SSCL-SR-1198
SGR-12

Raba-Kistner Consultants, Inc.

Engineers, Geologists, Chemists, Water Planners
Hygienists and Environmental Scientists

BASE MATERIAL EVALUATION STUDY

FOR

ON-SITE MATERIAL
SUPERCONDUCTING SUPER COLLIDER

Project No. ASA91-020-00
Assignment No. 4-1056-4
October 25,1991

Engineers, Geologists, Chemists, Water Planners, Hygienists and Environmental Scientists

Raba-Kistner Consultants, Inc.

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Mr. Hugh Kelly
The PB/MK Team
Redbird Business Center, Bldg. 5
5610 Redbird Center Drive, Suite 400
Dallas, Texas 75237

Re: Base Materials Evaluation Study
On-Site Material
Superconducting Super Collider

Dear Mr. Kelly:

On June 27, 1991, members of our engineering staff obtained a large bulk sample of stockpiled limestone material from the above referenced project. The purpose of this study was to evaluate this stockpiled material for possible production of base course and riprap material to be utilized on various phases of this project. The following attachments (Attachment Nos. 1 through 8) summarize the laboratory testing performed on this material.

Important considerations when evaluating this material are:

1) Lack of fines produced after initial or primary crushing (Attachment No. 1). It would be necessary to supplement the crushed material with imported fines or perform several crushing runs to produce enough binder fines for workable base course.

2) Softness of the coarse aggregate. Material does not conform to West Ball Mill criteria as well as exhibiting excessive wear on the Los Angeles abrasion test. Sodium sulfate soundness weighted percentage loss is extremely high, indicating an aggregate with little weathering resistance.

3) Even when artificially blended with crusher fines, under the best possible grading conditions, the base material did not achieve the minimal triaxial strength criteria established by the Texas Highway Department.

This report was submitted in draft form on July 16, 1991, for comments. No comments were received and the report is being reissued without changes.

We appreciate the opportunity to be of technical service to you on this project. If we may be of additional assistance, please do not hesitate to call.

Very truly yours,

RABA-KISTNER CONSULTANTS, INC.

David P. Darnell
Manager
Engineering Laboratory Services

/cad
Copies submitted: Above (5)
Attachments

*GRADING AFTER INITIAL OR PRIMARY CRUSHING
BULK SAMPLES OF ON-SITE MATERIALS

Sieve Size	% Retained	% Retained Cummulative	% Passing
1 3/4-inch	0	0	100
No. 4	77.2	77.2	22.8
No. 40	15.1	92.3	7.7
-No. 40	7.7		

*Material sampled from stockpile on-site.

THD ITEM 248 TYPE A GRADE 1
BASE MATERIAL EVALUATION

Sieve Size	*% Retained Cummulative	THD Specifications
1 3/4-inch	0	0
7/8-inch	22.5	10-35
3/8-inch	40.0	30-50
No. 4	55.0	45-65
No. 40	77.5	70-85
Liquid Limit	23	Maximum 35
Plasticity Index	5	Maximum 10

THD TEX-113 Proctor Values: 117.0 lbs/cu ft at 12.5% Moisture Content
Wet Ball Mill Value: 56.6; Maximum 40
% Increase Passing No. 40: 34.1; Maximum 20

THD TEX 117-E TRIAXIAL DATA

Test Set No.	1	2	3	
Avg. Compressive Strength (P.S.I.)				
0 P.S.I. Lateral Pressure:	34	35	33	Minimum 45
15 P.S.I. Lateral Pressure:	159	164	168	Minimum 175

*Artificially blended to produce grading in middle of specification band.

5 Cycle Na_2So_4
Soundness Results of Coarse Aggregates

Test No. 1

Sieve Size	** Original Grading (%) Retained	Initial Weight of Sample	Weight After Correction Sieve	(%) Loss Per Size	Weighted (%) Loss
4-inch	24.4	6737.0	1375.0 (2 1/2)	79.6	19.40
3-inch	23.7	6561.0	1596.0 (2 1/2)	75.7	17.90
2 1/2-inch	23.8	6593.5	1152.8 (1 1/2)	82.5	19.60
2-inch	11.1	3065.9	594.2 (1 1/4)	80.6	8.90
1 1/2-inch	7.0	1937.6	179.9 (1 1/4)	90.7	6.30
1-inch	3.5	955.4	162.5 (5/8)	83.0	2.40
3/4-inch	1.8	510.7	41.3 (5/8)	91.9	1.70
1/2-inch	2.4	667.5	150.6 (5/16)	77.4	1.90
3/8-inch	1.2	332.7	77.6 (5/16)	76.7	0.92
No. 4	1.1	298.3	127.6 (No. 5)	57.2	0.63

* Total (%) Loss: 79.7

Sieve Size	Initial Weight	No. Fractions Before Test	No. Retain on same Sieve	Splitting/Crumbling		Cracking/Flaking		Total % Passing Same Sieve
				#	%	#	%	
4-inch	6737.0	4	0	2	50	2	50	100
3-inch	6561.0	5	0	3	60	2	40	100
2 1/2-inch	6593.5	13	0	10	77	3	23	100

* Aggregates exhibited a high degree of splitting and cracking to complete disintegration and flaking to a moderately high degree.

