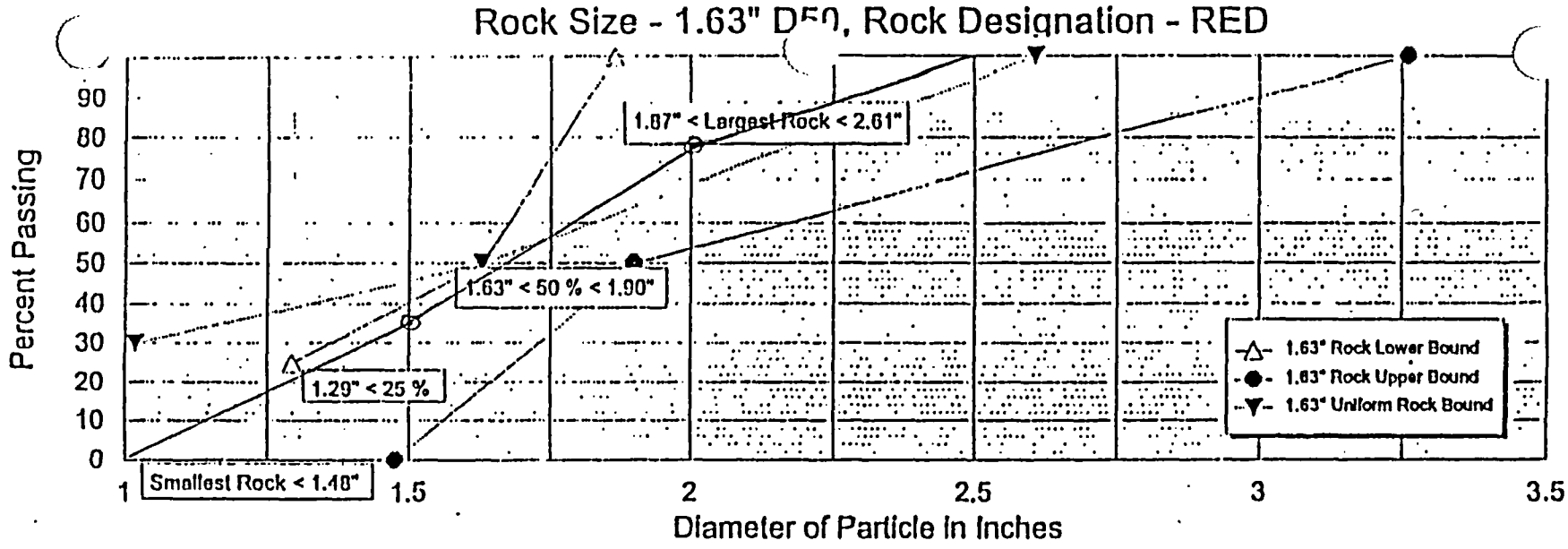


FIGURE 3

Passing

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 12-9-98 BY JFM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 9 Total Sample wt. 166.55

Wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
	-0-	32.3	68.5	65.75	
Sheet total					
TOTAL					
% Retained	-0-	19.4	41.1	39.5	
% Passing	100.0	80.6	39.5	-0-	

INBERG-MILLER ENGINEERS

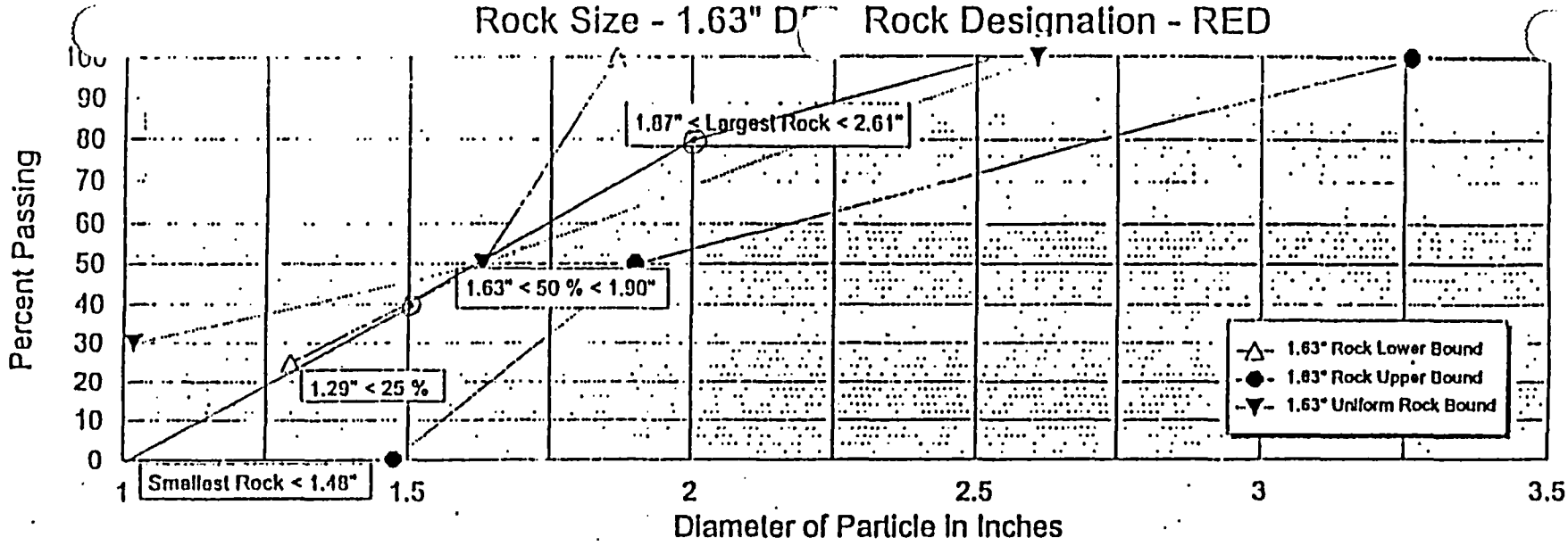


FIGURE 3

Passing

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 12-21-93 BY JAM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 10 Total Sample wt. 151.55

wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	1.7	31.25	61.0	57.6	
Sheet total					
TOTAL	1.7	31.25	61.0	57.6	
% Retained	1.1	20.6	40.3	38.0	
% Passing	98.9	78.3	38.0	-0-	

INBERG-MILLER ENGINEERS

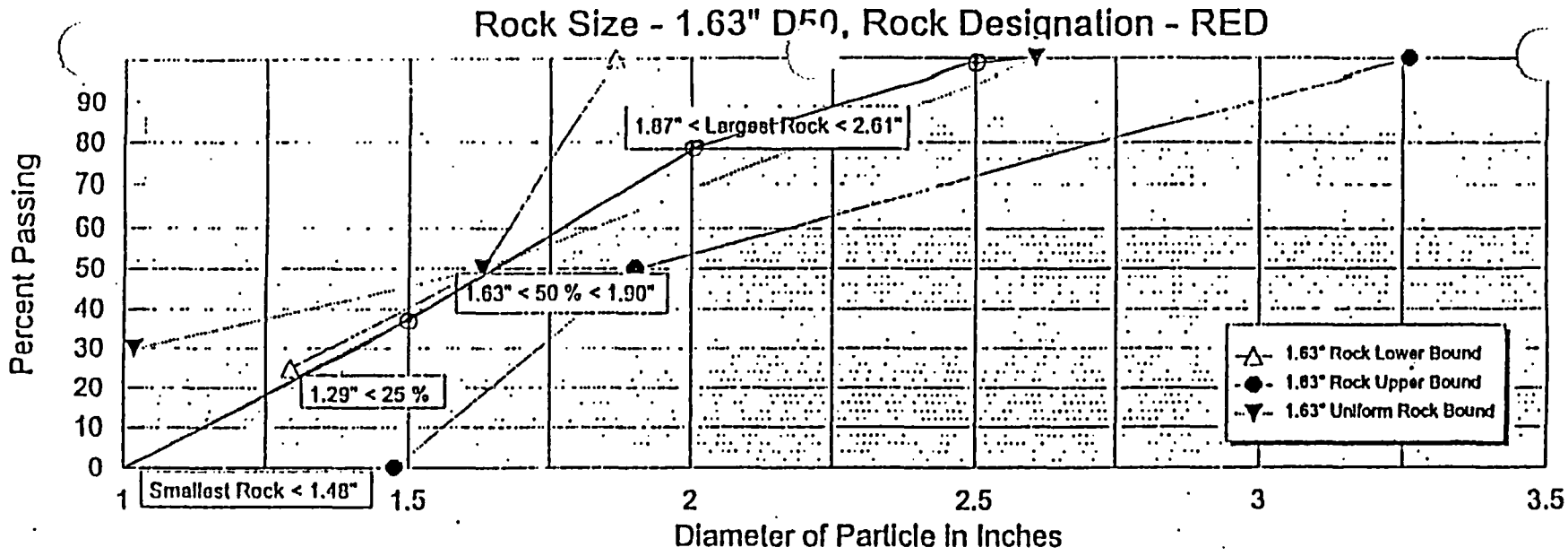


FIGURE 3

Passing

D_{50} 2.17" ROCK MULCH

1998

SUBJECT Rock gradation samples PROJECT NO. 8152km PAGE

CLIENT Pathfinder DATE 2-27-98 BY

PROJECT Limestone Testing CHECKED BY

Pink #1 D_{50} 2.17" sample wt. 250.16

	3.47"	3"	2½"	2"	1.5"	pan
wt. ret	Ø	6.66	91.11	92.46	43.11	15.82
% ret	Ø	2.7	36.4	37.4	17.2	6.3
% pass	100	97.3	60.9	23.5	6.3	

Red #1 D_{50} 1.63" sample wt. 169.40

	2½"	2"	1½"	pan
wt. ret	Ø	17.87	85.31	66.22
% ret.	Ø	10.5	50.4	39.1
% pass	100	89.5	39.1	

Blue #1 D_{50} 1" sample wt. 56.18

	1½"	1¼"	1"	¾"	pan
wt. ret.	Ø	4.92	14.93	21.58	14.75
% ret.	Ø	8.8	26.6	38.4	26.2
% pass	100	91.2	64.6	26.2	

Crushed Limestone filter (Nom. max part. size = 1")

#1 Sample size = 27.58

	1"	pan
wt. ret	Ø	27.58
% pass	100%	

INBERG-MILLER ENGINEERS

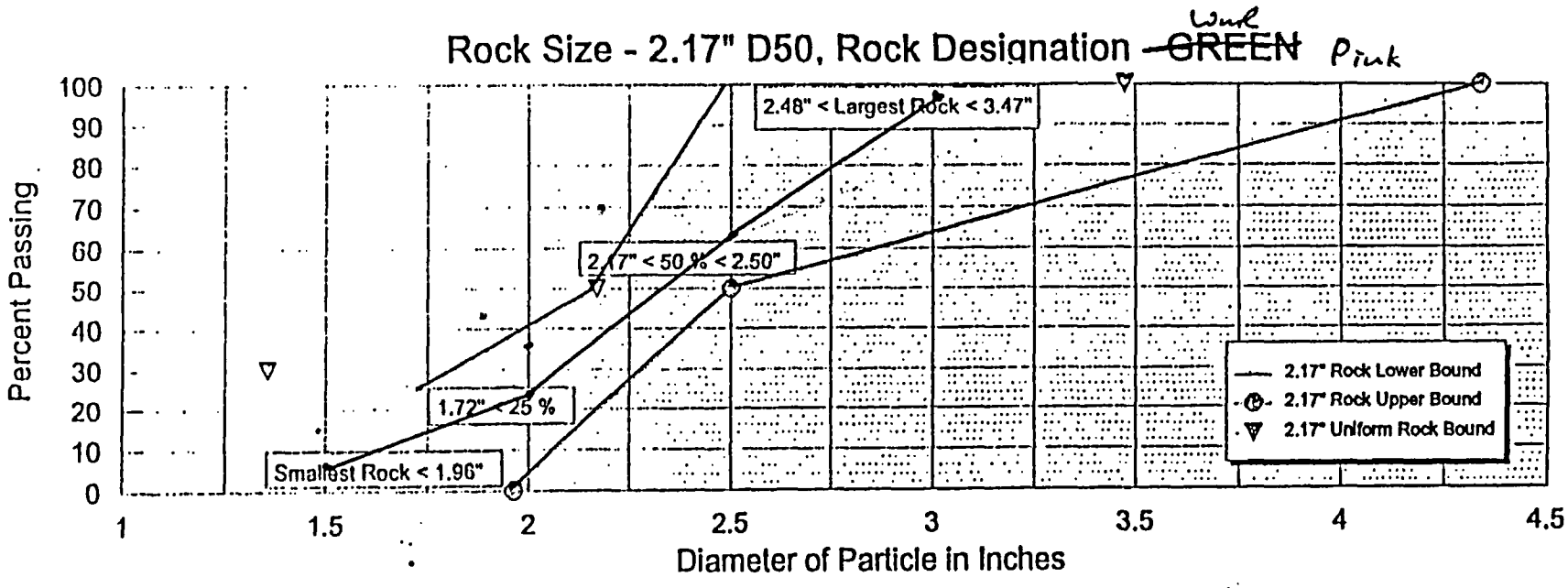


FIGURE 3 (Continued)

SUBJECT D_{50} 2.17" Green PROJECT NO. 8157 RM PAGE

CLIENT Path Finder DATE BY

PROJECT Limestone Testing CHECKED BY

Sample # 2 Total sample wt. 311.60 lbf

wt. Retained

Screen size ⇒	3.47"	3"	2½"	2"	1½"	pan
61.85	-0-	-0-	52.50	42.9	51.80	22.85
62.20			20.80	57.05	26.65	
61.35				36.55		
63.45						
62.75						
311.60 lbF						

5-15-98

VCH -

The results of gradation on the 2.17" D_{50} material will be done this morning. Could you plot the results on the attached graph and fax to Jim Couch this morning?

Thanks

Glen

Total	0	0	73.30	136.6	78.45	22.85
% Retained	0.	0	23.52	43.84	25.18	7.33
% Passing	100	100	76.5	32.6	7.5	0.1

how do we get a percent passing the pan?

INBERG-MILLER ENGINEERS

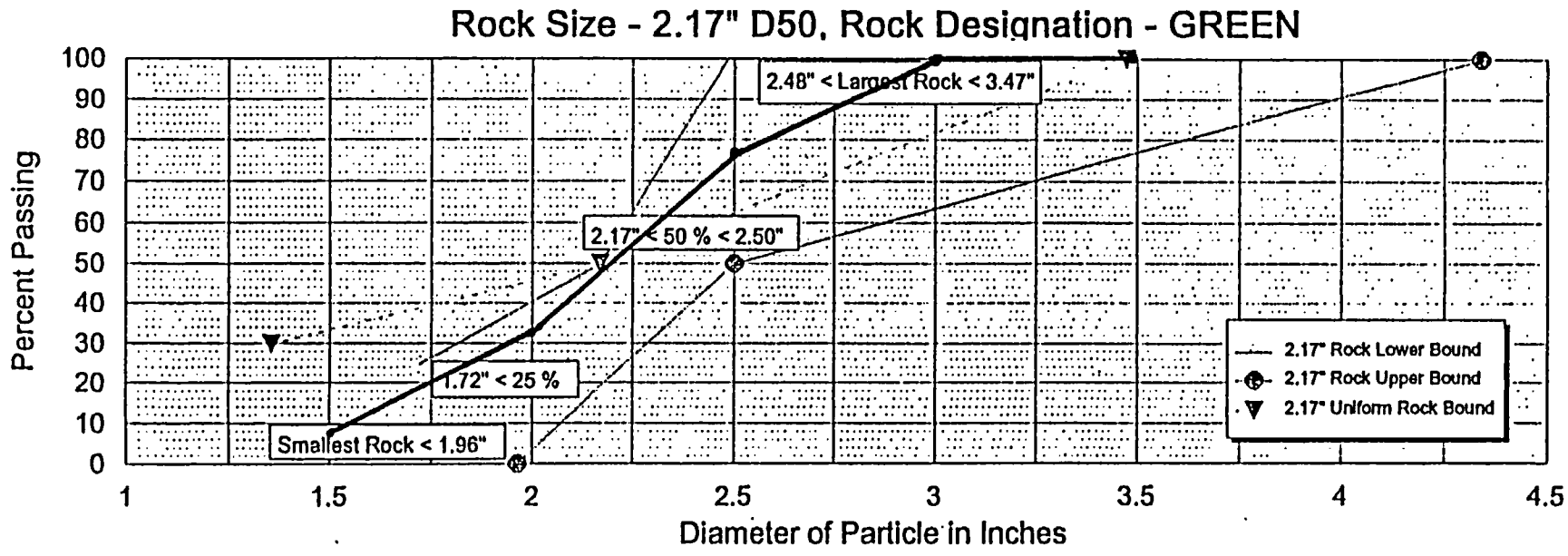


FIGURE 3 (Continued)

SUBJECT D_{50} 2.17" Green PROJECT NO. 8157 Rm PAGE

CLIENT Path Finder DATE 8-31-98 BY JFM

PROJECT Limestone Testing CHECKED BY

Sample # 3 Total sample wt. 132.91

Wt. Retained

Screen size ⇒	3.47"	3"	2½"	2"	1½"	pan
	-0-	27.19	37.65	49.27	12.92	5.88
Total	-0-	27.19	37.65	49.27	12.92	5.88
% Retained	-0-	20.5	28.3	37.1	9.7	4.4
% Passing	100%	79.5	51.2	14.1	4.4	-0-

INBERG-MILLER ENGINEERS

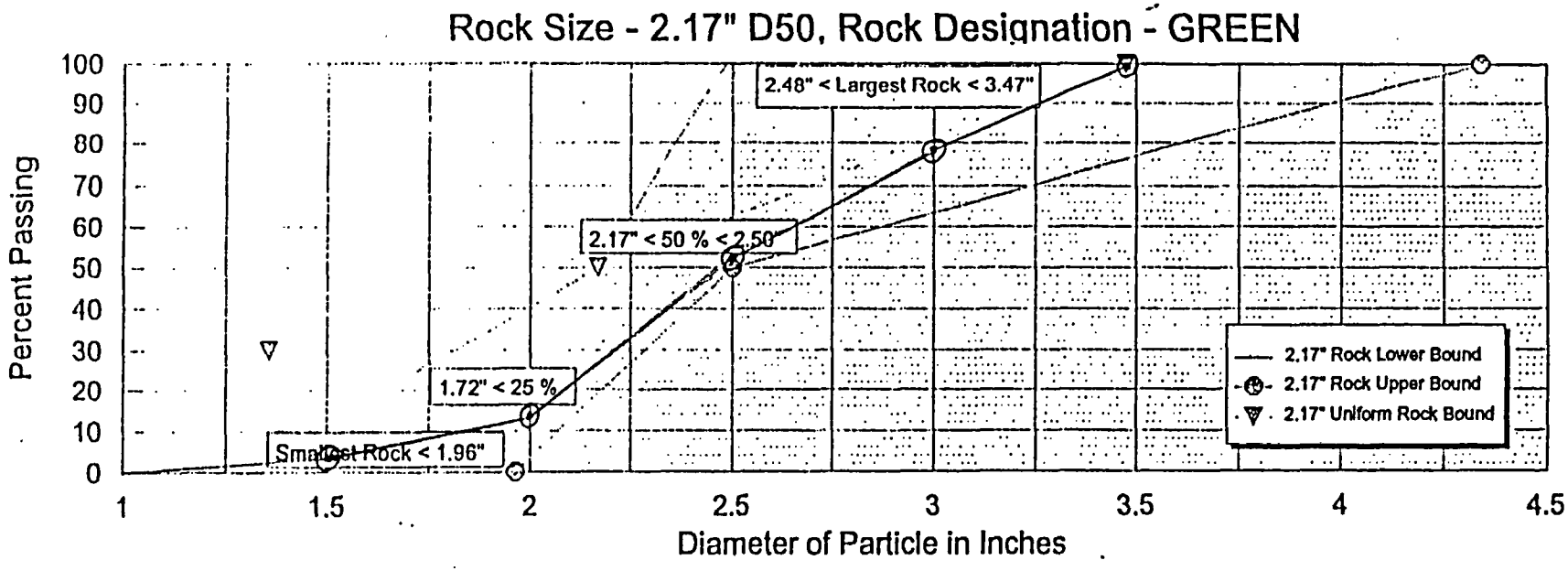


FIGURE 3 (Continued)

SUBJECT D_{50} 2.17" Green PROJECT NO. 8157 Rm PAGE

CLIENT Path Finder DATE 10-9-98 BY JPM

PROJECT Limestone Testing CHECKED BY

Sample # 4 Total sample wt. 245.6

wt. Retained

Screen size ⇒	3.47"	3"	2½"	2"	1½"	pan
	0	41.5	82.3	77.1	36.5	8.2
Total	0.0	41.5	82.3	77.1	36.5	8.2
% Retained	0.0	16.9	33.5	31.4	14.9	3.3
% Passing	100.0	83.1	49.6	18.2	3.3	0.0

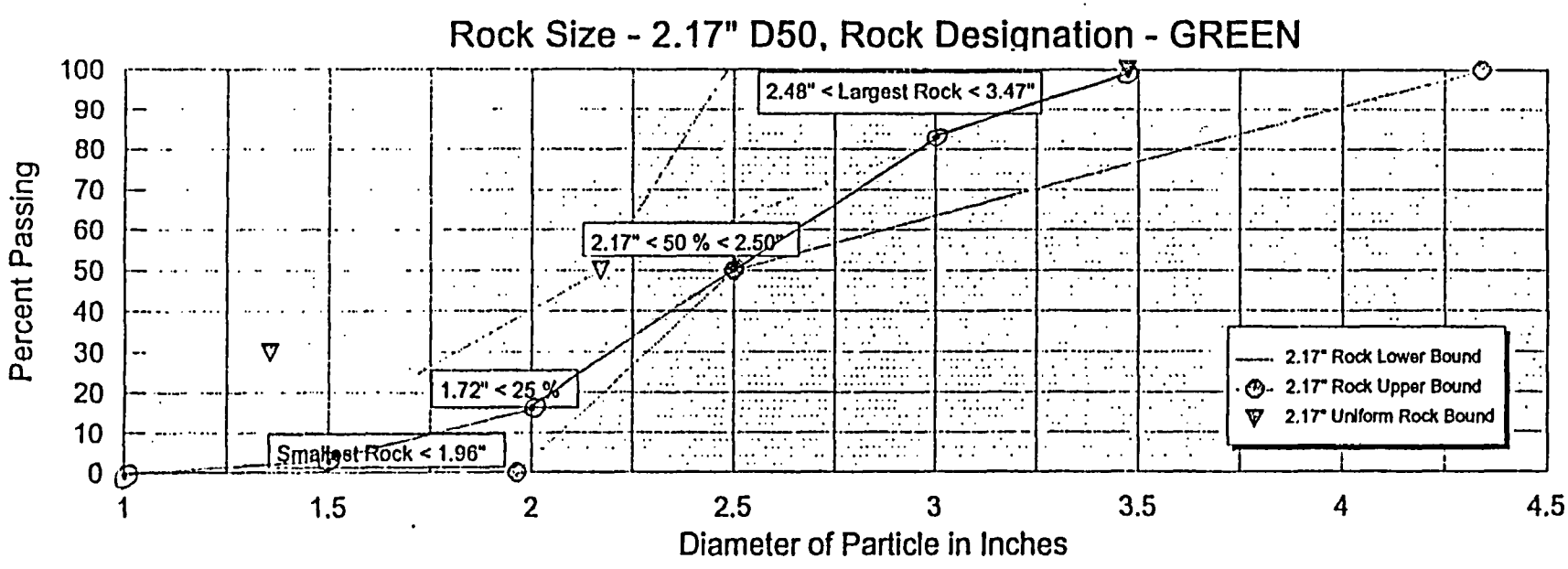


FIGURE 3 (Continued)

SUBJECT D_{50} 2.17" Green PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 10-28-98 BY JPM

PROJECT Limestone Testing CHECKED BY

Sample # 5 Total sample wt. 247.45

Wt. Retained

Screen size ⇒	3.47"	3"	2½"	2"	1½"	pan
	-0-	31.65	89.1	73.0	22.35	31.35
Total	-0-	31.65	89.1	73.0	22.35	31.35
% Retained	-0-	12.8	36.0	29.5	9.0	12.7
% Passing	100.0	87.2	51.2	21.7	12.7	-0-

INBERG-MILLER ENGINEERS

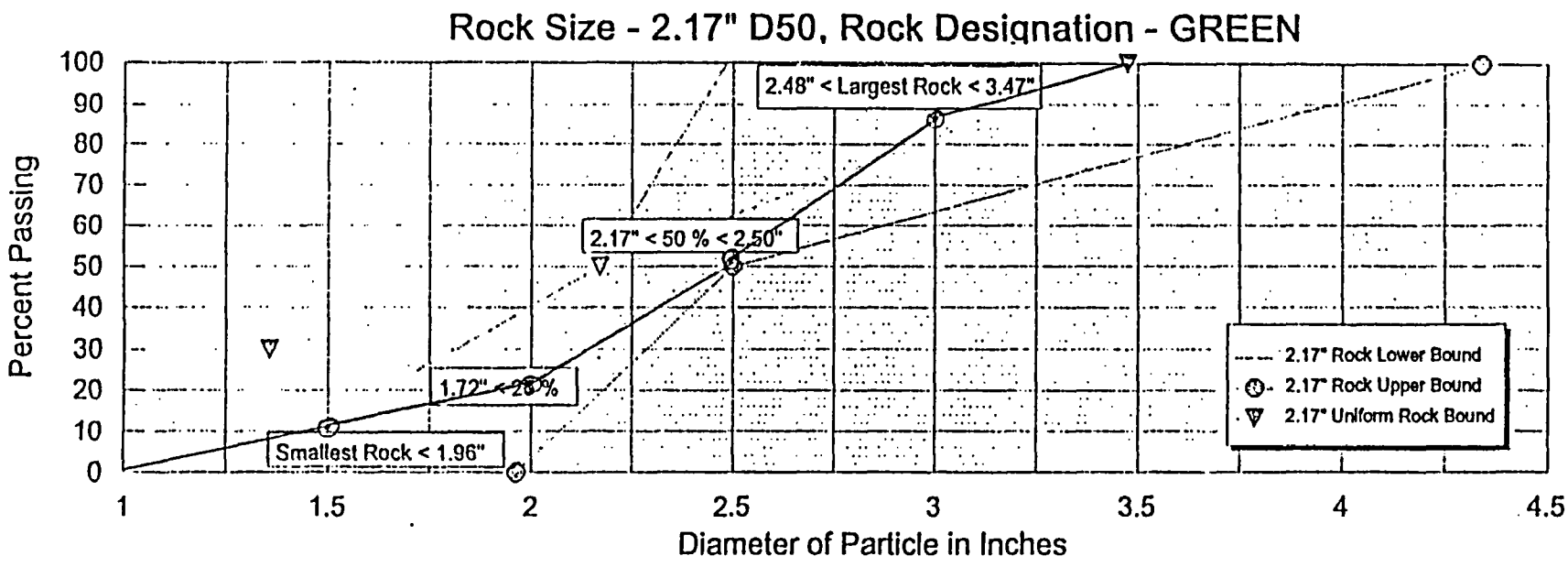


FIGURE 3 (Continued)

SUBJECT D50 2.17" Green PROJECT NO. 8157 Rm PAGE

CLIENT Path Finder DATE 11-9-98 BY JPM

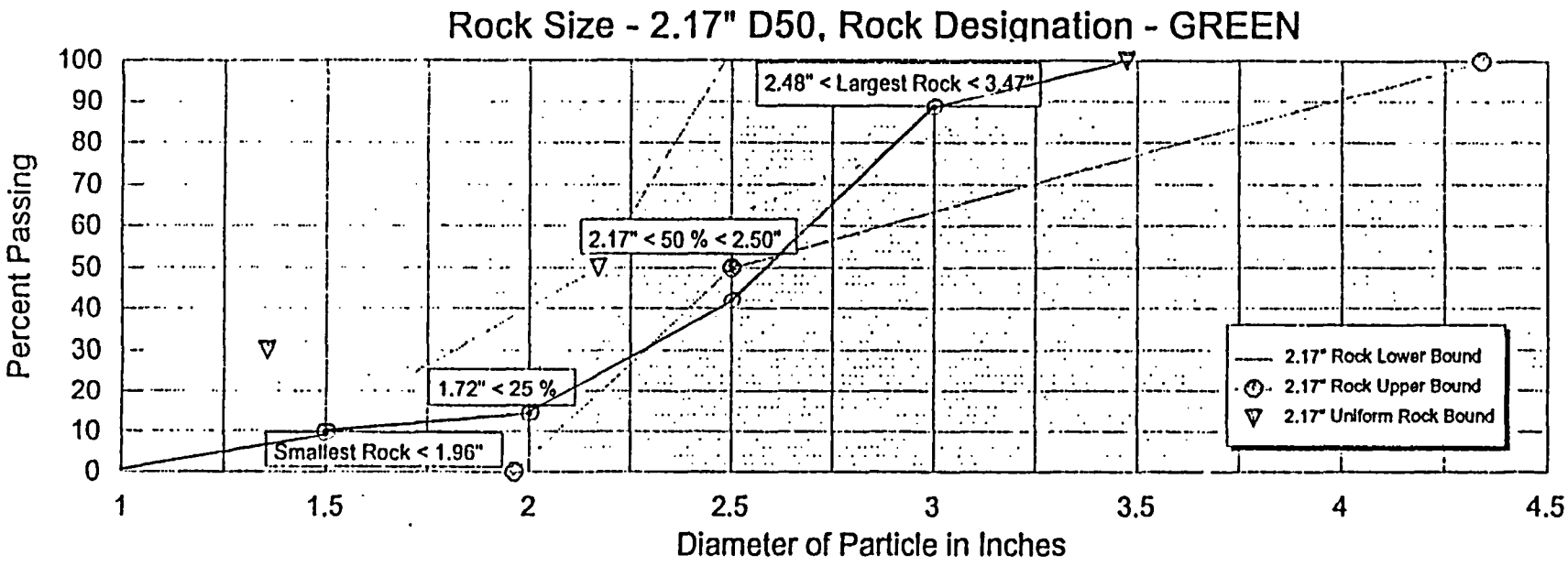
PROJECT Limestone Testing CHECKED BY

Sample # 6 Total sample wt. 233.45

Wt. Retained

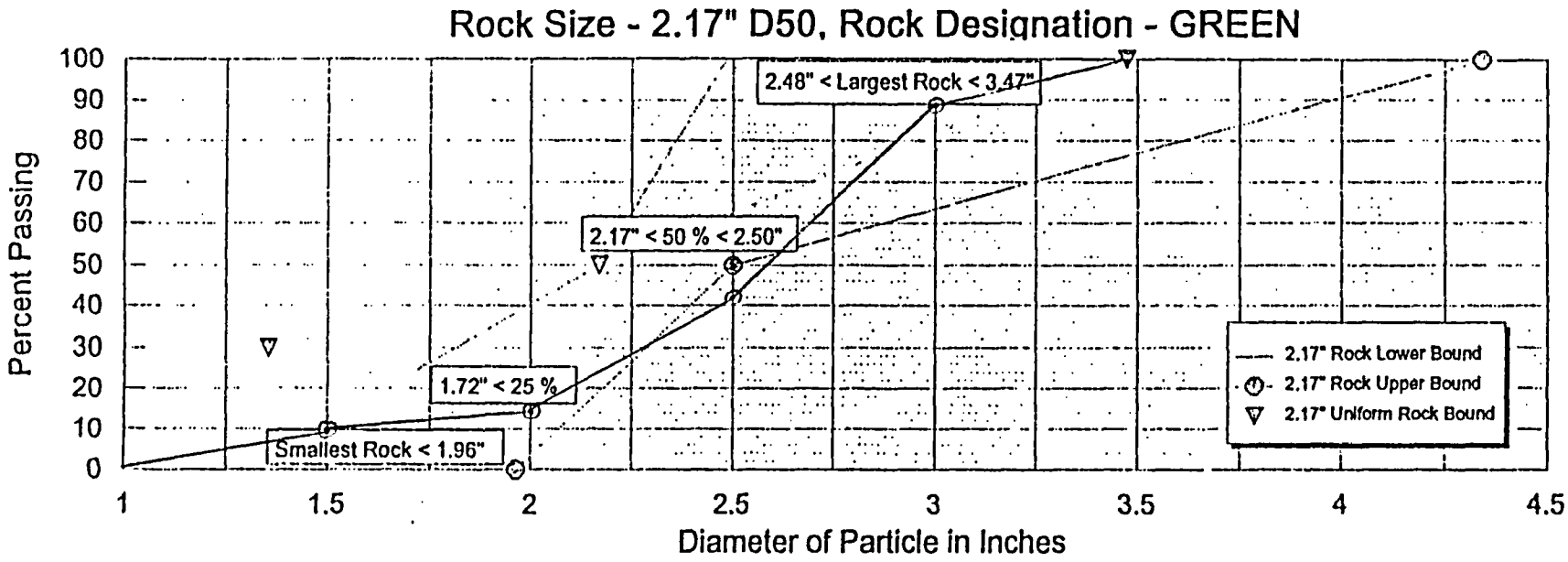
Screen size ⇒	3.47"	3"	2½"	2"	1½"	pan
		24.95	113.2	59.5	10.55	25.25
Total	-0-	24.95	113.2	59.5	10.55	25.25
% Retained	-0-	10.69	48.5	25.5	4.5	10.8
% Passing	100.0	89.3	40.8	15.3	10.8	-0-

INBERG-MILLER ENGINEERS



Kevin;
I'll be out to resample both 2.17 + 1.63 on wensday.
2.17 might pass without changing screens but it'll be close.
The frozen mud gave a higher percent passing on the low end (10.8% uns mud)

FIGURE 3 (Continued)



Kevin;
I'll be out to resample both 2.17 + 1.63 on wensday.
2.17 might pass without changing screens but it'll be close.
The frozen mud gave a higher percent passing on the low end (10.8% wms mud)

FIGURE 3 (Continued)

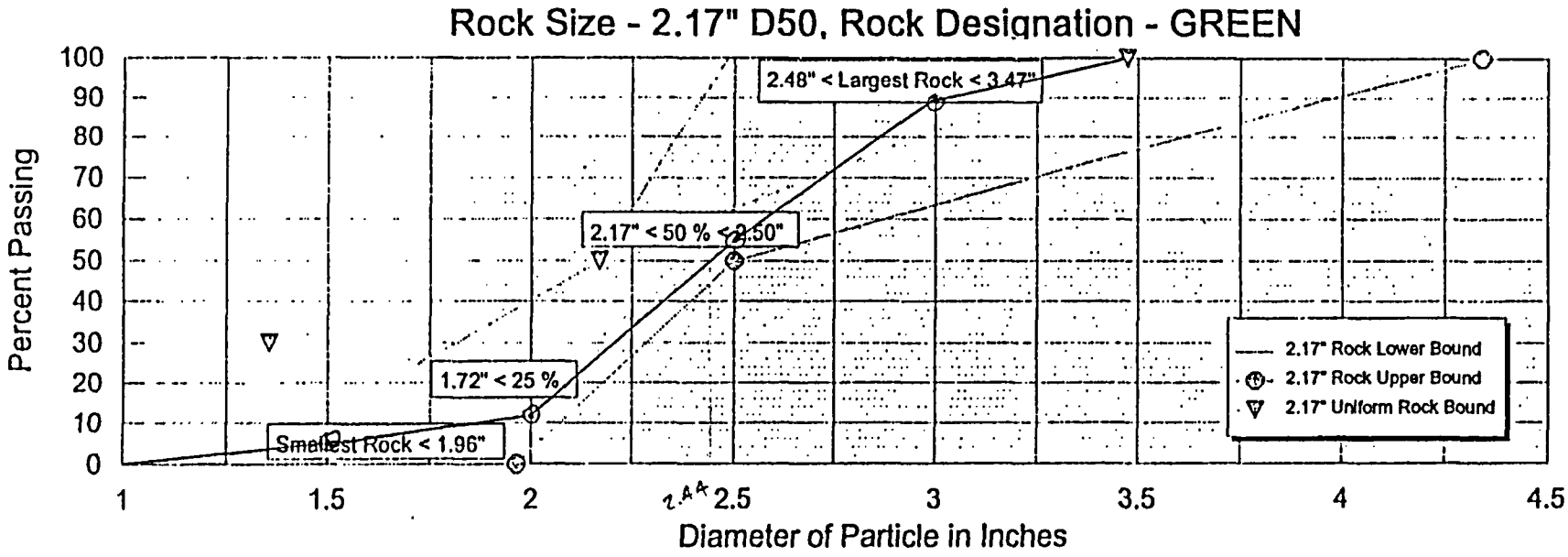


FIGURE 3 (Continued)

D_{50} 4" SMALL RIP RAP

1998

SUBJECT D50 4" BLUE PROJECT NO. 8152 Rm PAGE

CLIENT Pathfinder DATE 3-2-78 BY CWR

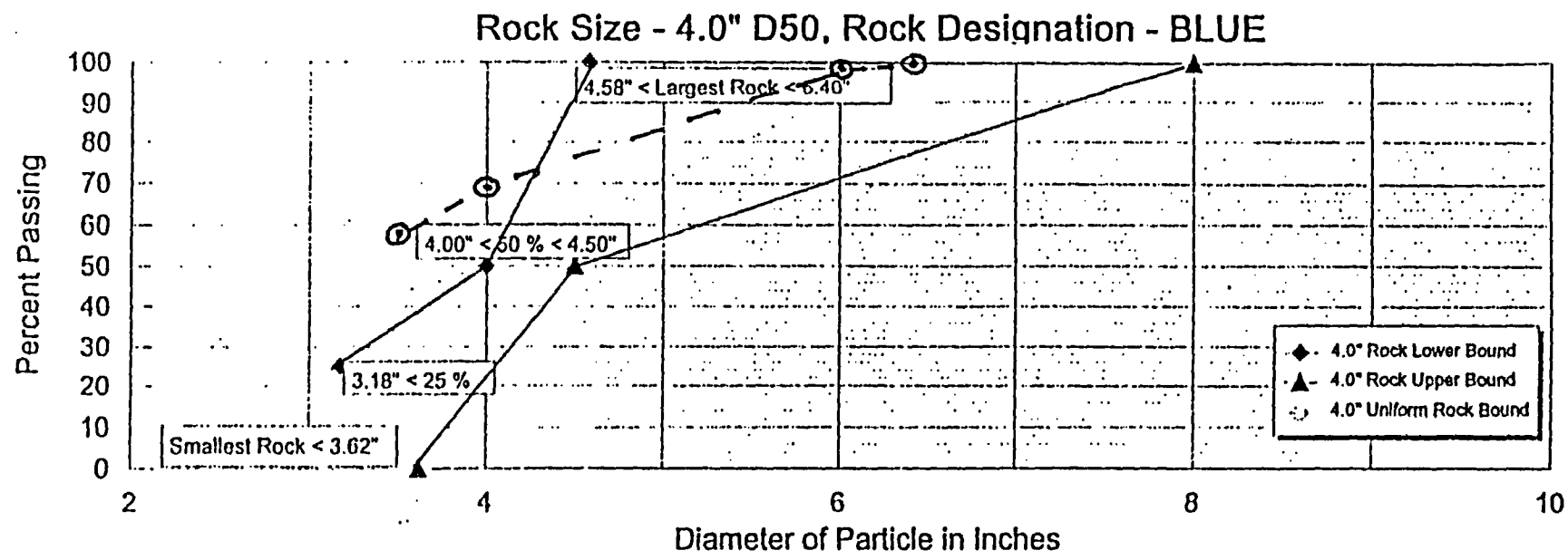
PROJECT Limestone Rock Testing CHECKED BY

Sample # 1 Total Sample wt. 2,703 lbs

wt. retained

Screen Size	6.4"	6"	4"	3.5"	Pan
	Ø	10	179	48	114
			103	41	103
					114
			102	37	107
			97	44	175
					102
			105	54	164
			101	58	116
			123		
				13	114
					112
					103
					104
					107
					57
Sheet total	—	—	—	—	—
TOTAL	Ø	10	810 ✓	295 ✓	1588 ✓
% Retained	Ø	0.3	30.0	10.9	58.8
% Passing	100	99.7	69.7	58.8	

INBERG-MILLER ENGINEERS


Rock Size - 4.0" D50, Rock Designation - BLUE
Percent Passing
Diameter of Particle in Inches
4.58" < Largest Rock < 6.40"
4.00" < 50 % < 4.50"
3.18" < 25 %
Smallest Rock < 3.62"
4.0" Rock Lower Bound
4.0" Rock Upper Bound
4.0" Uniform Rock Bound

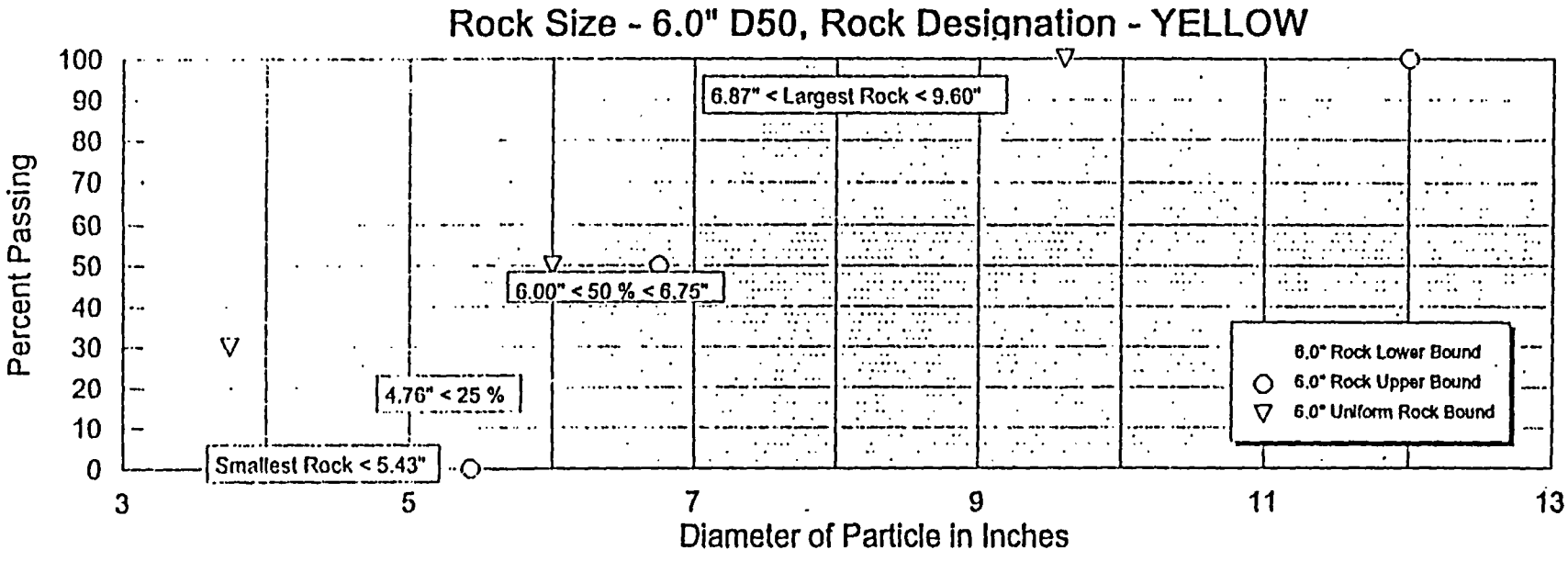

Rock Size - 6.0" D50, Rock Designation - YELLOW
Percent Passing
Diameter of Particle in Inches
6.87" < Largest Rock < 9.60"
6.00" < 50 % < 6.75"
4.76" < 25 %
Smallest Rock < 5.43"
6.0" Rock Lower Bound
6.0" Rock Upper Bound
6.0" Uniform Rock Bound

FIGURE 2

SUBJECT D50 4" BLUE PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-4-78 BY

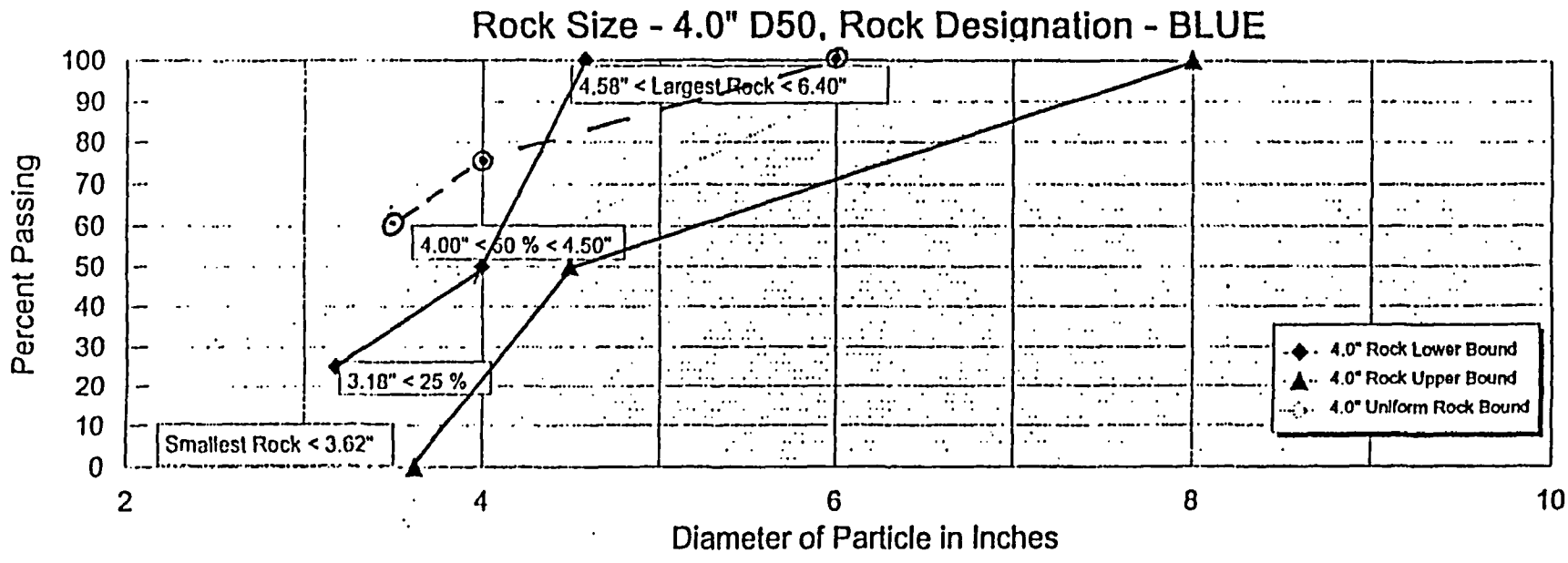
PROJECT Limestone Rock Testing CHECKED BY

