SIERRA GEOTECHNICAL SERVICES INC.

ENVIRONMENTAL • GEOTECHNICAL • GEOLOGY • HYDROGEOLOGY • MATERIALS

January 13, 2012 Project No. 3.02951.2

Triad/Holmes Associates
P.O. Box 1570
Mammoth Lakes, CA 93546

Attention: Mr. Matt Schober

Subject: **PAVEMENT RECOMMENDATIONS**
Lee Vining Streets
Mono County, California

Dear Mr. Schober:

In accordance with your request, Sierra Geotechnical Services, Inc. (SGSI) herein submits our pavement recommendations for the subject streets. The pavement sections and recommendations are provided based upon the results of our investigation which included: coring of the existing asphalt to measure thickness and observe subsurface conditions, and laboratory testing of representative soil samples obtained during the field investigation.

Reconstruction of the proposed streets is feasible from a geotechnical standpoint. No geologic hazards were observed. Class II Base was not found below the existing asphalt. Site subgrade soils are generally granular with minor silt. These materials are relatively dense, and have R-values ranging from approximately 69.9 to 81.8. These materials will provide adequate support for the new road and any improvements. Groundwater seepage was not encountered.

It is our understanding that the proposed improvements will include the replacement of the existing pavement, the addition of curb and gutter and sidewalks, construction of concrete cross gutters, intersection improvement, and possible storm drainage water treatment.

As previously noted, this project is in the design process and detailed plans for construction are currently not available. SGSI should review grading plans prior to construction in order to assure that they will be in conformance with our recommendations.

PAVEMENT RECOMMENDATIONS

The pavement sections are provided based on the results of R-value laboratory testing performed on selected subgrade soil samples. Pavement sections were determined using the Caltrans method for design of flexible pavements. Traffic Indices utilized in this method of design are based on estimated equivalent axle loads over a period of 20 years. The pavement sections were designed for the assumed traffic loading and environmental conditions. Based upon our experience, environmental conditions such as freeze-thaw and thermal cracking will most likely govern the life of the pavement. Therefore, a 3-inch AC section is the minimum recommended.

AC PAVEMENT SECTION THICKNESS

Traffic Index	Asphaltic-Concrete (AC) Thickness (inches)	Class II AB (R=78) Thickness (inches)
5	3	4
7	4	4

Class II Aggregate Base or recycled AC, shall all be compacted to a minimum of 95-percent of the material's maximum dry density as determined by ASTM D1557. Class II aggregate base should conform to Section 26 of the State of California, Department of Transportation, Standard Specifications.

If pavement areas are adjacent to heavily watered landscape areas, some deterioration of the subgrade load bearing capacity may result. We recommend some measures of moisture control (such as deepened curbs or other moisture barrier materials) be provided to prevent the subgrade soils from becoming saturated.

We recommend that any sidewalks, curbs and/or gutters be designed by a civil engineer or structural engineer. For any proposed sidewalks, and curbs and gutters, a minimum 4-inch paving section of reinforced concrete (minimum 4,000 psi) may be used. Minimum reinforcement shall consist of welded-wire mesh. We suggest control joints, at appropriate intervals, as determined Mono County Standards and the project civil or structural engineer, be considered.

NOTABLE FEATURES

On Lee Vining Avenue in proximity to Cores C-22 to C-23 alligator cracking along the edge of the road, as well as loose shoulder soils were noted. The cracking was due in large part as a result of loss of lateral support caused by erosion of the adjacent slope which has had a negative impact on the narrow shoulders. We recommend that either the slope in this area be properly rebuilt and shoulders widened to at least 5', or the roadway alignment moved to the south.

EARTHWORK AND PAVING SPECIFICATIONS

Earthwork should be conducted in accordance with applicable grading ordinances, the current California Building Code, and the recommendations of this letter. The following recommendations are provided regarding specific aspects of the proposed earthwork construction. These recommendations should be considered subject to revision based on field conditions observed by the geotechnical consultant during construction.