** Arbitrary grading based on test procedure requirement for individual sieve sizes in relation to total sample size.

5 Cycle Na_2So_4
Soundness Results of Coarse Aggregates

Test No. 2

Sieve Size	** Original Grading (%) Retained	Initial Weight of Sample	Weight After Correction Sieve	(%) Loss Per Size	Weighted (%) Loss
4-inch	27.6	7768.5	2459.0 (2 1/2)	68.3	18.85
3-inch	23.1	6483.0	0.0 (2 1/2)	100.0	23.10
2 1/2-inch	22.1	6201.5	2340.0 (1 1/2)	62.3	13.76
2-inch	10.4	2931.5	368.3 (1 1/4)	87.4	9.09
1 1/2-inch	6.8	1918.0	178.2 (1 1/4)	90.7	6.17
1-inch	3.6	1003.1	233.3 (5/8)	76.7	2.76
3/4-inch	1.8	495.7	67.7 (5/8)	86.3	1.55
1/2-inch	2.4	672.3	188.5 (5/16)	72.0	1.73
3/8-inch	1.2	331.8	80.2 (5/16)	75.8	0.91
No. 4	1.1	299.9	111.6 (No. 5)	62.8	0.69

* Total (%) Loss: 78.6

Sieve Size	Initial Weight	No. Fractions Before Test	No. Retain on same Sieve	Splitting/Crumbling		Cracking/Flaking		Total % Passing Same Sieve
				#	%	#	%	
4-inch	7768.5	5	0	3	60	2	40	100
3-inch	6483.0	7	0	5	71	2	29	100
2 1/2-inch	6201.5	13	0	11	85	2	15	100

* Aggregates exhibited a high degree of splitting and cracking to complete disintegration and flaking to a moderately high degree.

** Arbitrary grading based on test procedure requirement for individual sieve sizes in relation to total sample size.

5 Cycle Na_2So_4
Soundness Results of Coarse Aggregates

Test No. 3

Sieve Size	** Original Grading (%) Retained	Initial Weight of Sample	Weight After Correction Sieve	(%) Loss Per Size	Weighted (%) Loss
4-inch	24.1	6576.0	2117.0 (2 1/2)	67.8	16.34
3-inch	23.6	6444.5	574.0 (2 1/2)	91.1	21.50
2 1/2-inch	24.7	6730.0	1272.0 (1 1/2)	81.1	20.23
2-inch	10.3	2811.7	420.3 (1 1/4)	85.1	8.77
1 1/2-inch	7.1	1950.0	287.2 (1 1/4)	85.3	6.06
1-inch	3.6	971.3	211.2 (5/8)	78.3	2.82
3/4-inch	1.8	502.2	38.2 (5/8)	92.4	1.66
1/2-inch	2.5	669.2	162.3 (5/16)	75.7	1.89
3/8-inch	1.2	330.6	93.2 (5/16)	71.8	0.86
No. 4	1.1	299.4	123.4 (No. 5)	58.8	0.65

* Total (%) Loss: 80.6

Sieve Size	Initial Weight	No. Fractions Before Test	No. Retain on same Sieve	Splitting/Crumbling		Cracking/Flaking		Total % Passing Same Sieve
				#	%	#	%	
4-inch	6576.0	4	0	3	75	1	25	100
3-inch	6444.5	7	0	4	57	3	43	100
2 1/2-inch	6730.0	13	1	11	85	2	15	92.3

* Aggregates exhibited a high degree of splitting and cracking to complete disintegration and flaking to a moderately high degree.

** Arbitrary grading based on test procedure requirement for individual sieve sizes in relation to total sample size.

L.A. Abrasion
ASTM C 535-81

Test Sample No. 1

Project No.:	ASA91-020-00	Date:	7/10/91
Assignment No.:	4-105604	Technician:	AJV
		Grading:	1

Grading	Number of Spheres	Weight of Charge, g
1	12	5000 ± 25
2		
3		

Material Retained on	Grams Retained
3-inch	0
2 1/2-inch	2524.6
2-inch	2492.6
1 1/2-inch	5044.0
1-inch	0
3/4-inch	0

Total Grams Retained 10,061.2 g (A)

Dry Material Retained on No. 12 Sieve 5,485.9 g (B)

L.A. Abrasion Percentage = $\frac{A-B}{A}$ X 100 = 45.5 %

ATTACHMENT NO. 6

L.A. Abrasion
ASTM C 535-81

Test Sample No. 2

Project No.:	ASA91-020-00	Date:	7/10/91
Assignment No.:	4-105604	Technician:	AJV
		Grading:	1

Grading	Number of Spheres	Weight of Charge, g
1	12	5000 ÷ 25
2		
3		

Material Retained on	Grams Retained
3-inch	0
2 1/2-inch	2549.9
2-inch	2530.4
1 1/2-inch	5006.2
1-inch	0
3/4-inch	0

Total Grams Retained 10,086.5 g (A)

Dry Material Retained on No. 12 Sieve 4,975.0 g (B)

L.A. Abrasion Percentage = $\frac{A-B}{A}$ X 100 = 50.7 %

ATTACHMENT NO. 7

L.A. Abrasion
ASTM C 535-81

Test Sample No. 3

Project No.:	ASA91-020-00	Date:	7/10/91
Assignment No.:	4-105604	Technician:	AJV
		Grading:	1

Grading	Number of Spheres	Weight of Charge, g
1	12	5000 ± 25
2		
3		

Material Retained on	Grams Retained
3-inch	0
2 1/2-inch	2531.8
2-inch	2533.7
1 1/2-inch	5019.2
1-inch	0
3/4-inch	0

Total Grams Retained 10,085.0 g (A)

Dry Material Retained on No. 12 Sieve 5,622.2 g (B)

L.A. Abrasion Percentage = $\frac{A-B}{A}$ X 100 = 44.3 %

ATTACHMENT NO. 8