Sample # 1R Total Sample wt. 805

Wt. retained

Screen SIZE	6.4"	6"	4"	3.5"	-3.5
			118	98	106
			72	31	112
					115
					153
Sheet total					
TOTAL	Ø	Ø	190	129	486
% Retained	Ø	Ø	23.6	16.0	60.4
% Passing		100	76.4	60.4	

INBERG-MILLER ENGINEERS


Rock Size - 4.0" D50, Rock Designation - BLUE
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
2
4
6
8
10
Diameter of Particle in Inches
4.58" < Largest Rock < 6.40"
4.00" < 50 % < 4.50"
3.18" < 25 %
Smallest Rock < 3.62"
4.0" Rock Lower Bound
4.0" Rock Upper Bound
4.0" Uniform Rock Bound

SUBJECT D50 4" BLUE PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-5-98 BY

PROJECT Limestone Rock Testing CHECKED BY

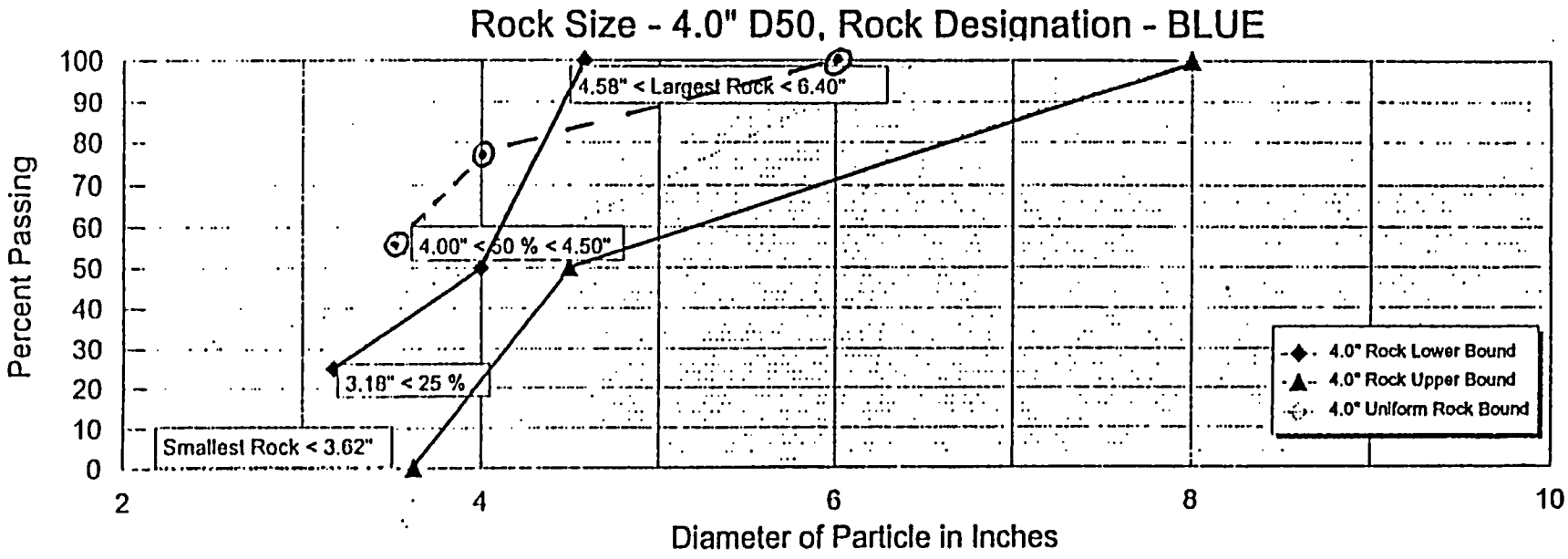
Sample # 1R(2) Total Sample wt. 988

wt. retained

Screen SIZE	6.4"	6"	4"	3.5"	-3.5"
	Ø	Ø	103	49	51
			112	56	58
				69	107
				43	45
					59
					48
					56
					57
					~~62~~ 51
Sheet total					
TOTAL	Ø	Ø	215	217	556
% Retained		Ø	21.8	21.9	56.3
% Passing			~~78.2~~	~~54.3~~	

INBERG-MILLER ENGINEERS

Sample # 1 R(2) 3-5-



SUBJECT D50 4" BLUE PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-13-98 BY WMR

PROJECT Limestone Rock Testing CHECKED BY

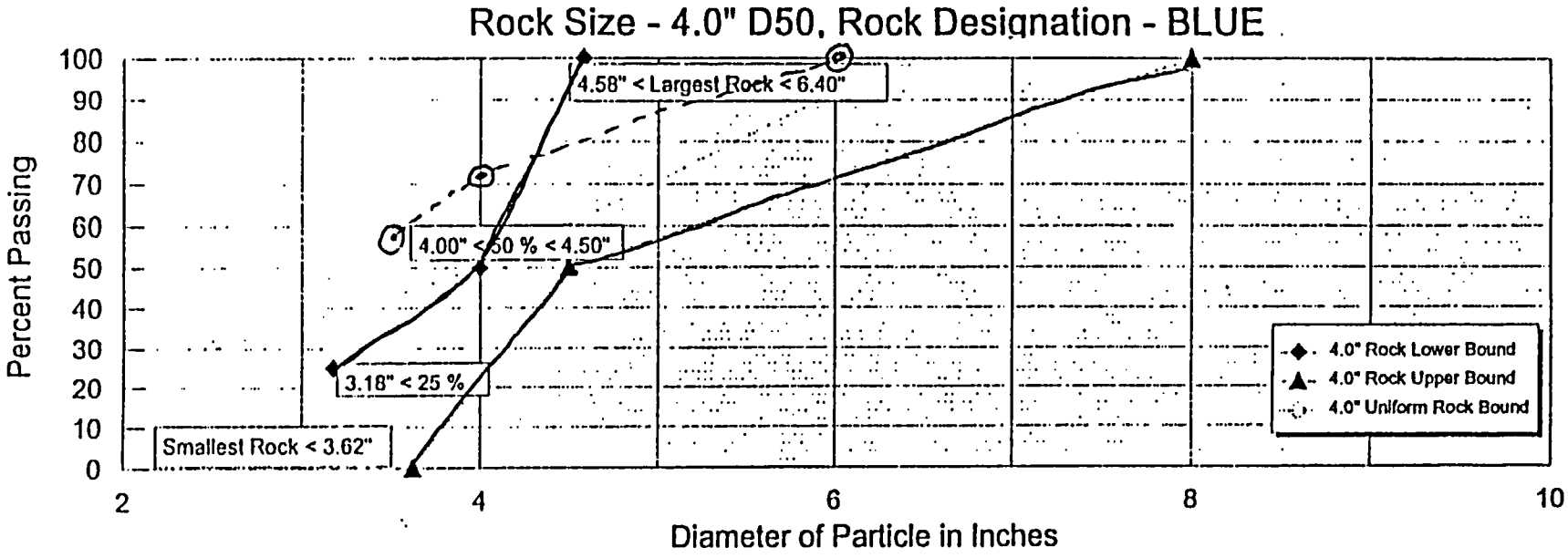
Sample # 1R(3) Total Sample wt. 948'

Wt. retained

Screen Size	6.4"	6"	4"	3.5"	-3.5
	Ø	Ø	111	64	256
			90	68	257
				42	60
Sheet total					
TOTAL	Ø	Ø	201	174	573
% Retained		Ø	21.2	18.4	60.4
% Passing		100	78.8	60.4	—

INBERG-MILLER ENGINEERS

3-13-98 Sample #



SUBJECT D50 4" BLUE PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-13-98 p.m. BY

PROJECT Limestone Rock Testing CHECKED BY

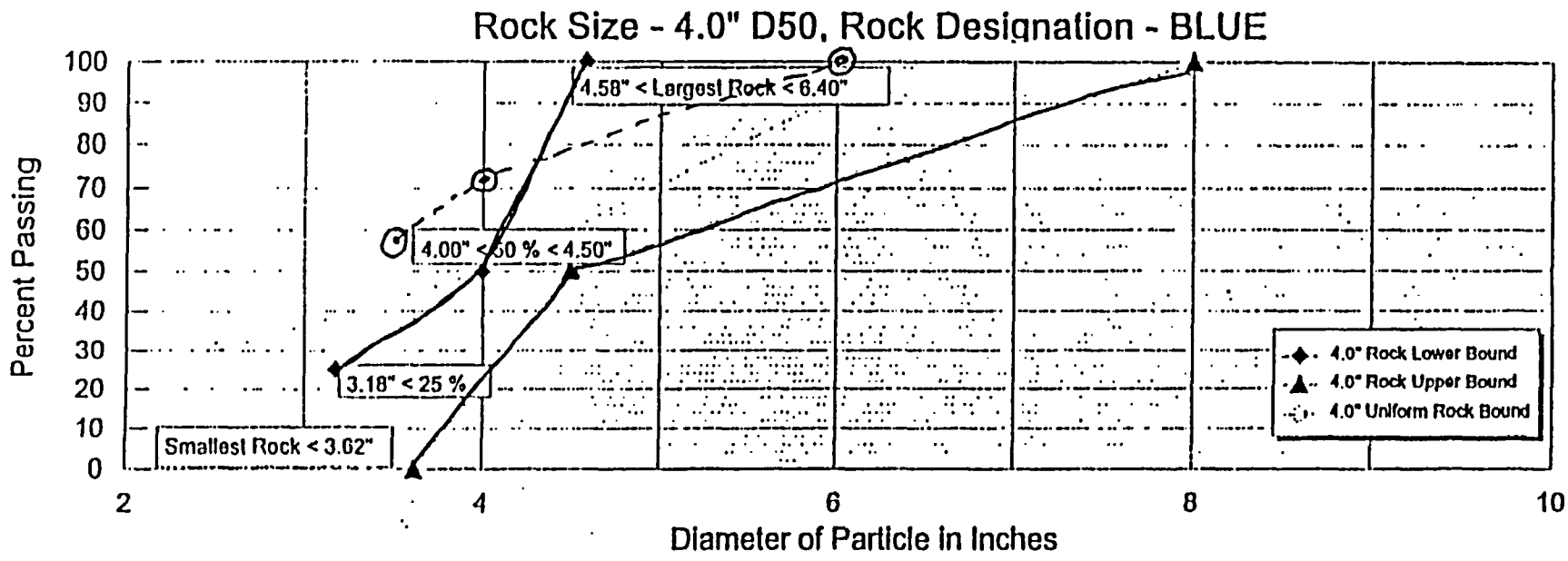
Sample # 1R(4) Total Sample wt. 1,150

Wt. retained

Screen Size	6.4"	6"	4"	3.5"	-3.5
	∅	∅	334	56	125
				90	225
					184
					136
Sleet total					
TOTAL	∅	∅	334	146	670
% Retained	∅	∅	29.0	12.7	58.3
% Passing		100	71.0	58.3	

INBERG-MILLER ENGINEERS

3-15-98 Sample # 1R(4)



SUBJECT D50 4" BLUE PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-16-96 BY

PROJECT Limestone Rock Testing CHECKED BY

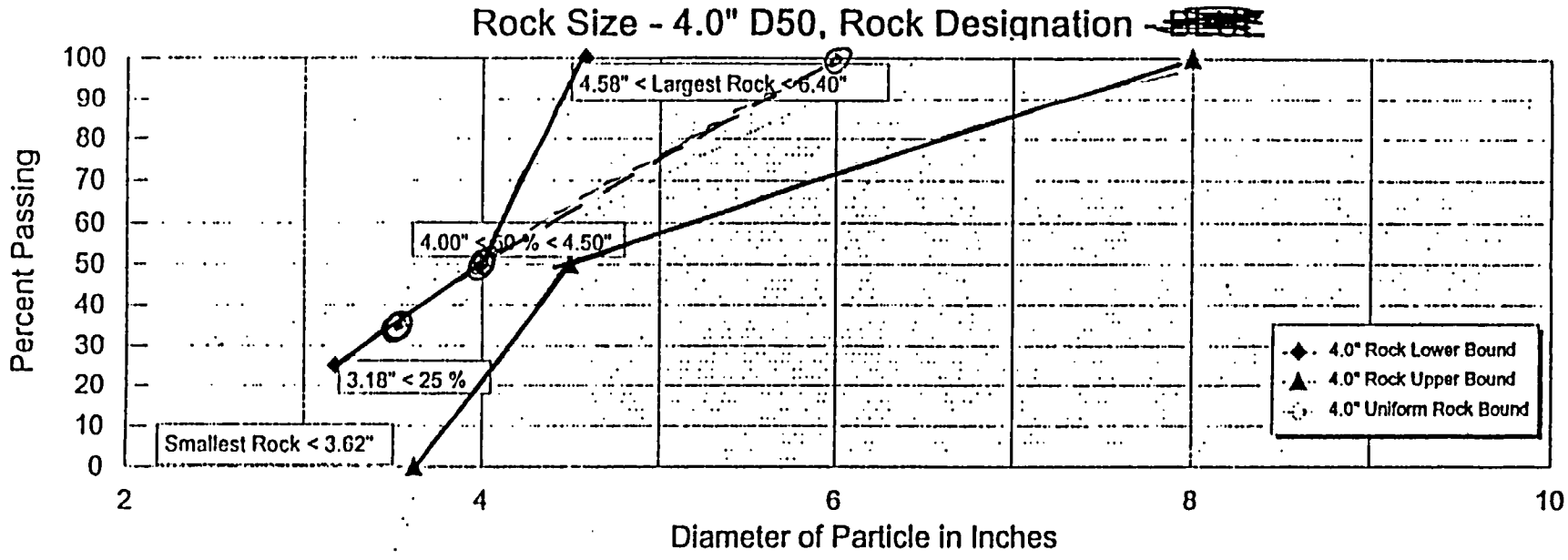
Sample # 1R (5) Total Sample wt. 985

wt. retained

Screen Size	6.4"	6"	4"	3.5"	-3.5
	Ø	Ø	252	90	125
			222	79	217
Sheet total					
TOTAL	Ø	Ø	474	169	342
% Retained	Ø	Ø	48.1	17.2	34.7
% Passing		100	51.9	34.7	—

INBERG-MILLER ENGINEERS

3-16-98


Rock Size - 4.0" D50, Rock Designation
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
2
4
6
8
10
Diameter of Particle in Inches
4.58" < Largest Rock < 6.40"
4.00" < 50 % < 4.50"
3.18" < 25 %
Smallest Rock < 3.62"
4.0" Rock Lower Bound
4.0" Rock Upper Bound
4.0" Uniform Rock Bound

SUBJECT D50 4" BLUE PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 4-10-98 BY Gerald Miller

PROJECT Limestone Rock Testing CHECKED BY

Sample # 2 Total Sample wt. 2520.4

Wt. retained

Screen Size	6.4"	6"	4"	3.5"		
			68.5	61.9	61.4	
			66.2	63.9	57.5	
			62.2	46.7	60.2	
			58.2	64.4	63.0	
			65.4	55.5	59.1	
			51.2	70.5	63.9	
			47.9	66.8	68.3	
			58.5	58.8	63.9	
			67.6	66.8		
			62.7	59.3		
			68.3			
			56.4			
			54.2			
			54.1			
			60.8			
			46.9			
			58.4			
			61.8			
			54.3			
			57.1			
			53.5			
			52.6			
			52.3			
			63.4			
Sheet total						
TOTAL	Ø	Ø	1408.5	614.6	497.3	2520.4
% Retained			55.9	24.4	19.7	
% Passing		100%	44.1	19.7		

INBERG-MILLER ENGINEERS

SUBJECT D50 4" BLUE PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE BY

PROJECT Limestone Rock Testing CHECKED BY

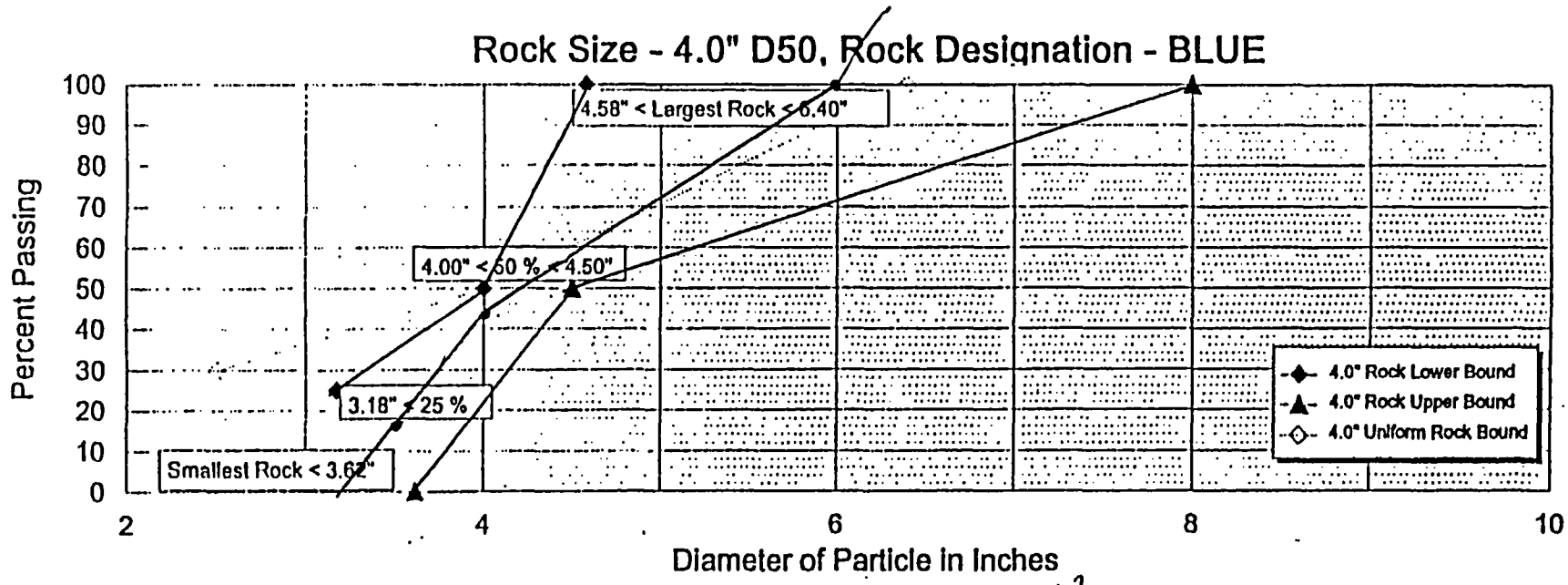
Sample # _____ Total Sample wt. _____

Wt. retained

Screen Size	6.4"	6"	4"	3.5"	< 3.5"
			70.6 - 2.1	69.3 - 2.4	58
			68.4 - 2.2	66.2 - 2.3	63.5 - 2.1
			64.5 - 2.3	48.95 - 2.3	59.2 - 1.7
			59.9 - 1.7	66.5 - 2.1	65.0 - 4.8
			67.4 - 2.0	60.2 - 4.75	65.1 - 2.1
			53.1 - 1.9	72.7 - 2.2	62.3 - 3.2
			52.6 - 4.75	69.0 - 2.2	65.7 - 1.8
			60.5 - 2.0	60.9 - 2.1	70.2 - 1.9
			69.7 2.1	69.0 - 2.2	
			65.0 - 2.3	61.3 - 2.0	65.6 - 1.7
			70.3 - 2.0		
			58.6 - 2.2		
			56.2 - 2.0		
			56.4 - 2.3		
			72.5 - 1.7		
			48.8 - 1.9		
			60.7 - 2.3		
			63.9 - 2.1		
			61.5 - 2.2		
			59.2 - 2.1		
			55.6 - 2.1		
			54.7 - 2.1		
			54.9 - 1.6		
Sheet total			[illegible]		
TOTAL					
% Retained					
% Passing					

INBERG-MILLER ENGINEERS

4-10-98


Rock Size - 4.0" D50, Rock Designation - BLUE
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
2
4
6
8
10
Diameter of Particle in Inches
4.58" < Largest Rock < 6.40"
4.00" < 50 % < 4.50"
3.18" < 25 %
Smallest Rock < 3.62"
4.0" Rock Lower Bound
4.0" Rock Upper Bound
4.0" Uniform Rock Bound

SUBJECT D50 4" BLUE PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 6-11 BY

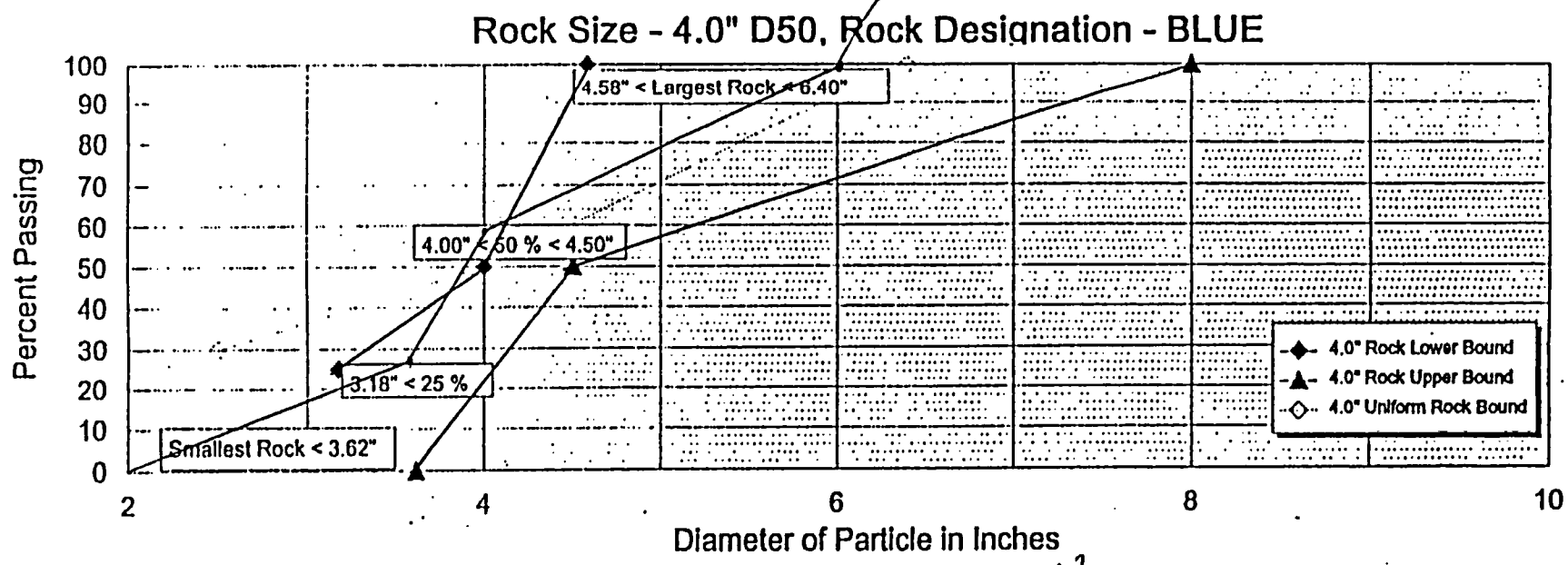
PROJECT Limestone Rock Testing CHECKED BY

Sample # 3 Total Sample wt. 308

wt. retained 262 lbs sample size

Screen SIZE	6.4"	6"	4"	3.5"		
	0 0	0 0	70 54	83 10	58 33	
Sheet total			124	93	91	308
TOTAL						
% Retained			40.3	30.2	29.6	
% Passing		100	59.7	29.5		

INBERG-MILLER ENGINEERS


Rock Size - 4.0" D50, Rock Designation - BLUE
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
2
4
6
8
10
Diameter of Particle in Inches
4.58" < Largest Rock < 6.40"
4.00" < 50 % < 4.50"
3.18" < 25 %
Smallest Rock < 3.62"
4.0" Rock Lower Bound
4.0" Rock Upper Bound
4.0" Uniform Rock Bound

D_{50} 6" SMALL RIP RAP

1998

SUBJECT D50 6" ~~Yellow~~ Purple PROJECT NO. 8152 Ron PAGE

CLIENT Path Finder DATE 3-11-98 BY

PROJECT Limestone Rock Testing CHECKED BY

Sample # 1 Total Sample wt. 3,001.00

wt. retained W.b. 46 #

Screen Size	9.6"	8"	6"	5"	
	298	261	244	226	218
	225	274	264		
	254				
	164	129	183		
	261				
Sheet total					
TOTAL	1202	664	691	226	218
% Retained	40.1	22.1	23.0	7.5	7.3
% Passing	59.9-	37.8-	14.8-	7.3	

INBERG-MILLER ENGINEERS

Sample # 5-11-98

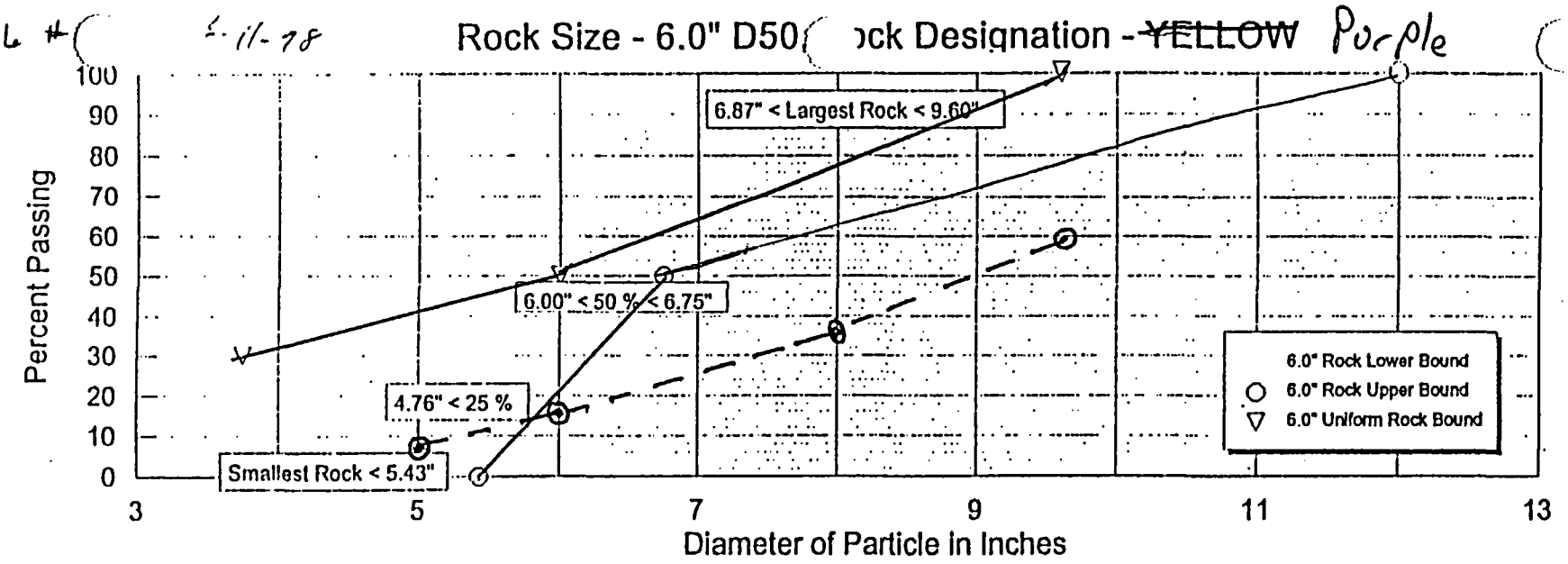


FIGURE 2

SUBJECT Dsd 6" Yellow PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-26-98 BY

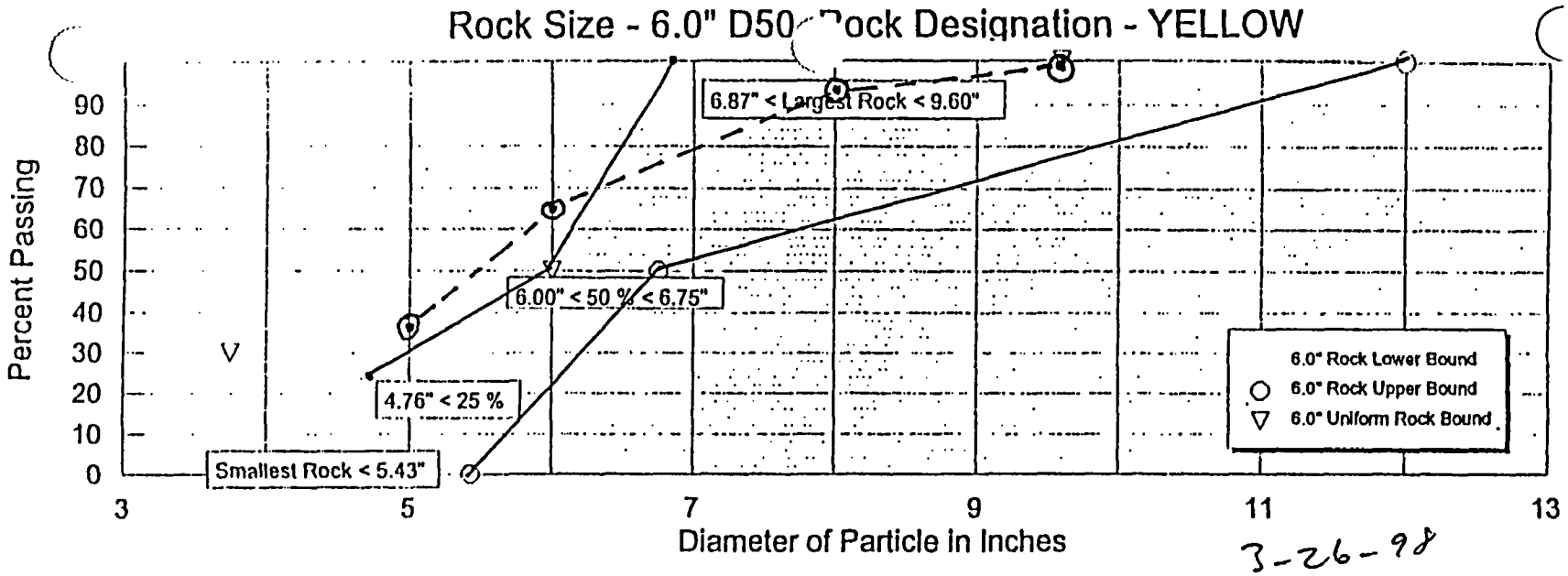
PROJECT Limestone Rock Testing CHECKED BY

Sample # 1R(1) Total Sample wt. 2,728

wt. retained

Screen Size	9.6"	8"	6"	5"	-5"
	22	77	274	204	230
		27	~~234~~	90	227
			234		253
				232	256
			264	254	
			84		
Sheet total					
TOTAL	22	104	856	780	966
% Retained	0.8	3.8	31.4	28.6	35.4
% Passing	99.2	95.4	64.0	35.4	—

INBERG-MILLER ENGINEERS



3-26-98

Sample #1 R(1)

FIGURE 2

SUBJECT D50 6" YELLOW PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-27-98 BY

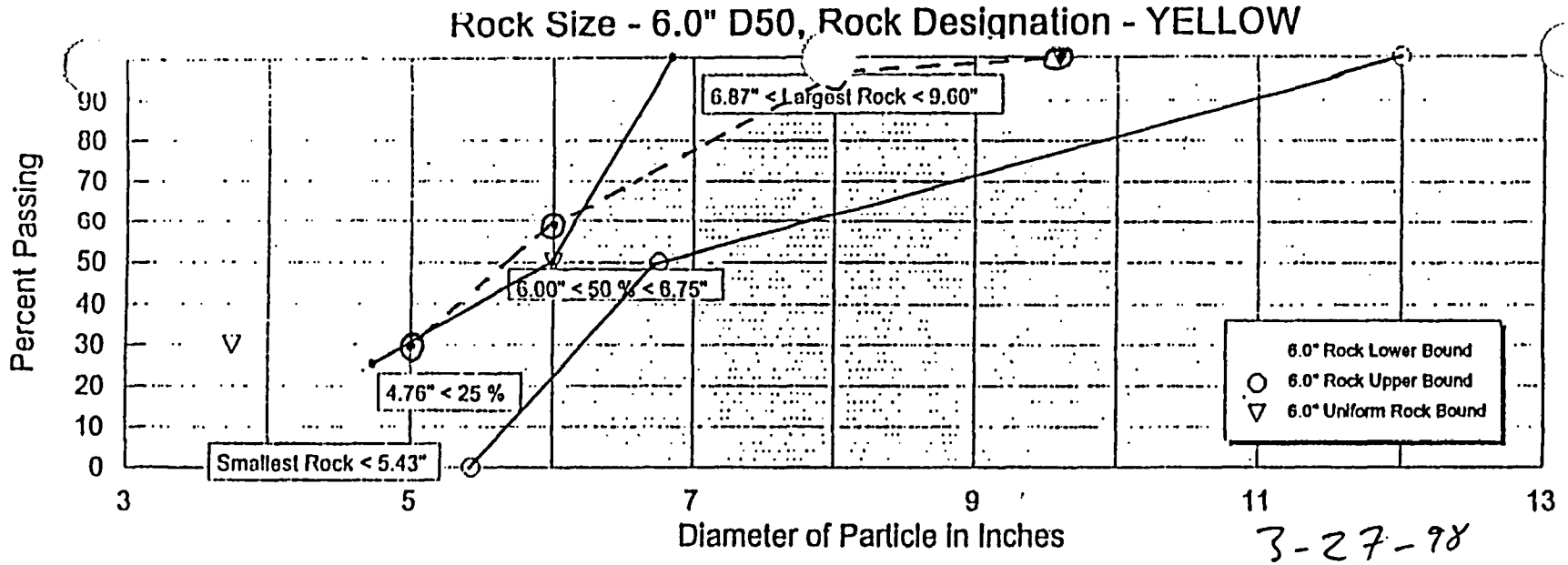
PROJECT Limestone Rock Testing CHECKED BY

Sample # 1R(2) Total Sample wt. 2,385

Wt. retained

Screen Size	9.6"	8"	6"	5"	-5"
	Ø	150	234	234	264
			238	259	185
			336	222	263
Sheet total					
TOTAL	Ø	150	808	715	712
% Retained	Ø	6.3	33.9	30.0	29.8
% Passing	100	93.7	59.8	29.8	—

INBERG-MILLER ENGINEERS



3-27-98
Sample #1 R(2)

FIGURE 2

SUBJECT Dsd 6" Yellow PROJECT NO. 8152 Rm PAGE

CLIENT Pathfinder DATE 4-1-98 BY WMR

PROJECT Limestone Rock Testing CHECKED BY

Sample # 1R(3) Total Sample wt. 2,950

wt. retained

Screen Size	9.6"	8"	6"	5"	-5"
		304	265 375 267 285	296 245 357	209 215 132
Sheet total					
TOTAL	~~0~~	304	1,192	898	556
% Retained	~~0~~	10.3	40.4	30.4	18.9
% Passing	100	89.7	49.3	18.9	—

INBERG-MILLER ENGINEERS

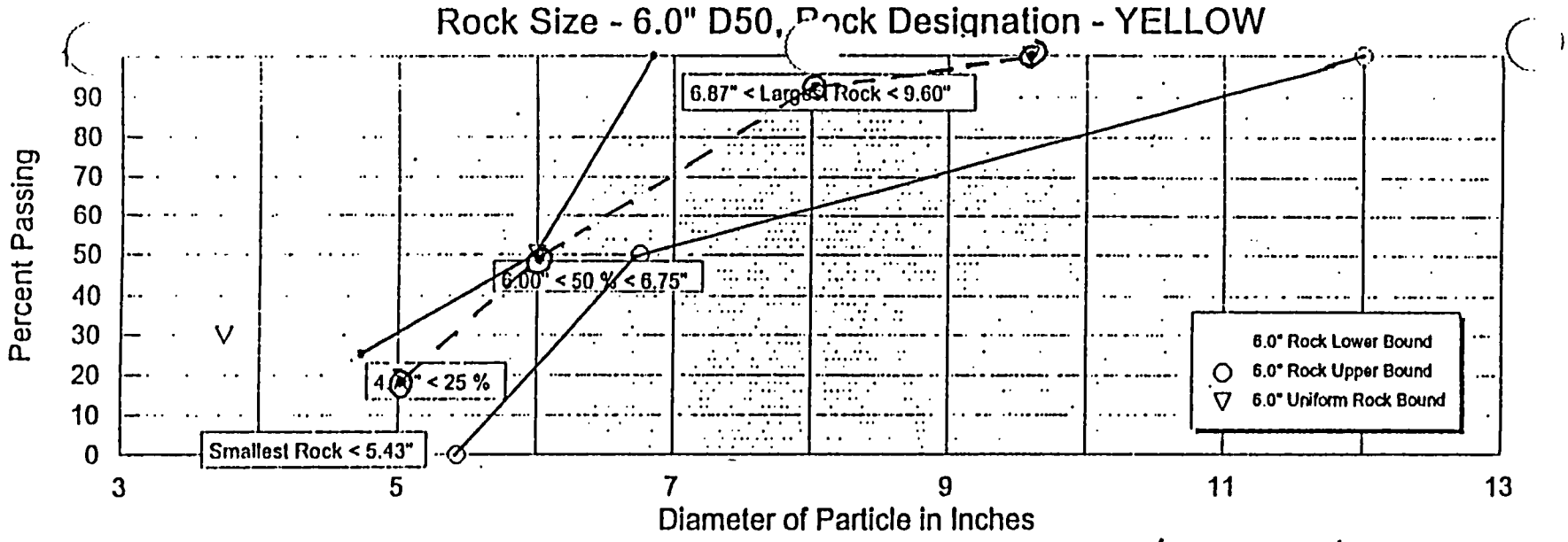


FIGURE 2

4-1-98
sample # 1R(8)

SUBJECT D50 6" YELLOW PROJECT NO. 8152 Rm PAGE

CLIENT Pathfinder DATE 6-11 BY

PROJECT Limestone Rock Testing CHECKED BY

Sample # 2 Total Sample wt. 1426

wt. retained 885 lbs Sample Size

Screen Size	9.6"	8"	6"	5"	
	76.0	80	318 322 48 688	345	237
Sheet total	76	80	688	345	237
TOTAL					
% Retained	5.3	5.6	48.3	24.2	16.6
% Passing	94.7	89.1	40.8	16.6	

INBERG-MILLER ENGINEERS

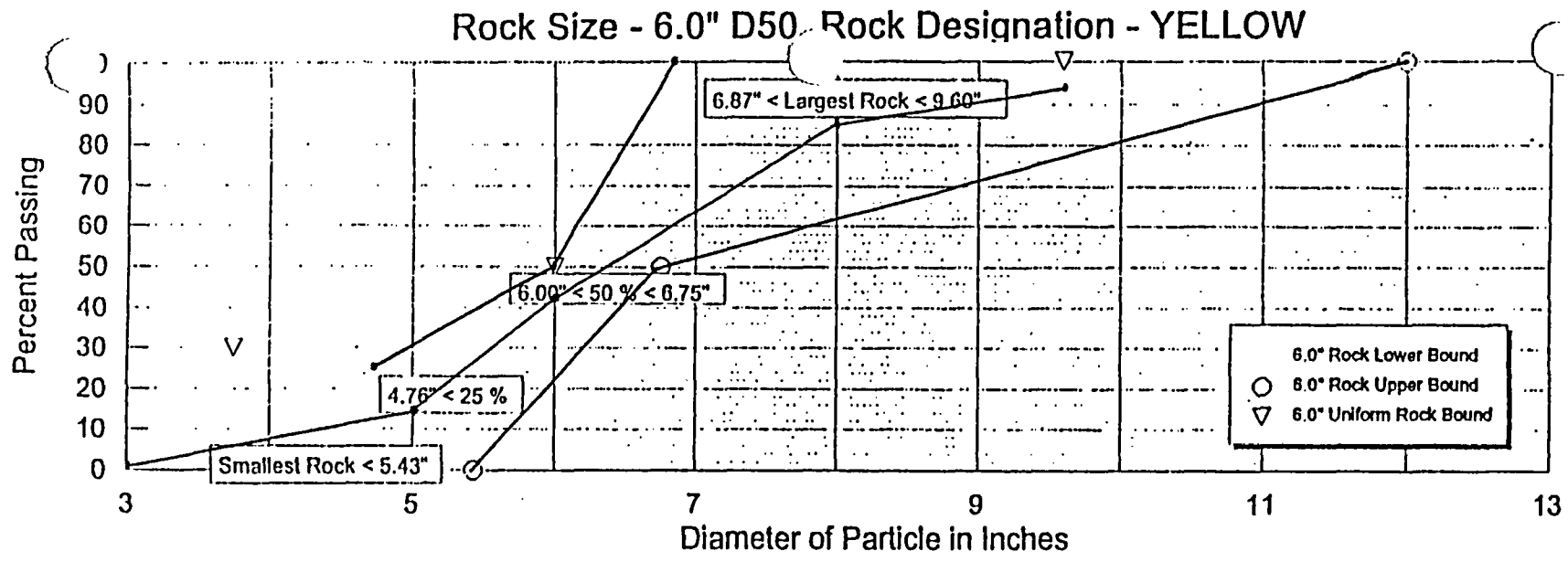

Rock Size - 6.0" D50 Rock Designation - YELLOW
Percent Passing
0
10
20
30
40
50
60
70
80
90
3
5
7
9
11
13
Diameter of Particle in Inches
6.87" < Largest Rock < 9.60"
6.00" < 50 % < 6.75"
4.76" < 25 %
Smallest Rock < 5.43"
6.0" Rock Lower Bound
6.0" Rock Upper Bound
6.0" Uniform Rock Bound

FIGURE 2

SUBJECT D50 6" YELLOW PROJECT NO. 8152 Rch PAGE

CLIENT Path Finder DATE 7-28-98 BY

PROJECT Limestone Rock Testing CHECKED JPM BY

Sample # 3 Total Sample wt. 968.0

wt. retained

Screen SIZE	9.6"	8"	6"	5"	
		175.0	168.5 212.0	295	117.5
Sheet total	0	175	380.5	295	117.5
TOTAL	0	175	380.5	295	117.5
% Retained	0	18.1	39.3	30.5	12.1
% Passing	100.0	81.9	42.6	12.1	0.0

INBERG-MILLER ENGINEERS

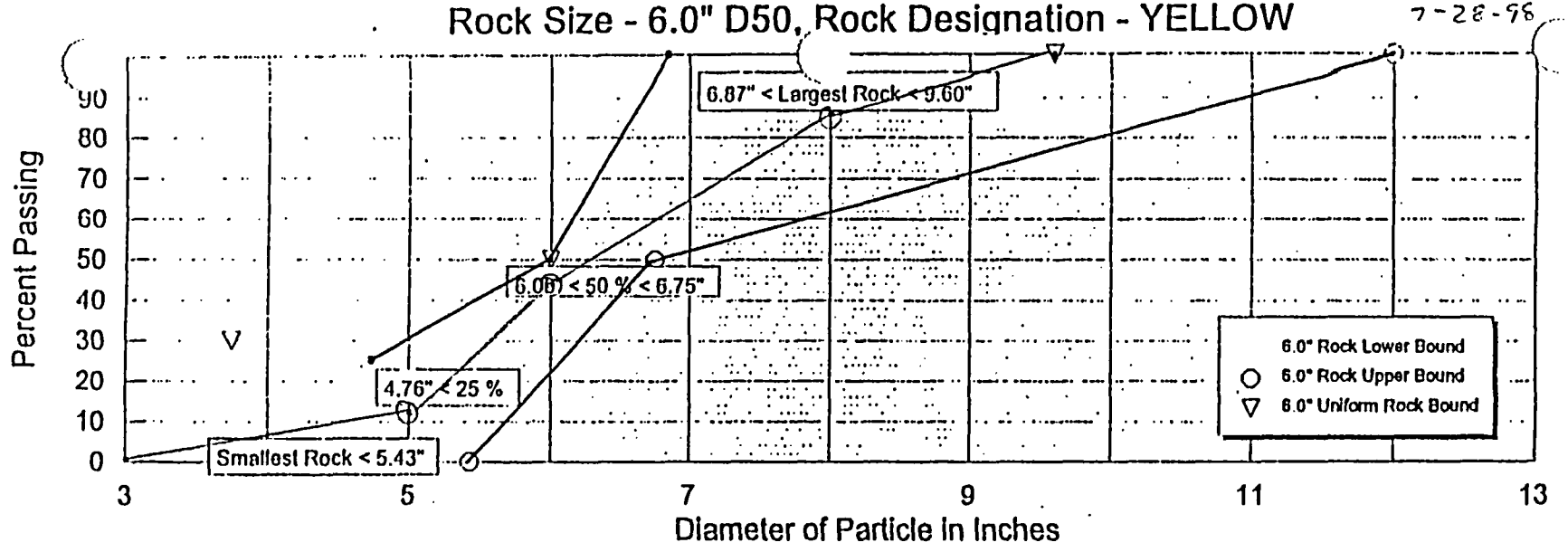

Rock Size - 6.0" D50, Rock Designation - YELLOW
7-28-98
Percent Passing
90
80
70
60
50
40
30
20
10
0
3
5
7
9
11
13
Diameter of Particle In Inches
6.87" < Largest Rock < 9.60"
6.06" < 50 % < 6.75"
4.76" < 25 %
Smallest Rock < 5.43"
6.0" Rock Lower Bound
6.0" Rock Upper Bound
6.0" Uniform Rock Bound