Site Preparation

General: Site preparation includes removal of deleterious materials, unsuitable materials, and existing improvements from areas where new improvements or new fills are planned. Deleterious materials, which include vegetation, trash, and debris, should be removed from the site and legally disposed of off-site. Unsuitable materials include loose or disturbed soils, undocumented fills, contaminated soils, or other unsuitable materials. The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1-percent of organic materials (by volume). No fill lift shall contain more than 5-percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

Any existing subsurface utilities that are to be abandoned should be removed and the trenches backfilled and compacted. If necessary, abandoned pipelines may be filled with grout or slurry cement as recommended by, and under the observation of, the Geotechnical Consultant.

Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths included within this report are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured, or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

Compaction

All fill should be relatively free of organics, any oversized rock (greater than 6-inches in diameter) and any deleterious materials. Any import soils shall be tested for suitability in advance by the project Geotechnical Engineer. Earth fill material shall not contain more than 1-percent of organic materials (by volume). No fill lift shall contain more than 5-percent of organic matter. Nesting of the organic materials shall not be allowed. All fill and backfill to be placed in association with the proposed construction should be accomplished at slightly over optimum moisture content using equipment that is capable of producing a uniformly compacted product throughout the entire fill lift. Fill materials at less than optimum moisture should have water added and the fill mixed to result in material that is uniformly above optimum moisture content. Fill materials that are too wet can be aerated by blading or other satisfactory methods until the moisture content is as required. The wet soils may be mixed with drier materials in order to achieve an acceptable moisture content.

The fill and backfill should be placed in horizontal lifts at a thickness appropriate for equipment spreading, mixing, and compacting the material, but generally should not exceed

eight inches in thickness. No fill soils shall be placed during unfavorable weather conditions. When work is interrupted by rains or snow, fill operations shall not be resumed until the field tests by the geotechnical engineer indicate that the moisture content and density of the fill are as previously specified.

Class II Aggregate Base and/or recycled AC (if used) and placed HMAC shall be compacted to a minimum of 95-percent of the materials maximum dry density.

Utility Trench Backfill

Exterior trenches, paralleling a footing and extending below a 1:1 plane projected from the outside bottom edge of the footing, shall be compacted to a minimum of 95-percent per ASTM 1557. All trenches in structural areas and under concrete flatwork shall be compacted to a minimum of 95-percent per ASTM 1557. All trenches in non-structural areas shall be compacted to a minimum of 85-percent per ASTM 1557.

All material used for backfill shall be approved by the Geotechnical Engineer prior to placement. All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1-foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 95-percent of maximum from 1-foot above the top of the conduit to the surface.

Lift thickness of backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

Regulations of the governing agency may supersede the above, and all trench excavations should conform to all applicable safety codes. The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations.

Temporary Excavations

All excavations should comply with the requirements of the California Construction and General Industry Safety Orders and the Occupational Safety and Health Act and other public agencies having jurisdiction.

We appreciate the opportunity to be of service to you. Should you have any questions regarding this report, please do not hesitate to contact us.

Respectfully,

SIERRA GEOTECHNICAL SERVICES, INC.

Joseph A. Adler
Principal Geologist
CEG 2198

Thomas A. Platz
Principal Engineer
PE C41039

SIERRA GEOTECHNICAL SERVICES INC.

RESULTS OF CORING

Lee Vining Streets

Project No. 3.02951.2

Core Number	Diameter	Location	Station	Average Thickness
1	4"	Mattly Avenue, NB Lane	See Map	4.5"
2	4"	Mattly Avenue, CL	See Map	4.6"
3	4"	Mattly Avenue, SB Lane	See Map	3.75"
4	4"	Mattly Avenue, NB Lane	See Map	4"
5	4"	Mattly Avenue, SB Lane	See Map	3.5"
6	4"	Mattly Avenue, NB Lane	See Map	2.75"
7	4"	1st Street, WB Lane	See Map	3.5"
8	4"	1st Street, EB Lane	See Map	3"
9	4"	Mono Lake Ave., SB Lane	See Map	2.75"
10	4"	Mono Lake Ave., NB Lane	See Map	4.5"
11	4"	2nd Street, WB Lane	See Map	3.5"
12	4"	Yosemite Drive, WB Lane	See Map	2.25"
13	4"	Pahoa Drive, CL	See Map	2"
14	4"	Pahoa Drive, CL	See Map	2"
15	4"	Pahoa Drive, CL	See Map	2"
16	4"	3rd Street, EB Lane	See Map	2.25"
17	4"	3rd Street, WB Lane	See Map	3.5"
17a	NA	Lee Vining Avenue, SB Lane	See Map	3"
18	4"	D Street, WB Lane	See Map	4.5"
19	4"	4th Street, EB Lane	See Map	3.75"
20	4"	Lee Vining Avenue, SB Lane	See Map	4.5"
21	4"	Lee Vining Avenue, SB Lane	See Map	4.75"
22	4"	Lee Vining Avenue, SB Lane	See Map	3.5"
23	4"	Lee Vining Avenue, CL	See Map	2"
24	4"	Lee Vining Avenue, NB Lane	See Map	3.5"
25	4"	Lee Vining Avenue, SB Lane	See Map	2"