FIGURE 2

SUBJECT Dsd 6" Yellow PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 10-9-98 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 4 Total Sample wt. 1501.0

wt. retained

Screen Size	9.6"	8"	6"	5"	
	145.0 39.0	112.0 30.0	100.0 122.0 234.0 134.0	140.0 224.0 99.0	54.0 50.0 28.0
Sheet total					
TOTAL	185.0	142.0	580.0	463.0	132.0
% Retained	12.3	9.5	38.6	30.8	8.8
% Passing	87.7	78.2	39.6	8.8	0.0

INBERG-MILLER ENGINEERS

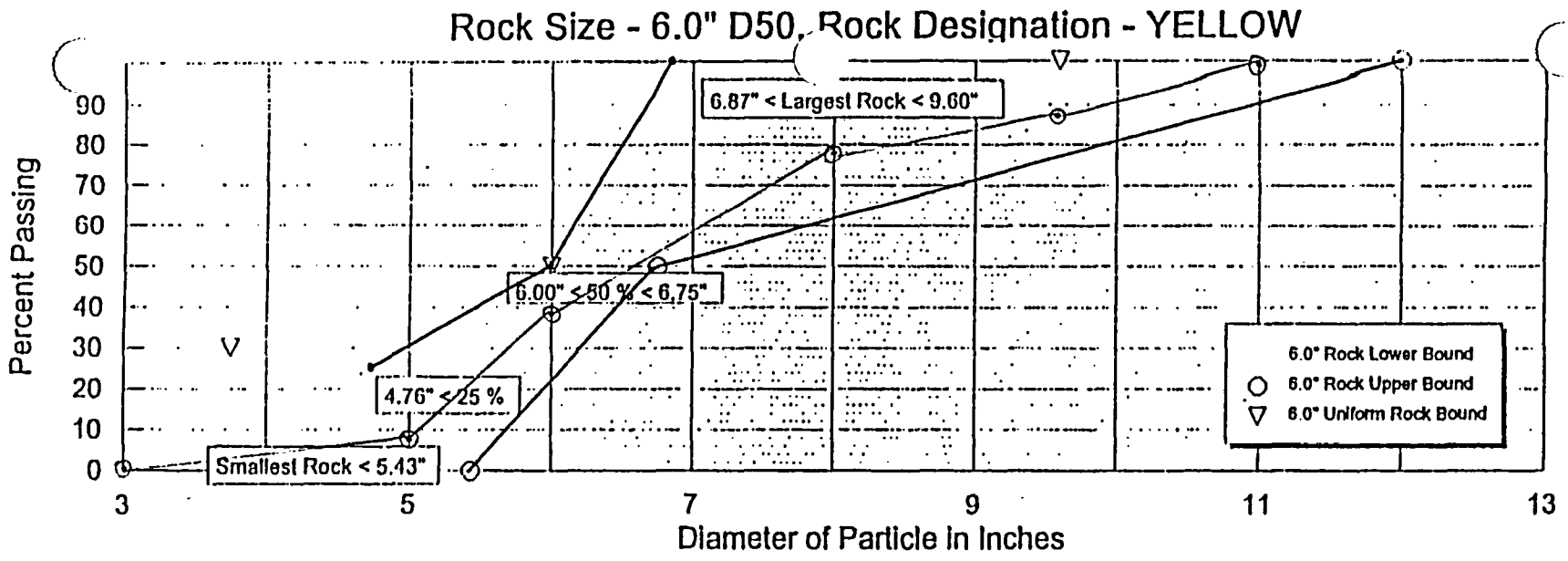

Rock Size - 6.0" D50, Rock Designation - YELLOW
Percent Passing
90
80
70
60
50
40
30
20
10
0
3
5
7
9
11
13
Diameter of Particle In Inches
6.87" < Largest Rock < 9.60"
6.00" < 50 % < 6.75"
4.76" < 25 %
Smallest Rock < 5.43"
6.0" Rock Lower Bound
6.0" Rock Upper Bound
6.0" Uniform Rock Bound

FIGURE 2

D_{50} 9.6" RIP RAP

1998

SUBJECT D_{50} 9.6" ~~Orange~~ Yellow PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-12-98 BY

PROJECT Limestone Rock Testing CHECKED BY

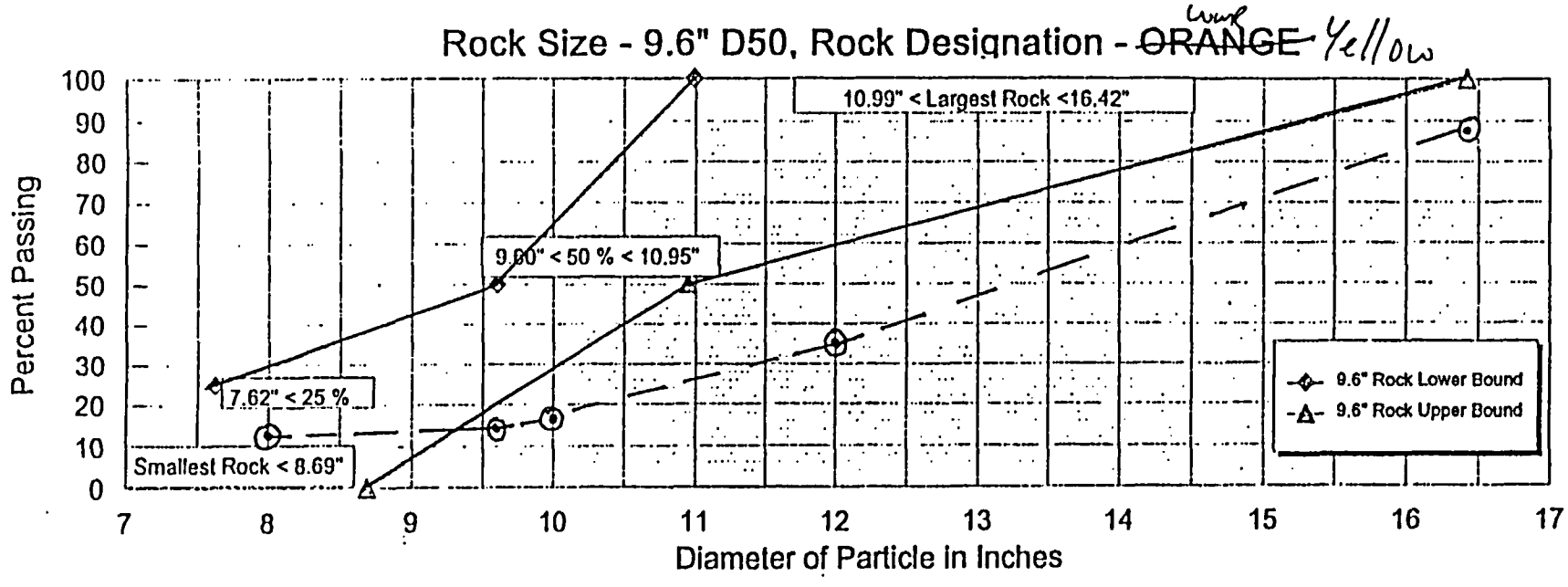
Sample # 1 Total Sample wt. 12,602

wt. retained wb = 46
wet = 91

Screen Size	16.42"	12"	10"	9.6"	8"	-8
	444	122	229	161	207	237
	294	137	210	274		293
	495	162	247	104		248
	269	265	344			534
		224	300			377
		260	417			110
		164	149			
		157	104			
		164				
		116				
		237				
		178				
		170				
		139				
		137				
		194				
		263				
		150				
		232 / 127				
		216 / 236				
		185 / 295				
		168 / 194				
		214 / 159				
		312 / 211				
		313 / 228				
		184 / 241				
Sheet total						
TOTAL	1502	6,755	2000	539	207	1599
% Retained	11.9	53.6	15.9	4.3	1.6	12.7
% Passing	88.1	34.5	18.6	14.3	12.7	

INBERG-MILLER ENGINEERS

Sample #1 3-12-98



SUBJECT D_{50} 9.6" ORANGE PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-16-98 BY

PROJECT Limestone Rock Testing CHECKED BY

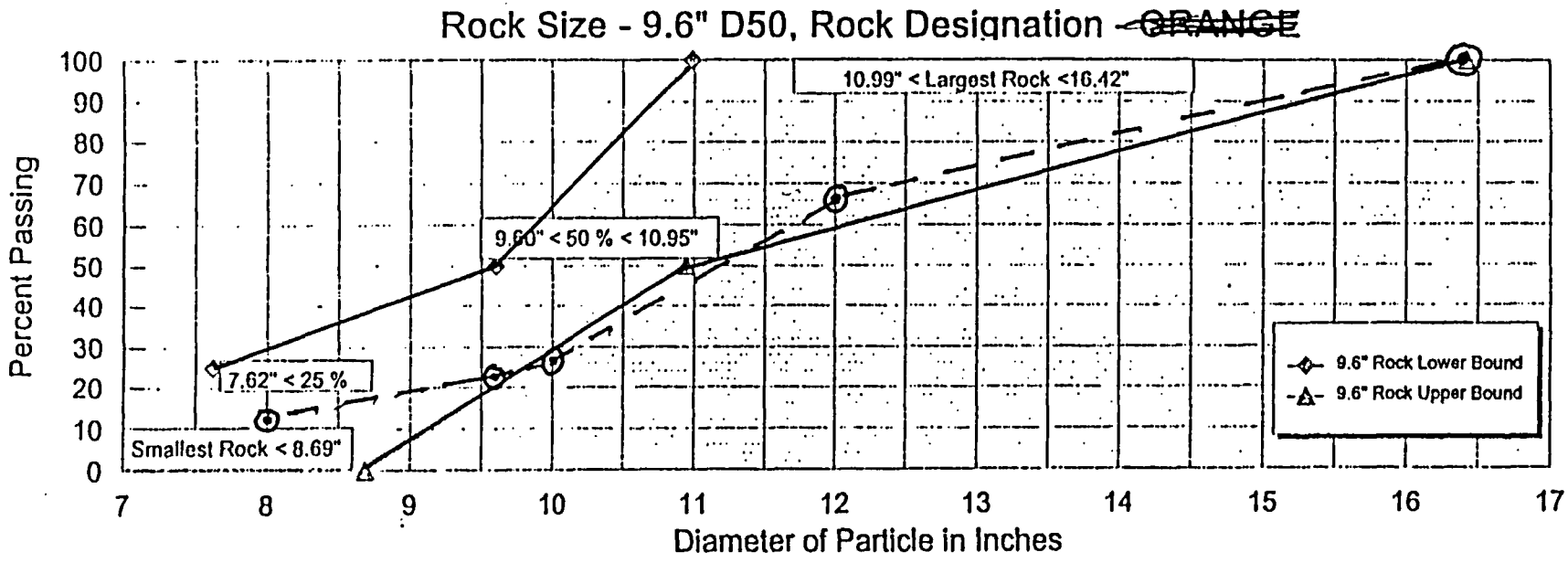
Sample # 1R(1) Total Sample wt. 8,878

wt. retained

Screen Size	16.42"	12"	10"	9.6"	8"	-8"
	Ø	90	238	294	221	225
		165	134	268	109	~~24~~
		131	145		248	240
		154	115		210	311
		250	302			256
		154	95			
		149	205			
		255	146			
		254	193			
		179	334			
		106	292			
		184	276			
		204	300			
		132	182			
		137	324			
		210	210			
		191				
Sheet total						
TOTAL	Ø	2,945	3,491	562	848	1032
% Retained	Ø	33.2	39.3	6.3	9.6	11
% Passing	100	66.8	27.5	21.2	11.6	

INBERG-MILLER ENGINEERS

3-16-98


Rock Size - 9.6" D50, Rock Designation ~~ORANGE~~
Percent Passing
Diameter of Particle in Inches
10.99" < Largest Rock <16.42"
9.60" < 50 % < 10.95"
7.62" < 25 %
Smallest Rock < 8.69"
9.6" Rock Lower Bound
9.6" Rock Upper Bound
0
10
20
30
40
50
60
70
80
90
100
7
8
9
10
11
12
13
14
15
16
17

D_{50} 12" RIP RAP

1998

SUBJECT D_{50} 12" Brown PROJECT NO. 8152 Rm PAGE 1/2

CLIENT Pathfinder DATE 3-25-98 BY Wmc

PROJECT Limestone Rock Testing CHECKED BY

Sample # 1 Total Sample wt. 25,080

Wt. retained

Screen Size	20.52"	15"	12"	10"	-10"
	480	268	205	274	261
		227	219	219	273
		287	159	266	188
		224	190	115	294
		189	164	174	230
		184	236	234	175
		198	264		234
		178	296	147	220
		223	217	132	190
		177	165	80	120
		254	264	22	
		128	122		
		320	247		
		263	263		
		230	239		
		280	136		
		165	274		
		227	280		
		132	202		
		101	225		
		217	134		
		355	308		
		158	88		
		221	218		
		167	172		
		262	117		
		217	195		
		322	207		
		290	264		
Sheet total	480	6,464	6,070	1,663	2,185
TOTAL	480	11,369	9,383	1,663	2,185
% Retained	1.9	45.3	37.4	6.6	8.7
% Passing	98.1	52.8	15.4	8.8	—

INBERG-MILLER ENGINEERS

SUBJECT D_{50} 12" Brown PROJECT NO. 8152 Run PAGE 2/2

CLIENT Pathfinder DATE 3-25-98 BY WMR

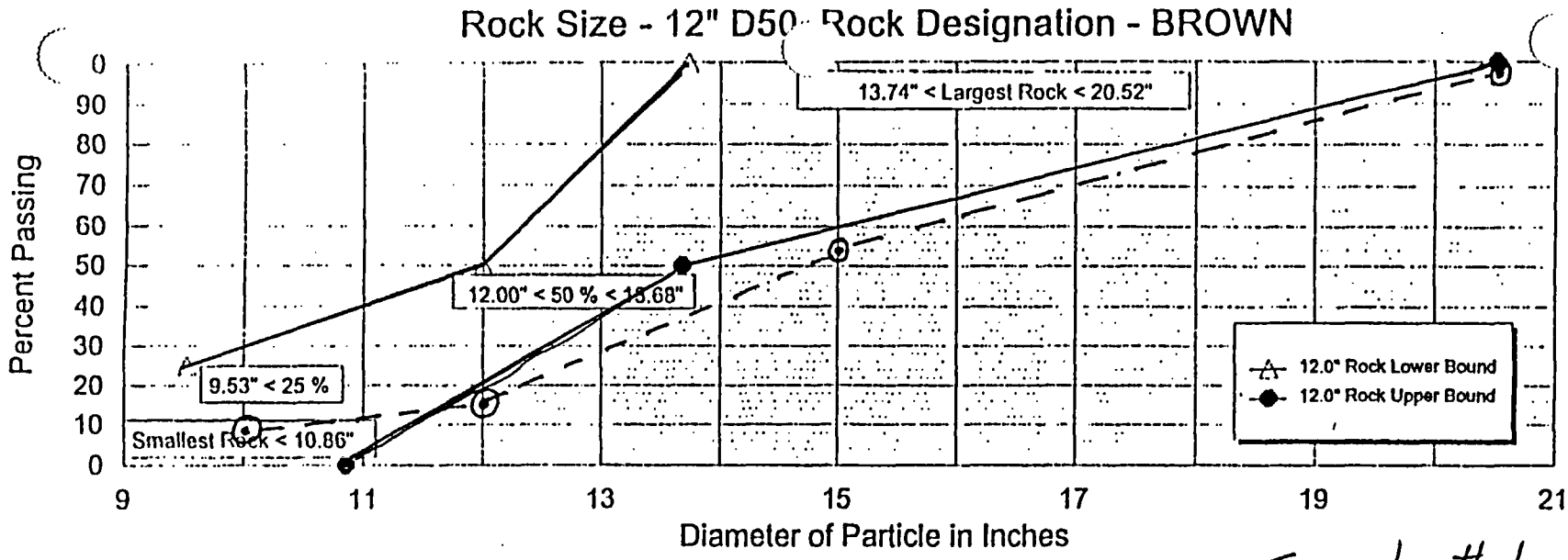
PROJECT Limestone Rock Testing CHECKED BY

Sample # 1 Total Sample wt. _____

wt. retained

Screen Size	20.52"	15"	12"	10"	-10"
	Ø	185	170	Ø	Ø
		195	255		
		372	272		
		200	165		
		260	180		
		236	145		
		225	122		
		175	123		
		230	192		
		320	130		
		230	222		
		210	197		
		220	74		
		175	110		
		222	220		
		220	147		
		300	215		
		152	100		
		244	165		
		222	109		
		312			
Sheet total	Ø	4,905	3,313	Ø	Ø
TOTAL					
% Retained					
% Passing					

INBERG-MILLER ENGINEERS



Sample #1
3-25-98

FIGURE 1

SUBJECT D_{50} 12" Brown PROJECT NO. 8152 Rm PAGE

CLIENT Path Finder DATE 3-25-98 BY

PROJECT Limestone Rock Testing CHECKED BY

Sample # _____ Total Sample wt. _____

wt. retained

Screen Size	20.52"	15"	12"	10"	-10
	*480	268	205	274	261
		227	219	219	273
		287	159	266	188
		224	190	175	294
		189	164	174	230
		184	236	234	175
		198	264		
		178	296		
		223	217		
		177	165		
			264		
			122		
			247		
			263		
			239		
			136		
			274		
			280		
			202		
			225		
Sheet total					
TOTAL					
% Retained					
% Passing					

390
390

390
274

INBERG-MILLER ENGINEERS

SUBJECT D_{50} 12" Brown PROJECT NO. 8152 Rm PAGE

CLIENT Path Finder DATE 3-25-93 BY

PROJECT Limestone Rock Testing CHECKED BY

Sample # _____ Total Sample wt. _____

wt. retained

Screen Size	20.52"	15"	12"	10"	-10"
		254	134	147	234
		128	308	132	220
		320	88	80	190
		263	218	22	120
		230	~~132~~		
		280	172		
		165	117		
		227	195		
		132	207		
		101	264		
		217	170		
		355	255		
		158	272		
		221	165		
		167	180		
		262	145		
		217	122		
		322	124		
		290	192		
		145	130		
		195	222		
			147		
		375	74		
		200	110		
		260	220		
		236	147		
		225	215		
		175	106		
		230	165		
		120	109		
		230			
		210			
		220			
		145			
		222			
		220			
		300			
		152			
		214			
		122			
		242			
Sheet total					
TOTAL					
% Retained					
% Passing					

INBERG-MILLER ENGINEERS

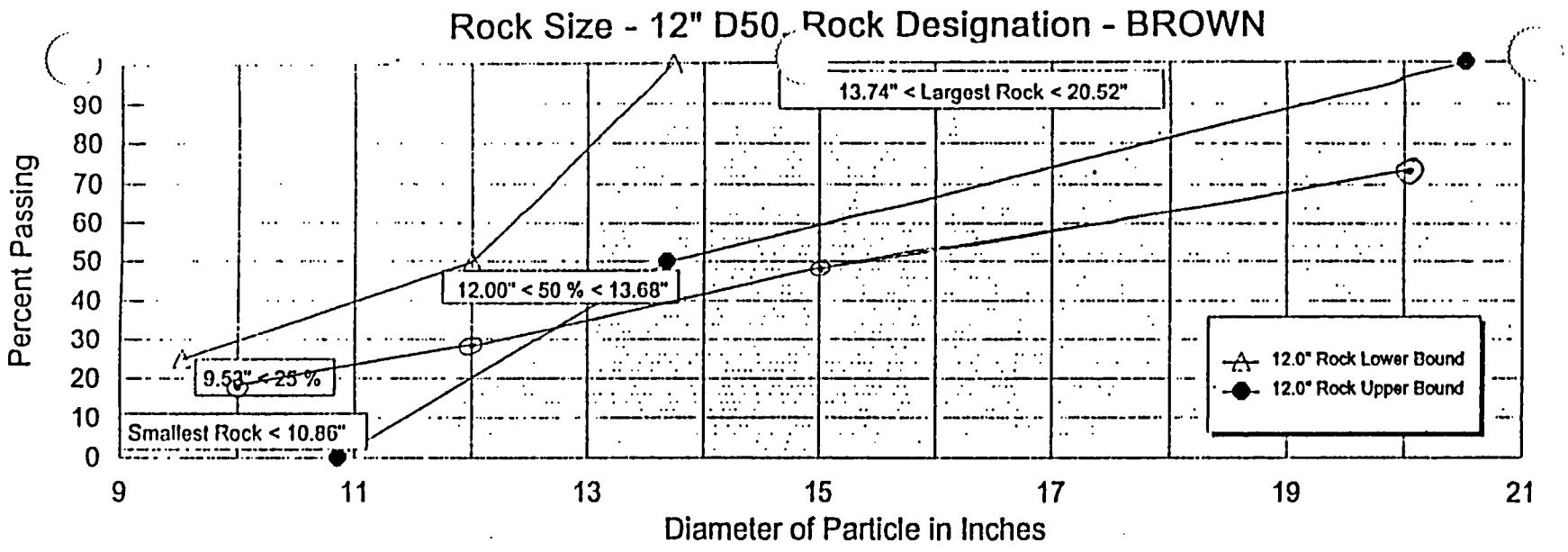

Rock Size - 12" D50, Rock Designation - BROWN
13.74" < Largest Rock < 20.52"
12.00" < 50 % < 13.68"
9.53" < 25 %
Smallest Rock < 10.86"
12.0" Rock Lower Bound
12.0" Rock Upper Bound
Percent Passing
0
10
20
30
40
50
60
70
80
90
9
11
13
15
17
19
21
Diameter of Particle in Inches

FIGURE 1

SUBJECT D_{50} 12" Brown PROJECT NO. 8152 Rm PAGE

CLIENT Path Finder DATE 8-21 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

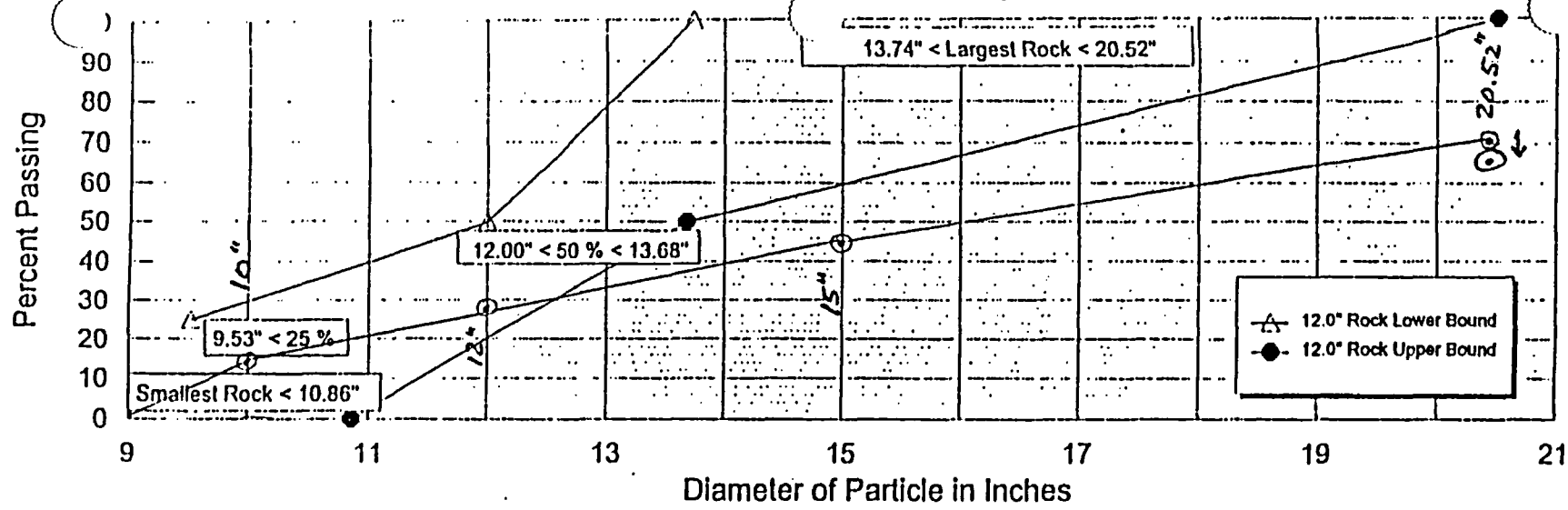
Sample # 1 Total Sample wt. 7281.0

Wt. retained

Screen Size	20.52"	15"	12"	10"	
	374 385 1787	604 503 418	1023 122	183 810	282 466 324
Sheet total					
TOTAL	2546	1525	1145	993	1072
% Retained	34.97	20.94	15.73	13.64	14.72
% Passing	65.03	44.07	28.34	14.72	0.0

INBERG-MILLER ENGINEERS

~~Rock Size 12" D50 Rock Designation BROWN~~



Size	% Finer
20.52	65
15	44
12	28
10	15

FIGURE 1

LIMESTONE ROCK PRODUCTS
QUALITY CONTROL
GRADATION RESULTS

1998

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
2.17"	1	2/27/98	0 (Initial)												100	97.3	60.9	23.5	6.3				P
1.63"	1	2/27/98	0 (Initial)														100	89.5	39.1				P
1"	1	2/27/98	0 (Initial)																100	91.2	64.6	26.2	F
Filter 1" max	1	2/27/98	0 (Initial)																		100		P

Non-Conformance Description: D_{50} 1" did not meet specs.	Tested By: [illegible]	Date: 2-27-98
Corrective Action: Adjustments made to crusher	IME Project Manager: [illegible]	Date: 3-16-98
for resample + retest	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	1R(1)	3/2/98	-0-																99	95	76	46	F
4"	1	"	-0-								100	100	~~70~~ 100	70	59								F

Non-Conformance Description: D_{50} 1" and D_{50} 4" did not meet spec.	Tested By: William G	Date: 3-2-98
Corrective Action: Adjustments made to crusher, resample and retest	IME Project Manager: [signature]	Date: 4-1-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	1R(2)	3-3-98	— 0 —																100	89	55	24	F

Non-Conformance Description: D_{50}/11 D.2 not meet specification	Tested By: [illegible]	Date: 3-3-98
Corrective Action: Adjustments made to crusher, resample and retest	IME Project Manager: [illegible]	Date: 4-1-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	1R(3)	3/4/98	- 0 -																100	95	70	34	F
4"	1R(1)	"	"									100	~~[illegible]~~	76	60								F

Non-Conformance Description: D_{50} 1" and 4" did not meet spec.	Tested By: [illegible]	Date: 3-4-98
Corrective Action: Adjustments made to crusher, resample and retested	IME Project Manager: [illegible]	Date: 4-1-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	1R(4)	3/5/98	-0-																100	94	73	40	F
4"	1R(2)	"	"									100		78	56								F

Non-Conformance Description: D50 1" and 4" did not meet spec	Tested By: William G	Date: 3-5-98
Corrective Action: Adjustments made to crusher, resampled and retested	IME Project Manager: [signature]	Date: 4-1-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	1R(S)	3/11/98	-0-																100	95	74	39	F
6"	1	"	"						60	38		15	7										F

Non-Conformance Description: D_{50} 1" and 6" did not meet spec.	Tested By: Willis	Date: 3-11-98
Corrective Action: Adjustments made to D_{50} 1", resampled	IME Project Manager:	Date: 4-1-98
and retested. D_{50} 6" production on hold	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	1R(6)	3/12/98	-0-																100	94	67	35	F
9.6"	1	"	-0-		88		35	19	14	13													F

Non-Conformance Description: D_{50} 1" and 9.6" did not meet spec	Tested By: [illegible]	Date: 3-12-98
Corrective Action: Adjustments made to crusher and grizzly, resampled, retested.	IME Project Manager: [illegible]	Date: 4-1-98
	PMC Construction Manager:	Date:

PMC102A - REV. 2-10-98

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	1R(7)	3-13-98	- 0 -																100	94	75	31	F
4"	1R(3)	"	"									100		79	60								F
4"	1R(4)	"	"									100		71	58								F

Non-Conformance Description: D50 1" and 4" did not meet spec.	Tested By: [illegible]	Date: 3-13-98
Corrective Action: Adjustments made to crusher, resampled and retested	IME Project Manager: [illegible]	Date: 4-1-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	1R(8)	3/16/98	-0-																100	97	79	40	F
4"	1R(5)	"	-0-									100		52	35								P
9.6"	1R(1)	"	-0-		100		67	28	21	12													P

Non-Conformance Description: D50 1" did not meet spec	Tested By: William G	Date: 3-16-98
Corrective Action: Adjustments made to crusher,	IME Project Manager: Glen M Bohnik	Date: 4-1-98
rescreened and retested.	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
1"	1R(9)	3/17/98	-0-																100	88	65	26		F
1"	1R(10)	"	-0-																100	90	56	22		F
1.63"	2	"															100	80	2					P

Non-Conformance Description: D50 1" did not meet spec	Tested By: [illegible]	Date: 3-17-98
Corrective Action: Adjustments made to crusher,	IME Project Manager: [illegible]	Date: 4-1-98
resampled and retested	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
1"	1R(11)	3/20/98	-0-																100	89	50	10		P

Non-Conformance Description: NONE	Tested By: Willis	Date: 3-20-98
Corrective Action:	IME Project Manager: Gary M Bohm	Date: 4-1-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
12"	1	3/25/98	-0-	98		53	15	9															P

Non-Conformance Description: None	Tested By: Willie	Date: 3-25-98
Corrective Action:	IME Project Manager: Tom M Bobnak	Date: 4-21-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	2	3/26/98	-																100	90	49	10	P
6"	1R(1)	"	-0-						99	95		64	35										F

Non-Conformance Description: D_{50} 6" did not meet spec.	Tested By: William	Date: 3-26-98
Corrective Action:	IME Project Manager: [illegible]	Date: 4-1-98
	PMC Construction Manager:	Date:

pmcdoca - rev [illegible]

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
6"	1R(2)	3/27/98	- 0 -						100	94		60	30										F

Non-Conformance Description: D_{50} 6" did not meet grading specs.	Tested By: William [illegible]	Date: 3/27/98
Corrective Action: Adjustment made to crusher, resample and	IME Project Manager: [illegible]	Date: 4-21-98
retest	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
6"	12(3)	4-1-98	—0—						100	90		49	19										P

Non-Conformance Description: None	Tested By: Willi	Date: 4-1-98
Corrective Action:	IME Project Manager: Tom McBride	Date: 4-21-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
4"	2	4/10/98										100		44	20								P

Non-Conformance Description:	Tested By: Gerald Miller	Date: 4-10-98
Corrective Action:	IME Project Manager: Glenn M Bobnick	Date:
	PMC Construction Manager:	Date:

PMCROCK • REV 3-10-98

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
<1"	2	5-11																			100		P
<1"	3	5-11																			100		P

Non-Conformance Description:	Tested By: JLB	Date: 5-11-98
Corrective Action:	IME Project Manager: GMS	Date: 5-11-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	3	5-14															100	96.3	63.4				

Non-Conformance Description: Out of Spec on 1½"	Tested By: GNB	Date: 5-14-98
Corrective Action: Adjust screens	IME Project Manager: GNB	Date: 5-14-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
2.17	2	5-15													100	100	76.5	32.6	7.5					P
1.63	SR(1)	5-15																						F

Non-Conformance Description: 1.63 out of spec. on 1½"	Tested By: JLB/GMB	Date: 5-15-98
Corrective Action: Adjust screens	IME Project Manager: GMB	Date: 5-15-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
1"	3	6/8/98																	100	90	53	10		(P)

Non-Conformance Description:	Tested By: JLB	Date: 6-5-98
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
4"	3	6/11/98										100		59.7	29.5								F
6"	2	6/11/98							94.7	89.1		40.9	16.6										P

Non-Conformance Description: 4" MAT'L Sampled From Stockpile	Tested By: JPM	Date: 6-11-98
Corrective Action: Production of 4" D50 has been completed. Collection of representative sample may be impractical.	IME Project Manager: [signature]	Date: 6-16-98
	PMC Construction Manager:	Date:

PMC/DCA - REV 3-14-98

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
Filter	5	7-16-98																			100.0		P

Non-Conformance Description:	Tested By: JPM	Date: 7-27-98
Corrective Action:	IME Project Manager: [illegible]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
6"	3	7-28-98							100.0	81.9	—	42.6	12.1										P
																							P

Non-Conformance Description:	Tested By: JPM	Date: 7-28-98
Corrective Action:	IME Project Manager: [signature]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
Filter	6	7-29-98																			100.0		P

Non-Conformance Description:	Tested By: JPM	Date: 7-29-98
Corrective Action:	IME Project Manager: [illegible]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16 42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	4	8-5-98														100.0	97.4	95.1	33.2				P
Filter	7	8-5-98																			100.0		P

Non-Conformance Description:	Tested By: JPM	Date: 8-5-98
Corrective Action:	IME Project Manager: [signature]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
Filter	8	8-14-98																	100.0				P

Non-Conformance Description:	Tested By: JFM	Date: 8-14-98
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
12"(Quartzite)	upper 1 stage-ore	8-21		65.0	—	44.1	28.4	14.72															—

Non-Conformance Description:	Tested By:	Date:
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
12" Quarzite	2 lower stockpile	8-21-98		73.0	—	48.5	29.1	19.4															—

Non-Conformance Description:	Tested By: JRM	Date: 8-21-98
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
2.17"	3	8-31-98													100.0	79.5	51.2	14.1	4.4				P

Non-Conformance Description:	Tested By: JAM	Date: 8-31-98
Corrective Action:	IME Project Manager: [signature]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
Filter	9 Yakoale	9-23-98																	100.0					P

Non-Conformance Description:	Tested By: JFM	Date: 9-23
Corrective Action:	IME Project Manager: [illegible]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1"	5	10-1-98															.	100.0	26.2	50.5	34.5	13.4	P

Non-Conformance Description:	Tested By: JPM	Date: 10-1-98
Corrective Action:	IME Project Manager: [signature]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
1.63"	5	10-8-98															100.0	93.0	44.8					F

Non-Conformance Description:	Tested By: JPM	Date: 10-8-98
Corrective Action:	IME Project Manager: [illegible]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
6"	4	10-9-98						100.0	87.7	78.2	—	39.6	8.8										P

Non-Conformance Description:	Tested By: JPM	Date: 10-9-98
Corrective Action:	IME Project Manager: GMB	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
2.17	4	10-9-98													100.0	93.1	49.6	19.2	3.3					P

Non-Conformance Description:	Tested By: JPM	Date: 10-9-98
Corrective Action:	IME Project Manager: GJS	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	5(R)	10-12-98															100.0	85.6	47.8				P

Non-Conformance Description:	Tested By: [illegible]	Date: 10-12-98
Corrective Action:	IME Project Manager: [illegible]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
Filter	12	10-26-98																	100.0				P

Non-Conformance Description:	Tested By: TFM	Date: 9-18-95
Corrective Action:	IME Project Manager: GMZ	Date: 11-20-98
	PMC Construction Manager:	Date:

PMCFORM - REV 3-10-98

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
2.17	5	10-28-98													100.0	87.2	51.2	21.7	12.7				P

Non-Conformance Description:	Tested By: JPM	Date: 10-28-98
Corrective Action:	IME Project Manager: GMS	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
1 5/8" max	13	11-3-98																	100.0					P

Non-Conformance Description:	Tested By: JEM	Date: 11-3-98
Corrective Action:	IME Project Manager: [illegible]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
Filter	14	11-4-98																	100.0					P

Non-Conformance Description:	Tested By: JAM	Date: 10-26-98
Corrective Action:	IME Project Manager: [illegible]	Date: 11-26-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
2.17"	6	11-9-98													100.0	89.3	40.5	15.3	10.8				F
1.63"	6	11-9-98															100.0	87.83	51.37				F
1 5/8" max	15	11-9-98																	100.0				P

Non-Conformance Description: 1.63 + 2.17	Tested By: JPM	Date: 11-9-98
Corrective Action: Took retests	IME Project Manager: [illegible]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63"	6(R)	11-12-98															100.0	81.4	53.3				F
1 5/8" max	16	11-12-98																	100.0				P
2.17"	6(R)	11-12-98													100.0	88.7	55.6	12.2	5.1				P

Non-Conformance Description: 1.63"	Tested By: JPM	Date: 11-12-98
Corrective Action: Took a retest.	IME Project Manager: [illegible]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	GR(2)	11-17-98															100.0	84.7	47.2				F

Non-Conformance Description:	Tested By: JPM	Date: 11-17-98
Corrective Action:	IME Project Manager: [illegible]	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1 5/8" max	17	11-18-98																	100.0				P
1.63"	GR(3)	11-18-98															100.0	83.8	42.7				F
.66'	1	11-18-98						90.0	—	18.6	7.0	—	1.8										F

Non-Conformance Description: 1.63"	Tested By: JPM	Date: 11-18-98
Corrective Action: .66	IME Project Manager:	Date:
Took retests	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63"	7	11-20-98															100.0	79.5	39.0				P

Non-Conformance Description:	Tested By: JPM	Date: 11-20-98
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
1 5/8 max	18	11-20																	100.0					P
1.63"	(6R(4))	11-20															99.4	78.2	39.3					P

Non-Conformance Description:	Tested By: JPM	Date: 11-20-98
Corrective Action:	IME Project Manager:	Date: 11-20-98
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
Filter	19	12-2																	1200				P

Non-Conformance Description:	Tested By: JPM	Date: 12-2
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	8	12-2															100.0	81.1	42.1				F

Non-Conformance Description:	Tested By: JPM	Date: 12-2-98
Corrective Action: Resample	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																				Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"		
1.63"	8(R)	12-4-98															100.0	77.2	35.1					P

Non-Conformance Description:	Tested By: JPM	Date: 12-4-98
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	4	12-9															.002	80.6	39.5				P

Non-Conformance Description:	Tested By: JTM	Date: 12-9-96
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	10	12-21														100.0	98.9	78.3	38.0				P
Filter	20	12-21																	100.0				P

Non-Conformance Description:	Tested By: JPM	Date: 12-21-98
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

LIMESTONE SIZE TESTING

1999

FILTER BED MATERIAL

1999

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 1-3-989 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 21 Total Sample Wt. 57.5

	1 5/8"	Pan
Weight Retained	-0-	57.5
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 1-6-99 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 23 Total Sample Wt. 58.2

	1 5/8"	Pan
Weight Retained	-0-	58.2
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 2-3-91 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 23 Total Sample Wt. 57.35

	1 5/8"	Pan
Weight Retained	-0-	57.35
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 2-15-99 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 24 Total Sample Wt. 53.0

	1 5/8"	Pan
Weight Retained	-0-	53.0
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 2-18-99 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample #: 25 Total Sample Wt.: 62.0

Weight	2 5/8"	Pan
Retained	-0-	62.0
% Retained	-0-	100.0
% Passing	100.0	-0-

D_{50} 1.63" ROCK MULCH

1999

SUBJECT D50 1.63" Red PROJECT NO. 8152 Rch PAGE

CLIENT Path Finder DATE 1-6-99 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 11 Total Sample wt. 157.45

Wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	2.5	33.45	48.2 18.75	54.55	
Sheet total					
TOTAL	2.5	33.45	66.95	54.55	
% Retained	1.6	21.2	42.5	34.7	
% Passing	98.4	77.2	34.7	0	

INBERG-MILLER ENGINEERS

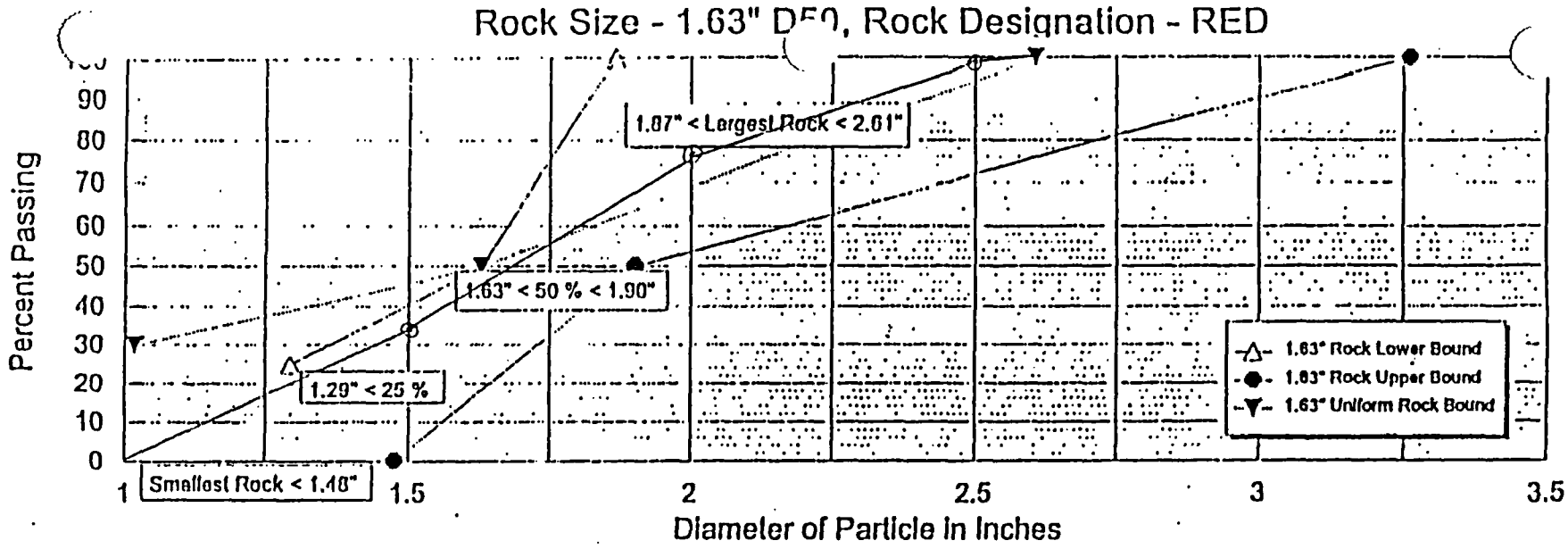


FIGURE 3

Passing

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 1-15-99 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 12 Total Sample wt. 147.3

wt. retained

Screen SIZE	2 1/2"	2"	1 1/2"	pan	
	-0-	24.85	70.5	51.95	
Sheet total					
TOTAL	-0-	24.85	70.5	51.95	
% Retained	-0-	16.8	47.9	35.3	
% Passing	100.0	83.2	35.3	-0-	

INBERG-MILLER ENGINEERS

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 2-3-99 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 13 Total Sample wt. 161.45

wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
	-0-	29.35	53.95	78.15	
Sheet total					
TOTAL	-0-	29.35	53.95	78.15	
% Retained	-0-	18.2	33.4	48.4	
% Passing	100.0	81.8	48.4	-0-	

INBERG-MILLER ENGINEERS

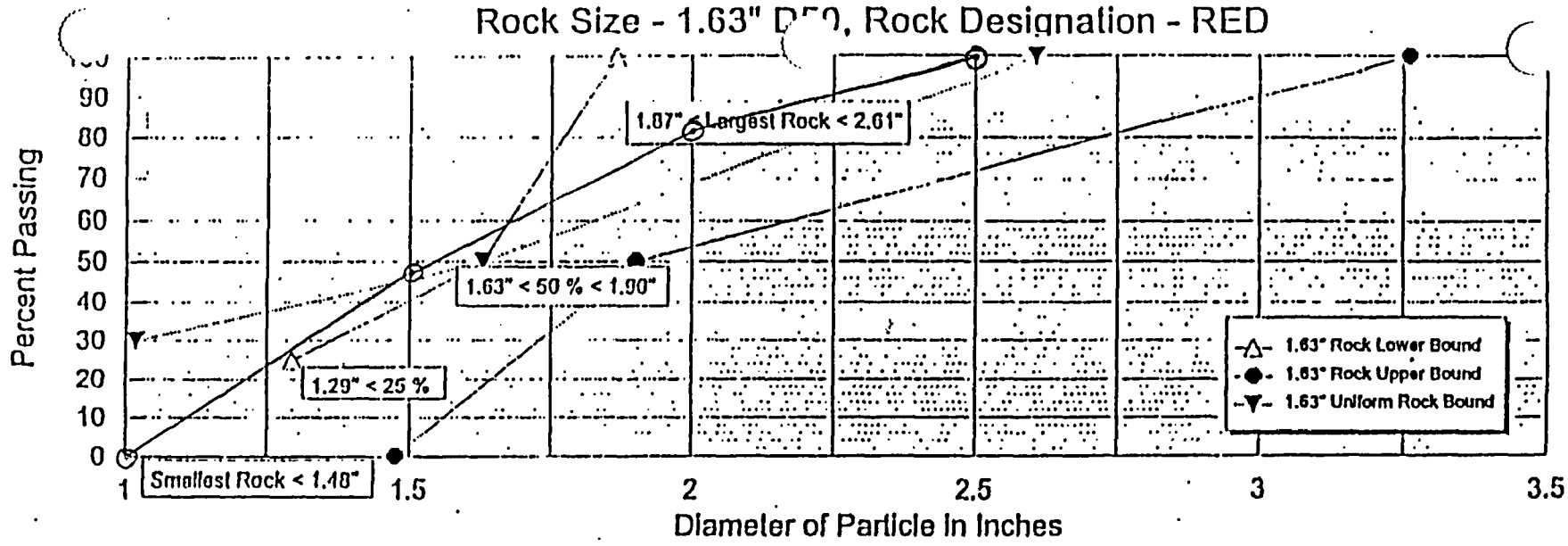


FIGURE 3

Failing - I'll retest tomorrow
2-3-99 2-4-99

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 2-4-99 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 13(R) Total Sample wt. 145.85

Wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
	-0-	35.85	55.35	54.65	
Sheet total					
TOTAL	-0-	35.85	55.35	54.65	
% Retained	-0-	24.6	38.0	37.5	
% Passing	100.0	75.5	37.5	0	

INBERG MILLER ENGINEERS

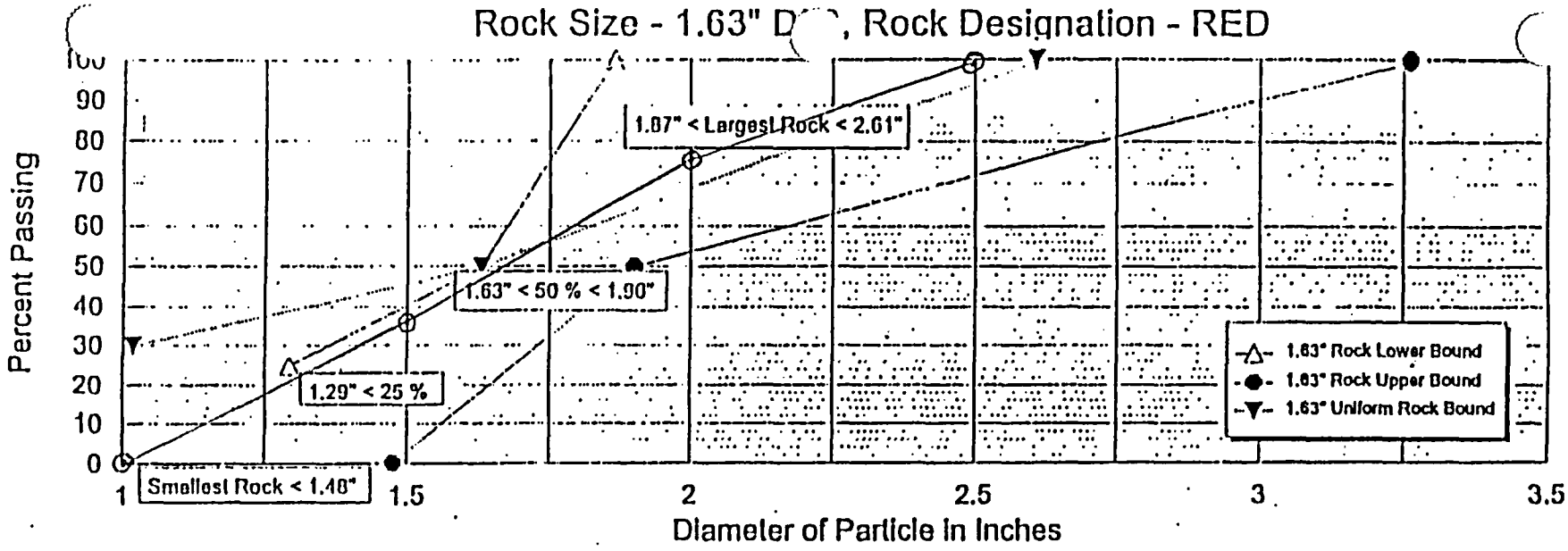


FIGURE 3

2-4-99 (Retest)

Passing

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 2-15-99 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 14 Total Sample wt. 146.25

wt. retained

Screen size	2 1/2"	2"	1 1/2"	pan	
	.85	49.0	67.75	28.65	
Sheet total					
TOTAL					
% Retained	.6	33.5	46.3	[illegible]	
% Passing	[illegible]	[illegible]	19.[illegible]	-0-	

INBERG-MILLER ENGINEERS

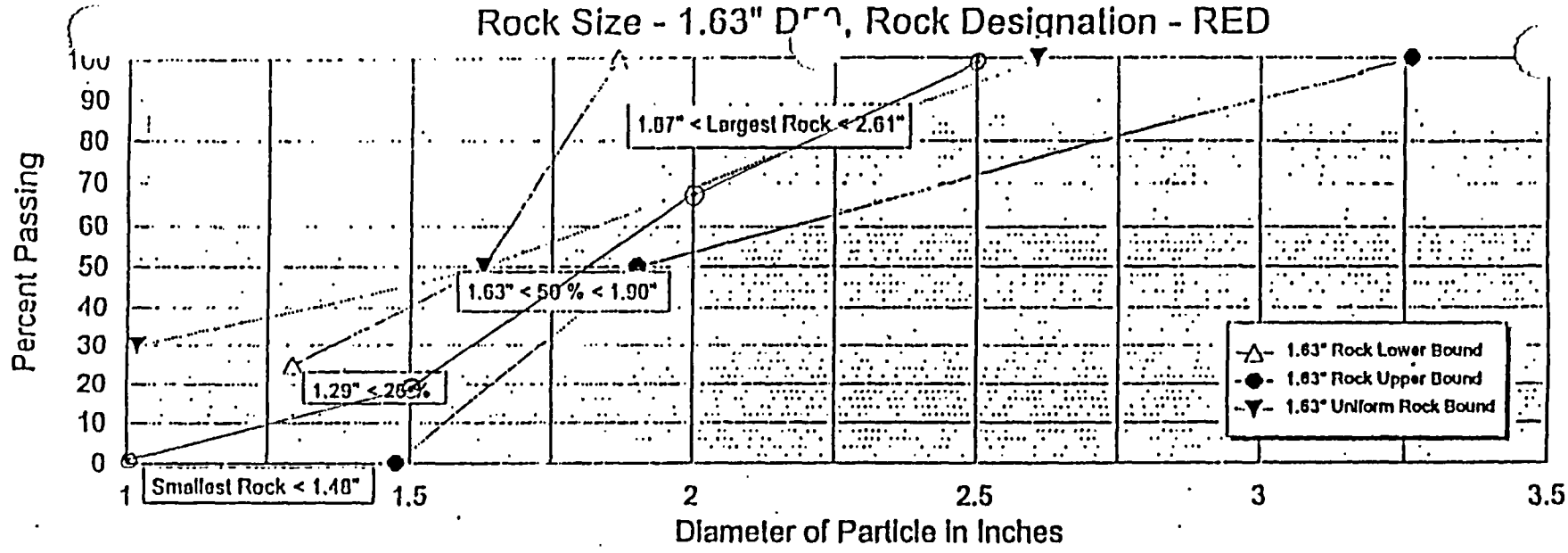


FIGURE 3

Passing 2-15-99

D_{50} 2.17" ROCK MULCH

1999

SUBJECT D_{50} 2.17" Green PROJECT NO. 8157 Rm PAGE

CLIENT Path Finder DATE 2-18-99 BY JPM

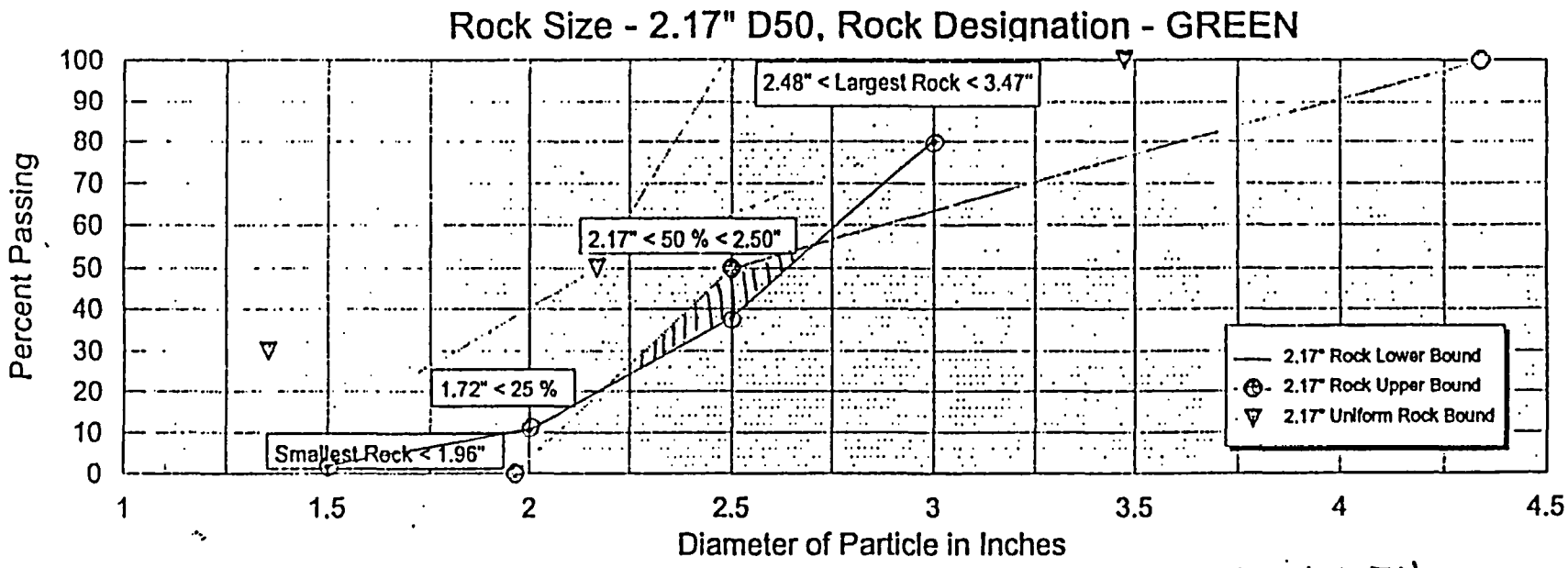
PROJECT Limestone Testing CHECKED BY

Sample # 8 Total sample wt. 233.7

Wt. Retained

Screen size ⇒	3.47"	3"	2½"	-2"	1½"	pan
	-0-	45.65	38.8 46.1 12.2	42.85 16.15 8.4	16.9	6.65
Total	-0-	45.65	97.1	67.4	16.9	6.65
% Retained	-0-	19.5	41.6	28.8	7.2	2.9
% Passing	100.0	80.5	38.9	10.1	2.9	-0-

INBERG-MILLER ENGINEERS



Failing, I'll retest Friday

FIGURE 3 (Continued)

SUBJECT D_{50} 2.17" Green PROJECT NO. 8157 Rm PAGE

CLIENT Path Finder DATE BY

PROJECT Limestone Testing CHECKED BY

Sample # 8R-2 Total sample wt. 216.9

wt. Retained

Screen size ⇒	3.47"	3"	2½"	2"	1½"	pan
	-0-	45.1	59.9	54.8	42.5	15.6
Total	-0-	45.1	59.9	54.8	42.5	15.6
% Retained	-0-	20.7	27.5	25.2	19.5	7.2
% Passing	100.0	79.4	51.9	26.7	7.2	-0-

INBERG-MILLER ENGINEERS

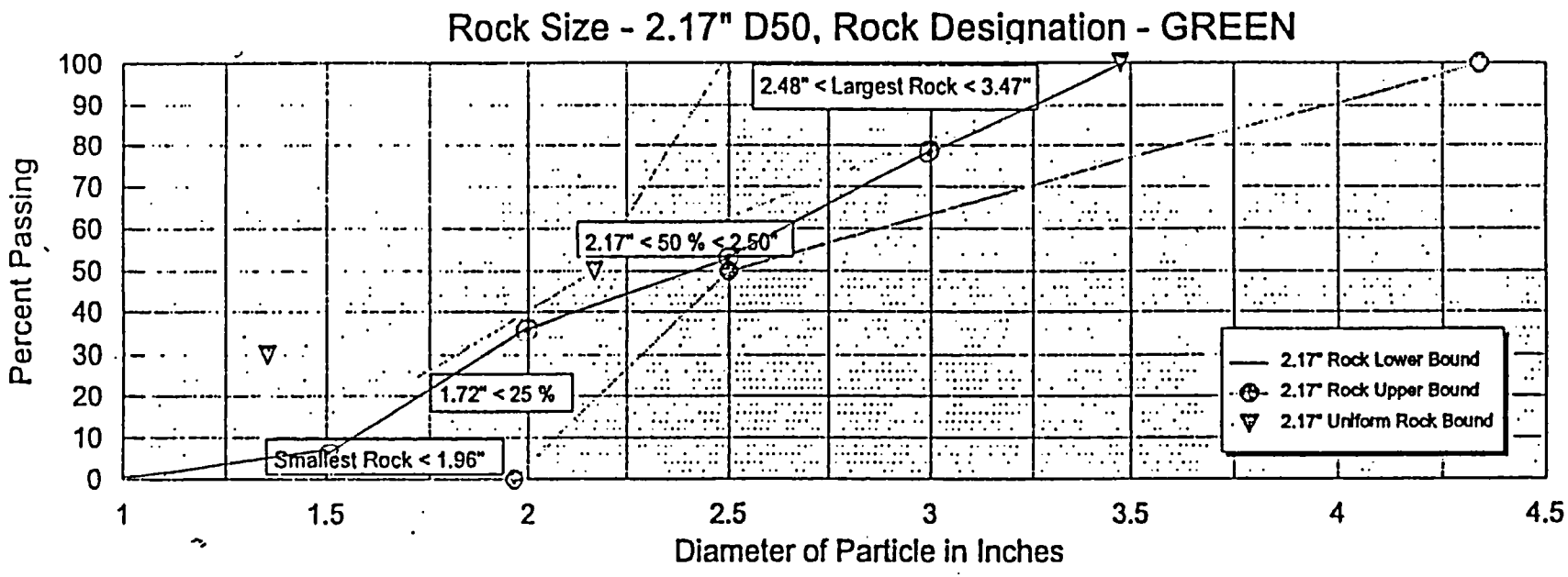


FIGURE 3 (Continued)

SUBJECT D_{50} 2.17" Green PROJECT NO. 8152 Rm PAGE

CLIENT Path Finder DATE 2-19-'99 BY GLM

PROJECT Limestone Testing CHECKED BY

Sample # 9 Total sample wt. 208.73

wt. Retained

Screen size ⇒	3.47"	3"	2½"	2"	1½"	pan
	Ø	62.55	57.55	52.35	21.85	14.43
Total	Ø	62.55	57.55	52.35	21.85	14.43
% Retained		30.0	27.6	25.1	10.5	6.9
% Passing	100	70.0	42.4	17.3	6.8	

INBERG-MILLER ENGINEERS

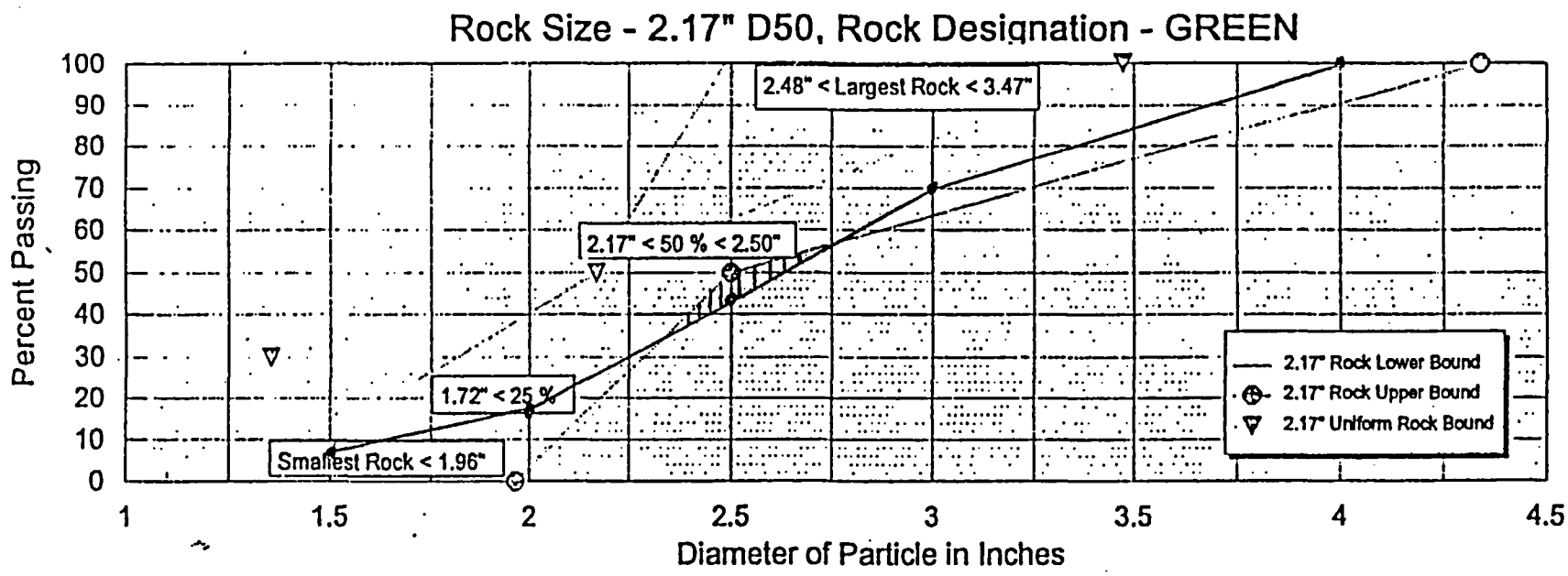


FIGURE 3 (Continued)

LIMESTONE ROCK PRODUCTS
QUALITY CONTROL
GRADATION RESULTS

1999

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
filter	21	1-3																	1000				P

Non-Conformance Description:	Tested By: JPM	Date: 1-3-99
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	11	1-6														106.0	98.4	77.2	34.7				P
filter	22	1-6																	100.0				P

Non-Conformance Description:	Tested By: JPM	Date: 1-6-99
Corrective Action:	IME Project Manager:	Date:
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	12	1-15															100.0	83.2	35.3				P

Non-Conformance Description:	Tested By: JPM	Date: 1-15-99
Corrective Action:	IME Project Manager:	Date: 1-15-99
	PMC Construction Manager:	Date:

PMC/IME - REV 3-10-98

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	~~10"~~ 11"	9.6"	8"	~~6.4"~~ 7"	~~6"~~ 5.5"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
.66	1R	1-20						75.2		36.3	15.9	4.8											P

Non-Conformance Description:	Tested By: JPM	Date: 1-20-99
Corrective Action:	IME Project Manager: [illegible]	Date: 1-20-99
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	~~10"~~ 11"	9.6"	8"	~~6.4"~~ 7"	6"	~~5"~~ 5.5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
.66	2	2-2						69.2		35.7	17.5		1.8										F

Non-Conformance Description:	Tested By: JPM	Date: 2-2-99
Corrective Action: Retest	IME Project Manager: [signature]	Date: 2-2-99
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
Filter	23	2-3																	100.0				P
1.63	13	2-3															100.0	81.8	48.4				F

Non-Conformance Description:	Tested By: JPM	Date: 2-3-99
Corrective Action:	IME Project Manager:	Date: 2-3-99
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	~~9.6"~~ 11"	8"	~~6.4"~~ 7"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
.66	2(R)	2-4							79.9	38.6	21.2		8.4										P
1.63	13(R)	2-4															1000	75.5	37.5				P

Non-Conformance Description:	Tested By: JPM	Date: 2-4-99
Corrective Action:	IME Project Manager: [signature]	Date: 2-4-99
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
1.63	14	2-15														100.0	99.4	65.9	19.6				P
filter	24	2-15																	100.0				P

Non-Conformance Description:	Tested By: JAM	Date: 2-15-99
Corrective Action:	IME Project Manager: [illegible]	Date: 2-15-99
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
2.17	8	2-18													100.0	80.5	38.9	10.1	2.9				F
filter	25	2-18															100.0						P

Non-Conformance Description: On the course side	Tested By: JPM	Date: 2-18
Corrective Action: Retest.	IME Project Manager: GKR	Date: 2-18-99
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	~~10"~~ 11"	9.6"	8"	~~6.4"~~ 7"	~~6"~~ 5.5	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
.66	3	2-17						74.0		37.6	16.2	6.9											P

Non-Conformance Description:	Tested By: JPM	Date: 2-17-99
Corrective Action:	IME Project Manager: [signature]	Date: 2-17-99
	PMC Construction Manager:	Date:

Pathfinder Mines Corporation
Lucky Mc Mine Reclamation Project

Rock Products Quality Control Gradation Results

Design D_{50}	Test No.	Date	Cumulative Volume (cy)	Percent Passing																			Pass(P) Fail (F)
				20.42"	16.42"	15"	12"	10"	9.6"	8"	6.4"	6"	5"	4"	3.5"	3"	2.5"	2"	1.5"	1.25"	1"	.75"	
2.17	8R-2	2-25													100.0	79.4	51.9	26.7	7.2				

Non-Conformance Description:	Tested By: JPM	Date: 2-25-99
Corrective Action:	IME Project Manager: GWB	Date: 2-25-99
	PMC Construction Manager:	Date:

LIMESTONE SIZE TESTING

2001

SUBJECT D50 6" YELLOW PROJECT NO. 8152 Run PAGE

CLIENT Path finder DATE 3-8-01 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 5 Total Sample wt. 966

wt. retained

Screen SIZE	9.6"	8"	6"	5"	
	100.0 53.0 153.0	115.0 74.0 189.0	199.0 46.0 245	139.0 141.0 39.0 319.0	60.0
Sheet total					
TOTAL	153.0	189	245	319	60
% Retained	15.8	19.6	25.4	33.0	6.2
% Passing	84.2	64.6	39.2	6.2	0

INBERG-MILLER ENGINEERS

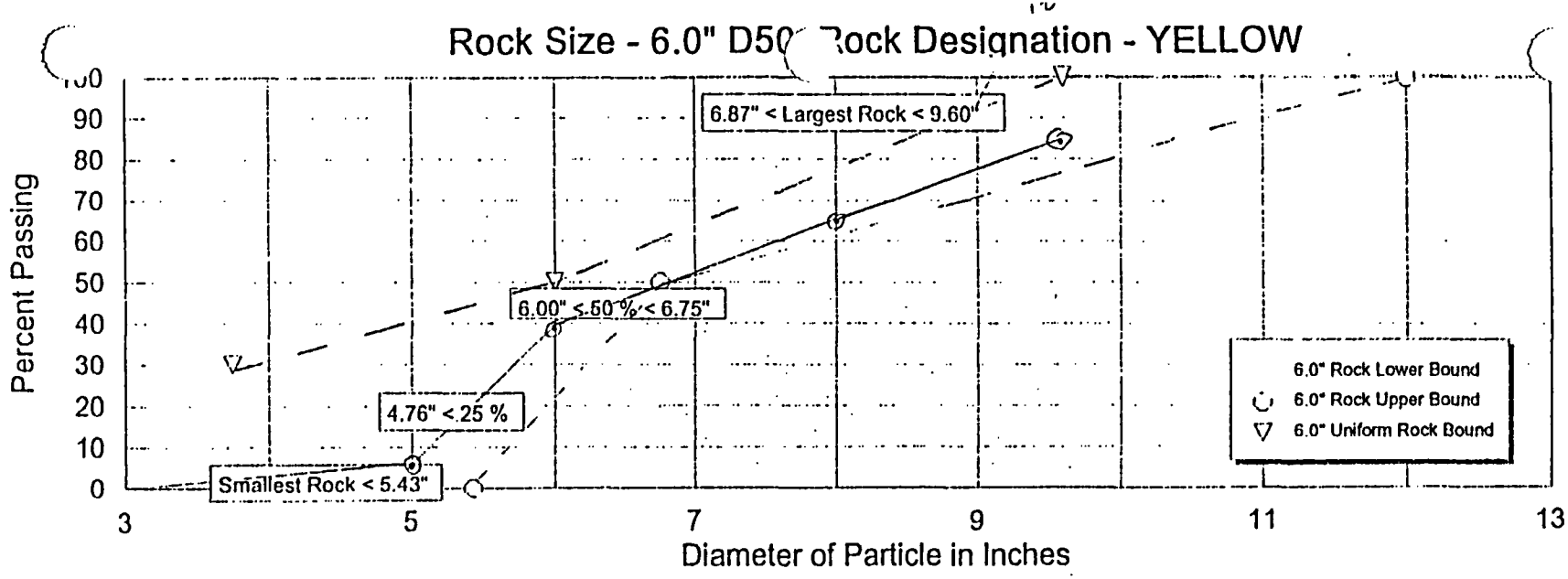


FIGURE 2

3-8-01 SAMPLE #5

SUBJECT D50 2.17" Green PROJECT NO. 8157.1Rm PAGE

CLIENT Path Finder DATE 2-6-01 BY JPM

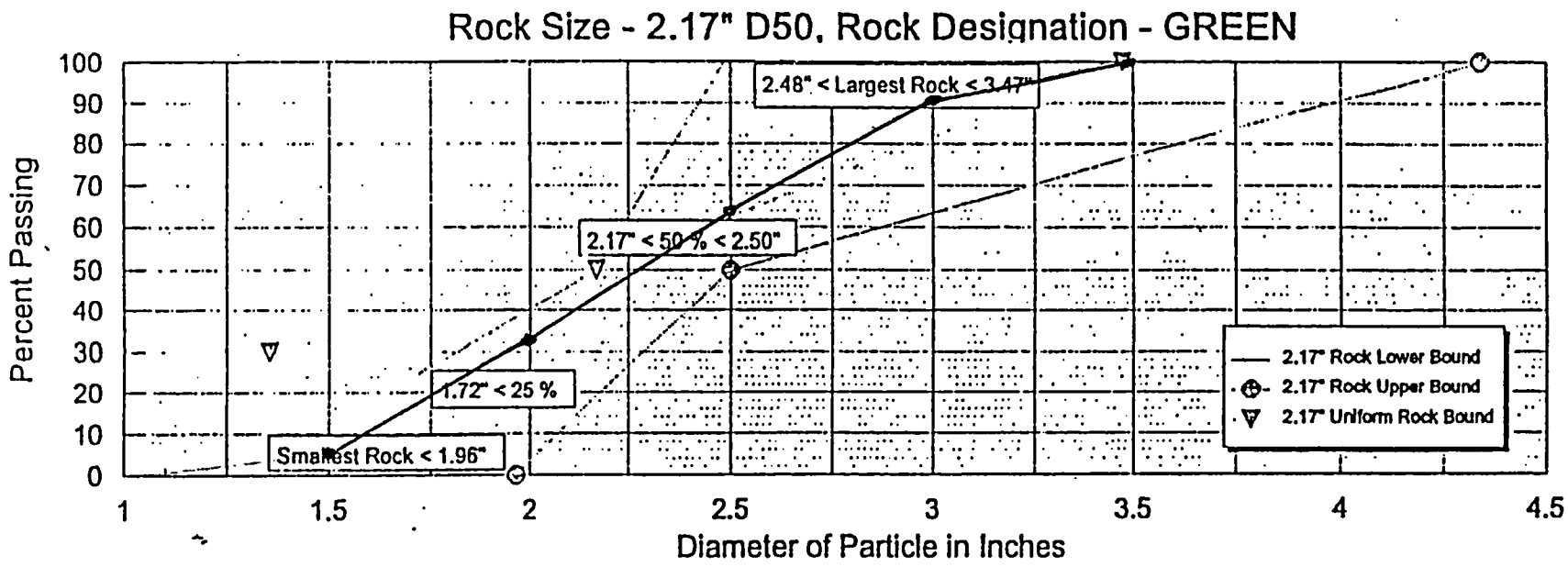
PROJECT Limestone Testing CHECKED BY

Sample # 9 Total sample wt. 210.7

Wt. Retained

Screen size ⇒	3.47"	3"	2½"	2"	1½"	pan
	-0-	18.4	63.7	60.8	55.3	12.5
Total	-0-	18.4	63.7	60.8	55.3	12.5
% Retained	-0-	8.73	30.23	28.86	26.25	5.93
% Passing	100.0	91.27	61.04	32.18	5.93	-0-

INBERG-MILLER ENGINEERS



sample #9 3-6-01

FIGURE 3 (Continued)

SUBJECT D50 2.17" Green PROJECT NO. 8152 Rm PAGE

CLIENT Path Finder DATE 4-16-01 BY JPM

PROJECT Limestone Testing CHECKED BY

Sample # 10

Total sample wt. 212.95

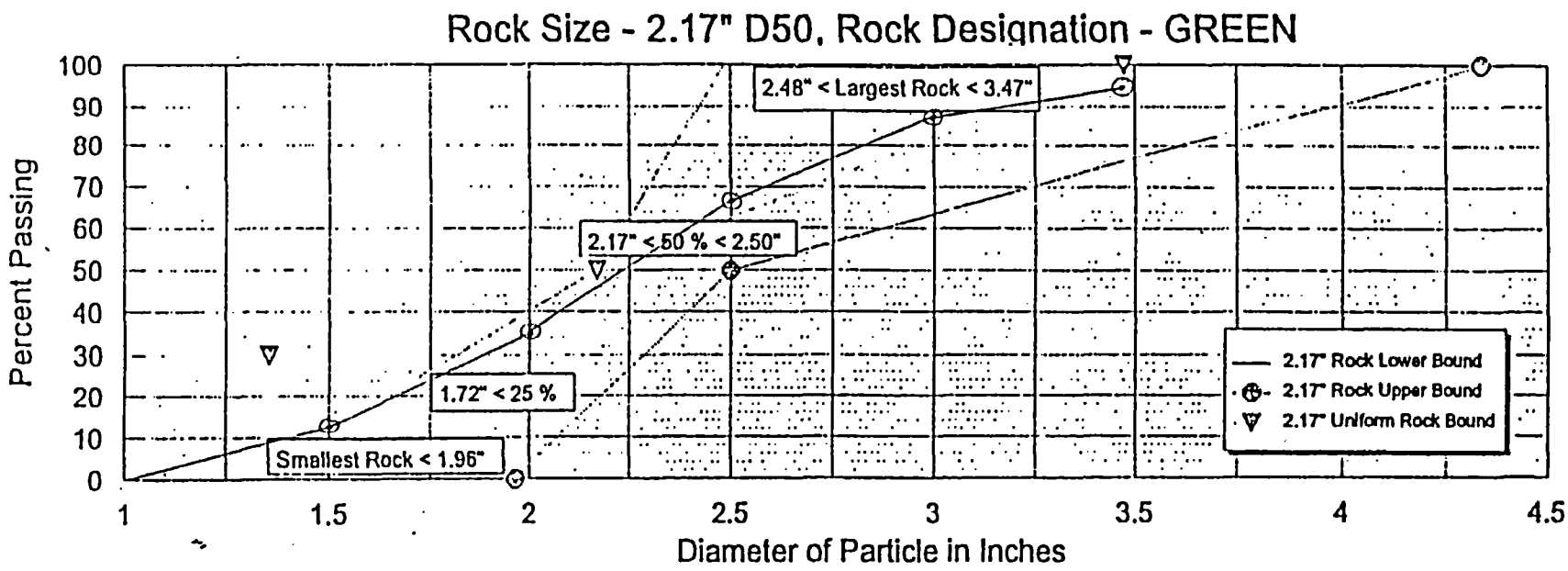
wt. Retained

Screen size ⇒	3.47"	3"	2½"	2"	1½"	pan
	10.3	15.85	46.3	38.95 22.35	50.3	28.85
Total						
% Retained	4.84	7.44	21.74	28.79	23.62	13.55
% Passing	95.16	87.72	65.98	37.19	13.57	—

457-1

2:00-7:00

INBERG-MILLER ENGINEERS



Sample #10 4-16-01

FIGURE 3 (Continued)

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 3-6-01 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 15 Total Sample wt. 93.6

wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
	.6	18.15	40.15	34.7	
Sheet total					
TOTAL	.6	18.15	40.15	34.7	
% Retained	.64	19.39	42.9	37.07	
% Passing	99.36	79.97	37.07	-0-	

INBERG-MILLER ENGINEERS

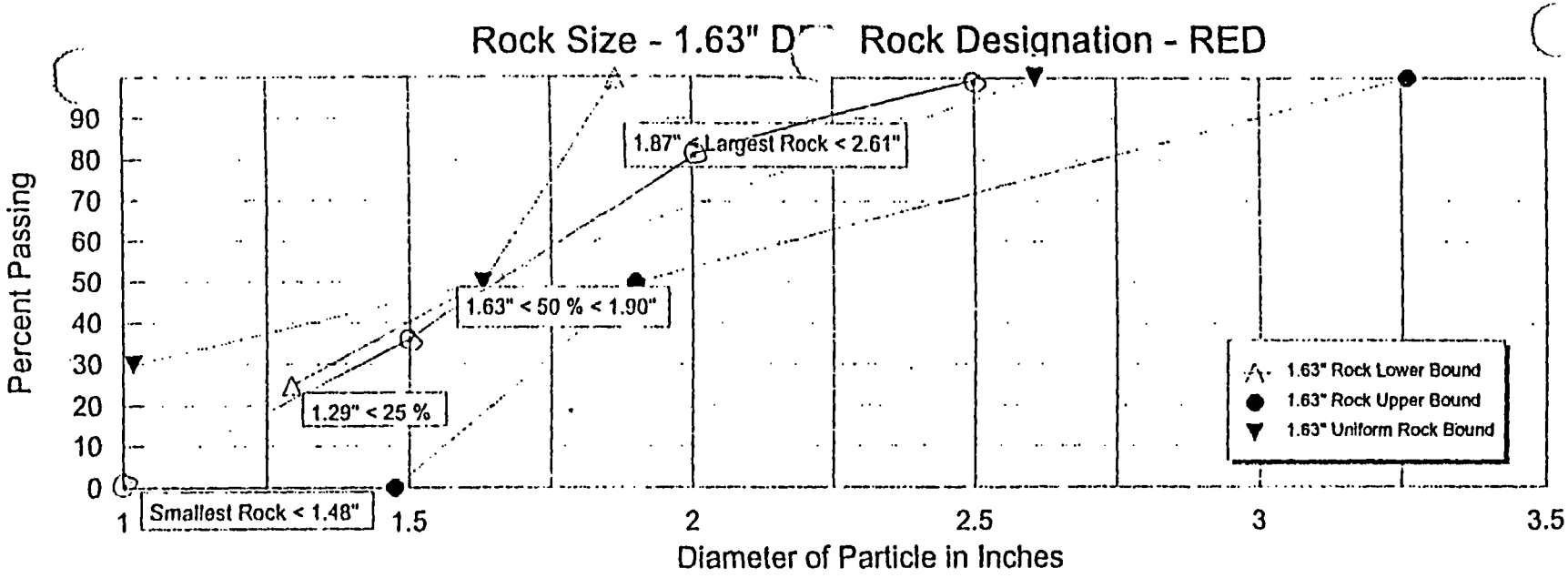


FIGURE 3

3-6-01 Sample #15

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Path Finder DATE 3-21-01 BY JFM.

PROJECT Limestone Rock Testing CHECKED BY

Sample # 16 Total Sample wt. 147.15

wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
3" -0-	4.4	39.4	27.45 33.3	37.6	
Sheet total					
TOTAL	4.4	39.4	65.75	37.6	
% Retained	3.0	26.78	44.68	25.55	
% Passing	97.01	70.23	25.55	0	

INBERG-MILLER ENGINEERS

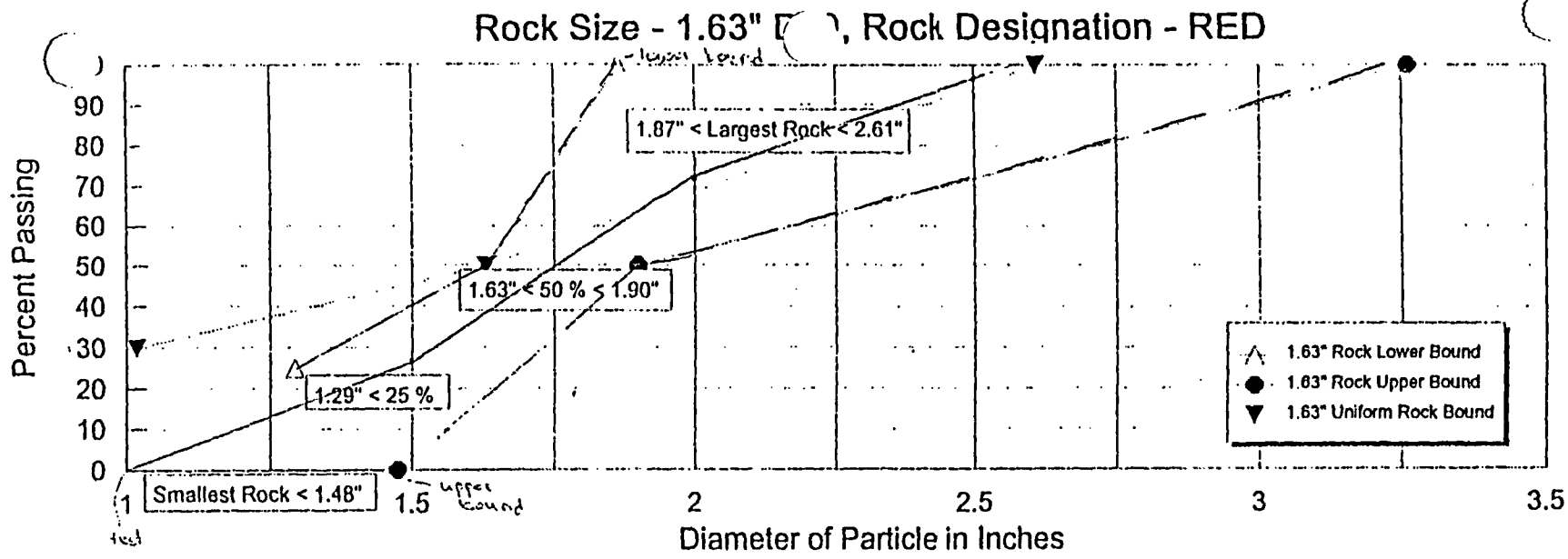


FIGURE 3

3-21-01
JPM

Sample #16

SUBJECT D50 1.63" Red PROJECT NO. 8152 Run PAGE

CLIENT Pathfinder DATE 4-3-01 BY JPM

PROJECT Limestone Rock Testing CHECKED BY

Sample # 17

Total Sample wt. 174.35

wt. retained

Screen Size	2 1/2"	2"	1 1/2"	pan	
3" -0-	6.15	~~54.5~~ 46.4	34.5 32.8	55.5	
Sheet total					
TOTAL	6.15	46.4	68.3	55.5	
% Retained	3.5	26.3	38.7	31.5	
% Passing	25.1	70.2	31.5	-0-	

INBERG-MILLER ENGINEERS

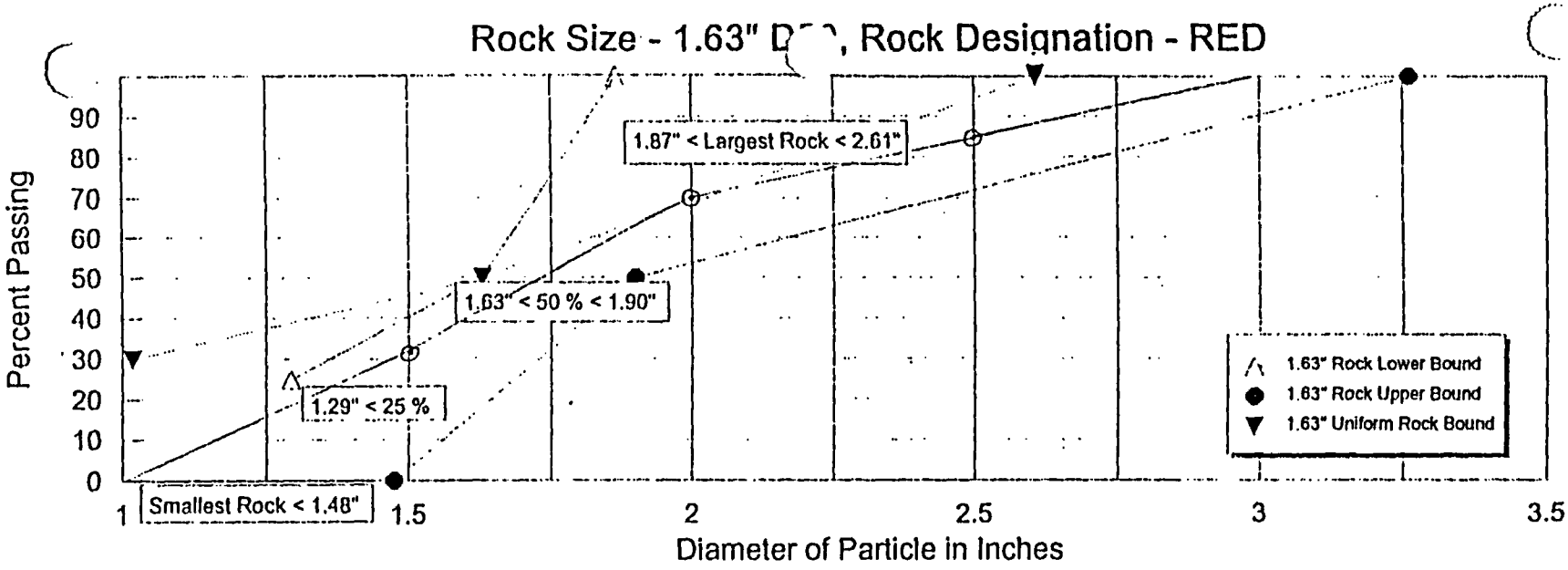


FIGURE 3

4-3-01 SAMPLE #17

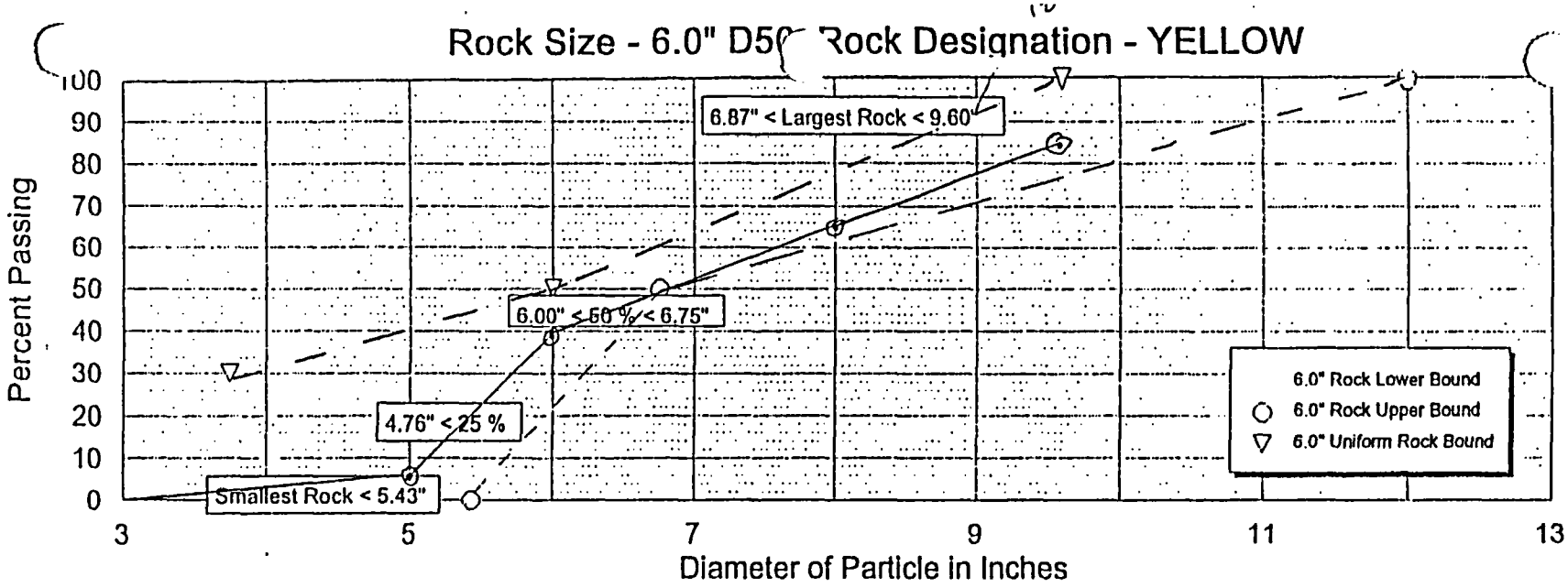
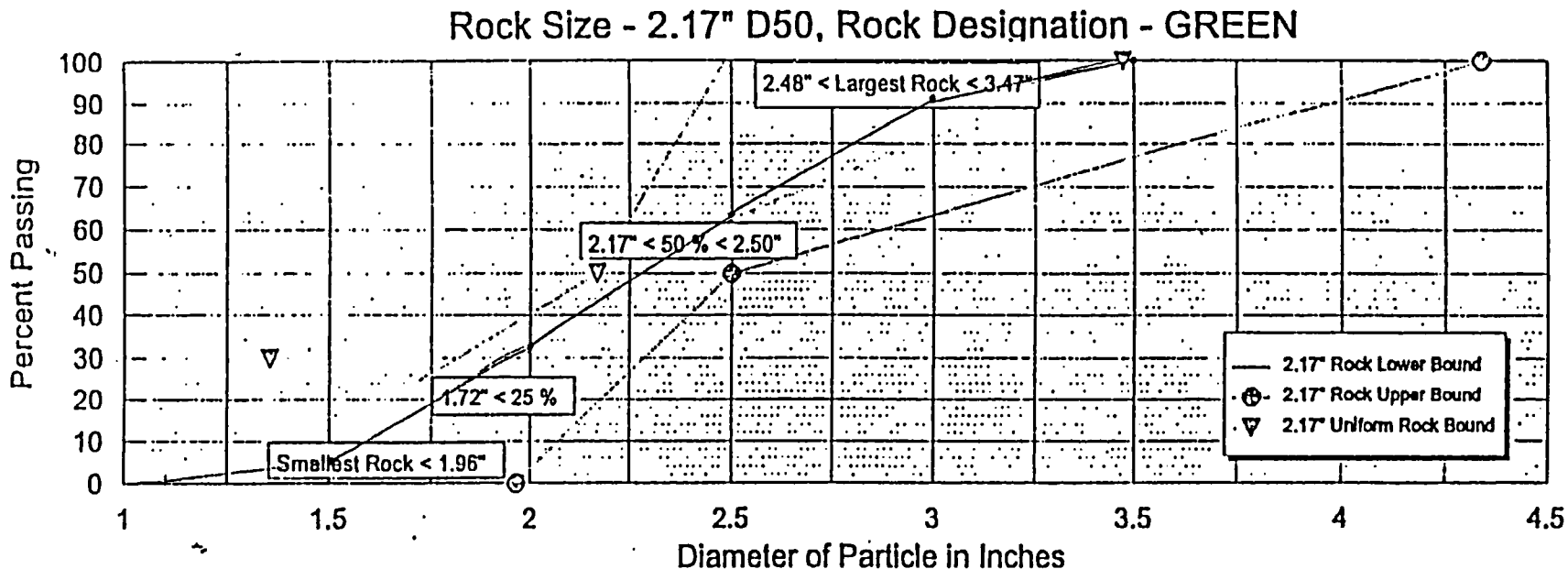


FIGURE 2

Size	% Passing
9.6"	84.2
8"	64.6
6"	39.2
5"	6.2



Size	% Passing
3.47"	100
3"	91.3
2½"	61.0
2"	32.2
1½"	5.9

FIGURE 3 (Continued)

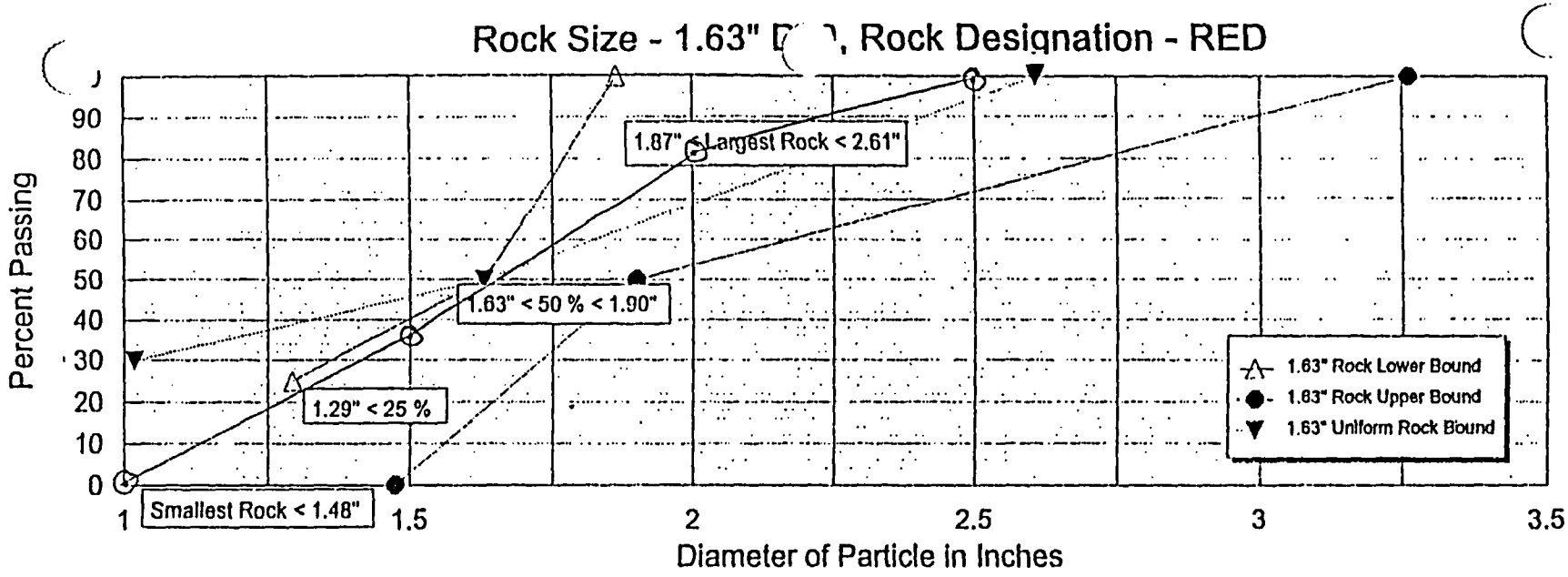


FIGURE 3

Size	% Passing
2½"	99.4%
2"	80.0
1½"	37.1

SUBJECT Crushed Limestone Filter PROJECT NO. 8152.1 8152 RM PAGE

CLIENT Pathfinder DATE 3-6-01 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 26 Total Sample Wt. 53.2

	1 5/8"	Pan
Weight Retained	-0-	53.2
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 2-21-01 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 27 Total Sample Wt. 74.0

	1 5/8"	Pan
Weight Retained	-0-	74.0
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 4-3-01 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 28 Total Sample Wt. 57.0

	1 5/8"	Pan
Weight Retained	-0-	57.0
% Retained	-0-	100.0
% Passing	100.0	-0-

SUBJECT Crushed Limestone Filter PROJECT NO. 8152 RM PAGE

CLIENT Pathfinder DATE 4-16-01 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 29 Total Sample Wt. 62.8

	1 5/8"	Pan
Weight Retained	5.15	57.65
% Retained	8.2	91.8
% Passing	91.8	-0-

All rock passed the 2" screen.