CL - Centerline
EB - East Bound
NB - North Bound
SB - South Bound
WB - West Bound

NOT TO SCALE

LEGEND

C-4 APPROXIMATE LOCATION OF ASPHALT CORE

Sierra Geotechnical Services

PROJECT: SUBSURFACE LOCATION MAP LEE VINING STREETS	
SCALE: N.T.S	DATE: 1/2011
DRAWING: FIG2	DRAWN BY: JAA
JOB NO.: 3.02951.2	FIGURE: **FIGURE 1a**

NOT TO SCALE

LEGEND

C-8 APPROXIMATE LOCATION OF ASPHALT CORE

Sierra Geotechnical Services

PROJECT: SUBSURFACE LOCATION MAP LEE VINING STREETS	
SCALE: N.T.S	DATE: 1/2011
DRAWING: FIG2	DRAWN BY: JAA
JOB NO.: 3.02951.2	FIGURE: **FIGURE 1b**

NOT TO SCALE

LEGEND

C-18 APPROXIMATE LOCATION OF ASPHALT CORE

Sierra Geotechnical Services

PROJECT: SUBSURFACE LOCATION MAP LEE VINING STREETS	
SCALE: N.T.S	DATE: 1/2011
DRAWING: FIG2	DRAWN BY: JAA
JOB NO.: 3.02951.2	FIGURE: FIGURE 1c

NOT TO SCALE

LEGEND

C-18 APPROXIMATE LOCATION OF ASPHALT CORE

PROJECT: SUBSURFACE LOCATION MAP LEE VINING STREETS	
SCALE: N.T.S	DATE: 1/2011
DRAWING: FIG2	DRAWN BY: JAA
JOB NO.: 3.02951.2	FIGURE: **FIGURE 1d**

Sierra Geotechnical Services

SIERRA GEOTECHNICAL SERVICES INC.

P.O. BOX 5024, MAMMOTH LAKES, CALIFORNIA 93546
(760) 934-3992; (760) 934-8832 Fax

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES

Per ASTM C136 or CTM 202 (underline one)

Project:	Lee Vining Streets	*Job No.:*	3.02951.2
Client:	Triad/Holmes Associates	*Tested by:*	BY
Sampled by:	JAA	*Delivered by:*	BY
Sample Date/time:	11/2011	*Delivered Date/time:*	
Sample Location:	C-6	*Test Date:*	12/2011
Description:	Subgrade	*Initial Dry Weight (g):*	C/F=546 (463 after wash)

Sieve Size			Fine Wt. Ret.	Fine % Ret.	Fine % Pass	Coarse Wt. Ret.	Coarse % Ret.	Coarse % Pass	Fine + Coarse	Specified
No.	**Inches**	**mm**								
2”	2.0	50.0								
1-1/2”	1.5	37.5								
1”	1.0	25.0								
3/4”	0.750	19.0				46	8	92	92	
1/2”	0.500	12.7								
3/8”	0.375	9.5								
1/4”	0.250	6.3								
4	0.187	4.75				81	15	85	85	
5	0.157	4.00								
6	0.132	3.35								
7	0.111	2.80								
8	0.0937	2.36	102	19					81	
10	0.0787	2.00								
12	0.0661	1.70								
14	0.0550	1.40								
16	0.0469	1.18	127	23					77	
18	0.0394	1.00								
20	0.0331	0.850								
30	0.0234	0.600	159	29					71	
40	0.0165	0.425								
50	0.0117	0.300	228	42					58	
60	0.0098	0.250								
70	0.0083	0.212								
80	0.0070	0.180								
100	0.0059	0.150	349	64					36	
200	0.0029	0.075	443	81					19	
200-MINUS or PAN										
TOTAL										