SUBJECT Crushed Limestone Filter PROJECT NO. 8152 RM PAGE

CLIENT Pathfinder DATE 4-18-01 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 29A Total Sample Wt. 89.7

	1 5/8"	Pan
Weight Retained	13.7	76.0
% Retained	15.3	84.7
% Passing	84.7	—

100% is -2"

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 5-9-01 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 30 Total Sample Wt. 77.8

	1 5/8"	Pan
Weight Retained	10.6	67.2
% Retained	13.6	86.4
% Passing	86.4	-0-

100% passing 2" screen

SUBJECT Crushed Limestone Filter PROJECT NO. 8152RM PAGE

CLIENT Pathfinder DATE 5-13-01 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

Sample # 31 Total Sample Wt. 111.0

	1 5/8"	Pan
Weight Retained	10.7	100.3
% Retained	9.6	90.4
% Passing	90.4	-0-

100% passing 2" screen

SOUTH PASS
IRON MINE RIP RAP
SIZE TESTING

1/25/02 Sample taken at South Pass site – marginally too small for 9.6" rock.

2/9/02 Sample of delivered South Pass rock at Lucky Mc – significantly undersized for 9.6" rock.

2/11/02 Sample tested at South Pass site – still significantly undersized for 9.6" rock.

2/15/02 Sample of delivered South Pass rock at Lucky Mc after processing/screening adjustment – rock generally meets 9.6" specification with the exception of a few oversized rocks which could be carefully placed to fit within rock layer.

2/18/02 Sample of delivered South Pass rock at Lucky Mc – rock intended to augment the undersized rock that had been previously delivered. Several combination gradations were evaluated to forecast result of augmentation.

3/12/02 Sample of placed composite South Pass rock at Lucky Mc – rock generally meets 9.6" specification with the exception of a few oversized rocks which could be carefully placed to fit within rock layer.

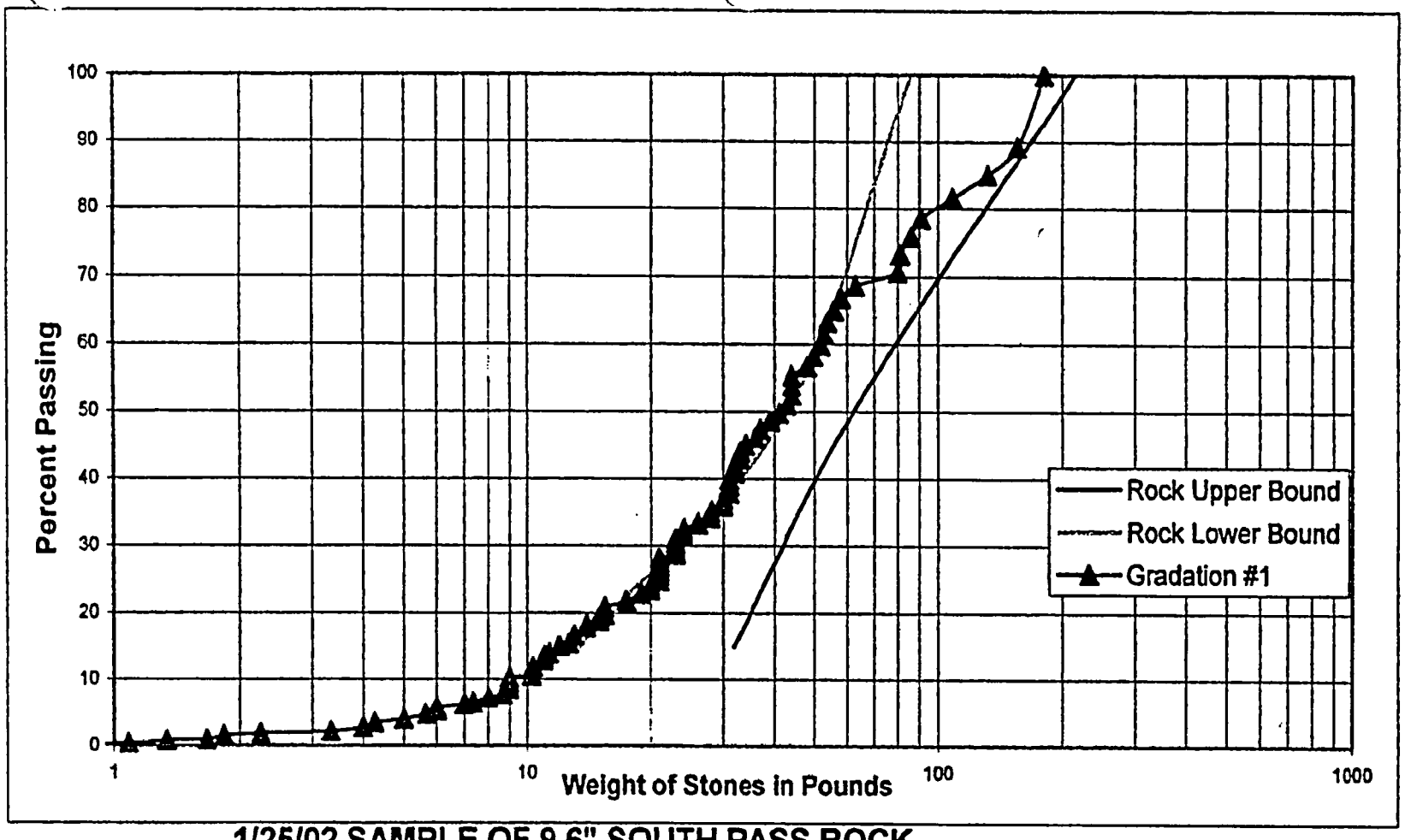
5/20/02 Sample of placed composite South Pass rock at Lucky Mc – rock generally meets 9.6" specification. The exceedence of upper bound D50 is obviated by the fact that the South Pass rock has a much greater density than the 160 lb/ft^3 assumed in the design process,

9/3/02 Sample taken at South Pass site – rock meets for 9.6" specification.

9/20/02 Sample of 12" South Pass rock at Lucky Mc – rock meets 12" specification.

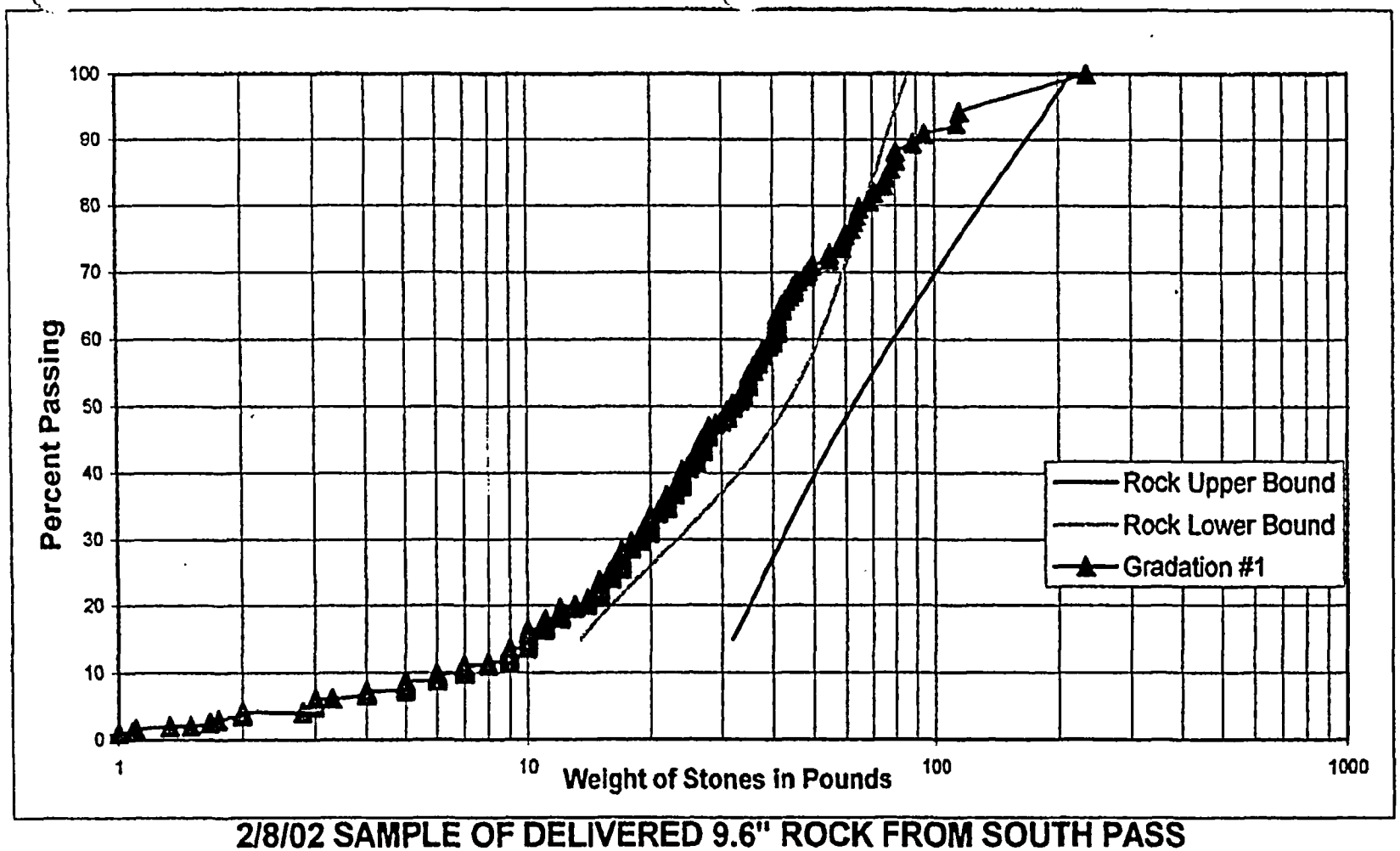
1/30/03 Initial sample taken at South Pass site – rock is slightly larger than 12" rock specification.

1/30/03 Second sample taken at South Pass site – rock nearly fits 12" rock specification.



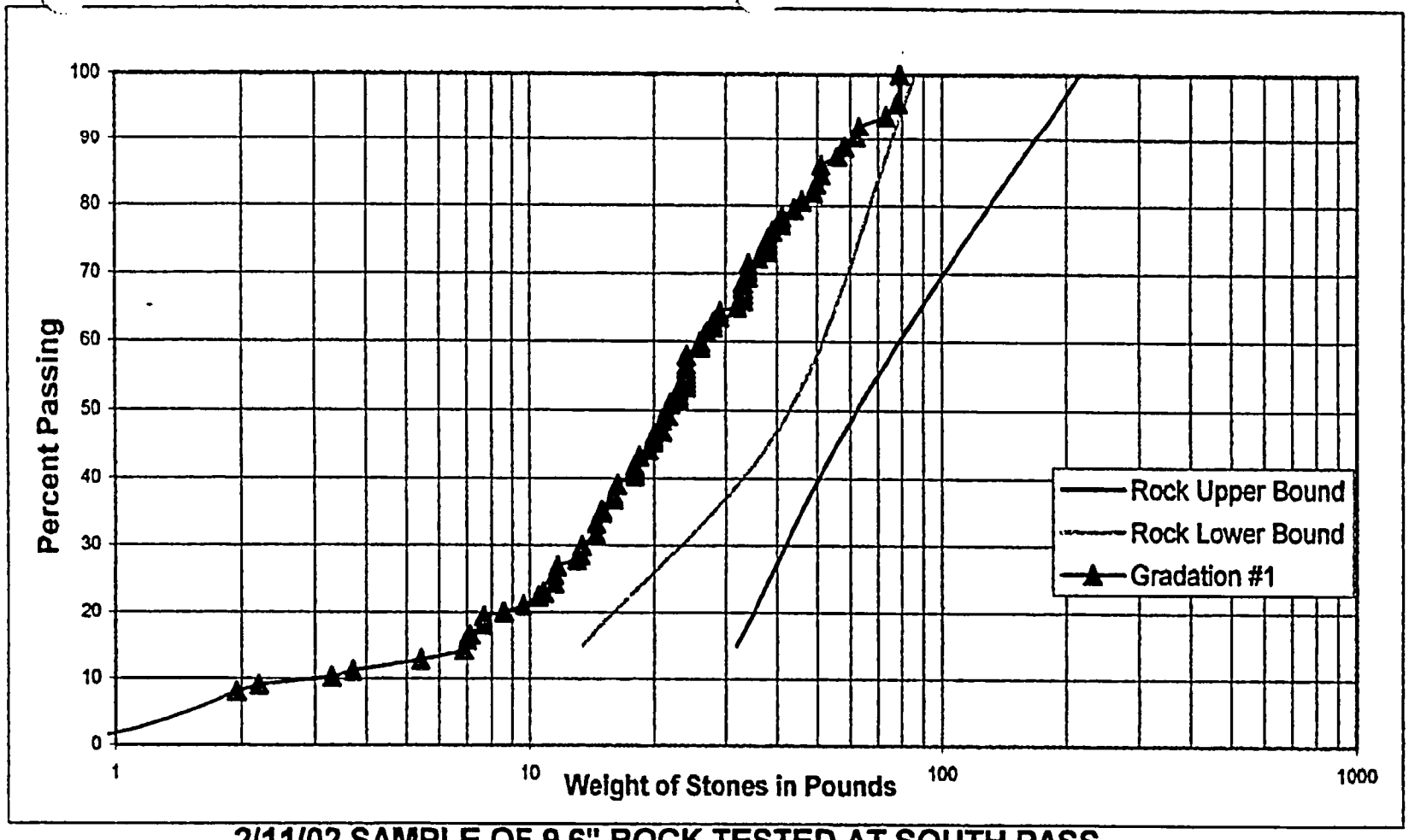
1/25/02 SAMPLE OF 9.6" SOUTH PASS ROCK

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)			Assumed Sp. Wt.
ACOE Upper Bound	31.8		62.2	214.5	Layer Thickness	16.3	160
ACOE Lower Bound	13.4	13.4	42.9	85.8	Shape Factor	1.40	
Gradation Results	12.0	21.0	41.3	180.0	Spherical D100	15.5	
	Grad #1 % in Combination			100	D100 with Shape		
	Grad #2 % in Combination			0	Factor (inch)	13.8	



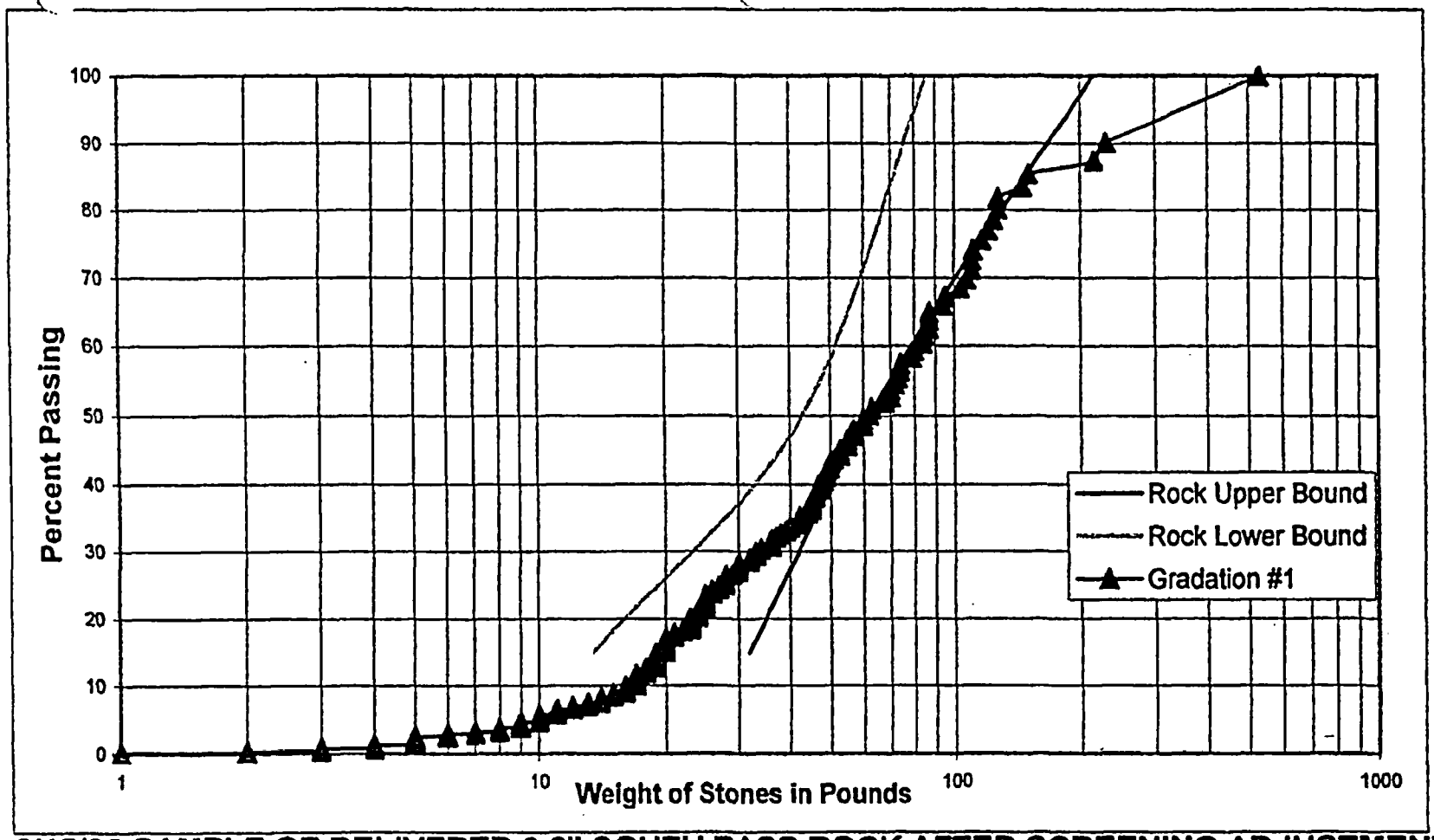
2/8/02 SAMPLE OF DELIVERED 9.6" ROCK FROM SOUTH PASS

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)			Assumed Sp. Wt.
ACOE Upper Bound	31.8		62.2	214.5	Layer Thickness	16.3	160
ACOE Lower Bound	13.4	13.4	42.9	85.8	Shape Factor	1.40	
Gradation Results	10.0	16.0	32.0	234.0	Spherical D100	16.9	
	Grad #1 % in Combination			100	D100 with Shape		
	Grad #2 % in Combination			0	Factor (inch)	15.1	



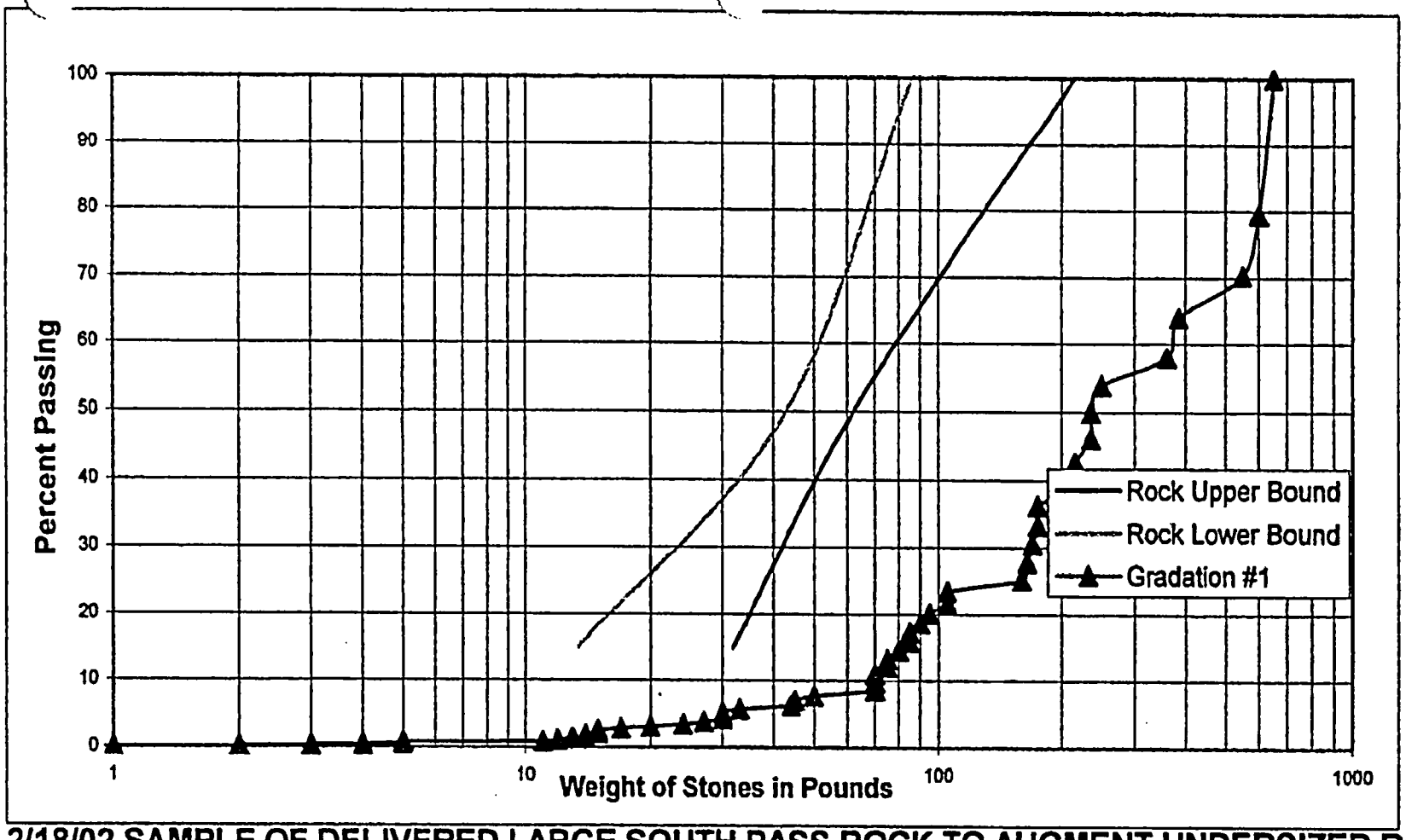
2/11/02 SAMPLE OF 9.6" ROCK TESTED AT SOUTH PASS

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)			Assumed Sp. Wt.
ACOE Upper Bound	31.8		62.2	214.5	Layer Thickness	16.3	160
ACOE Lower Bound	13.4	13.4	42.9	85.8	Shape Factor	1.40	
Gradation Results	6.9	11.5	21.8	79.0	Spherical D100	11.8	
	Grad #1 % in Combination			100	D100 with Shape		
	Grad #2 % in Combination			0	Factor (inch)	10.5	



2/15/02 SAMPLE OF DELIVERED 9.6" SOUTH PASS ROCK AFTER SCREENING ADJUSTMENT

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)			Assumed Sp. Wt.
ACOE Upper Bound	31.8		62.2	214.5	Layer Thickness	16.3	160
ACOE Lower Bound	13.4	13.4	42.9	85.8	Shape Factor	1.40	
Gradation Results	19.8	27.5	61.4	530.0	Spherical D100	22.2	
	Grad #1 % in Combination			100	D100 with Shape		
	Grad #2 % in Combination			0	Factor (inch)	19.8	

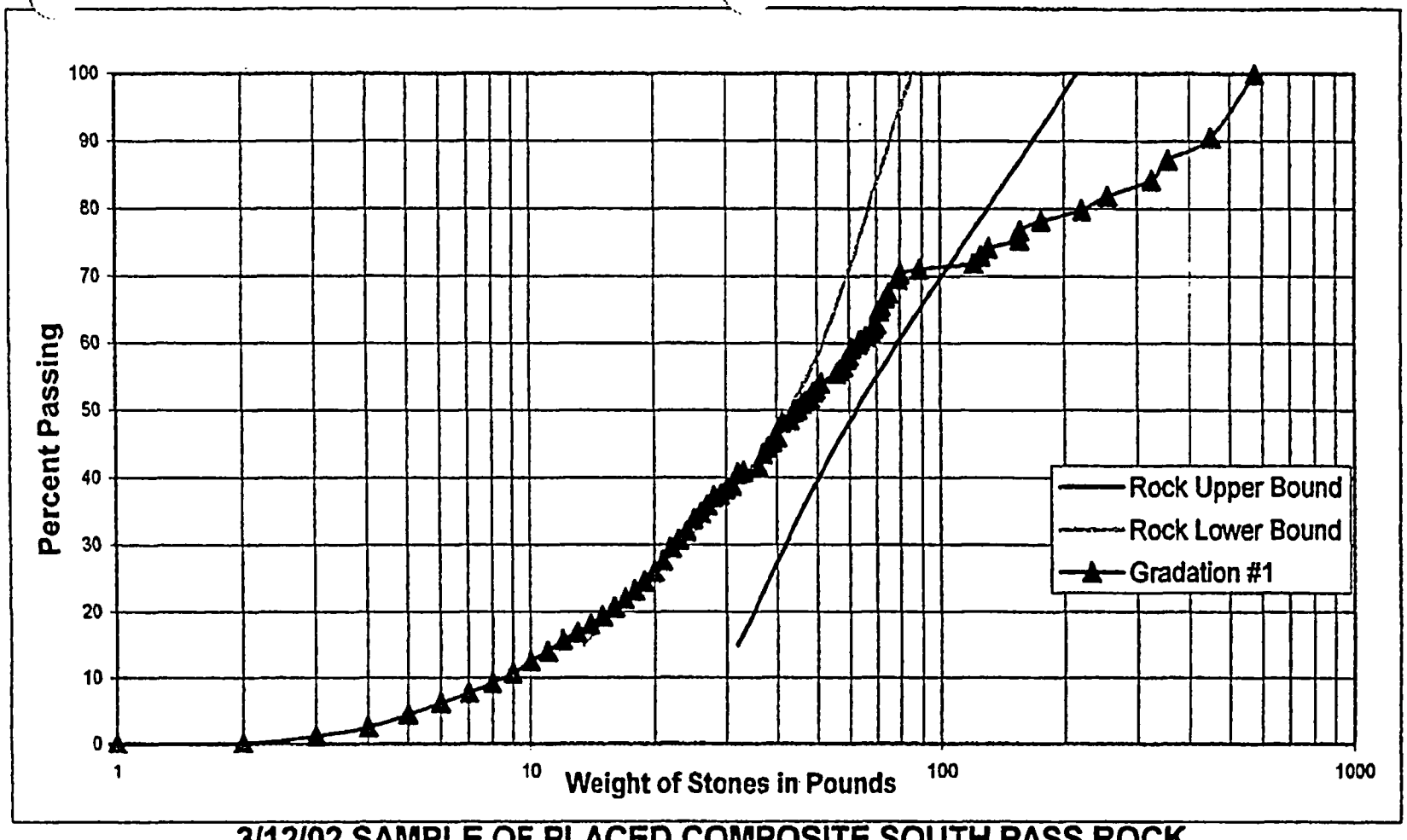


2/18/02 SAMPLE OF DELIVERED LARGE SOUTH PASS ROCK TO AUGMENT UNDERSIZED RO

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)
ACOE Upper Bound	31.8		62.2	214.5
ACOE Lower Bound	13.4	13.4	42.9	85.8
Gradation Results	81.8	154.4	235.0	650.0

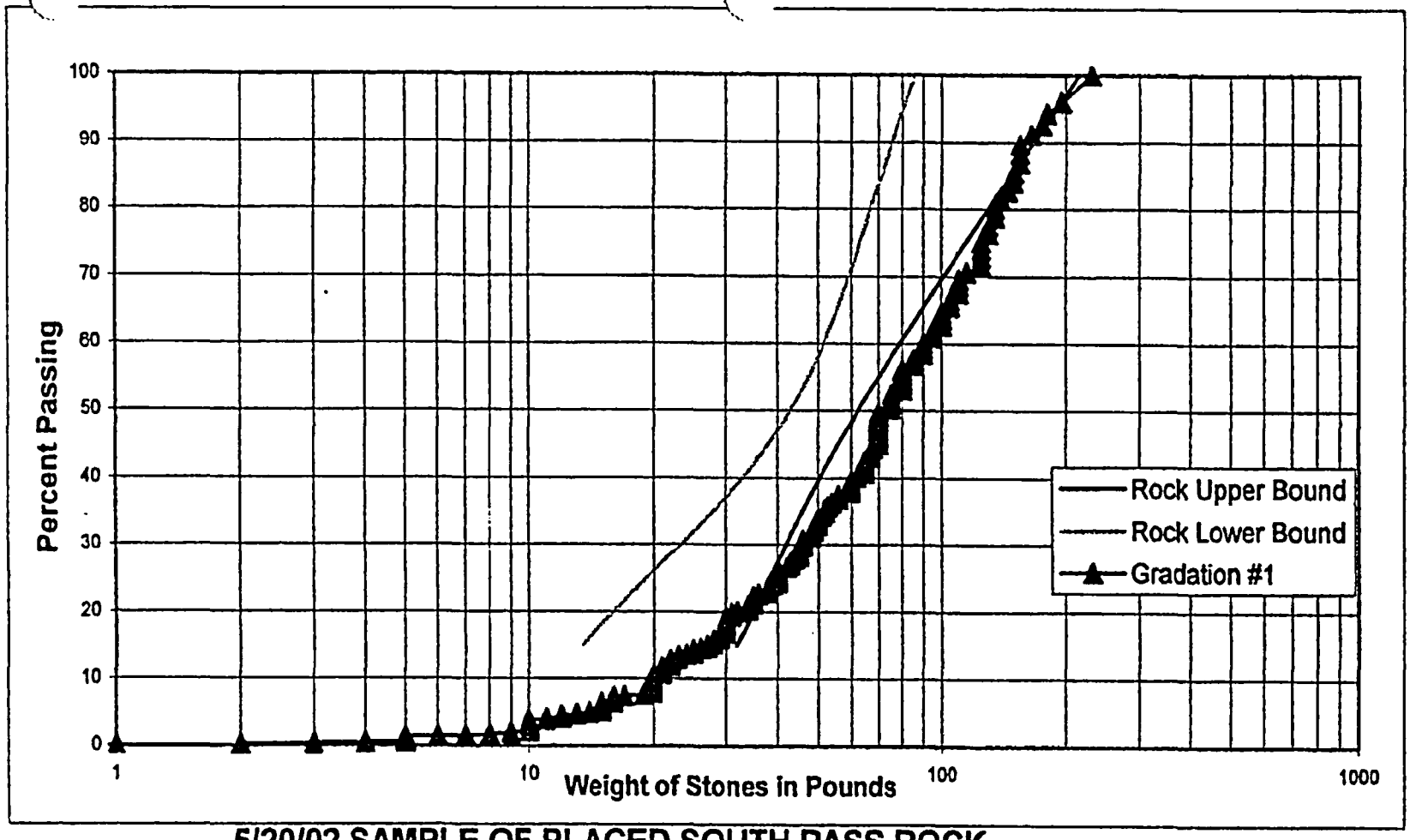
Grad #1 % in Combination	100
Grad #2 % in Combination	0

		Assumed Sp. Wt.
Layer Thickness	16.3	160
Shape Factor	1.40	
Spherical D100	23.8	
D100 with Shape Factor (inch)	21.2	



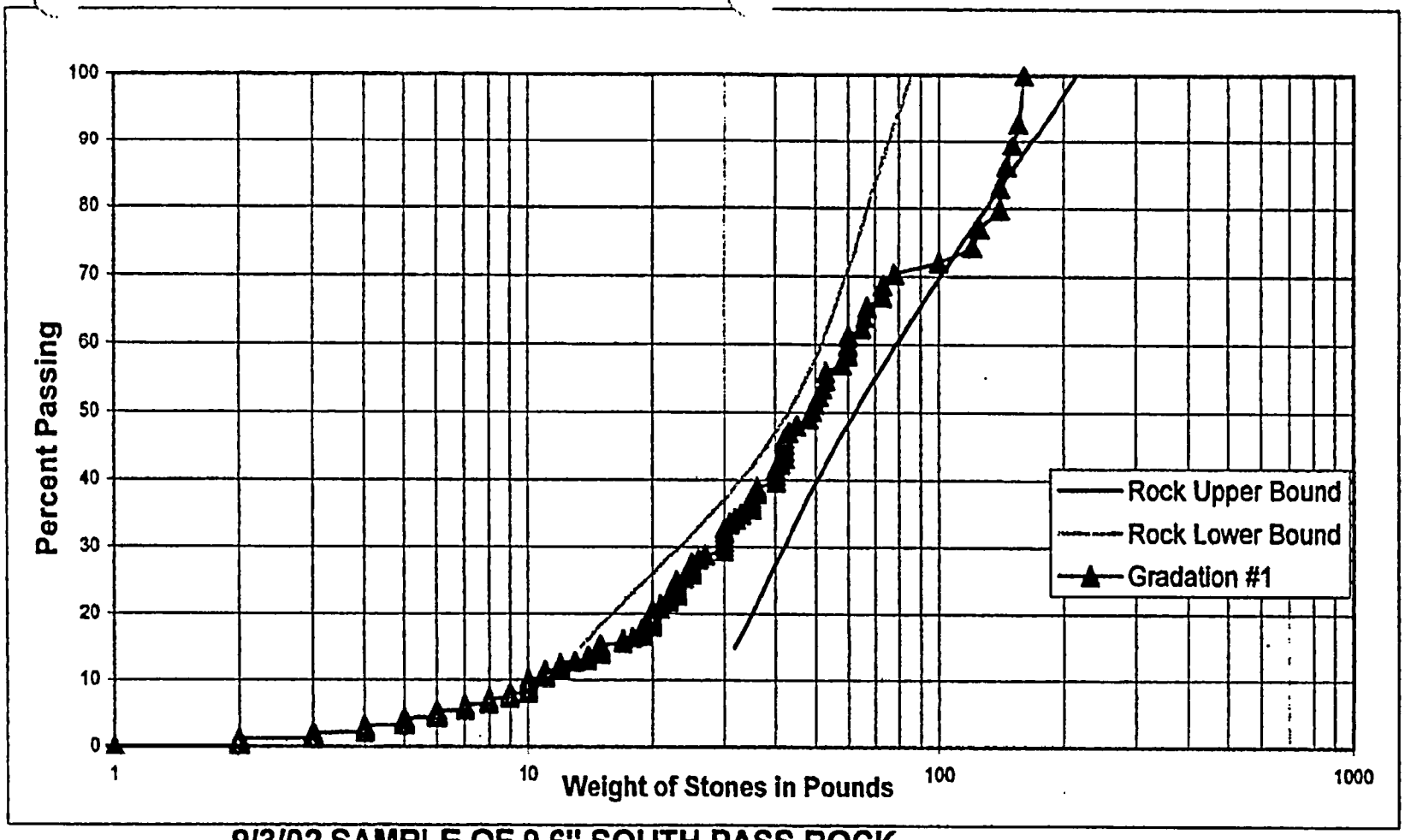
3/12/02 SAMPLE OF PLACED COMPOSITE SOUTH PASS ROCK

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)			Assumed Sp. Wt.
ACOE Upper Bound	31.8		62.2	214.5	Layer Thickness	16.3	160
ACOE Lower Bound	13.4	13.4	42.9	85.8	Shape Factor	1.40	
Gradation Results	11.5	19.3	44.7	575.0	Spherical D100	22.8	
	Grad #1 % in Combination			100	D100 with Shape		
	Grad #2 % in Combination			0	Factor (Inch)	20.4	



5/20/02 SAMPLE OF PLACED SOUTH PASS ROCK

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)			Assumed Sp. Wt.
ACOE Upper Bound	31.8		62.2	214.5	Layer Thickness	16.3	160
ACOE Lower Bound	13.4	13.4	42.9	85.8	Shape Factor	1.40	
Gradation Results	27.0	40.0	72.8	230.0	Spherical D100	16.8	
	Grad #1 % in Combination			100	D100 with Shape		
	Grad #2 % in Combination			0	Factor (inch)	15	

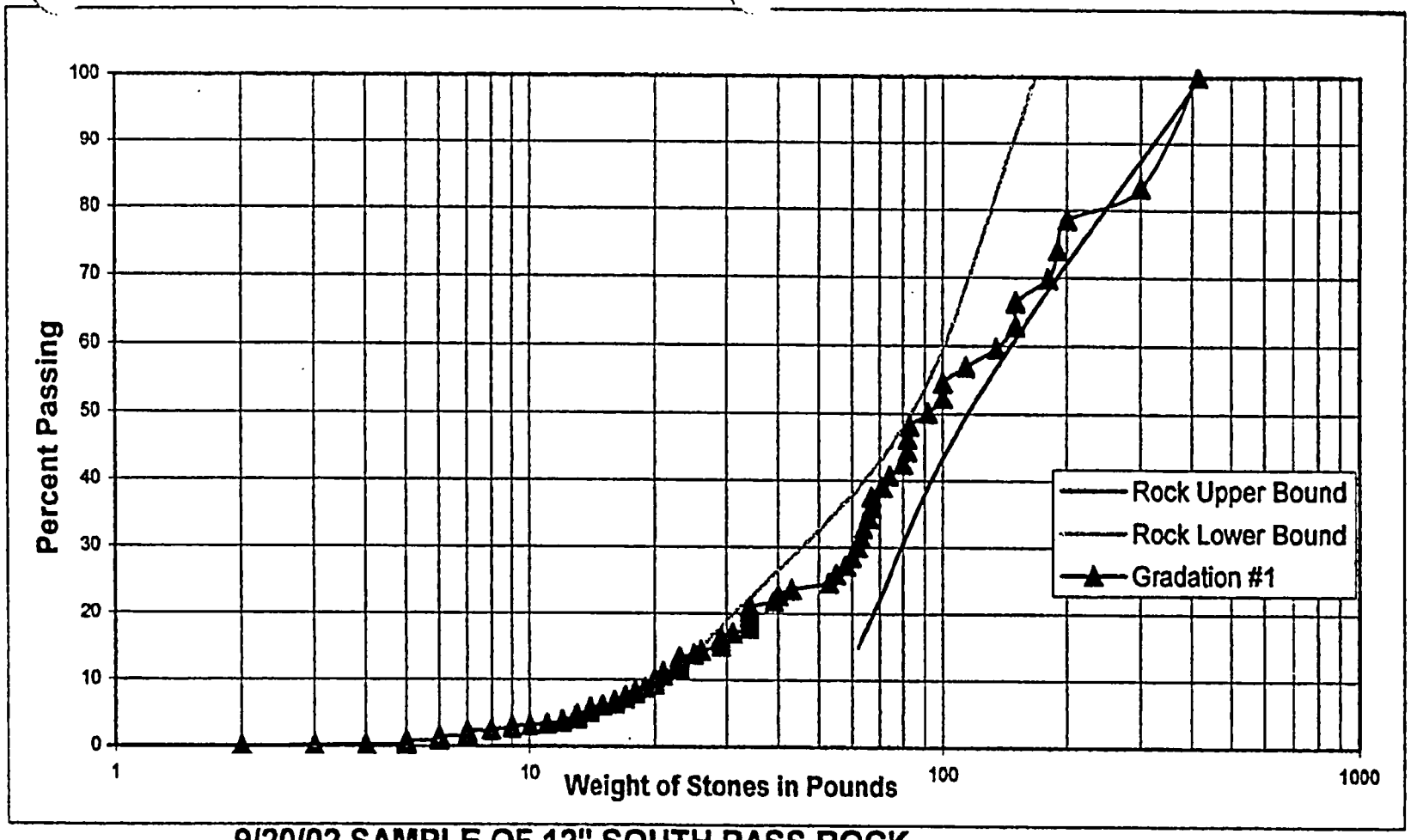


9/3/02 SAMPLE OF 9.6" SOUTH PASS ROCK

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)
ACOE Upper Bound	31.8		62.2	214.5
ACOE Lower Bound	13.4	13.4	42.9	85.8
Gradation Results	15.0	23.2	48.8	160.0

Grad #1 % in Combination	100
Grad #2 % in Combination	0

		Assumed Sp. Wt.
Layer Thickness	16.3	160
Shape Factor	1.40	
Spherical D100	14.9	
D100 with Shape Factor (inch)	13.3	

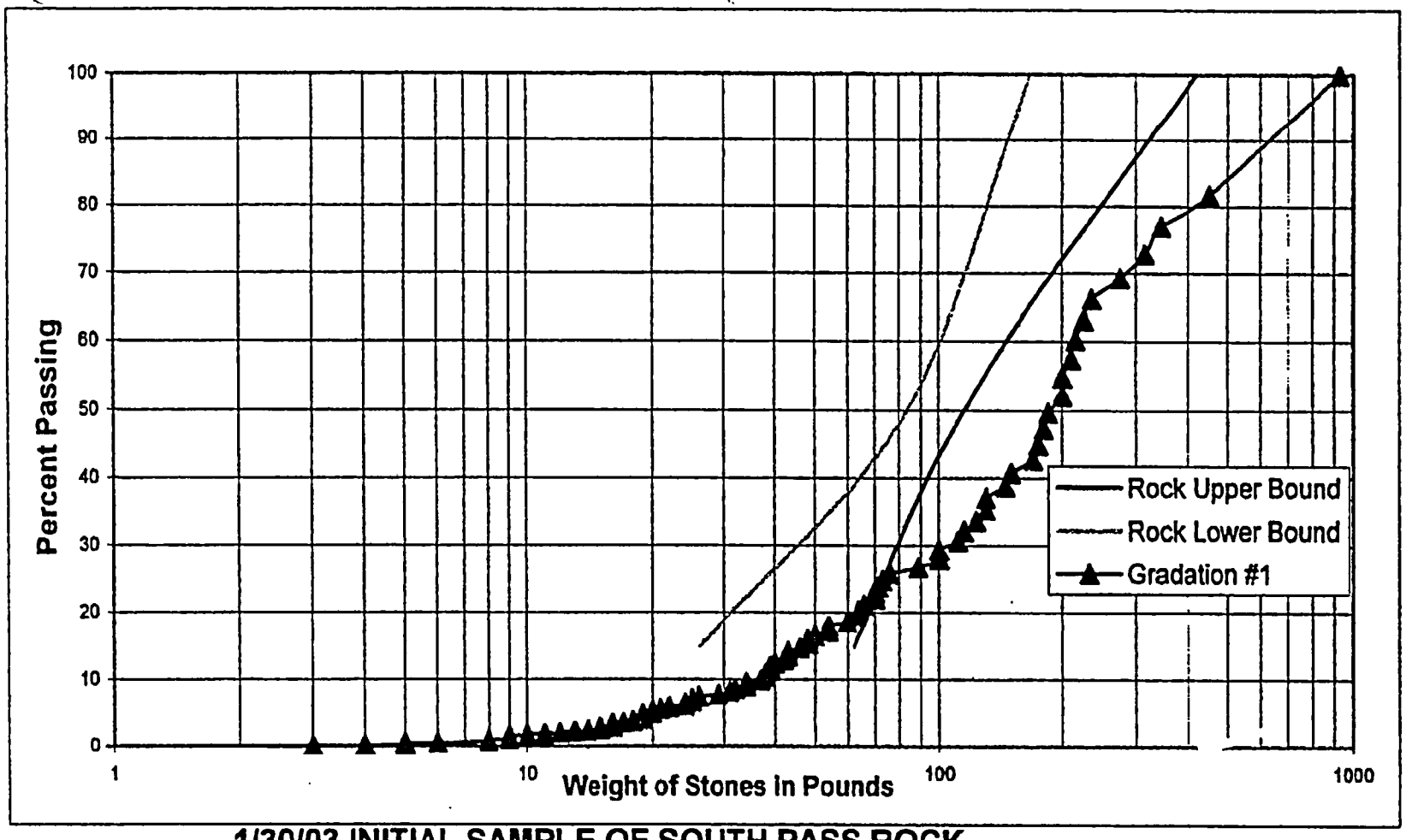


9/20/02 SAMPLE OF 12" SOUTH PASS ROCK

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)
ACOE Upper Bound	62.1		114.9	418.9
ACOE Lower Bound	26.2	26.2	83.8	167.6
Gradation Results	28.6	53.5	91.2	415.0

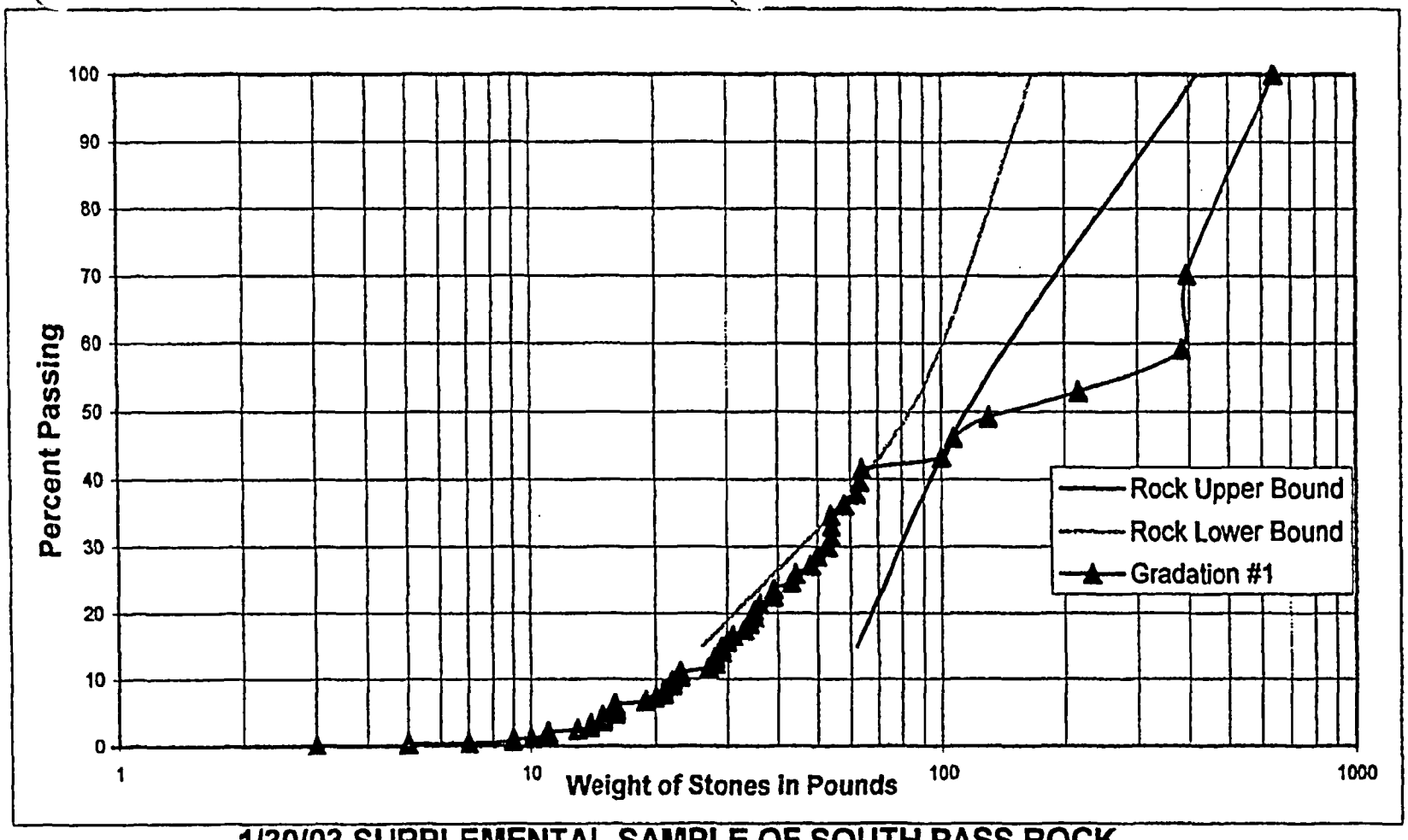
Grad #1 % in Combination	100
Grad #2 % in Combination	0

		Assumed Sp. Wt.
Layer Thickness	20.0	160
Shape Factor	1.40	
Spherical D100	20.5	
D100 with Shape Factor (inch)	18.3	



1/30/03 INITIAL SAMPLE OF SOUTH PASS ROCK

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)			Assumed Sp. Wt.
ACOE Upper Bound	62.1		114.9	418.9	Layer Thickness	20.0	160
ACOE Lower Bound	26.2	26.2	83.8	167.6	Shape Factor	1.40	
Gradation Results	46.9	73.4	186.9	930.0	Spherical D100	26.8	
	Grad #1 % in Combination			100	D100 with Shape		
	Grad #2 % in Combination			0	Factor (inch)	23.9	



1/30/03 SUPPLEMENTAL SAMPLE OF SOUTH PASS ROCK

	W15 (lb)	W25 (lb)	W50 (lb)	W100 (lb)			Assumed Sp. Wt.
ACOE Upper Bound	62.1		114.9	418.9	Layer Thickness	20.0	160
ACOE Lower Bound	26.2	26.2	83.8	167.6	Shape Factor	1.40	
Gradation Results	29.1	43.2	146.7	640.0	Spherical D100	23.6	
	Grad #1 % in Combination			100	D100 with Shape		
	Grad #2 % in Combination			0	Factor (inch)	21.1	

APPENDIX

H

LIMESTONE
DURABILITY TESTS

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

May 28, 1998 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JIM CROUCH

RE: LABORATORY TESTING RESULTS AND
NRC SCORING OF ROCK SAMPLES FROM
LUCKY MCMINE RECLAMATION PROJECT
E. GAS HILLS, WYOMING

Gentlemen:

We have tested the first limestone rock sample which was collected on March 5, 1998 at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Table 1 shows the test results and calculations for Test Number 1.

TABLE 1

ROCK TYPE: SEDIMENTARY – LIMESTONE

ROCK SAMPLE: Test Number 1

Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.698	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.677	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.670	8.4	12	100.8	120
Absorption, % ASTM C127	0.49	8.0	13	104.0	130
Sodium Sulfate Soundness, % Loss ASTM C88	2.87	9.1	4	36.4	40
L.A. Abrasion, % Loss ASTM C535	4.8	8.1	1	8.1	10
TOTAL SCORE				249.3	300

Durability Rating = 249.3 / 300 x 100 = 83.1

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:jlw:geotech/8152-RM

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

May 28, 1998 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JIM CROUCH

RE: LABORATORY TESTING RESULTS AND
NRC SCORING OF ROCK SAMPLES FROM
LUCKY MCMINE RECLAMATION PROJECT
E. GAS HILLS, WYOMING

Gentlemen:

We have tested the second limestone rock sample which was collected on April 14, 1998 at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Table 1 shows the test results and calculations for Test Number 2.

TABLE 1

ROCK TYPE: SEDIMENTARY – LIMESTONE

ROCK SAMPLE: Test Number 2

Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.695	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.679	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.670	8.4	12	100.8	120
Absorption, % ASTM C127	0.34	8.8	13	114.4	130
Sodium Sulfate Soundness, % Loss ASTM C88	2.15	9.4	4	37.6	40
L.A. Abrasion, % Loss ASTM C535	4.7	8.1	1	8.1	10
TOTAL SCORE				260.9	300

Durability Rating = 260.9 / 300 x 100 = 87.0

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:jlw:geotech/8152-RM

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

June 3, 1998 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JIM CROUCH

RE: LABORATORY TESTING RESULTS AND
NRC SCORING OF ROCK SAMPLES FROM
LUCKY MCMINE RECLAMATION PROJECT
E. GAS HILLS, WYOMING

Gentlemen:

We have tested the third limestone rock sample which was collected on May 6, 1998 at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Table 1 shows the test results and calculations for Test Number 3.

TABLE 1

ROCK TYPE: SEDIMENTARY – LIMESTONE

ROCK SAMPLE: Test Number 3

Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.686	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.662	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.649	8.0	12	96.0	120
Absorption, % ASTM C127	0.52	7.9	13	102.7	130
Sodium Sulfate Soundness, % Loss ASTM C88	0.70	10.0	4	40.0	40
L.A. Abrasion, % Loss ASTM C535	4.8	8.1	1	8.1	10
TOTAL SCORE				246.8	300

Durability Rating = 246.8/ 300 x 100 = 82.2

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:jlw:geotech/8152-RM

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

June 17, 1998 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JIM CROUCH

RE: LABORATORY TESTING RESULTS AND
NRC SCORING OF ROCK SAMPLES FROM
LUCKY MCMINE RECLAMATION PROJECT
E. GAS HILLS, WYOMING

Gentlemen:

We have tested the fourth limestone rock sample which was collected on May 6, 1998 at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Table 1 shows the test results and calculations for Test Number 4.

TABLE 1

ROCK TYPE: SEDIMENTARY – LIMESTONE

ROCK SAMPLE: Test Number 4

Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.698	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.674	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.659	8.2	12	98.4	120
Absorption, % ASTM C127	0.55	7.7	13	100.1	130
Sodium Sulfate Soundness, % Loss ASTM C88	0.34	10.0	4	40.0	40
L.A. Abrasion, % Loss ASTM C535	5.0	8.0	1	8.0	10
TOTAL SCORE				246.5	300

Durability Rating = 246.5/ 300 x 100 = 82.2

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:jlw:geotech/8152-RM

2.182

INBERG-MILLER ENGINEERS

124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

July 21, 1998 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JIM CROUCH

RE: LABORATORY TESTING RESULTS AND NRC SCORING OF ROCK SAMPLES FROM LUCKY MCMINE RECLAMATION PROJECT E. GAS HILLS, WYOMING

Gentlemen:

We have tested the fifth limestone rock sample which was collected on May 6, 1998 at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Table 1 shows the test results and calculations for Test Number 5.

TABLE 1

ROCK TYPE: SEDIMENTARY – LIMESTONE

ROCK SAMPLE: Test Number 5

Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.703	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.678	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.664	8.3	12	99.6	120
Absorption, % ASTM C127	0.55	7.7	13	100.1	130
Sodium Sulfate Soundness, % Loss ASTM C88	0.34	10.0	4	40.0	40
L.A. Abrasion, % Loss ASTM C535	6.1	7.4	1	7.4	10
TOTAL SCORE				247.1	300

Durability Rating = 247.1/ 300 x 100 = 82.4

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:jlw:geotech/8152-RM-July Results

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

November 19, 1998 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JIM CROUCH

RE: LABORATORY TESTING RESULTS AND
NRC SCORING OF ROCK SAMPLES FROM
LUCKY MCMINE RECLAMATION PROJECT
E. GAS HILLS, WYOMING

Gentlemen:

We have tested the sixth through the ninth limestone rock samples which were collected at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Tables 1 through 4 show the test results and calculations for Test Number 6 through 9, respectively.

TABLE 1

ROCK TYPE: SEDIMENTARY – LIMESTONE

ROCK SAMPLE: Test Number 6

Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.711	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.683	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.666	8.2	12	98.4	120
Absorption, % ASTM C127	0.61	7.4	13	96.2	130
Sodium Sulfate Soundness, % Loss ASTM C88	0.91	10.0	4	40.0	40
L.A. Abrasion, % Loss ASTM C535	5.1	7.9	1	7.9	10
TOTAL SCORE				242.5	300

Durability Rating = 242.5/ 300 x 100 = 80.8

TABLE 2					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 7					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.702	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.676	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.661	8.2	12	98.4	120
Absorption, % ASTM C127	0.57	7.6	13	98.8	130
Sodium Sulfate Soundness, % Loss ASTM C88	0.43	10.0	4	40.0	40
L.A. Abrasion, % Loss ASTM C535	5.7	7.6	1	7.6	10
TOTAL SCORE				244.8	300
Durability Rating = 244.8/ 300 x 100 = 81.6					

TABLE 3					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 8					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.706	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.678	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.662	8.2	12	98.4	120
Absorption, % ASTM C127	0.61	7.6	13	98.8	130
Sodium Sulfate Soundness, % Loss ASTM C88	0.31	10.0	4	40.0	40
L.A. Abrasion, % Loss ASTM C535	2.5	9.3	1	9.3	10
TOTAL SCORE				246.5	300
Durability Rating = 246.5/ 300 x 100 = 82.2					

TABLE 4					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 9					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.706	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.683	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.670	8.4	12	100.8	120
Absorption, % ASTM C127	0.51	7.9	13	102.7	130
Sodium Sulfate Soundness, % Loss ASTM C88	0.31	10.0	4	40.0	40
L.A. Abrasion, % Loss ASTM C535	2.5	9.3	1	9.3	10
TOTAL SCORE				252.8	300
Durability Rating = 252.8/ 300 x 100 = 84.3					

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:jlw:geotech/8152-rm-(6-9)

cc. JDW
2.182

INBERG-MILLER ENGINEERS

124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

November 25, 1998 8152 RM

Pathfinder Mines Corporation
Post Office Box 831
Riverton, Wyoming 82501

RECEIVED
DEC 01 1998
By TWH

ATTENTION: TOM HARDGROVE

RE: SAMPLE NO. 12 ROCK DURABILITY SCORE
CORRECTIVE ACTION
LUCKY MC MINE RECLAMATION PROJECT

Dear Sir:

This letter summarizes corrective action for a recent low rock durability score that was determined for crushed limestone rock products at the above project.

Inberg-Miller Engineers collected rock sample No. 12 on November 6, 1998 and performed a rock durability test on the sample. The test results were used to score the sample in accordance with the Nuclear Regulatory Commission's (NRC) Table D1 "Scoring Criteria for Determining Rock Quality". We calculated a score of 70.6%, which is below the minimum of 80% where no oversizing is required.

We reviewed the rock durability score of 70.6% with you on November 19, 1998, and you requested that we review gradation results for rock products that were represented by the same sample. We understand that the rock crusher was not in operation for a period following satisfactory rock durability testing of sample No. 11. The rock-crushing contractor began producing 1.63" and 2.17" D50 rock products after the crusher was back in operation and prior to November 19, 1998. Only one gradation test result met project specifications during this time interval, and all other produced material was rejected. The acceptable gradation was for 2.17" D50 material. The actual D50 for the acceptable material as tested is 2.44".

In summary, the rock durability score of 70.6% would require that products represented by associated test data be oversized. In accordance with the "Final Staff Technical Position – Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites", dated August 1990, the product should be oversized by a percentage of the rock diameter equal to the difference between the score and 80. Based on the score for sample No. 12, the rock products should be oversized by 9.4%.

There is only one rock product apparently affected by the rock durability score of 70.6%. The actual D50 gradation data indicates that this product is oversized by 12.4% as compared to the D50 specifications. The 12.4% oversizing exceeds the NRC oversizing requirement of 9.4%.

We also understand that the apparent reason for the 70.6% score was due to the presence of sandstone overburden materials that had become mixed with the crushed limestone. You indicated that rock mining operations will be changed after November 19, 1998 to limit the likelihood that sandstone would get into the limestone.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:ltr\8152rk

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

January 15, 1999 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JACK WADSWORTH

RE: LABORATORY TESTING RESULTS AND
NRC SCORING OF ROCK SAMPLES FROM
LUCKY MCMINE RECLAMATION PROJECT
E. GAS HILLS, WYOMING

Gentlemen:

We have tested the tenth through the thirteenth limestone rock samples which were collected at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Tables 1 through 4 show the test results and calculations for Test Number 10 through 13, respectively.

TABLE 1

ROCK TYPE: SEDIMENTARY – LIMESTONE

ROCK SAMPLE: Test Number 10

Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.717	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.686	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.672	8.4	12	101.2	120
Absorption, % ASTM C127	0.62	7.3	13	94.9	130
Sodium Sulfate Soundness, % Loss ASTM C88	1.0	10.0	4	40.0	40
L.A. Abrasion, % Loss ASTM C535	4.9	8.1	1	8.1	10
TOTAL SCORE				244.2	300

Durability Rating = 244.2/ 300 x 100 = 81.4

TABLE 2					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 11					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.679	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.647	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.660	8.2	12	98.4	120
Absorption, % ASTM C127	0.55	7.7	13	100.1	130
Sodium Sulfate Soundness, % Loss ASTM C88	1.68	9.7	4	38.8	40
L.A. Abrasion, % Loss ASTM C535	2.6	9.2	1	9.2	10
TOTAL SCORE				246.5	300
Durability Rating = 246.5/ 300 x 100 = 82.2					

TABLE 3					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 12					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.708	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.670	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.649	8.0	12	96.0	120
Absorption, % ASTM C127	0.82	6.1	13	79.3	130
Sodium Sulfate Soundness, % Loss ASTM C88	6.6	7.2	4	28.6	40
L.A. Abrasion, % Loss ASTM C535	5.2	7.9	1	7.9	10
TOTAL SCORE				211.8	300
Durability Rating = 211.8/ 300 x 100 = 70.6					

TABLE 4					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 13					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.684	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.661	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.648	8.0	12	96.0	120
Absorption, % ASTM C127	0.49	8.1	13	105.3	130
Sodium Sulfate Soundness, % Loss ASTM C88	1.15	9.9	4	39.6	40
L.A. Abrasion, % Loss ASTM C535	4.7	8.2	1	8.2	10
TOTAL SCORE				249.1	300
Durability Rating = 249.1/ 300 x 100 = 83.0					

Please refer to our November 25, 1998 letter regarding corrective action with regard to the rock durability score for Sample No. 12.

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:msr:geotech/8152-rm-(10-13)

INBERG–MILLER ENGINEERS

124 East Main Street
Riverton, Wyoming 82501
307–856–8136

DATE: 1-8-99 COVER + 1 PAGES

TO: Jack Wadsworth

COMPANY: PMC FAX: 4576629

PROJECT: Lucky McMine

PROJECT NO.: B152-RM

FROM: GM Bobnick FAX: 307–856–3851

WE ARE TRANSMITTING:

Date	No. Pages	Description

☐ For approval ☒ For your use ☐ As requested ☐ Review/comment

MESSAGE:

Rock Durability Scores:

Sa #	Score
10	81.4
11	82.2
12	70.6
13	82.6
14	80.3
15	75.8

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INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

February 16, 1999 8152 RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, Wyoming 82501

ATTENTION: JACK WADSWORTH

RE: ROCK DURABILITY SCORING
LUCKY MC MINE RECLAMATION PROJECT
GAS HILLS, WYOMING

Dear Sir:

This letter summarizes the basis for rock durability scoring as you requested during a February 1, 1999 meeting between representatives of Pathfinder Mines Corporation and Inberg-Miller Engineers.

We discussed rock durability testing issues with Mr. Jim Crouch at the onset of crushed rock production and testing early in 1998. We explained the test procedures and factors affecting the tests. Test setup and calculation of results depends on product gradation. We also indicated to Mr. Crouch that it is impractical to test products larger than approximately 4 inches because of the dimensional limitations of conventional test equipment and methods specifically outlined in the test standards. Mr. Crouch selected the 1.63" D_{50} product as a basis for testing for the following reasons:

- The 1.63" D_{50} product has relatively small particle sizes compared to all but one of the other crushed rock products. The small particle sizes would likely yield conservative test results as compared with larger sized products. Rock durability is related to particle surface area. Smaller sized materials have a larger surface area per unit volume and are exposed to greater loss due to wear and weathering.
- The 1.63" D_{50} product comprises the largest percentage of the combined volume of the various crushed rock products produced for the project.

Please feel free to call if you have any questions.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick

Glen M. Bobnick, P.E.
Geotechnical Engineer

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

February 18, 1999 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JACK WADSWORTH

RE: LABORATORY TESTING RESULTS AND
NRC SCORING OF ROCK SAMPLES FROM
LUCKY MCMINE RECLAMATION PROJECT
E. GAS HILLS, WYOMING

Gentlemen:

We have tested the tenth through the thirteenth limestone rock samples which were collected at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Tables 1 through 4 show the test results and calculations for Test Number 14 through 17, respectively.

TABLE 1

ROCK TYPE: SEDIMENTARY – LIMESTONE

ROCK SAMPLE: Test Number 14

Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.708	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.681	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.665	8.3	12	99.6	120
Absorption, % ASTM C127	0.60	7.4	13	96.2	130
Sodium Sulfate Soundness, % Loss ASTM C88	2.7	9.2	4	36.8	40
L.A. Abrasion, % Loss ASTM C535	4.7	8.2	1	8.2	10
TOTAL SCORE				240.8	300

Durability Rating = 240.8/ 300 x 100 = 80.3

TABLE 2					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 15					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.701	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.705	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.651	8.0	12	96.0	120
Absorption, % ASTM C127	0.71	6.8	13	88.4	130
Sodium Sulfate Soundness, % Loss ASTM C88	3.4	8.8	4	35.2	40
L.A. Abrasion, % Loss ASTM C535	5.1	7.9	1	7.9	10
TOTAL SCORE				227.5	300
Durability Rating = 227.5/ 300 x 100 = 75.8					

TABLE 3					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 16					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.700	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.670	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.653	8.1	12	97.2	120
Absorption, % ASTM C127	0.65	7.1	13	92.3	130
Sodium Sulfate Soundness, % Loss ASTM C88	1.5	9.8	4	39.2	40
L.A. Abrasion, % Loss ASTM C535	5.2	7.9	1	7.9	10
TOTAL SCORE				236.6	300
Durability Rating = 236.6/ 300 x 100 = 78.9					

TABLE 4					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 17					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.701	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.671	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.664	8.3	12	99.6	120
Absorption, % ASTM C127	0.52	7.9	13	102.7	130
Sodium Sulfate Soundness, % Loss ASTM C88	1.4	9.8	4	39.2	40
L.A. Abrasion, % Loss ASTM C535	4.6	8.2	1	8.2	10
TOTAL SCORE				249.7	300
Durability Rating = 249.7/ 300 x 100 = 83.2					

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:msr:geotech/8152-rm-(10-13)

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

March 25, 1999 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JACK WADSWORTH

RE: LABORATORY TESTING RESULTS AND NRC SCORING OF ROCK SAMPLES FROM LUCKY MCMINE RECLAMATION PROJECT E. GAS HILLS, WYOMING

Gentlemen:

We have tested the eighteenth through the twenty-first limestone rock samples which were collected at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Tables 1 through 4 show the test results and calculations for Test Number 18 through 21, respectively.

TABLE 1

ROCK TYPE: SEDIMENTARY – LIMESTONE

ROCK SAMPLE: Test Number 18

Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.699	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.671	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.654	8.0	12	96.0	120
Absorption, % ASTM C127	0.63	7.3	13	94.9	130
Sodium Sulfate Soundness, % Loss ASTM C88	1.2	9.9	4	39.6	40
L.A. Abrasion, % Loss ASTM C535	4.8	8.1	1	8.1	10
TOTAL SCORE				238.6	300

Durability Rating = 238.6/ 300 x 100 = 79.5

TABLE 2					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 19					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.686	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.672	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.656	8.1	12	97.2	120
Absorption, % ASTM C127	0.63	7.2	13	93.6	130
Sodium Sulfate Soundness, % Loss ASTM C88	0.67	10.0	4	40.0	40
L.A. Abrasion, % Loss ASTM C535	4.4	8.3	1	8.3	10
TOTAL SCORE				239.1	300
Durability Rating = 239.1/ 300 x 100 = 79.7					

TABLE 3					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 20					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.693	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.666	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.651	8.0	12	96.0	120
Absorption, % ASTM C127	0.59	7.5	13	97.5	130
Sodium Sulfate Soundness, % Loss ASTM C88	2.5	9.3	4	37.2	40
L.A. Abrasion, % Loss ASTM C535	4.9	8.1	1	8.1	10
TOTAL SCORE				238.8	300
Durability Rating = 238.8/ 300 x 100 = 79.6					

TABLE 4					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 21					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.702	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.675	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.659	8.2	12	98.4	120
Absorption, % ASTM C127	0.59	7.5	13	97.5	130
Sodium Sulfate Soundness, % Loss ASTM C88	1.4	9.8	4	39.2	40
L.A. Abrasion, % Loss ASTM C535	5.2	7.9	1	7.9	10
TOTAL SCORE				243.0	300
Durability Rating = 243.0/ 300 x 100 = 81.0					

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:msr:geotech/8152-rm-(18-21)

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

April 26, 1999 8152-RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

ATTENTION: JACK WADSWORTH

RE: LABORATORY TESTING RESULTS AND NRC SCORING OF ROCK SAMPLES FROM LUCKY MCMINE RECLAMATION PROJECT
E. GAS HILLS, WYOMING

Gentlemen:

We have tested the twenty-second and twenty-third limestone rock samples which were collected at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2"), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock product for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference.)

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Tables 1 and 2 show the test results and calculations for Test Number 22 and 23, respectively.

TABLE 1					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 22					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.691	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.667	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.652	8.0	12	96.0	120
Absorption, % ASTM C127	0.55	7.7	13	100.1	130
Sodium Sulfate Soundness, % Loss ASTM C88	4.0	8.5	4	34.0	40
L.A. Abrasion, % Loss ASTM C535	4.1	8.5	1	8.5	10
TOTAL SCORE				238.6	300
Durability Rating = 238.6 / 300 x 100 = 79.5					

TABLE 2					
ROCK TYPE: SEDIMENTARY – LIMESTONE					
ROCK SAMPLE: Test Number 23					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.698	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.674	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.660	8.2	12	98.4	120
Absorption, % ASTM C127	0.53	7.8	13	101.4	130
Sodium Sulfate Soundness, % Loss ASTM C88	0.8	10.0	4	40	40
L.A. Abrasion, % Loss ASTM C535	4.8	8.1	1	8.1	10
TOTAL SCORE				247.9	300
Durability Rating = 247.9 / 300 x 100 = 82.6					

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

July 15, 1999 8152 RM

Pathfinder Mines Corporation
P.O. Box 831
Riverton, Wyoming 82501

ATTENTION: TOM HARDGROVE

RE: LIMESTONE ROCK
SPECIFIC GRAVITY AND ABSORPTION RESULTS
LUCKY MC MINE PROJECT

Dear Sir;

This letter summarizes the results of testing that Inberg-Miller Engineers performed on large size (greater than 6 inch diameter) rock samples that were submitted to our Riverton, Wyoming laboratory.

The tests were performed in accordance with ASTM C127 " Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate", except for the submersion period. Because of the substantially smaller surface area to weight ratio of the large rocks as compared to the 2.17" D_{50} rock samples that were tested during rock crushing for the project, a longer submersion period was used. The rocks were submerged in water for a period of 96 hours instead of 24 hours. The longer submersion results in higher percent asborption and more conservative results

Due to the large size, rocks designated HD9.6, HD12, and RH (eight rocks total) were tested individually rather than as a sample made up of several rocks at a total test-sample weight.

The results of testing are tabulated below:

Sample No.	Bulk Specific Gravity	Percent Absorption	Oven-dry Sample Wt. (lb)
HD6-1	2.665	0.34	59.30
HD6-2	2.682	0.70	64.10
HD6-3	2.667	0.48	62.55
HD9.6-1	2.673	0.21	96.75
HD9.6-2	2.658	0.62	72.30
HD9.6-3	2.688	0.55	63.85
HD12-1	2.703	0.27	55.00
HD12-2	2.671	0.39	102.15
HD12-3	2.659	0.48	83.90
RH-1	2.670	0.27	37.65
RH-2	2.642	0.40	62.75

Please feel free to call if you have any questions.

Sincerely,
Inberg-Miller Engineers

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:jlw:client ltrs\8152-RM-Rock Springs

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

March 15, 2001 8152.1-RM

Mr. Bob Niezwaag
Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

RE: LABORATORY TESTING RESULTS AND NRC SCORING
OF ROCK SAMPLES FROM LUCY MC MINE RECLAMATION PROJECT
EAST GAS HILLS, WYOMING

Dear Mr. Niezwaag:

We have tested the twenty-fourth (24) limestone rock sample which was collected at the quarry site located on the above-referenced facility near E. Gas Hills, Wyoming. As specified in your QA/QC Scope of Work, we have performed Specific Gravity and Absorption (nominal size 2-inches), L.A. Abrasion (100 rev.), and Sodium Sulfate Soundness (sieves 3 through 1"; 5 cycles). We have used a "weighted average" based on the crushed rock project for D_{50} of 1.63 inches to calculate the percent loss of the sodium sulfate soundness test. (Although, only the Bulk Specific Gravity is used for the NRC scoring, we have included the Apparent Specific Gravity and Bulk Saturated Surface Dry Specific Gravity for your reference).

We have "scored" the samples according to Table D1 of the NRC's Staff Technical Position (STP) Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailing Sites, August 1990. Table 1 shows the test results and calculations for Test Number 24.

TABLE 1					
ROCK TYPE: SEDIMENTARY - LIMESTONE					
ROCK SAMPLE. TEST NUMBER 24					
Laboratory Test	Result	Score	Weight	Score x Weight	Maximum Score
Apparent Specific Gravity ASTM C127	2.686	N/A	N/A	N/A	N/A
Saturated Surface Dry Specific Gravity ASTM C127	2.659	N/A	N/A	N/A	N/A
Bulk Specific Gravity ASTM C127	2.644	7.8	12	93.6	120
Absorption. %ASTM C127	0.592	7.5	13	97.5	130
Sodium Sulfate Soundness, %Loss ASTM C88	2.6	9.2	4	36.8	40
L.A. Abrasion, % Loss ASTM C535	4.1	8.5	1	8.5	10
TOTAL SCORE				236.4	300
Durability Rating = 236.4 / 300 x 100 = 78.8					

We appreciate the opportunity to be of service to you thus far. If you have any questions regarding the enclosed information or if we may be of additional assistance, please contact us.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:ksp:\ltr:\8152.1-RM

SUBJECT Durability PROJECT NO. 8152.1RM PAGE 1

CLIENT Pathfinder DATE 4-4-01 BY JPM

PROJECT Lucky McMine Rec. CHECKED BY

Durability #25

	Results	Score	Weight	Score x	Max Score
A.S.G.	2.699	—	—	—	—
Bulk SSD	2.681	—	—	—	—
Bulk SG	2.67	8.4	12	100.8	126
Absorption	.405	8.5	13	110.5	130
Sodium Sulfate	1.22	9.9	4	39.6	40
LA Abrasion	2.63	9.2	1	9.2	10
				260.1	300

86.7%

Bulk SG

A 2.7

B 2.67

C 2.65

$\frac{B-C}{A-C} = x$

x+8 = Answer

8.4

LA Abrasion

A 3

B 2.63

C 1

Absorption

A .5

B .405 8.53

C .3

Sodium Sulfate

A 3

B 1.22

C 1

AGGREGATE TESTS
LOS ANGELES ABRASION/SULFATE SOUNDNESS

ASTM C535, ASTM C131, ASTM C88

CLIENT Pathfinder — JOB NO.: 8152.1RM
SAMPLE DESCRIPTION Limestone — DATE: 3-22-01
PRODUCER Schmidt Sand + Gravel — TEST NO.: 25
PROJECT Lucky McMine Gradation

LOS ANGELES ABRASION

☐ ASTM C131, GRADING _____
☑ ASTM C535, GRADING _____

INITIAL DRY WT., W1 9996.6 g
FINAL DRY WT., W2 10266.8 g
WT. LOSS (W1-W2)= 270.2 g

CHECK GRADATION OF SAMPLE BEFORE SELECTING GRADING,

% LOSS = WT. LOSS / W1 x 100 = 2.63

SULFATE SOUNDNESS

ASTM C88 ☐ SODIUM ☐ MAGNESIUM ☐

_____ CYCLES

SIEVE SIZE			1	2	3	4	5
PAN	PASSING	RETAINED	INITIAL WT OF SAMPLE (GRAMS)	FINAL WT. OF SAMPLE AFTER TEST (GRAMS)	ACTUAL % LOSS	GRADING OF ORIGINAL SAMPLE % RETAINED	CORRECTED % LOSS
	1.5"	1"	1016.6	990.4	2.58	24	.62
	2.0"	1.5"	2011.1	1985.5	1.27	40	.51
	2.5"	2.0"	3133.9	3126.2	.25	32	.08
	3.0"	2.5"	6550.0	6537.7	.19	4	.01
						% LOSS =	1.22

3 = ((1 - 2) / 1) X 100
5 = (4 / 100) X 3)

TEST BY JPM

INBERG-MILLER ENGINEERS — RIVERTON, WYOMING

03/23/95

SPECIFIC GRAVITY OF COARSE AGGREGATE

ASTM C127

CLIENT: Pathfinder
PROJECT: Lucky McMine Reclamation
SAMPLE DESCRIPTION: Limestone

JOB NO.: 8152.1RM
DATE: 3-22-01
TEST NO.: 25

TEST NO.			1-1.5"	1.5-2"		
TEMPERATURE OF WATER AND AGG, T, °F						
WEIGHT IN GRAMS	TARE + SATURATED SURFACE-DRY AGG					
	TARE					
	SATURATED SURFACE-DRY AGG	B	5005.3	5010.3		
	(WIRE BASKET + AGG.) IN WATER					
	WIRE BASKET IN WATER					
	SATURATED AGG. IN WATER	C	3151.3 ~~3140.5~~	3140.5		
	TARE + DRY AGG.					
	TARE					
	DRY AGG. IN AIR	A	4983.9	4991.3		AVE
APPARENT S.G. (A/(A-C))			2.70189	2.69683		2.69936
BULK S.G. (A/(B-C))			2.6709	2.66943		2.67017
BULK S.S.D., S.G. (B/(B-C))			2.68237	2.67959		2.68098
ABSORPTION [((B-A)/A)X100]			.42938	.38066		.40502
				.37922		.4043

REMARKS:

TEST PERFORMED BY:

INBERG-MILLER ENGINEERS

RIVERTON, WYOMING

03/23/95

SUBJECT Pathfinder Durability PROJECT NO. 8152.1RM PAGE 1 of 1

CLIENT Pathfinder DATE 4-11-01 BY JFM

PROJECT Lucky McMine CHECKED BY

Sample 26

	Results	Score	Weight	Score ×	Max Score
ASG	2.693	—	—	—	—
Bulk SSD	2.662	—	—	—	—
Bulk SG	2.673	~~8.4~~ 8.2	12	~~100.8~~ 98.4	120
Absorption	.4315	~~8.65~~ 8.35	13	~~112.45~~ 108.55	130
Sodium S.	~~1.49~~ 2.25	~~9.76~~ 9.38	4	~~39.04~~ 37.52	40
LA Abrasion	5.56	7.67	1	7.67	10
				~~260.0~~ 252.14	300

86.7%

84.0%

SG	2.7	A	.02	AB	.6	SS	3		LA	6.7		
	2.67	B	.05		.43		1.49	.245		5.56	7.67	
	2.65	C			.3		1			5		

AGGREGATE TESTS
LOS ANGELES ABRASION/SULFATE SOUNDNESS

ASTM C535, ASTM C131, ASTM C88

CLIENT Pathfinder — JOB NO.: 8152.1RM
SAMPLE DESCRIPTION Limestone — DATE: 3-28-01
PRODUCER Schmidt Sand + Gravel — TEST NO.: 26
PROJECT Lucky McMine

LOS ANGELES ABRASION

☐ ASTM C131, GRADING _____
☐ ASTM C535, GRADING _____

INITIAL DRY WT., W1 9992.3 g
FINAL DRY WT., W2 9436.6 g
WT. LOSS (W1-W2)= 555.7 g

CHECK GRADATION OF SAMPLE BEFORE SELECTING GRADING,

% LOSS = WT. LOSS / W1 x 100 = 5.56

SULFATE SOUNDNESS

ASTM C88 ☐ SODIUM ☑ MAGNESIUM ☐

5 CYCLES

SIEVE SIZE			1 INITIAL WT OF SAMPLE (GRAMS)	2 FINAL WT. OF SAMPLE AFTER TEST (GRAMS)	3 ACTUAL % LOSS	4 GRADING OF ORIGINAL SAMPLE % RETAINED	5 CORRECTED % LOSS
PAN	PASSING	RETAINED					
	1.5"	1"	1013.1	974.2	3.84	24	~~.46~~ .92
	2.0"	1.5"	2015.0	1967.9	2.34	40	.94
	2.5"	2.0"	3022.4	2988.3	1.13	32	.36
	3.0"	2.5"	6841.6	6785.7	.82	4	.03
						% LOSS =	~~1.49~~ 2.25

3 = ((1 - 2) / 1) X 100
5 = (4 / 100) X 3)

TEST BY JPM

INBERG-MILLER ENGINEERS — RIVERTON, WYOMING

03/23/95

Pathfinder Durability
8152.1RM
Test # 27

4-3-01

	Results	Score	Weight	Score x	Max score
ASG	2.696	—	—	—	—
Bulk SD	2.669	—	—	—	—
Bulk SG	~~2.655~~ 2.658	~~8.6~~ 8.04	12	103.2 96.48	120
Absorption	.6941	7.2	13	93.6	130
Sodium S.	1.34	9.8	4	39.2	40
LA Abrasion	5.9	7.5	1	7.5	10
			Total;	243.5	300

236.78 81.2%

78.9%

SG
2.7
2.68 x=.6
2.65

SS 3.0
1.34 x=.17
1.0

AB .67
.64 x=.82
.5

LA 6.7
5.9
5.0

AGGREGATE TESTS
LOS ANGELES ABRASION/SULFATE SOUNDNESS

ASTM C535, ASTM C131, ASTM C88

CLIENT Pathfinder — JOB NO.: 8152.1RM
SAMPLE DESCRIPTION Limestone — DATE: 4-3-01
PRODUCER Schmidt Sand & Gravel — TEST NO.: 27
PROJECT Lucky McMine Rec.

LOS ANGELES ABRASION

☐ ASTM C131, GRADING _____
☐ ASTM C535, GRADING _____

INITIAL DRY WT., W1 10081.5 g
FINAL DRY WT., W2 9491.5 g
WT. LOSS (W1-W2)= 590 g

CHECK GRADATION OF SAMPLE BEFORE SELECTING GRADING,

% LOSS = WT. LOSS / W1 x 100 = 5.9

SULFATE SOUNDNESS

ASTM C88 ☐ SODIUM ☐ MAGNESIUM ☐

_____ CYCLES

SIEVE SIZE			1	2	3	4	5
PAN	PASSING	RETAINED	INITIAL WT OF SAMPLE (GRAMS)	FINAL WT. OF SAMPLE AFTER TEST (GRAMS)	ACTUAL % LOSS	GRADING OF ORIGINAL SAMPLE % RETAINED	CORRECTED % LOSS
	1.5	1.0	1015.8	999.5	1.60	24	~~.4~~ 0.38
	2.0	1.5	1934.2	1902.2	1.65	40	.66
	2.5	2.0	3005.2	2981.2	.8	32	~~.25~~ .26
	3.0	2.5	6857.4	6838.4	.28	4	.01
						% LOSS =	~~1.34~~ 1.31

3 = ((1 - 2) / 1) X 100
5 = (4 / 100) X 3)

TEST BY JPM

INBERG-MILLER ENGINEERS — RIVERTON, WYOMING

03/23/95

SUBJECT Rock Quality Scoring PROJECT NO. 8152.1 RM PAGE

CLIENT Pathfinder Mines DATE 4-27-01 BY JCH

PROJECT Lucky Mc Mine Reclamation CHECKED BY

	RESULTS	SCORE	WEIGHT	SCORE X	MAX SCORE
Apparant S.G.		—	—	—	—
Bulk SSD; S.G.		—	—	—	—
Bulk S.G.	2.659	8.18	12	98.16	120
Absorption	0.575	7.56	13	98.28	130
Na SO_4 Soundness	2.4	9.3	4	37.20	40
L.A. Abrasion	5.2	7.88	1	7.88	10
			TOTALS	241.52	300

80.5%

Sample 28

AGGREGATE TESTS
LOS ANGELES ABRASION/SULFATE SOUNDNESS

ASTM C535, ASTM C131, ASTM C88

CLIENT Pathfinder — JOB NO.: 8152.1RM
SAMPLE DESCRIPTION Limestone — DATE: 4-14-01
PRODUCER Schmidt Sand + Gravel — TEST NO.: 28
PROJECT Lucky McMine Reclamation

LOS ANGELES ABRASION

☐ ASTM C131, GRADING _____
☐ ASTM C535, GRADING _____

INITIAL DRY WT., W1 10023.3 g
FINAL DRY WT., W2 9503.3 g
WT. LOSS (W1-W2)= 520.0 g

CHECK GRADATION OF SAMPLE BEFORE SELECTING GRADING,

% LOSS = WT. LOSS / W1 x 100 = 5.2

SULFATE SOUNDNESS

ASTM C88 ☑ SODIUM ☑ MAGNESIUM ☐

5 CYCLES

SIEVE SIZE			1	2	3	4	5
PAN	PASSING	RETAINED	INITIAL WT OF SAMPLE (GRAMS)	FINAL WT. OF SAMPLE AFTER TEST (GRAMS)	ACTUAL % LOSS	GRADING OF ORIGINAL SAMPLE % RETAINED	CORRECTED % LOSS
	1.5"	1"	1011.8	1002.8	.90	24	.22
	2.0"	1.5"	1894.0	1889.2	5.3	40	2.1
	2.5"	2"	2924.2	2916.2	.27	32	.09
	3"	2.5"	7022.4	6981.1	.59	4	.02
						% LOSS =	2.4

3 = ((1 - 2) / 1) X 100
5 = (4 / 100) X 3)

TEST BY _____

INBERG-MILLER ENGINEERS — RIVERTON, WYOMING

03/23/95

SPECIFIC GRAVITY OF COARSE AGGREGATE

ASTM C127

CLIENT: Pathfinder
PROJECT: Lucky McMine
SAMPLE DESCRIPTION: Limestone

JOB NO.: 8152.1RM
DATE: 4-14-01
TEST NO.: 28

TEST NO.			1-1.5"	1.5-2"		
TEMPERATURE OF WATER AND AGG, T, °F						
WEIGHT IN GRAMS	TARE + SATURATED SURFACE-DRY AGG					
	TARE					
	SATURATED SURFACE-DRY AGG	B 4966.1	3564.2 1401.9	5078.3		
	(WIRE BASKET + AGG.) IN WATER					
	WIRE BASKET IN WATER					
	SATURATED AGG. IN WATER	C 3166.5	2210.8 895.7	3180.9		
	TARE + DRY AGG.		5277.9	5796.0		
	TARE	H	343.3	C1 743.5		
	DRY AGG. IN AIR	A	4934.6	5052.5		
APPARENT S.G. (A/(A-C))			2.699	2.700		
BULK S.G. (A/(B-C))			2.654	2.663		2.659
BULK S.S.D., S.G. (B/(B-C))			2.671	2.676		
ABSORPTION [((B-A)/A)X100]			0.638	0.511		0.575

REMARKS:

TEST PERFORMED BY:

SUBJECT Rock Quality Scoring PROJECT NO. 8152.1 RM PAGE

CLIENT Pathfinder Mines DATE 5-4-01 BY JCH

PROJECT Lucky Mc Mine Reclamation CHECKED BY

	RESULTS	SCORE	WEIGHT	SCORE X	MAX SCORE
Apparant S.G.		—	—	—	—
Bulk SSD; S.G.		—	—	—	—
Bulk S.G.	2.667 ~~2.649~~	8.34 ~~7.98~~	12	100.08 ~~95.76~~	120
Absorption	0.54 ~~0.85~~	7.76	13	100.88 ~~78~~	130
Na SO_4 Soundness	2.76	9.12	4	36.48	40
L.A. Abrasion	~~35.3~~ 4.8	~~Ø~~ 8.1	1	~~Ø~~ 8.1	10
			TOTALS	~~210.24~~ 245.54	300

245.54 ~~210.24~~ / 300 = ~~70.1%~~

81.8%

sample 29

AGGREGATE TESTS
LOS ANGELES ABRASION/SULFATE SOUNDNESS

ASTM C535, ASTM C131, ASTM C88

CLIENT Pathfinder	JOB NO.: 8152 RM
SAMPLE DESCRIPTION	DATE: 4-27-01
PRODUCER Schmidt Sand & Gravel	TEST NO.: 29
PROJECT Lucky Mc.	