Remarks:

SIERRA GEOTECHNICAL SERVICES INC. SGSI

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SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES

Per ASTM C136

Project:	Lee Vining Streets	*Job No.:*	3.02951.2
Client:	Triad/Holmes Associates	*Tested by:*	BY
Sampled by:	JAA	*Delivered by:*	BY
Sample Date/time:	11/2011	*Delivered Date/time:*	
Sample Location:	C-8	*Test Date:*	12/2011
Description:	Subgrade	*Initial Dry Weight (g):*	C/F=4512 (488 after wash)

Sieve Size			Fine Wt. Ret.	Fine % Ret.	Fine % Pass	Coarse Wt. Ret.	Coarse % Ret.	Coarse % Pass	Fine + Coarse	Specified
No.	Inches	mm								
2”	2.0	50.0								
1-1/2”	1.5	37.5								
1”	1.0	25.0				1269	28	72	72	
3/4”	0.750	19.0				1570	35	65	65	
1/2”	0.500	12.7				1953	43	57	57	
3/8”	0.375	9.5				2184	48	52	52	
1/4”	0.250	6.3								
4	0.187	4.75				2776	62	38	38	
5	0.157	4.00								
6	0.132	3.35								
7	0.111	2.80								
8	0.0937	2.36	109	22	78				30	
10	0.0787	2.00								
12	0.0661	1.70								
14	0.0550	1.40								
16	0.0469	1.18	204	42	58				22	
18	0.0394	1.00								
20	0.0331	0.850								
30	0.0234	0.600	287	59	41				16	
40	0.0165	0.425								
50	0.0117	0.300	367	75	25				10	
60	0.0098	0.250								
70	0.0083	0.212								
80	0.0070	0.180								
100	0.0059	0.150	408	84	16				6	
200	0.0029	0.075	424	87	13				5	
200-MINUS or PAN			428							
TOTAL										

Remarks:

SIERRA GEOTECHNICAL SERVICES INC. SGSI

SIERRA GEOTECHNICAL SERVICES INC.

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(760) 934-3992; (760) 934-8832 Fax

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES

Project:	Lee Vining Streets	*Job No.:*	3.02951.2
Client:	Triad/Holmes Associates	*Tested by:*	BY
Sampled by:	JAA	*Delivered by:*	BY
Sample Date:	11/2011	*Delivered Date:*	
Sample Location:	C-22	*Test Date:*	12/2011
Description:	Shoulder Fill	*Initial Dry Weight (g):*	C+F=19656/ F= 520

Sieve Size			Fine Wt. Ret.	Fine % Ret.	Fine % Pass	Coarse Wt. Ret.	Coarse % Ret.	Coarse % Pass	Fine + Coarse	Specified
No.	**Inches**	**mm**								
3”	3.0	76.0								
1-1/2”	1.5	37.5								
1”	1.0	25.0				0	0	100		
3/4”	0.750	19.0				33	0	100		
1/2”	0.500	12.7								
3/8”	0.375	9.5								
1/4”	0.250	6.3								
4	0.187	4.75				1538	8	92		
5	0.157	4.00								
6	0.132	3.35								
7	0.111	2.80								
8	0.0937	2.36	74	14	86			79		
10	0.0787	2.00								
12	0.0661	1.70								
14	0.0550	1.40								
16	0.0469	1.18	100	19	67			62		
18	0.0394	1.00								
20	0.0331	0.850								
30	0.0234	0.600	101	19	48			44		
40	0.0165	0.425								
50	0.0117	0.300	97	19	29			18		
70	0.0083	0.212								
80	0.0070	0.180								
100	0.0059	0.150	65	13	16			15		
200	0.0029	0.075	35	7	9			8		
200-MINUS or PAN			48	9						
TOTAL			520	100						