LOS ANGELES ABRASION

(23940)

☐ ASTM C131, GRADING _____

☒ ASTM C535, GRADING 1

2½	2500 ± 50	INITIAL DRY WT., W1	9984.8 g
2	2500 ± 50	FINAL DRY WT., W2	6458.8 g
1½	5000 ± 50	WT. LOSS (W1-W2)=	3526.0 g
	10,000 ± 100		

CHECK GRADATION OF SAMPLE BEFORE SELECTING GRADING,

% LOSS = WT. LOSS / W1 x 100 = 35.3%

SULFATE SOUNDNESS

ASTM C88 ☒ SODIUM ☒ MAGNESIUM ☐

5 CYCLES

	SIEVE SIZE			1	2	3	4	5
	PAN	PASSING	RETAINED	INITIAL WT OF SAMPLE (GRAMS)	FINAL WT. OF SAMPLE AFTER TEST (GRAMS)	ACTUAL % LOSS	GRADING OF ORIGINAL SAMPLE % RETAINED	CORRECTED % LOSS
	F	3	2½	7336.6	7242.2	1.3%	4	0.05
	D	2½	2	3149.3	3123.7	.81%	32	0.26
51.6	102P	2	1½	2002.3	1932.8	3.5%	40	1.39
	103P	1½	1	1016.3	971.3	4.4%	24	1.06
							% LOSS =	2.76

3 = ((1 - 2) / 1) X 100

5 = (4 / 100) X 3)

TEST BY _____

INBERG-MILLER ENGINEERS

RIVERTON, WYOMING

03/23/95

SPECIFIC GRAVITY OF COARSE AGGREGATE

ASTM C127

CLIENT: Pathfinder
PROJECT: Lucky McMine
SAMPLE DESCRIPTION:
Schmidt Sand & Gravel

JOB NO.: 8152 Rm
DATE: 5-1-01
TEST NO.: 29

TEST NO.			29			
TEMPERATURE OF WATER AND AGG, T, °F						
WEIGHT IN GRAMS	TARE + SATURATED SURFACE-DRY AGG					
	TARE	AK				
	SATURATED SURFACE-DRY AGG	B	9905.7			
	(WIRE BASKET + AGG.) IN WATER					
	WIRE BASKET IN WATER					
	SATURATED AGG. IN WATER	C	6196.5			
	TARE + DRY AGG.		11445.5			
	TARE	AK	1621.4			
	DRY AGG. IN AIR	A	9824.1			
APPARENT S.G. (A/(A-C))			2.708			
BULK S.G. (A/(B-C))			2.649			
BULK S.S.D., S.G. (B/(B-C))			2.671			
ABSORPTION [((B-A)/A)X100]			.83%			

REMARKS:

TEST PERFORMED BY:

AGGREGATE TESTS
LOS ANGELES ABRASION/SULFATE SOUNDNESS

100 Revol. #12

ASTM C535, ASTM C131, ASTM C88

CLIENT PMC	JOB NO.: 8152.1 Rm
SAMPLE DESCRIPTION Limestone	DATE: 5-6-01
PRODUCER Schmid Sand & Gravel	TEST NO.: 29
PROJECT Lucky Mac Mine	

LOS ANGELES ABRASION

☐ ASTM C131, GRADING _____

☐ ASTM C535, GRADING _____

INITIAL DRY WT., W1 10191.7 g

FINAL DRY WT., W2 9701.2 g

WT. LOSS (W1-W2)= 490.5 g

CHECK GRADATION OF SAMPLE BEFORE SELECTING GRADING,

% LOSS = WT. LOSS / W1 x 100 = 4.8

SULFATE SOUNDNESS

ASTM C88 ☐ SODIUM ☐ MAGNESIUM ☐

_____ CYCLES

SIEVE SIZE			1	2	3	4	5
PAN	PASSING	RETAINED	INITIAL WT OF SAMPLE (GRAMS)	FINAL WT. OF SAMPLE AFTER TEST (GRAMS)	ACTUAL % LOSS	GRADING OF ORIGINAL SAMPLE % RETAINED	CORRECTED % LOSS
						% LOSS =	

3 = ((1 - 2) / 1) X 100

5 = (4 / 100) X 3)

TEST BY _____

INBERG-MILLER ENGINEERS

RIVERTON, WYOMING

03/23/95

SPECIFIC GRAVITY OF COARSE AGGREGATE

ASTM C127

CLIENT: Pathfinder
PROJECT: Lucky McMine
SAMPLE DESCRIPTION: Limestone

JOB NO.: 8152.1RM
DATE: 4-27-01
TEST NO.: 29

			0:3	#11		
TEST NO.			1-1.5"	1.5-2"		
TEMPERATURE OF WATER AND AGG, T, °F						
WEIGHTS IN GRAMS	TARE + SATURATED SURFACE-DRY AGG		5578.6	6015.2		
	TARE		338.4	735.7		
	SATURATED SURFACE-DRY AGG	B	5240.2	5279.5		
	(WIRE BASKET + AGG.) IN WATER		4739.0	4766.2		
	WIRE BASKET IN WATER		1453.5	1455.8		
	SATURATED AGG. IN WATER	C	3285.5	3310.4		
	TARE + DRY AGG.		5551.4	5986.5		
	TARE		338.4	735.7		
	DRY AGG. IN AIR	A	5213.0	5250.8		
APPARENT S.G. (A/(A-C))			2.705	2.706		2.706
BULK S.G. (A/(B-C))			2.667	2.667		2.667
BULK S.S.D., S.G. (B/(B-C))			2.681	2.681		2.681
ABSORPTION [((B-A)/A)X100]			0.52	0.55		0.54

REMARKS:

TEST PERFORMED BY:

SUBJECT Rock Quality Scoring PROJECT NO. 8152.1RM PAGE

CLIENT Pathfinder Mines DATE 5-17-01 BY JPM

PROJECT Lucky McMine Reclamation CHECKED BY

	Results	Score	Weight	Score x	Max Score
Apparent SG;					
Bulk SSD; SG;					
Bulk SG;	2.663	8.26	12	99.12	120
Absorption;	.515	7.91	13	102.83	130
$NaSO_4$ Soundness;	~~.42~~ .89	10	4	40	40
LA Abrasion;	5.4	7.76	1	7.76	10
				249.71	300

$\frac{249.71}{300}$ 83.2%

SAMPLE 30

SPECIFIC GRAVITY OF COARSE AGGREGATE

ASTM C127

CLIENT: Pathfinder
PROJECT: Lucky McMine
SAMPLE DESCRIPTION:

JOB NO.: 8152RM
DATE:
TEST NO.: 30

			B	7		
TEST NO.			2"-1.5"	1.5"-1"		
TEMPERATURE OF WATER AND AGG, T, °F						
WEIGHTS IN GRAMS	TARE + SATURATED SURFACE-DRY AGG		5006.2	6072.3		
	TARE		326.8	747.5		
	SATURATED SURFACE-DRY AGG	B	4679.4	5324.8		
	(WIRE BASKET + AGG.) IN WATER		4387.2	4790.9		
	WIRE BASKET IN WATER		1455.8	1455.7		
	SATURATED AGG. IN WATER	C	2931.4	3335.2		
	TARE + DRY AGG.		4982.9	6043.9		
	TARE		326.8	747.5		
	DRY AGG. IN AIR	A	4656.1	5296.4		
APPARENT S.G. (A/(A-C))			2.70	2.701		
BULK S.G. (A/(B-C))			2.664	2.662		2.663
BULK S.S.D., S.G. (B/(B-C))			2.677	2.676		
ABSORPTION [((B-A)/A)X100]			0.50	0.53		.515

REMARKS:

TEST PERFORMED BY:

NBERG-MILLER ENGINEERS

RIVERTON, WYOMING

03/23/95

AGGREGATE TESTS
LOS ANGELES ABRASION/SULFATE SOUNDNESS

ASTM C535, ASTM C131, ASTM C88

CLIENT Pathfinder	JOB NO.: 8152 RM
SAMPLE DESCRIPTION	DATE:
PRODUCER	TEST NO.: 30
PROJECT Lucky McMine	

LOS ANGELES ABRASION

☐ ASTM C131, GRADING _____

☒ ASTM C535, GRADING 1

pan D2 INITIAL DRY WT., W1 9931.1 g

FINAL DRY WT., W2 9398.5 g

WT. LOSS (W1-W2)= 532.6 g

CHECK GRADATION OF SAMPLE BEFORE SELECTING GRADING,

% LOSS = WT. LOSS / W1 x 100 = 5.36

SULFATE SOUNDNESS

ASTM C88 ☒ SODIUM ☒ MAGNESIUM ☐

5 CYCLES

SIEVE SIZE			1	2	3	4	5
PAN	PASSING	RETAINED	INITIAL WT OF SAMPLE (GRAMS)	FINAL WT. OF SAMPLE AFTER TEST (GRAMS)	ACTUAL % LOSS	GRADING OF ORIGINAL SAMPLE % RETAINED	CORRECTED % LOSS
G	3	2½	6378.8	6370.4	.13	24 4	.03 .005
E	2½	2	3067.9	3060.0	.26	40 32	.1 .083
C	2	1½	1995.5	1982.9	.63	32 40	.2 0.252
105 P	1½	1	996.3	973.7	2.27	4 24	.09 0.545
						% LOSS =	.42 0.885

3 = ((1 - 2) / 1) X 100

5 = (4 / 100) X 3)

TEST BY _____

INBERG-MILLER ENGINEERS

RIVERTON, WYOMING

03/23/95

HYDRO - ENGINEERING, LLC
4685 SOUTH MAGNOLIA
CASPER, WYOMING 82604
Ph (307) 266-6597
Fax (307) 237-8565
E-mail hydro@trib.com

June 16, 1999

Tom Hardgrove
Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

RE: Rock Durability Testing

Dear Tom:

Concerning the durability testing for the limestone at Lucky Mc Mine, I've gone through a summary analysis of the test results. The attached table presents a summary of the rock testing results and the calculated scoring based on the NRC rock scoring method for limestone. The scoring was done both by Inberg-Miller Engineers and Hydro-Engineering, and the slight discrepancies between the two scorings result from minor differences in rounding and interpolation techniques. A third rock scoring was also developed using the saturated surface dry (SSD) specific gravity rather than the bulk specific gravity. Before discussing the results of the rock durability testing, it is worthwhile to review the sampling procedure and the implications of this procedure on the durability testing. The durability samples were taken from 1.63" D50 rock mulch product. This is verified in a letter by Glen Bobnick of Inberg-Miller Engineers dated January 16, 1999. As discussed in the Inberg-Miller letter, this was done for three reasons. The primary reasons for using this particular rock product were that the size of the product fit the limitations of test equipment, and the 1.63" D50 product represented the largest quantity of rock. A third reason for using this product was that a crushing operation tends to concentrate the more easily crushed (i.e. lesser durability) rock in the smaller products. Only a comparatively small quantity of smaller (1.0" D50) rock mulch was produced, so the 1.63" D50 rock represents the smallest rock product practical for durability testing. This results in a conservative sampling procedure that will bias the durability test results to the low side. Hence, the overall durability of the rock is likely to be better than indicated by the testing, and in particular, the durability of the larger rock products is likely to be significantly better than indicated by testing.

The attached summary table indicates that the durability results for the limestone were reasonably consistent and that most of the samples scored at 80% or above. Both the Hydro-Engineering and Inberg-Miller scoring calculations indicated that seven samples

did not meet the 80% minimum score for no oversizing. When the SSD specific gravity is used in the scoring, only one sample out of twenty three did not meet the 80% score. Using the Hydro-Engineering scoring calculation, only two of the seven sample scores below 80% are considered significant. The remaining five scores fall between 78.7% and 80%, and thus the required oversizing for the 1.63" D50 product ranges up to 0.02 inch for these five samples. This minute oversizing is beyond measurement resolution, and has undoubtedly been met by most if not all of the 1.63" D50 product simply by meeting the gradation specifications. Two other factors also lead to the observation that there is inherent oversizing in the rock that negates the concern for relatively small oversizing requirements. The assumed specific weight of the limestone rock in the design process was 160 lb/cu. ft., which corresponds to a specific gravity of 2.564. The average measured bulk specific gravity of the samples is 2.66 and the average measured SSD specific gravity is 2.67. The limestone has a significantly greater specific weight than anticipated in the design process, and therefore has inherent oversizing that is proportional to the ratio of actual specific gravity to design specific gravity. In this particular case, that ratio gives a universal built-in oversizing for the limestone of approximately 1.3% when the conversion from weight to diameter is made. In addition to this, it is important to note that the breaks in the rock size categories were made by grouping similarly sized rock designs, and then assigning the largest size in the group to the entire group. Hence, there is substantial oversizing built into all but a small area for each rock category. Therefore, concern over these very small oversizing requirements is unwarranted.

The remaining two scores below 80% required slightly more oversizing than those discussed in the preceding paragraph. The score of 75.7% (Hydro-Engineering scoring) for test #15 requires a total oversizing of 4.3%, or 3% beyond the built-in oversizing of 1.3%. This gives an oversizing of 0.05 inch for the 1.63" D50 rock, which is probably close to a realistic measurement resolution for this rock. According to Inberg-Miller, the only non-rejected gradation sample for this rock during the same time period yielded a measured oversizing of 1.2%. This leaves an oversizing shortfall of 1.8% or 0.03 inch. In light of the substantial oversizing for most of the rock in each size category as described in the preceding paragraph, a shortfall of 0.03 inch doesn't warrant any concern. The lowest calculated rock score in the summary table is 70.2% for test #12 (Hydro-Engineering scoring). This particular sample indicates that an oversizing of 9.8% is required for rock produced during this period. According to Inberg-Miller records, the only accepted rock produced during this period was large rock mulch with a 2.44" D50. The minimum D50 for this rock is 2.17", so there was a 12.4% oversizing which exceeds that required by the durability scoring deficit.

HYDRO - ENGINEERING, LLC

Pathfinder Mines Corporation (PMC) personnel and Inberg-Miller personnel have indicated that the reason for the more severe deficiencies in durability scores was the presence of some sandstone in the quarry area that was inadvertently introduced to the crusher stream. These same observers have indicated that the quantity of sandstone was very small and was virtually undetectable in the product or stockpiles. Based on the general consistency of the durability results, it is apparent that contamination of the product with measurable quantities of sandstone was very infrequent and represented only a very small fraction of the product stream. Stockpiles were examined and there were no areas where the sandstone was detected. The very small standard deviation in the scoring supports the contention that the two significant deficiencies in durability scores resulted from minor contamination of the sample or product. However the percentage of the poor quality sandstone in the sample(s) was obviously very small, because the reduction in durability score was minor. The few sandstone rocks that may be present in stockpiles represent only a tiny fraction of a percent and should not be detrimental to the performance of the rock.

In summary, the deficiencies in the rock scoring are compensated for by measured and inherent oversizing. The quarrying operation produced a consistent and durable rock product, and the significant deficiencies in rock durability scoring were rare, anomalous, and will not adversely affect the rock performance. I hope this information is useful. Please don't hesitate to call if you have questions or comments.

Sincerely,

Thomas G. Michel

Thomas G. Michel
Hydrologist

Cc: Jack Wadsworth

ROCK DURABILITY TESTING SUMMARY

Durability Test	Test #1 3/5/98	Test #2 4/14/98	Test #3 5/6/98	Test #4 5/6/98	Test #5 5/6/98	Test #6	Test #7	Test #8	Test #9	Test #10	Test #11	Test #12
Apparent Specific Gravity	2.698	2.695	2.686	2.698	2.703	2.711	2.702	2.706	2.706	2.717	2.679	2.708
SSD Specific Gravity	2.677	2.679	2.662	2.674	2.678	2.683	2.676	2.678	2.683	2.686	2.647	2.67
Bulk Specific Gravity	2.67	2.67	2.649	2.659	2.664	2.666	2.661	2.662	2.67	2.672	2.66	2.649
Absorption (%)	0.49	0.34	0.52	0.55	0.55	0.61	0.57	0.61	0.51	0.62	0.55	0.82
Sodium Sulfate Soundness (% Loss)	2.87	2.15	0.7	0.34	0.34	0.91	0.43	0.31	0.31	1	1.68	6.6
L.A. Abrasion	4.8	4.7	4.8	5	6.1	5.1	5.7	2.5	2.5	4.9	2.6	5.2
NRC Score (Inberg-Miller)	83.1	87	82.2	82.2	82.4	80.8	81.6	82.2	84.3	81.4	82.2	70.6
NRC Score (Hydro-Engineering)	83.3	87	82.1	82.1	82.3	81.1	81.6	81.2	84.4	81.4	82.1	70.2
NRC Score (SSD Spec. Grav.)	83.8	87.7	83.2	83.3	83.4	82.5	82.8	82.5	85.5	82.5	81.1	71.9

Durability Test	Test #13	Test #14	Test #15	Test #16	Test #17	Test #18	Test #19	Test #20	Test #21	Test #22	Test #23
Apparent Specific Gravity	2.684	2.708	2.701	2.7	2.701	2.699	2.686	2.693	2.702	2.691	2.698
SSD Specific Gravity	2.661	2.681	2.705	2.67	2.671	2.671	2.672	2.666	2.675	2.667	2.674
Bulk Specific Gravity	2.648	2.665	2.651	2.653	2.664	2.654	2.656	2.651	2.659	2.652	2.66
Absorption (%)	0.49	0.6	0.71	0.65	0.52	0.63	0.63	0.59	0.59	0.55	0.53
Sodium Sulfate Soundness (% Loss)	1.15	2.7	3.4	1.5	1.4	1.2	0.67	2.5	1.4	4	0.8
L.A. Abrasion	4.7	4.7	5.1	5.2	4.6	4.8	4.4	4.9	5.2	4.1	4.8
NRC Score (Inberg-Miller)	83	80.3	75.8	78.9	83.2	79.5	79.7	79.6	81	79.5	82.6
NRC Score (Hydro-Engineering)	82.7	80.2	75.7	78.7	83.1	79.6	79.9	79.5	80.8	79.7	82.7
NRC Score (SSD Spec. Grav.)	83.7	81.5	80	80.1	83.6	80.9	81.2	80.7	82.1	80.9	83.9

Average NRC Score (Inberg-Miller)	81.00
Standard Deviation	3.16
Average NRC Score (Hydro-Eng)	80.93
Standard Deviation	3.21
Average NRC Score (SSD Sp. Gr.)	82.12
Standard Deviation	2.85

SOUTH PASS
IRON MINE ROCK
DURABILITY TESTS

Pathfinder Rock Scoring

Sample Name - South Pass Rock
Sample Date - Jan. '02
Report Date-
Comments -

Test	Lab result	NRC Score	Igneous NRC Weight	NRC Score x Weight
Specific Gravity (SSD)	2.996	10	9	90
Absorption	0.058	10	2	20
Sodium Sulfate	0.37	10	11	110
L.A. Abrasion	2.5	9.25	1	9.25

Sum of Score x Weight	229.25
Maximum Sum of Score x Weight	230
Percentage Score	99.7 %

AGGREGATE TESTS
LOS ANGELES ABRASION/SULFATE SOUNDNESS

ASTM C535, ASTM C131, ASTM C88

CLIENT PMC	JOB NO.: 8152.1 Rm
SAMPLE DESCRIPTION	DATE: 2-5-02
PRODUCER	TEST NO.: 1 Durability
PROJECT Mine Reclamation	

LOS ANGELES ABRASION

☐ ASTM C131, GRADING 1

☐ ASTM C535, GRADING

Retained on
2½ 2485.5
2 2489.5
1½ 4952.0

INITIAL DRY WT., W1 9927.0 g

FINAL DRY WT., W2 9681.2 g

WT. LOSS (W1-W2)= 248.8 g

100 Rev.

CHECK GRADATION OF SAMPLE BEFORE SELECTING GRADING,

% LOSS = WT. LOSS / W1 x 100 = 2.5 %

SULFATE SOUNDNESS

ASTM C88 ☑ SODIUM ☐ MAGNESIUM ☐

5 CYCLES

SIEVE SIZE			1 INITIAL WT OF SAMPLE (GRAMS)	2 FINAL WT. OF SAMPLE AFTER TEST (GRAMS)	3 ACTUAL % LOSS	4 GRADING OF ORIGINAL SAMPLE % RETAINED	5 CORRECTED % LOSS
PAN	PASSING	RETAINED					
G	3	2½	6690.5	6686.2	.06		
C	2½	2	2912.7	2910.7	.07		
B	2	1½	2015.0	2010.2	.24		
						% LOSS =	0.37 %

3 = ((1 - 2) / 1) X 100

5 = (4 / 100) X 3)

TEST BY GLM

INBERG-MILLER ENGINEERS

29.6 rev/min

RIVERTON, WYOMING

03/23/95

RECEIVED FEB 22 2002 By TW

BULK SPECIFIC GRAVITY

~~ASTM D-2726~~

PROJECT: Mine Reclamation JOB NO.: 8152.1RM SOURCE:
CLIENT: PMC DATE: 2-4-02 SAMPLED BY:
SAMPLE NO.: TECH.:

ASTM METHOD

SPECIMEN NO.	DRY WEIGHT (A)	S.S.D. WEIGHT (B)	WEIGHT IN WATER (C)	B.S.G.	~~UNIT WEIGHT~~ Absorption
1	19177.2	19209.5	12504.8	2.860	.168
2	18789.0	18795.2	12622.5	3.044	.033
3	16617.1	16623.2	11142.2	3.032	.037
4	15171.6	15179.4	10297.6	3.108	.051
5	13152.7	13157.6	8823.0	3.034	.037
6	8026.6	8028.3	5260.6	2.900	.021
			AVE	2.996	.058%

RECEIVED
FEB 22 2002
By TWH

Pathfinder Rock Scoring

Sample Name - South Pass Rock
Sample Date - November, 2002
Report Date - 3-Dec-02

Test	Lab Result	NRC Score	Igneous NRC Weight	NRC Score x Weight
Specific Gravity	3.033	10	9	90
Absorption	0.47	8	2	16
Sodium Sulfate	0.11	10	11	110
L.A. Abrasion	2.51	9	1	9

Sum of Score x Weight	225
Max. Sum of Score x Weight	230
Percentage Score	97.80%

INBERG-MILLER ENGINEERS
124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

December 3, 2002

RECEIVED
DEC 10 2002
By TWH

8152.1-RM

Mr. Tom Hardgrove
Pathfinder Mines Corporation
P.O. Box 831
Riverton, WY 82501

RE: ROCK DURABILITY TEST RESULTS
SOUTH PASS ROCK SAMPLE
LUCKY MC MINE PROJECT
GAS HILLS, WYOMING

Dear Mr. Hardgrove;

This letter summarizes the results of rock durability testing that we performed on a rock sample that you submitted to our Riverton, Wyoming laboratory. We understand that you requested the following tests be performed:

Specific Gravity and Absorption – ASTM C127
Los Angeles Abrasion (100 revolutions) – ASTM C535
Sodium Sulfate Soundness – ASTM C88

The results of testing are tabulated below.

Laboratory Test	Result
Apparent Specific Gravity ASTM C127	3.033
Saturated Surface Dry Specific Gravity ASTM C127	3.005
Bulk Specific Gravity ASTM C127	2.990
Absorption. % ASTM C127	0.47
Sodium Sulfate Soundness, % Loss ASTM C88	*0.11
L.A. Abrasion, % Loss ASTM C535	2.51

*Note: The result presented for sodium sulfate soundness is the average loss for 4 size intervals that were tested between 1 inch and 3 inch diameter.

RECEIVED
FEB 27 2002
By TWH

REVIEW OF CHANNEL RIP RAP MATERIAL FOR THE LUCKY Mc MINE, FREMONT COUNTY, WYOMING.

As requested by Mr. Tom Hardgrove, I have reviewed and researched several rock samples of the material intended as design channel rip rap (D 50 = .8') to be utilized at the Pathfinder - Lucky Mc Uranium Mine, Gas Hills District, Wyoming.

The material is from a quarry that was originally part of the Atlantic City Iron Mine operated by U.S. Steel Corporation from 1962 to 1983 in the South Pass Mineral District, and is located in Sec. 26, T.30 N., R.100 W., Fremont County, Wyoming. The quarry is presently controlled by Rice Enterprises. Mr. Jim Rice of Dubois, Wyoming is owner and operator. The rock material is excavated and sold in the region for such projects as the Lucky Mc site. The State of Wyoming Department of Environmental Quality has utilized this same material as channel rip rap on several Abandoned Mine Lands (A.M.L.) projects in the Gas Hills area.

In my research for the proper rock description and durability of the material in question; I have reviewed several articles written on the geology of the South Pass Mining district including:

- *FIELD GUIDE TO THE GEOLOGY & MINERALIZATION OF THE SOUTH PASS REGION, WIND RIVER RANGE, WYOMING*; W.D. Hausel & J.D. Love; 1991; W.G.A. Guidebook *"Mineral Resources of Wyoming"*.
- *METAL DEPOSITS OF WYOMING - A REVIEW*; W.D. Hausel & P. J. Graff; 1991; W.G.A. Guidebook *"Mineral Resources of Wyoming"*.
- *SUMMARY OF LARAMIDE DEPOSITIONAL & TECTONIC EVENTS, EAST FORK AREA, NORTHWESTERN WIND RIVER BASIN*; G. F. Winterfeld; 1990; W.G.A. Guidebook *"Wyoming Sedimentation & Tectonics"*.

as well as the *"Igneous & Metamorphic Rock"* sections of *DANA'S MANUAL OF MINERALOGY*; 1963; 17TH Edition; P. 512 - 530. I have also held telephone conversations with Mr. Jim Rice and Mr. Paul Graff to discuss their knowledge of the use and geology of the sample material,

Laramide tectonics have exposed an Archean age Greenstone Belt in the Wind River Mountain Range of central Wyoming. The rip rap material in question is part of the regional host rock that develops the iron deposits within this Greenstone belt at Atlantic City, Wyoming.

My observation of the material has been limited to four rock samples collected by Tom Hardgrove of Pathfinder Mines, and Tom Miles of Hydro-Engineering in Casper Wyoming. I did not go to the quarry site to observe the material in-place. The four rock samples (Fig 1.) each weighing approx. 5 to 10 lbs. appear to be dense, angular, fine-grained, irregularly broken chunks of what was the host metamorphic rock for the iron deposits at South Pass.

Please feel free to call if you have any questions or require further information.

Sincerely,

INBERG-MILLER ENGINEERS

for

Glen M. Bobnick, P.E.
Geotechnical Engineer

GMB:ksp:\8152:\8152.1 South Pass Rock

The most probable rock classification based on my observation of the samples, review of the reference data and discussions with others (and without further thin-section investigation) appears to be as a high grade amphibolite gneiss, part of the Banded Ironstone Formation (BIF) and is a metamorphic rock of volcanic andesitic and/or dioritic origin. Typically gneiss would fall within the Moe's Hardness Scale in a range of from 5 to 7 (Diamond being 10) and would most typically average near 5. The material is massive, with no visible fractures or observable preferred cleavage pattern. As such it should be very resistant to weathering processes such as water or wind erosion, and exfoliation, and should make good rip rap material for its intended use at Lucky Mc.

Tom Nicholson W.P.G. No. 69

MAXIM TECHNOLOGIES INC

Consulting Engineers & Environmental Scientists

605 N. Warehouse Road
P. O. Box 2599 (82602)
Casper, WY 82601

Telephone: (307) 234-2126
Fax: (307) 266-5143

October 10, 2001

RECEIVED
OCT 11 2001

Mr. Jim Rice
Rice Enterprises, Inc.
P.O. Box 1548
Dubois, Wyoming 82513-1548

Subject: **Transmittal of Laboratory Test Results**
Maxim Project No. 1519896

Dear Mr. Rice:

Transmitted with this letter are the laboratory test results for the bulk aggregate sample submitted to our office on October 8, 2001. The material was identified as proposed riprap material from the Atlantic City Quarry.

As requested, the sample was tested for determination of the specific gravity and absorption (ASTM C127) and durability index (AASHTO T-210). The laboratory test results are as follows:

Specific Gravity (Bulk):	2.973
Absorption (%):	0.35
Durability Index:	96

If you have any questions or if we can be of further service, please call.

Sincerely,

MAXIM TECHNOLOGIES, INC.®

Mark Peloquin
Construction Services Manager

Attachment

n:\doc\ume\rice1-2.wpd

RECYCLED GRANITE DURABILITY TESTS

2.182

INBERG-MILLER ENGINEERS

124 EAST MAIN STREET RIVERTON, WYOMING 82501-4397 307-856-8136

August 3, 1999

8152-RM

RECEIVED
AUG 05 1999
By TWH

Pathfinder Mines Corporation
P.O. Box 831
Riverton, Wyoming 82501

ATTENTION: TOM HARDGROVE

RE: SODIUM SULFATE SOUNDNESS TEST RESULTS
RECYCLED GRANITE
LUCKY MC MINE RECLAMATION PROJECT
GAS HILLS, WY

Dear Sir:

This letter transmits the results of sodium sulfate soundness testing that we performed on six (6) granite samples that were submitted to our Riverton, Wyoming laboratory. We understand that the granite is being recycled as erosion control material from previous use at the project site.

The samples consisted of 6 individual rocks. The rock identification and initial oven-dry weight for each is listed below:

Identification	Oven Dry Weight (lb.)
GR-1	28.25
GR-2	15.70
GR-3	16.20
GR-4	68.80
G-1	57.55
G-2	66.45

The rocks were tested following the procedures of ASTM C88 "Standard Test Method for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate". In summary, the results indicated that after 5 cycles of submersion and drying, over 48 hours of rinsing, and drying until no further loss in weight, the samples gained between 0.2 and 0.6 percent of their original weight. The sodium sulfate solution used in the test appeared relatively clear at completion of the testing, and we observed no disintegrated rock in the solution indicating loss of the original sample during the test.

In our opinion, the reason for the weight gain is likely due to sodium sulfate that was absorbed and trapped in the specimen pores, and could not be washed out with rinsing. The tested samples have a very small surface area to weight ratio as compared to smaller-diameter samples. It is our opinion that the loss is partly a function of specimen surface area. As such, loss is correspondingly significantly smaller for a given sample weight of a single, relatively large diameter particle as opposed to a sample of the same weight comprised of several smaller diameter particles

We conclude that the weight of sodium sulfate retained by the specimen apparently exceeds the weight loss, if any, which resulted from the test, and the actual loss is practically 0% as measured per ASTM C88.

Please call if you have any questions.

Sincerely,

INBERG-MILLER ENGINEERS

Glen M. Bobnick

Glen M. Bobnick, P.E
Geotechnical Engineer

GMB:jlw:client ltrs\8152granite

ADDITIONAL GRANITE DURABILITY TESTING SUMMARY

Granite Sample Designation	Bulk Specific Gravity	Absorption (%)	Sodium Sulfate Soundness (%)	NRC Score
GR-1	2.616	0.35	0	87.9
GR-2	2.617	0.32	0	88.1
GR-3	2.634	0.62	0	88.4
GR-4	2.611	0.15	0	88.4
G-1	2.652	0.26	0	91.3
G-2	2.605	0.3	0	87.2

Stage I, No. 4. Dam Addition
Pathfinder Mines Corp.
Riverton, Wyoming

Table 6.

RIPRAP TEST RESULTS

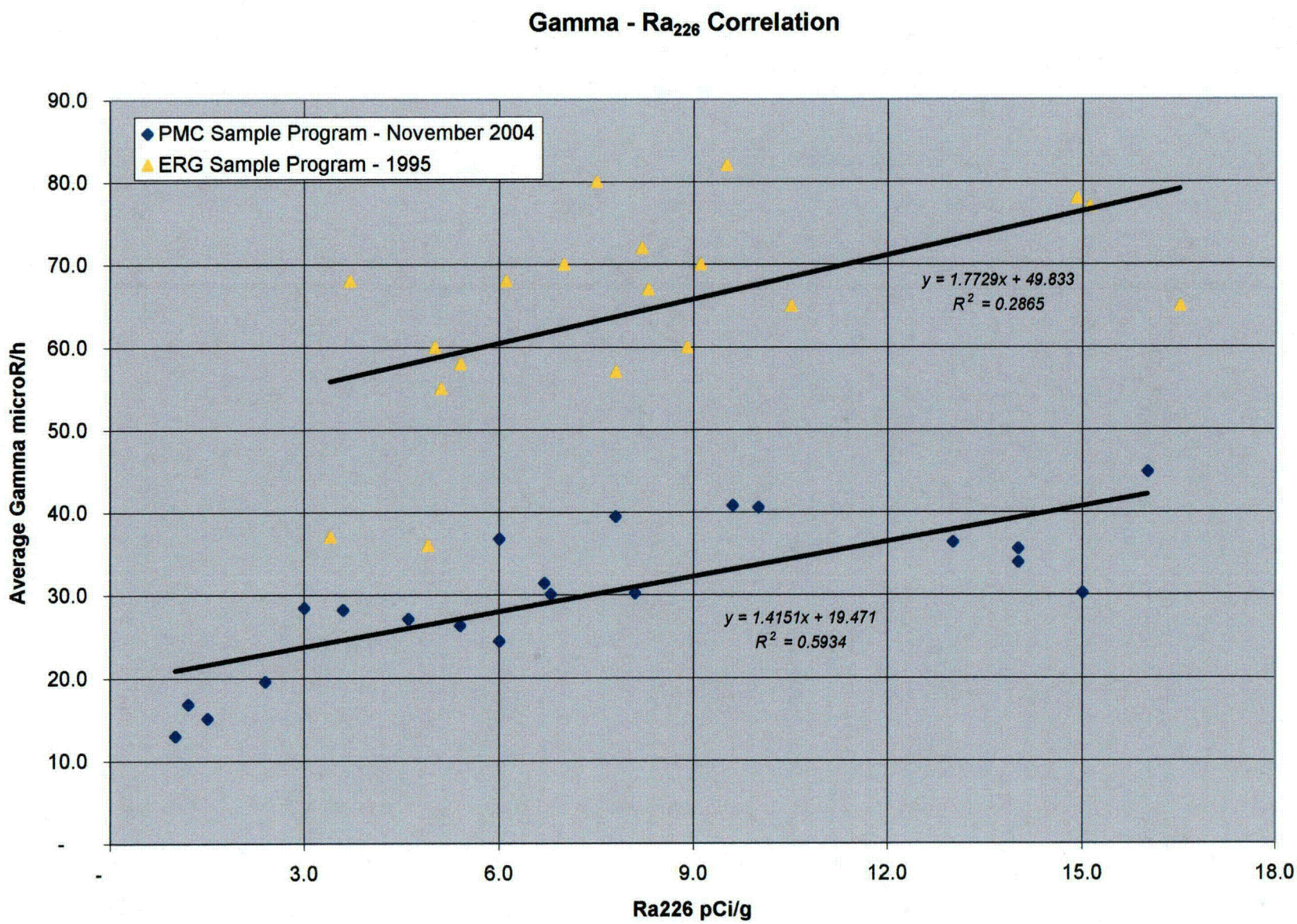
(Granite Boulders and Cobbles)

	Test Result	Specification
Soundness (Sodium Sulfate) (ASTM - C88, 5 cycle)	0.3%	10% Maximum
Abrasion Resistance (ASTM - C535)	9.9%	35% Miximum

	% Lighter By Weight	Stone Weight	Limit of Stone Weight
Gradation	100 %	400 lbs.	175-400 lbs.
	50 %	90 lbs.	60-130 lbs.
	15 %	20 lbs.	20-45 lbs.

APPENDIX

I



4/20/2005 10:55 AM
LM Soil Sample Assays Fall 2004.xls Chart1

C04

Figure I-1

PMC Sample Program - November 2004															ERG Sample Program - 1995		
Site	Gamma 1	Gamma 2	Gamma 3	Gamma 4	Gamma 5	Gamma 6	Gamma 7	Gamma 8	Gamma 9	Average Gamma microR/h	Max Gamma	Ra226 pCi/g	U mg/kg	Th_{230} pCi/g	Sample ID	Ra226 pCi/g	Gamma microR/h
LMSS04 #1	26	27	28	28	28	28	38	27	26	28.4	38.0	3.0			1a	7.8	57
LMSS04 #2	26	28	26	25	28	26	26	26	26	26.3	28.0	5.4			5a	4.9	36
LMSS04 #3	19	20	19	22	19	20	17	20	20	19.6	22.0	2.4			5b	3.4	37
LMSS04 #4	15	15	16	16	15	15	15	15	14	15.1	16.0	1.5			9a	5	60
LMSS04 #5	35	36	36	38	38	39	38	38	33	36.8	39.0	6.0			9b	8.9	60
LMSS04 #6	28	30	30	26	28	26	24	26	26	27.1	30.0	4.6			13a	5.4	58
LMSS04 #7	25	42	25	36	25	25	36	25	32	30.1	42.0	6.8			13b	5.1	55
LMSS04 #8	15	18	15	17	18	15	18	18	17	16.8	18.0	1.2			17a	15.1	77
LMSS04 #9	28	30	26	25	30	28	27	28	32	28.2	32.0	3.6			17b	9.5	82
LMSS04 #10	28	42	30	30	31	32	30	30	30	31.4	42.0	6.7			17c	7.5	80
LMSS04 #11	25	26	20	25	25	22	24	28	25	24.4	28.0	6.0			19a	10.5	65
LMSS04 #12	34	35	34	26	25	26	32	30	30	30.2	35.0	15.0			19b	16.5	65
LMSS04 #13	32	30	30	38	25	25	26	32	34	30.2	38.0	8.1			21a	8.2	72
LMSS04 #14	30	58	42	28	28	37	30	22	30	33.9	58.0	14.0	28.4	201	21c	3.7	68
LMSS04 #15	40	40	38	30	40	28	26	38	40	35.6	40.0	14.0	59.2	357	21d	9.1	70
LMSS04 #16	37	34	35	36	36	35	38	38	38	36.3	38.0	13.0			22a	6.1	68
LMSS04 #17	13	14	12	13	12	13	14	13	13	13.0	14.0	1.0			22b	7	70
LMSS04 #18	40	42	34	37	46	40	38	40	38	39.4	46.0	7.8			22c	14.9	78
LMSS04 #19	35	60	34	42	40	40	40	38	38	40.8	60.0	9.6	33.5	21	22d	8.3	67
LMSS04 #20	65	38	34	35	35	32	55	36	35	40.6	65.0	10.0	10.6	12			
LMSS04 #21	40	48	65	42	35	48	42	38	46	44.9	65.0	16.0	66.4	15	21b	31.8	91
Average	30	34	30	29	29	29	30	29	30						Note: 21b excluded on chart		
Max	65	60	65	42	46	48	55	40	46								

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C04120902
Report Date: 01/14/05

Lab ID: C04120902-001
Client Sample ID: LMSS04 #1
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	3.0	pCi/g-dry		0.2		E903.0	12/30/04 08:30 / df
Radium 226 precision (±)	1.0	pCi/g-dry				E903.0	12/30/04 08:30 / df

Lab ID: C04120902-002
Client Sample ID: LMSS04 #2
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	5.4	pCi/g-dry		0.2		E903.0	12/30/04 08:30 / df
Radium 226 precision (±)	1.3	pCi/g-dry				E903.0	12/30/04 08:30 / df

Lab ID: C04120902-003
Client Sample ID: LMSS04 #3
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	2.4	pCi/g-dry		0.2		E903.0	12/30/04 08:30 / df
Radium 226 precision (±)	0.9	pCi/g-dry				E903.0	12/30/04 08:30 / df

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Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C04120902
Report Date: 01/14/05

Lab ID: C04120902-004
Client Sample ID: LMSS04 #4
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	1.5	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.0	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Lab ID: C04120902-005
Client Sample ID: LMSS04 #5
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	6.0	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.3	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Lab ID: C04120902-006
Client Sample ID: LMSS04 #6
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	4.6	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.2	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C04120902
Report Date: 01/14/05

Lab ID: C04120902-007
Client Sample ID: LMSS04 #7
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	6.8	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.4	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Lab ID: C04120902-008
Client Sample ID: LMSS04 #8
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	1.2	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	0.8	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Lab ID: C04120902-009
Client Sample ID: LMSS04 #9
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	3.6	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.1	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C04120902
Report Date: 01/14/05

Lab ID: C04120902-010
Client Sample ID: LMSS04 #10
Matrix: SOIL

Collection Date: 11/19/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	6.7	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.4	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Lab ID: C04120902-011
Client Sample ID: LMSS04 #11
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	6.0	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.3	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Lab ID: C04120902-012
Client Sample ID: LMSS04 #12
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	15	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	2.0	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C04120902
Report Date: 01/14/05

Lab ID: C04120902-013
Client Sample ID: LMSS04 #13
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	8.1	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.5	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Lab ID: C04120902-014
Client Sample ID: LMSS04 #14
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Uranium	28.4	mg/kg-dry	D	0.03		SW6020	01/05/05 21:26 / sml
RADIONUCLIDES - TOTAL							
Radium 226	14	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.9	pCi/g-dry				E903.0	01/03/05 11:00 / trs
Thorium 230	201	pCi/g-dry		0.2		E907.0	01/05/05 10:30 / ph
Thorium 230 precision (±)	8.0	pCi/g-dry				E907.0	01/05/05 10:30 / ph

Lab ID: C04120902-015
Client Sample ID: LMSS04 #15
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Uranium	59.2	mg/kg-dry	D	0.03		SW6020	01/05/05 21:30 / sml
RADIONUCLIDES - TOTAL							
Radium 226	14	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	2.0	pCi/g-dry				E903.0	01/03/05 11:00 / trs
Thorium 230	357	pCi/g-dry		0.2		E907.0	01/05/05 10:30 / ph
Thorium 230 precision (±)	12	pCi/g-dry				E907.0	01/05/05 10:30 / ph

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C04120902
Report Date: 01/14/05

Lab ID: C04120902-016
Client Sample ID: LMSS04 #16
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	13	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.8	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Lab ID: C04120902-017
Client Sample ID: LMSS04 #17
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	1.0	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	0.8	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Lab ID: C04120902-018
Client Sample ID: LMSS04 #18
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	7.8	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.5	pCi/g-dry				E903.0	01/03/05 11:00 / trs

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C04120902
Report Date: 01/14/05

Lab ID: C04120902-019
Client Sample ID: LMSS04 #19
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Uranium	33.5	mg/kg-dry	D	0.03		SW6020	01/05/05 21:35 / sml
RADIONUCLIDES - TOTAL							
Radium 226	9.6	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.6	pCi/g-dry				E903.0	01/03/05 11:00 / trs
Thorium 230	21	pCi/g-dry		0.2		E907.0	01/05/05 10:30 / ph
Thorium 230 precision (±)	2.9	pCi/g-dry				E907.0	01/05/05 10:30 / ph

Lab ID: C04120902-020
Client Sample ID: LMSS04 #20
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Uranium	10.6	mg/kg-dry	D	0.03		SW6020	01/05/05 21:44 / sml
RADIONUCLIDES - TOTAL							
Radium 226	10	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	1.7	pCi/g-dry				E903.0	01/03/05 11:00 / trs
Thorium 230	12	pCi/g-dry		0.2		E907.0	01/05/05 10:30 / ph
Thorium 230 precision (±)	2.1	pCi/g-dry				E907.0	01/05/05 10:30 / ph

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C04120902
Report Date: 01/14/05

Lab ID: C04120902-021
Client Sample ID: LMSS04 #21
Matrix: SOIL

Collection Date: 11/22/04
DateReceived: 12/21/04

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Uranium	66.4	mg/kg-dry	D	0.03		SW6020	01/05/05 21:48 / sml
RADIONUCLIDES - TOTAL							
Radium 226	16	pCi/g-dry		0.2		E903.0	01/03/05 11:00 / trs
Radium 226 precision (±)	2.0	pCi/g-dry				E903.0	01/03/05 11:00 / trs
Thorium 230	15	pCi/g-dry		0.2		E907.0	01/05/05 10:30 / ph
Thorium 230 precision (±)	2.3	pCi/g-dry				E907.0	01/05/05 10:30 / ph