Remarks: Wash Sieve

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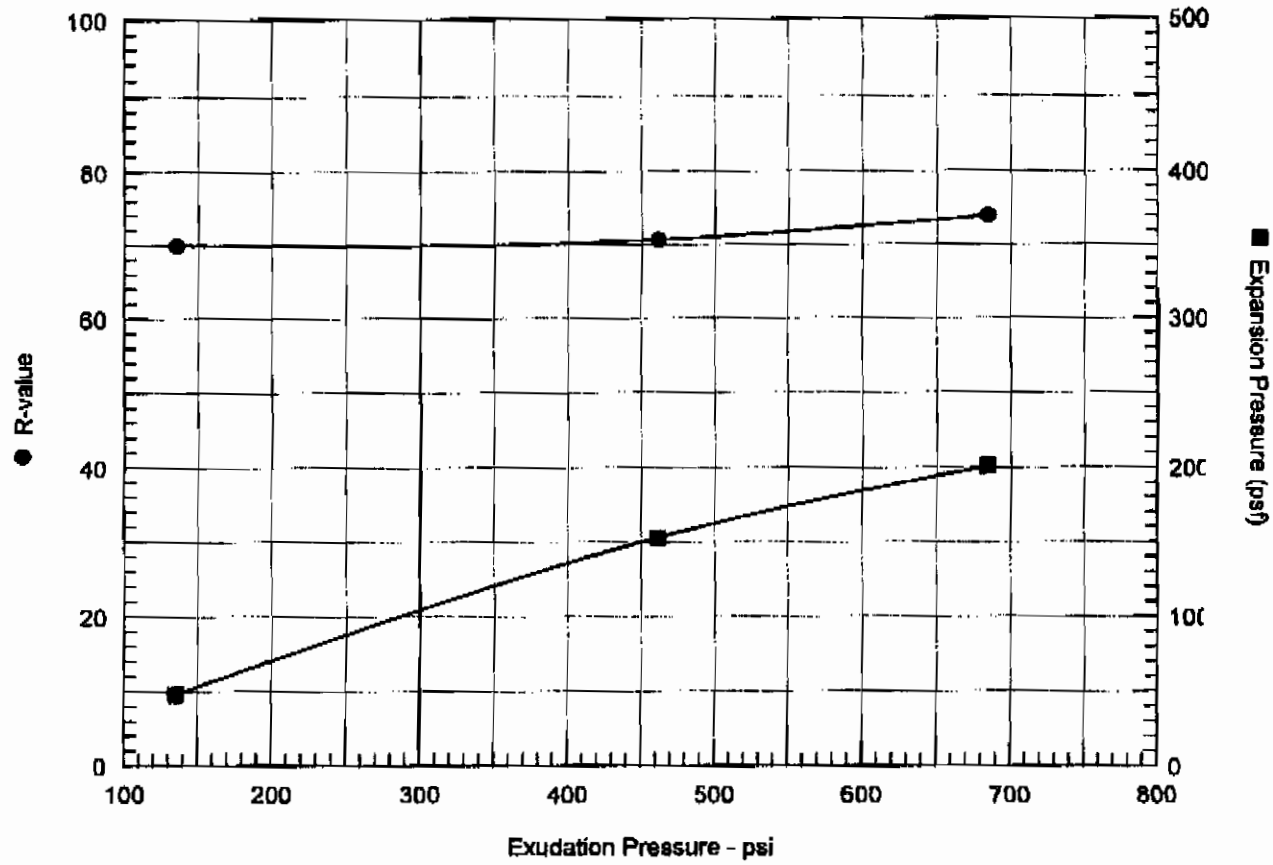
R-VALUE TEST REPORT