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Pathfinder Mines Corp
Project: Lucky Mc Mine

Lab Order: C05020126
Report Date: 03/01/05

Lab ID: C05020126-001
Client Sample ID: LMSS05 - #12
Matrix: SOIL

Collection Date: 02/02/05 11:30
DateReceived: 02/02/05

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	2.6	pCi/g-dry		0.2		E903.0	02/18/05 11:15 / trs
Radium 226 precision (±)	1.0	pCi/g-dry				E903.0	02/18/05 11:15 / trs

Lab ID: C05020126-002
Client Sample ID: LMSS05 - #14
Matrix: SOIL

Collection Date: 02/02/05 11:45
DateReceived: 02/02/05

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	2.4	pCi/g-dry		0.2		E903.0	02/18/05 11:15 / trs
Radium 226 precision (±)	1.0	pCi/g-dry				E903.0	02/18/05 11:15 / trs

Lab ID: C05020126-003
Client Sample ID: LMSS05 - #16
Matrix: SOIL

Collection Date: 02/02/05 12:00
DateReceived: 02/02/05

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Radium 226	ND	pCi/g-dry		0.2		E903.0	02/18/05 11:15 / trs

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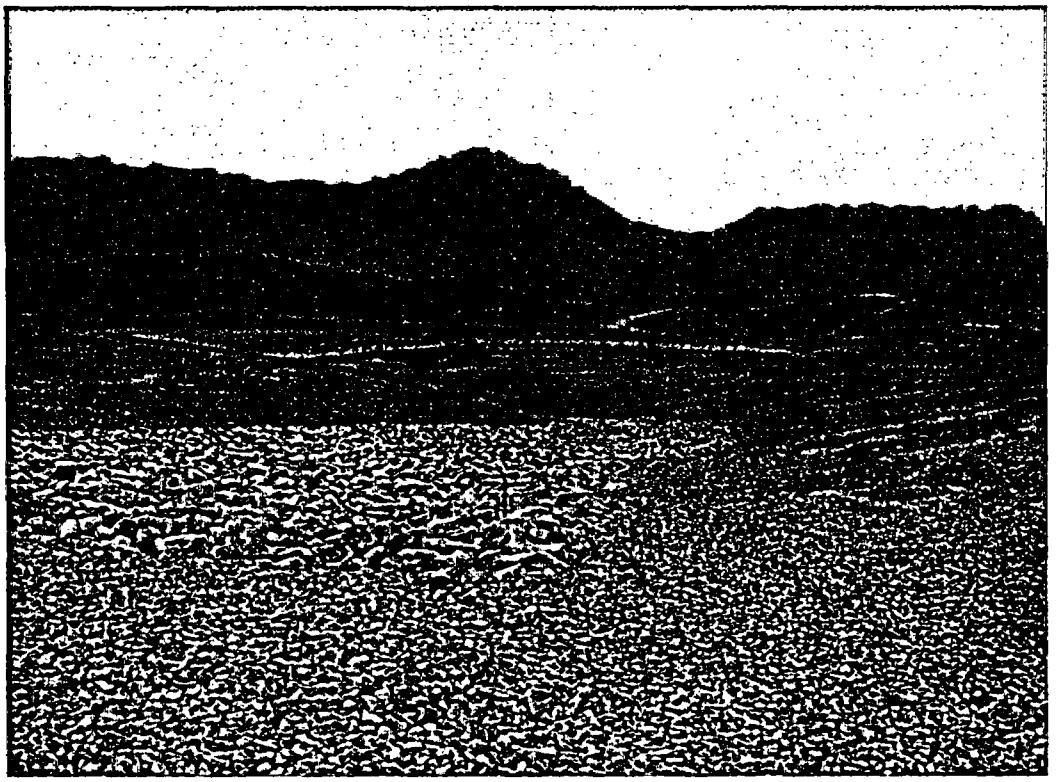
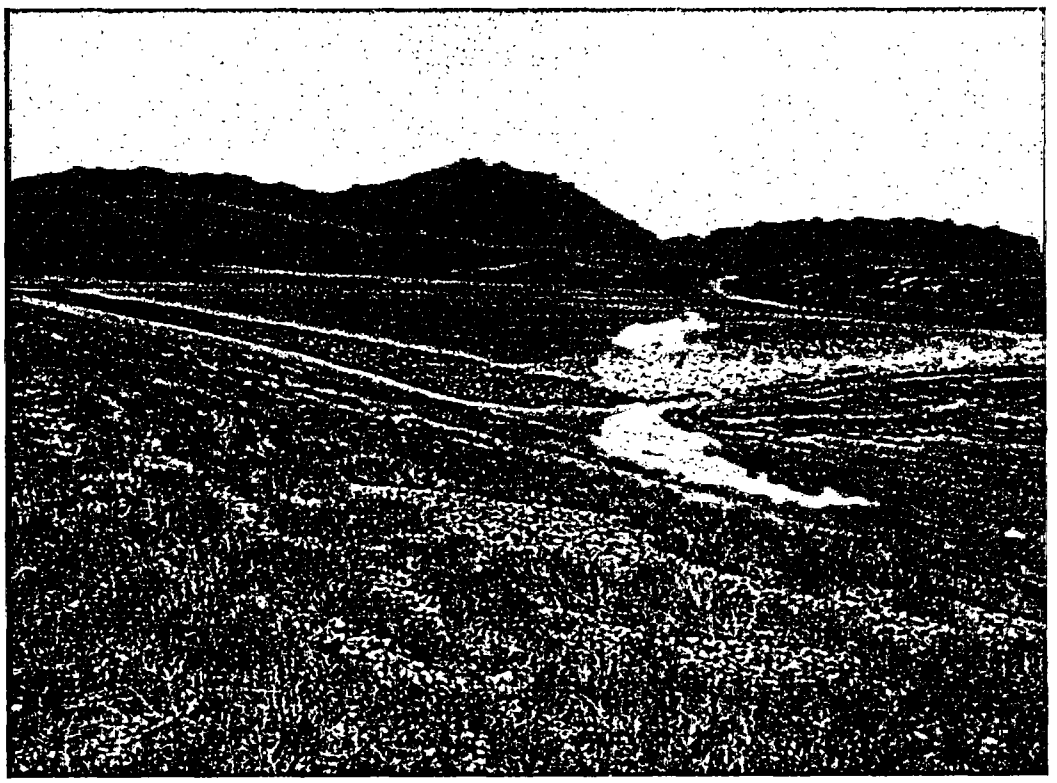
By TWH

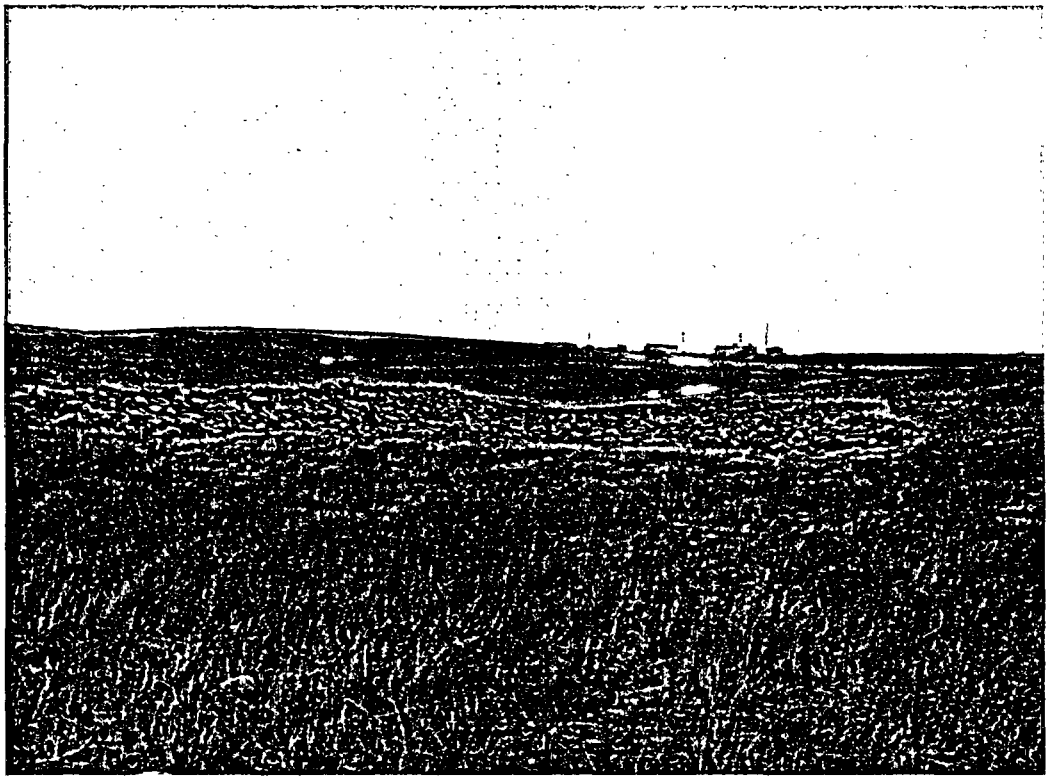
Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.



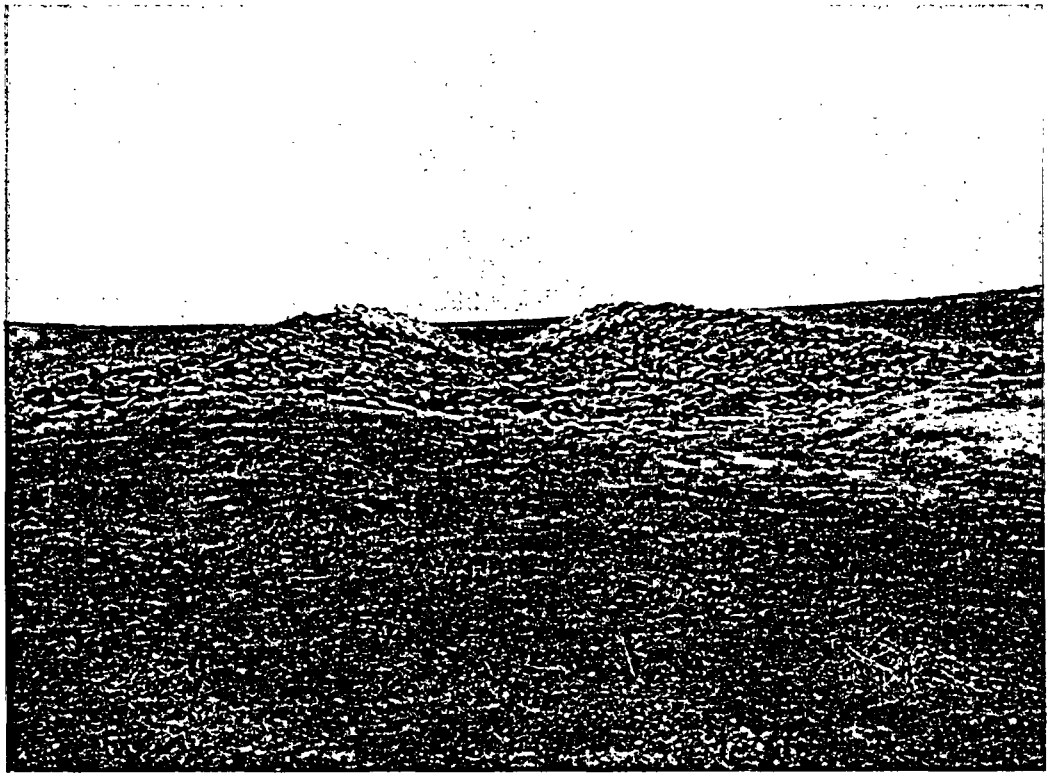
Channel CH100 - Looking Downgradient



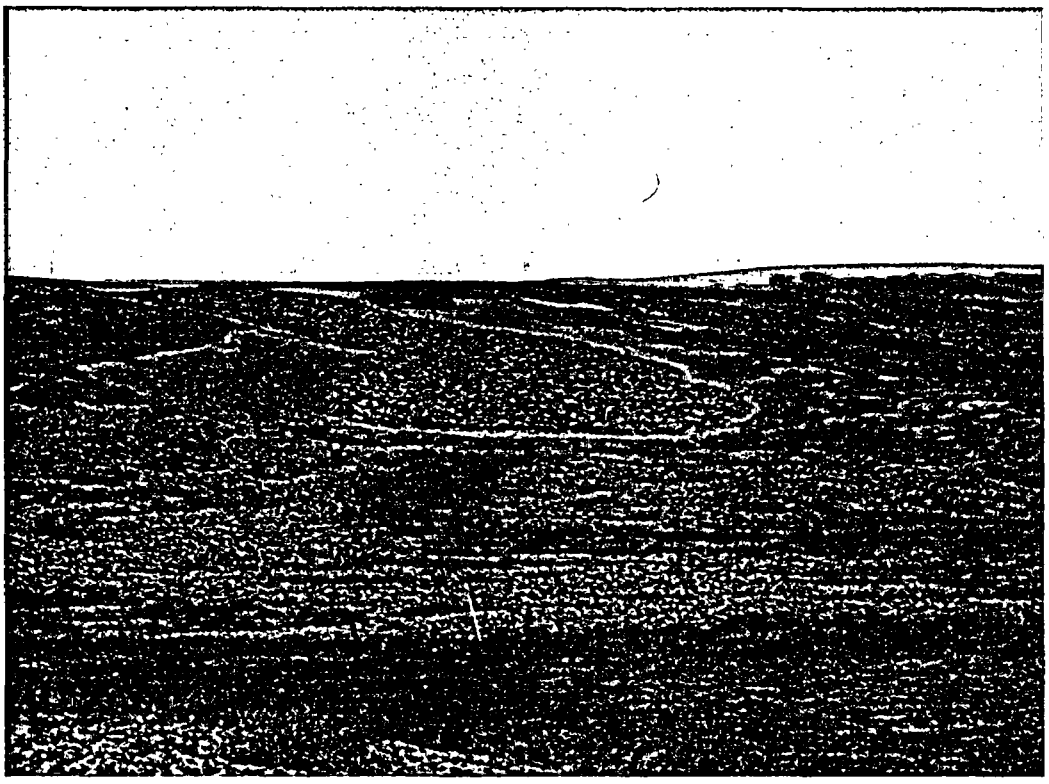
Intersection of Channel CH100 and Channel CH103
Looking Downgradient



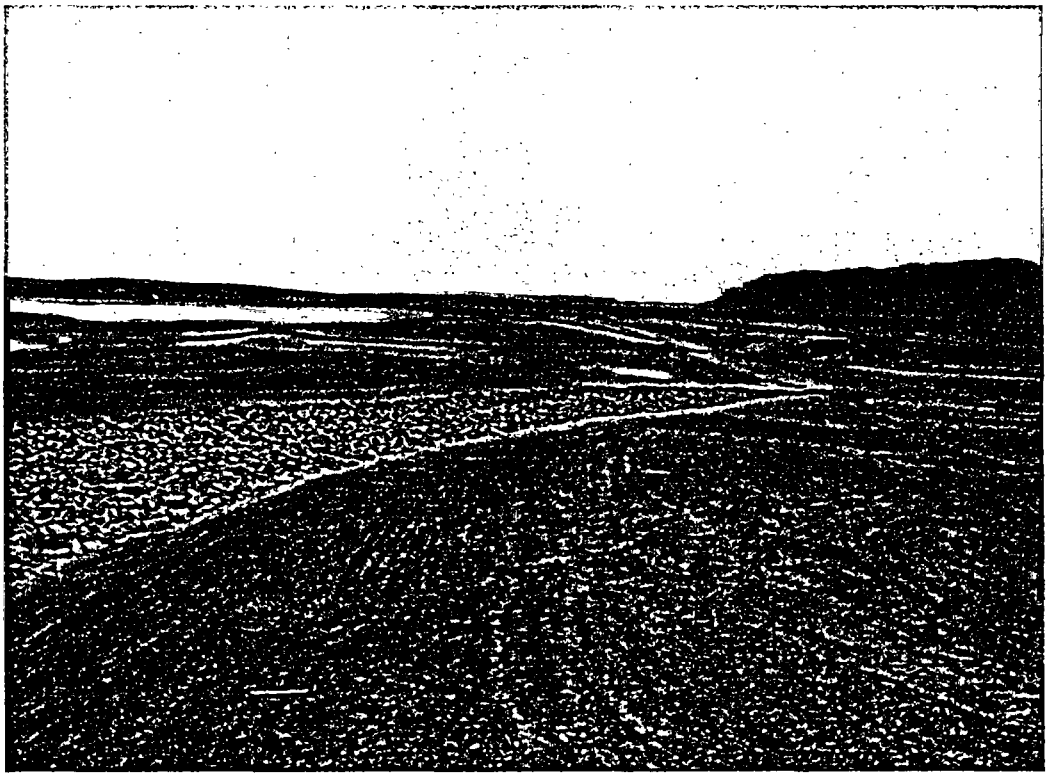
Channel CH100 - Discharge End
Looking Upgradient



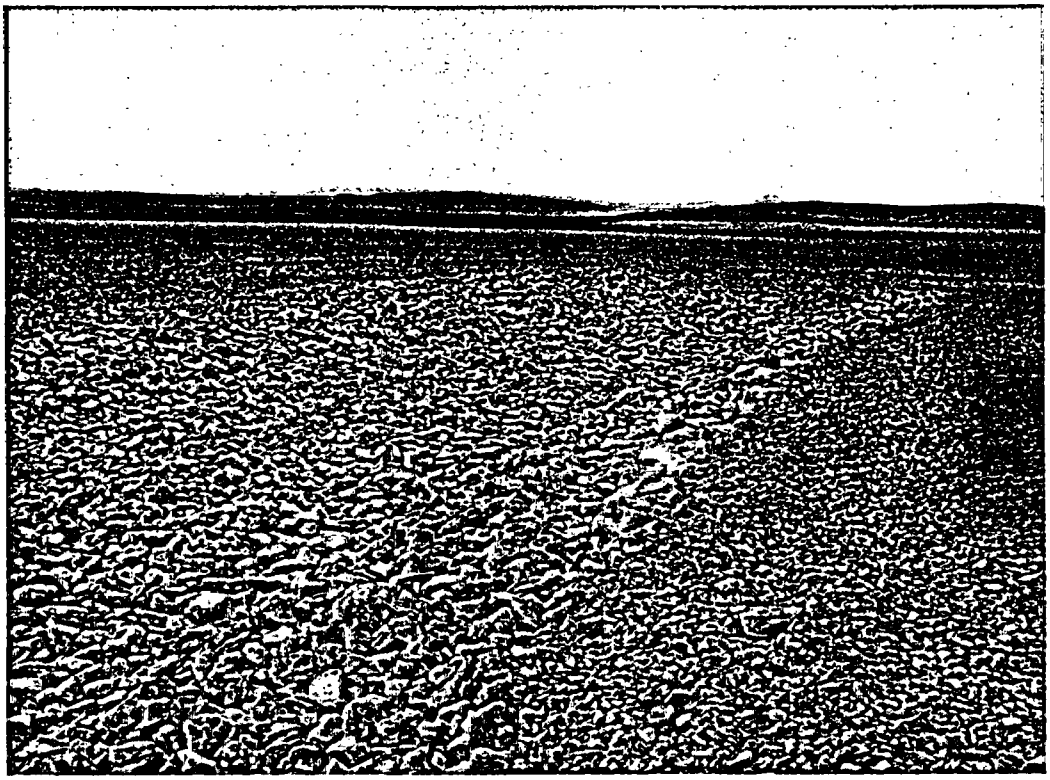
Channel CH108 - Control Structure
Looking Upgradient



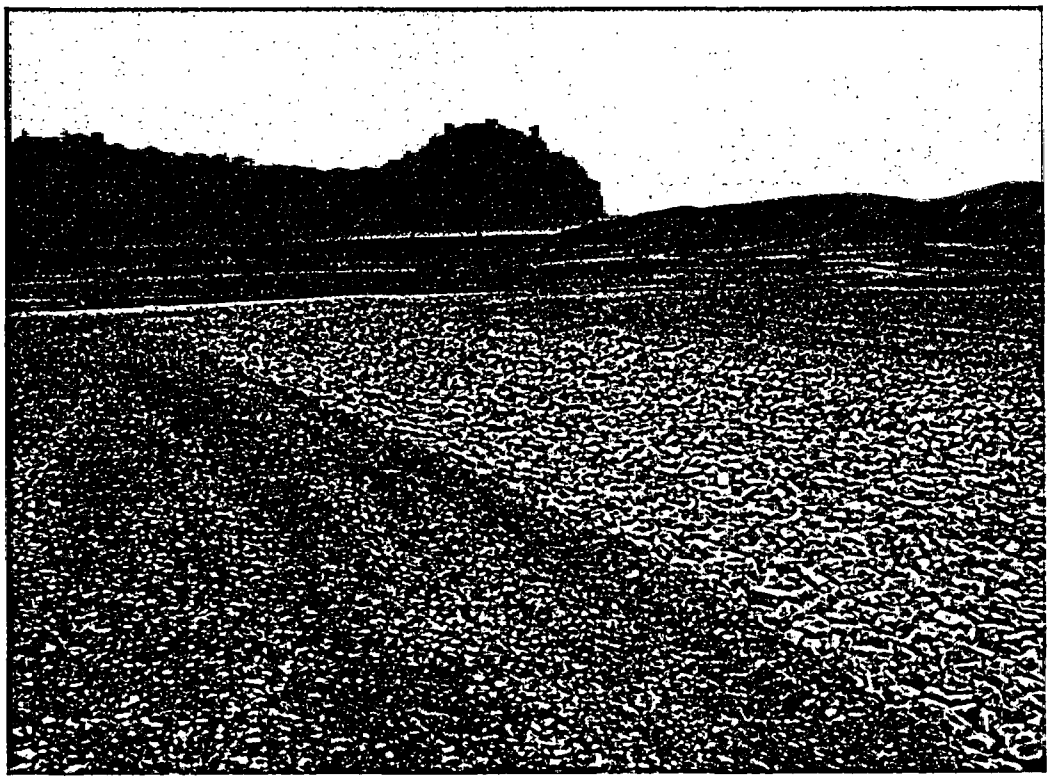
Channel CH105 - Looking Upgradient



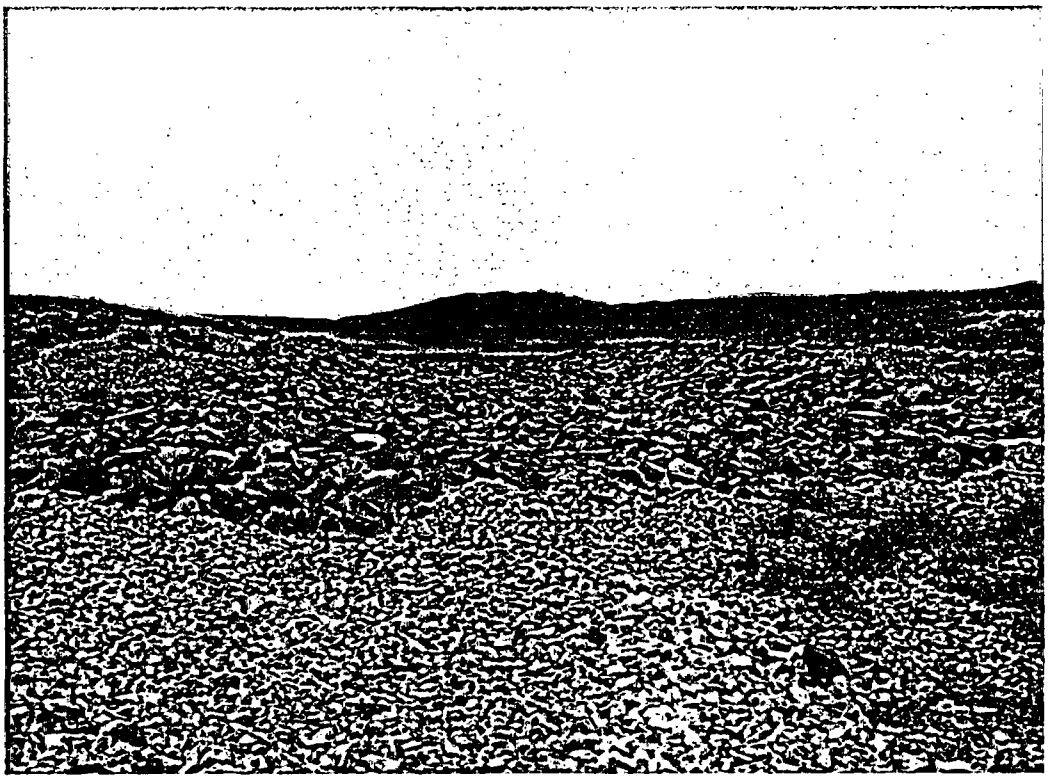
Channel 4PE - Looking Downgradient



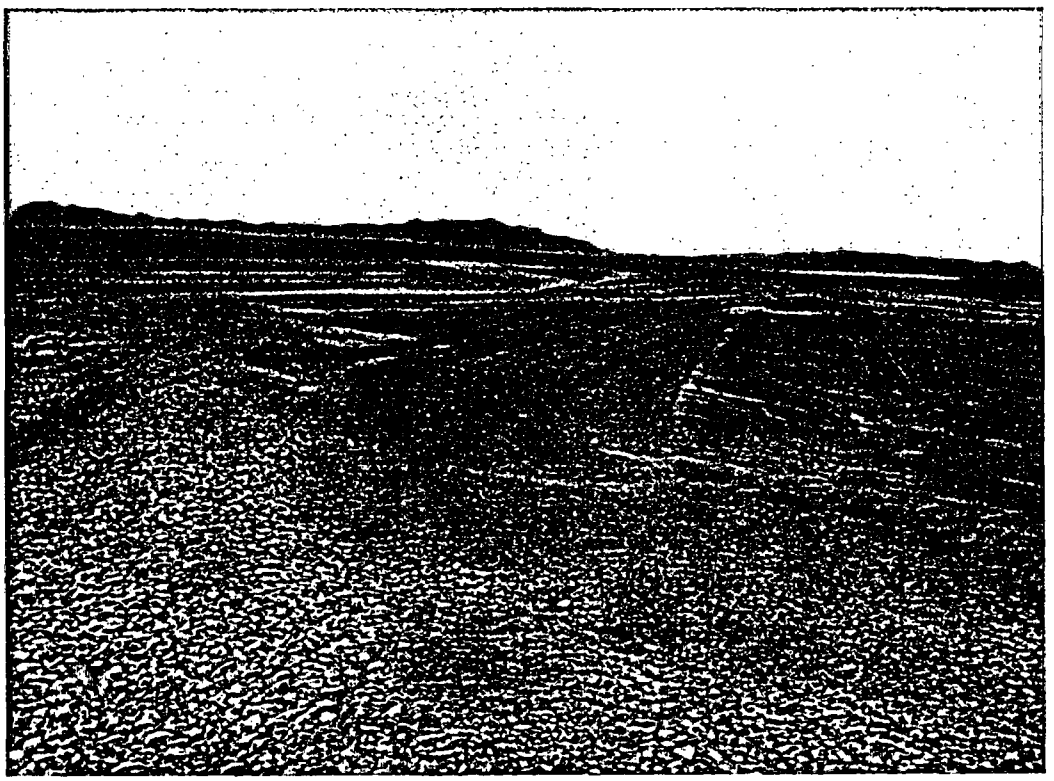
Channel CH4PC - Looking Upgradient Towards Reclaimed Evaporation Pond



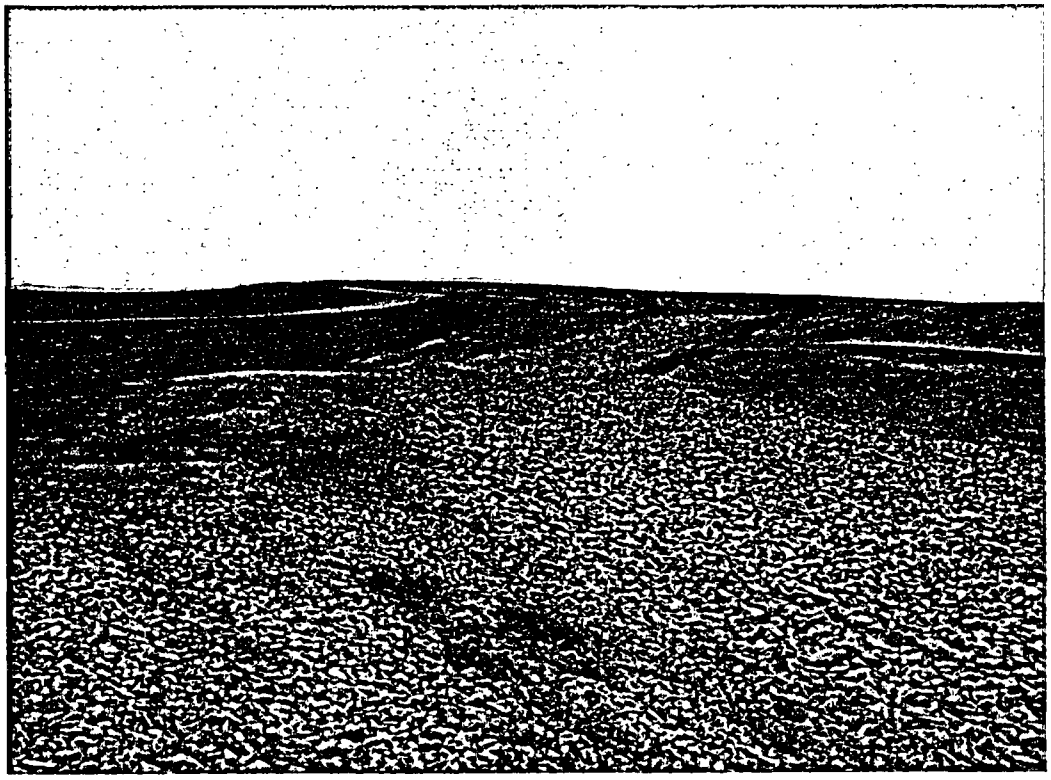
Channel CH4PC - Looking Downgradient



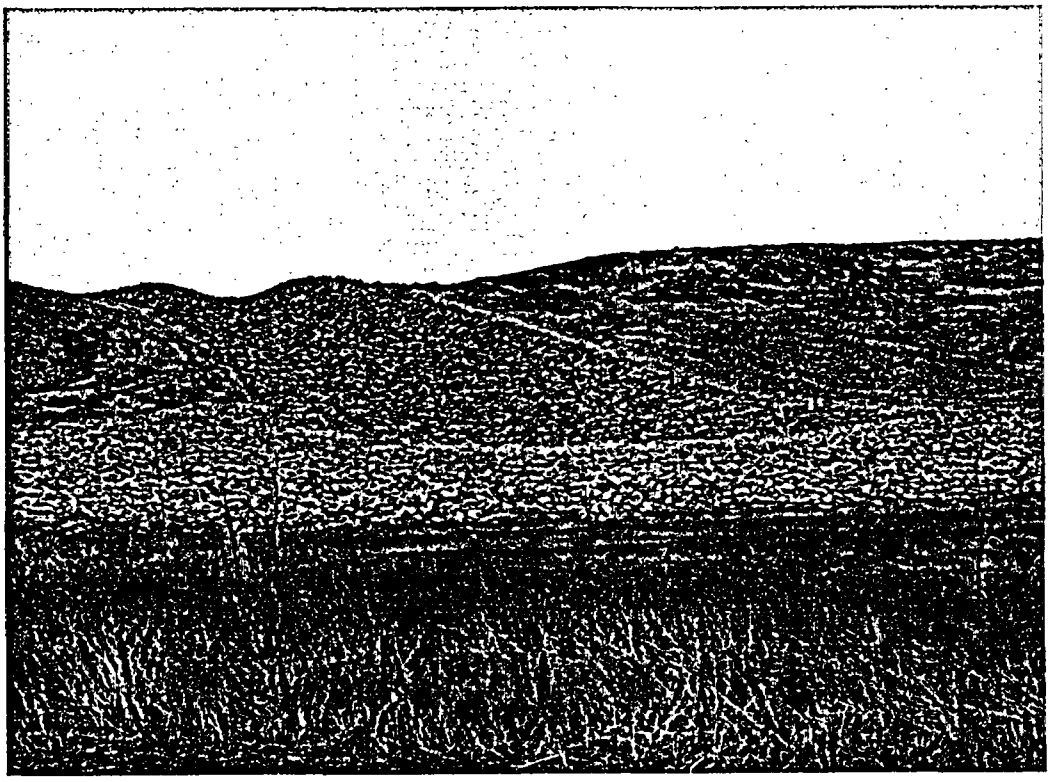
Channel CH117 - Control Structure
Looking Downgradient



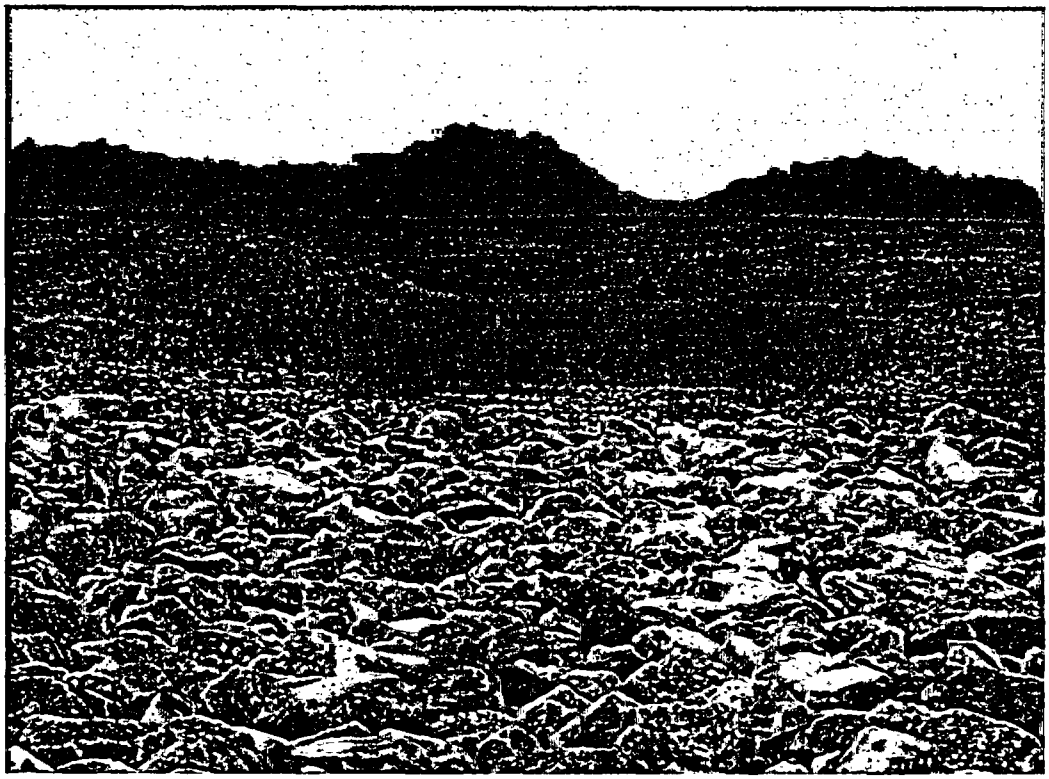
Auxiliary Berm Adjacent to Channel CH1116



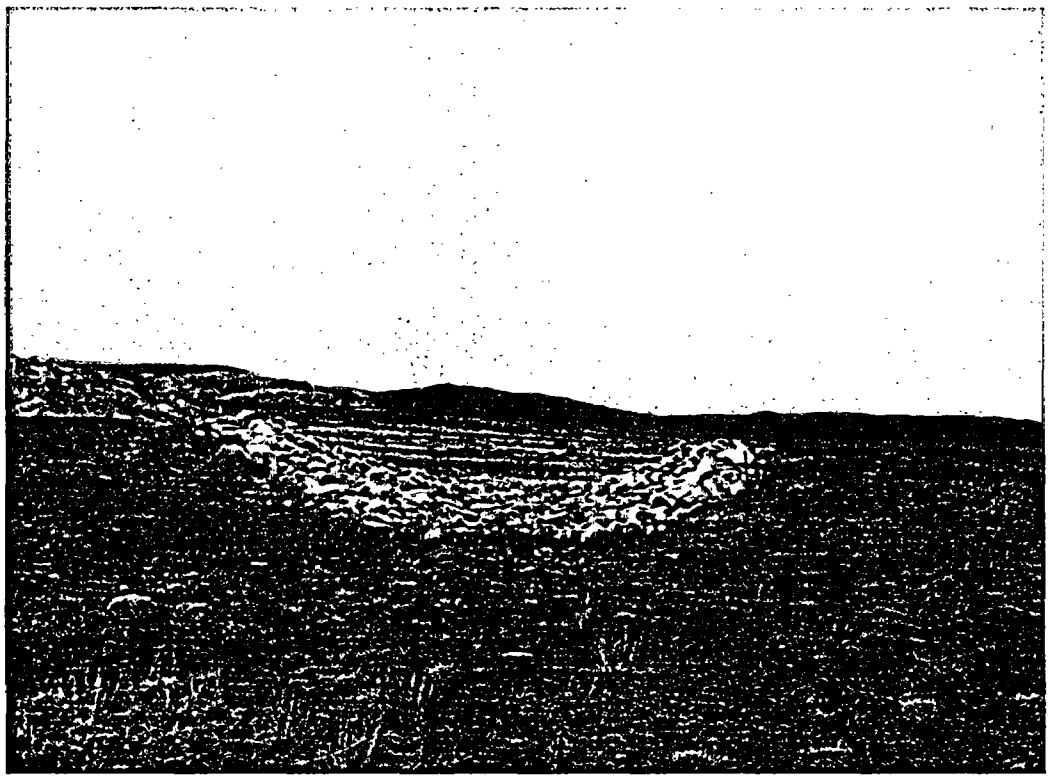
Channel CH116 - Looking Upgradient



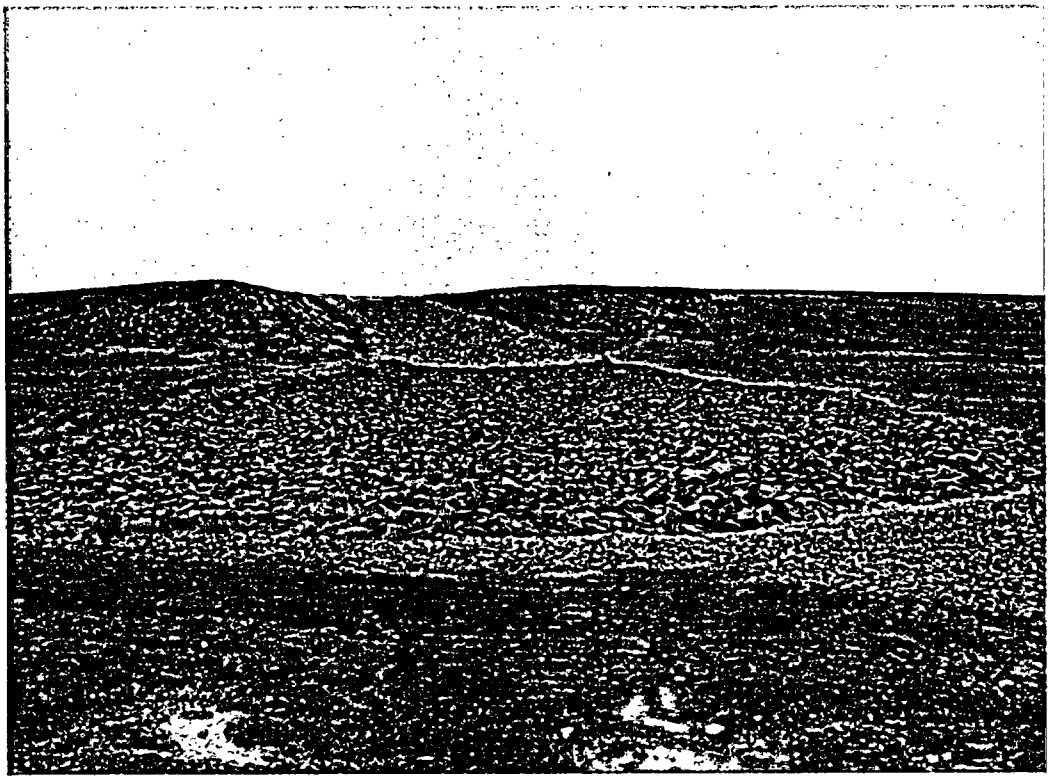
Channel CH114 - Looking Upgradient



Channel CH114B - Looking Upgradient

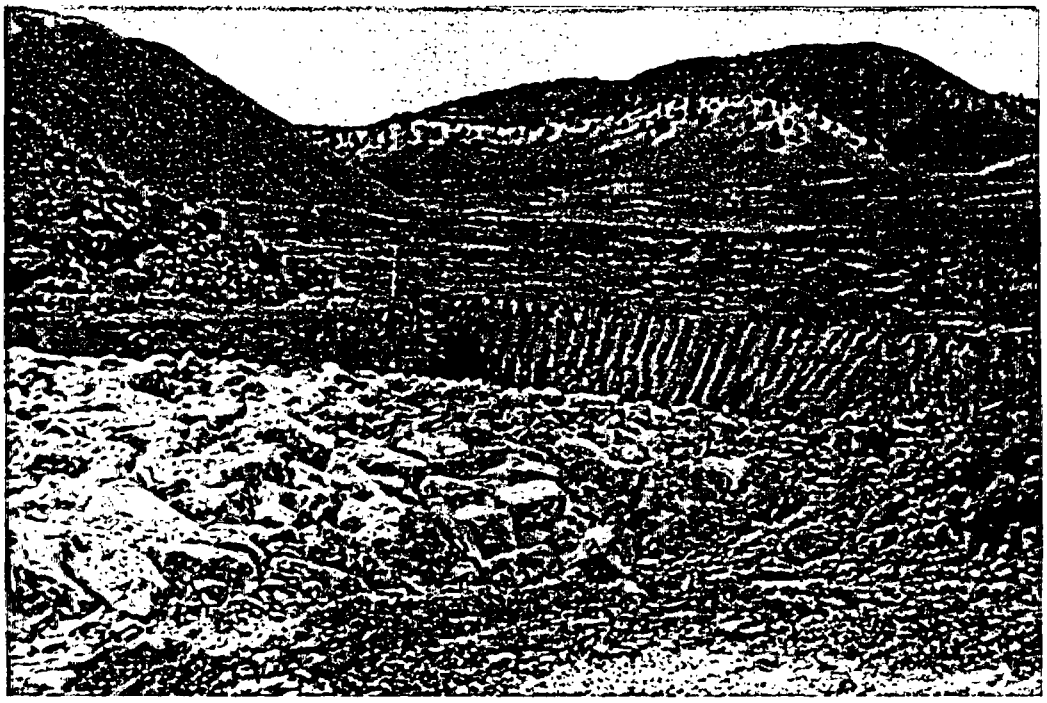


Channel CH114A - Control Structure
Looking Downgradient



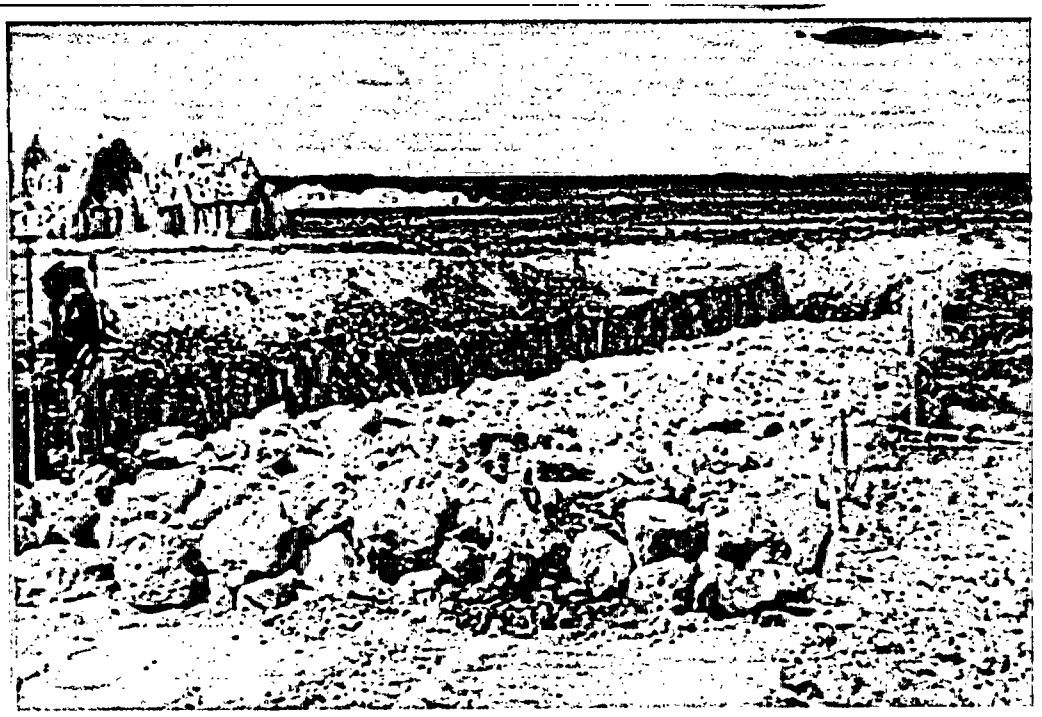
Channel CH111 - Looking Upgradient

End Protection Installation - CH100 - August, 2002



End Protection Installation - CH108 - September, 2002

End Protection Installation - CH114A - August, 2002



End Protection Installation - CH114B - May, 2002

End Protection Installation - CH4PN - July, 2002