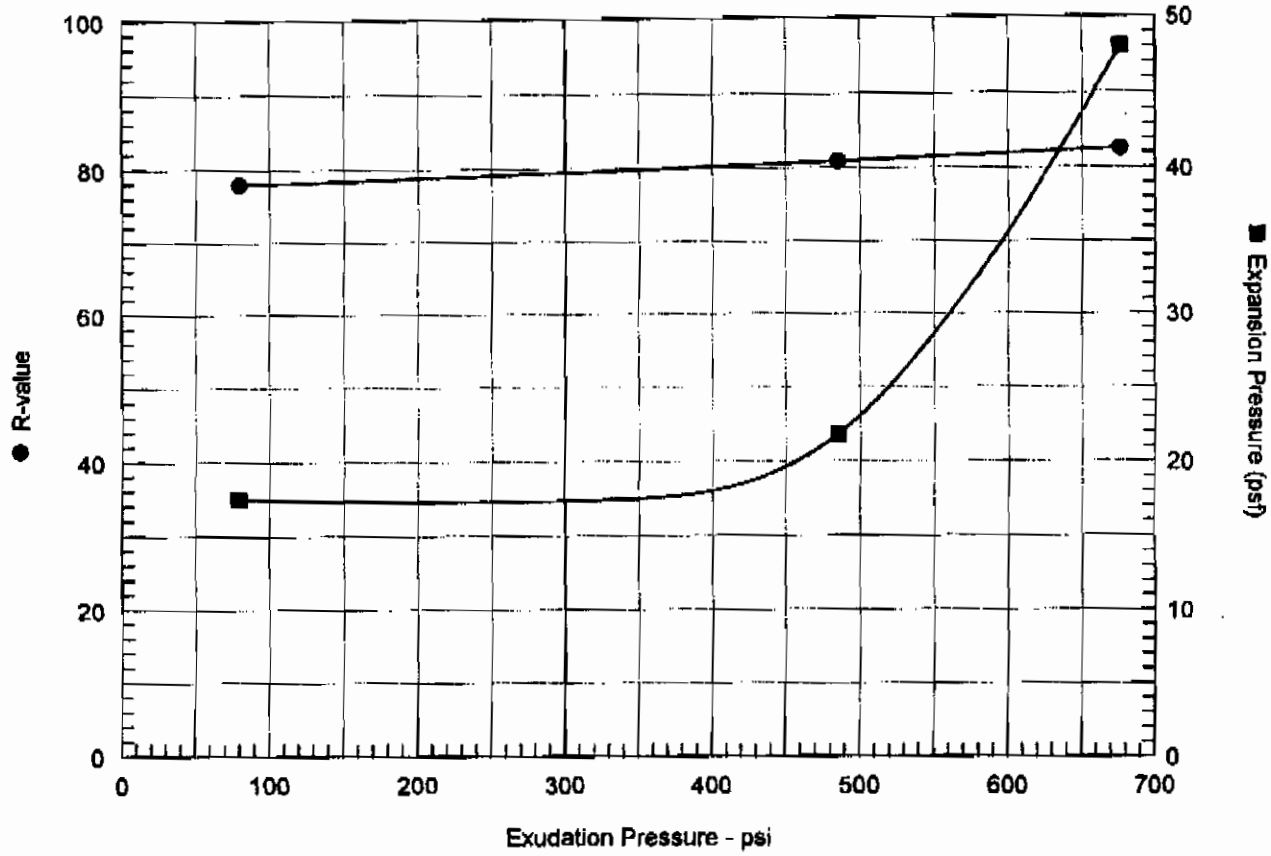


Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	350	102.8	17.2	153	30	2.44	462	71.8	70.7
2	350	99.8	18.8	48	31	2.54	135	69.9	69.9
3	350	103.5	16.5	201	29	2.56	684	72.9	74.0

Test Results	Material Description
R-value at 300 psi exudation pressure = 69.9 **Exp. pressure at 300 psi exudation pressure** = 105 psf	Light tan silty, clayey sand (SC-SM) with gravel
Project No.: 4437.07I **Project:** Sierra Geotechnical Services **Location:** Mattly Avenue; C-6 **Sample Number:** 11-289 **Date:** 1/16/2012	**Tested by:** **Checked by:** **Remarks:** Lee Vining Rehab Project Job #302951.2
R-VALUE TEST REPORT **PEZONELLA ASSOCIATES, INC.**	**Plate** _____

R-VALUE TEST REPORT

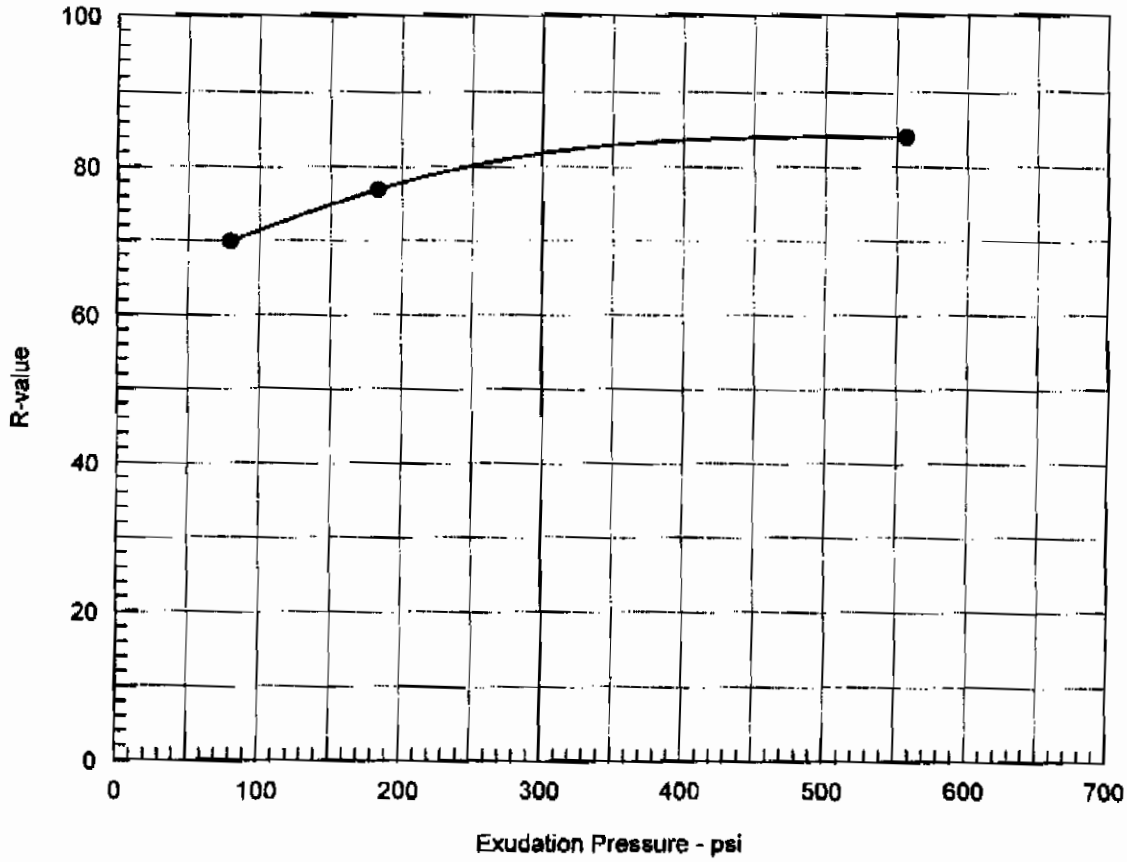


Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	350	118.0	8.0	48	18	2.50	676	82.5	82.6
2	350	116.0	11.4	17	22	2.41	80	79.2	78.0
3	350	117.5	8.9	22	19	2.46	485	80.9	80.9

Test Results	Material Description
R-value at 300 psi exudation pressure = 79.5 **Exp. pressure at 300 psi exudation pressure** = 17 psf	Brown silty sand (SM) with gravel
Project No.: 4437.071 **Project:** Sierra Geotechnical Services **Location:** Paoha Drive; C-14 **Sample Number:** 11-290 **Date:** 1/16/2012	**Tested by:** **Checked by:** **Remarks:** Lee Vining Rehab Project Job #302951.2
R-VALUE TEST REPORT **PEZONELLA ASSOCIATES, INC.**	**Plate**

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	350	123.7	7.8	0	15	2.36	557	85.4	84.1
2	250	124.4	10.4	0	30	2.36	80	72.5	69.9
3	350	126.1	9.0	0	21	2.30	183	79.7	77.0

Test Results	Material Description
R-value at 300 psi exudation pressure = 81.8	Brown silty sand (SM) with gravel

Project No.: 4437.07I
Project: Sierra Geotechnical Services
Location: Lee Vining Avenue; C-22
Sample Number: 11-291
Date: 1/16/2012

Tested by:
Checked by:
Remarks:
Lee Vining Rehab Project
Job #3029512

R-VALUE TEST REPORT

PEZONELLA ASSOCIATES, INC.

Plate ____