

Architecture
Structural
Geotechnical



ROCKY MOUNTAIN GROUP
EMPLOYEE OWNED

Materials Testing
Forensic
Civil/Planning

APPROVED
Engineering Department

03/18/2019 5:18:48 PM

dsdnijkamp

EPC Planning & Community
Development Department

PAVEMENT DESIGN REPORT

**Lorson Boulevard
Crossing East Tributary Jimmy Camp Creek
Lorson Ranch East, Filing No. 1
El Paso County, Colorado**

PREPARED FOR:

**Lorson Ranch Metropolitan District
212 N. Wahsatch Ave. Ste 301
Colorado Springs, CO**

JOB NO. 162626

November 30, 2018

Respectfully Submitted,

RMG – Rocky Mountain Group

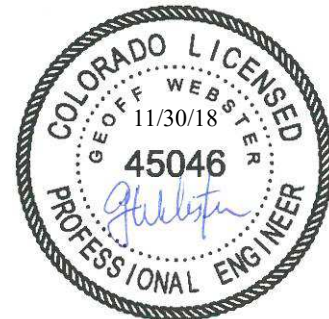
A handwritten signature in blue ink that reads "Kelli Zigler".

**Kelli Zigler
Project Geologist**

Reviewed by,

RMG – Rocky Mountain Group

**Geoff Webster, P.E.
Sr. Geotechnical Project Manager**



SF Number – 18-008

TABLE OF CONTENTS

GENERAL SITE AND PROJECT DESCRIPTION.....	3
Location.....	3
Existing Conditions	3
Project Description	3
SUBSURFACE CONDITIONS.....	3
Introduction	3
Subsurface Materials	3
LABORATORY DOCUMENTATION.....	4
Laboratory Testing	4
PAVEMENT DESIGN.....	4
Pavement Thickness	5
Pavement Materials	5
Soil Mitigation.....	5
Subgrade Preparation	5
Surface Drainage.....	6
Subgrade Observations and Testing	6
CLOSING.....	6
FIGURES	
Site Vicinity Map	1
APPENDIX A	
Laboratory Test Results for Subgrade Structural Fill	
APPENDIX B	
AASHTO Structural Number Calculation for Flexible Pavements – Urban Principal Arterial, 4-lane	

GENERAL SITE AND PROJECT DESCRIPTION

Location

Lorson Ranch East Filing No. 1 is located east of Marksheffel Road and between Fontaine Boulevard to the north and Lorson Boulevard to the south in El Paso County, Colorado. The East Tributary of Jimmy Camp Creek forms the western boundary of the development. The location of the site is shown on the Site Vicinity Map, Figure 1.

Existing Conditions

At the time of this report Lorson Boulevard is close to grade and utility mains and services had been installed. Curb and gutter is being installed.

Project Description

This Pavement Design Report provides recommendations specific to the design and construction of Lorson Boulevard where it crosses the ConSpan Arch Bridge spanning the East Tributary of Jimmy Camp Creek. The approximate roadway stationing along Lorson Boulevard to which this pavement design report is applicable is Station 82+25 to Station 82+75. Lorson Boulevard is classified a Residential Urban Collector, with an 80-foot ROW and two 20-foot wide travel lanes.

SUBSURFACE CONDITIONS

Introduction

RMG previously prepared a Pavement Design Report for Lorson Ranch East, Filing No. 1 (SF Number 18-008) that included a pavement section for Lorson Boulevard consisting of 4.5-inches of Hot Mix Asphalt (HMA) over 11-inches of Cement Treated Subgrade (CTS). Where Lorson Boulevard crosses the East Tributary of Jimmy Camp Creek, however, a ConSpan Arch Bridge has been constructed to carry the roadway. It has proven impractical to construct the prescribed pavement section across the span due to space limitations and construction considerations, and therefore a different pavement section is necessary. This report provides documentation and design of a pavement section that can be constructed in the available space and meets El Paso County development requirements.

Subsurface Materials

The approved bridge plans indicate the steel ConSpan arch receives a cover of select structural backfill upon which the pavement may be constructed. The structural backfill serves in essence the role of a prepared subgrade beneath a composite section of Hot Mix Asphalt over Aggregate Base Course. CDOT Class I material has been installed as the select structural fill over the arch.

LABORATORY DOCUMENTATION

Laboratory Testing

The annual laboratory testing report for the soil being utilized as structural backfill over the ConSpan arch is presented in Appendix A. The results indicate this soil classifies as SW-SM, well-graded silty sand in accordance with the Unified Soils Classification System (USCS), which correlates to A-1 soil in the AASHTO classification system. In accordance with AASHTO this soil is rated “excellent” for use as subgrade material.

The laboratory report further indicates the soil meets the gradation and physical properties of CDOT Class I Structural Fill, and has an R-value of 75.

PAVEMENT DESIGN

This pavement design was performed in accordance with the El Paso County Engineering Criteria Manual, Appendix D. Pavement design parameters and design calculations are presented below utilizing an R-value of 75 for the subgrade soil. The recommended pavement section is supported by the calculations below.

Street Classification – Residential Urban Collector

1) Lorson Boulevard

ESAL = 821,000 (Table D-2)

Serviceability Index = 2.5 (Table D-1)

2) Strength coefficients (Table D-3)

Asphalt (HMA): $a_1 = 0.44$

Aggregate Base Course (ABC): $a_2 = 0.11$

3) Subgrade (Section D.4.1.C)

$S_1 = [(R-5) / 11.29] + 3 = [(75-5) / 11.29] + 3 = 9.2$

$M_r = 10 \text{ exponent } [(S_1 + 18.72) / 6.24] = 10 \exp [(9.2 + 18.72) / 6.24] = 29,812$

4) Structural number (SN) = 1.95 (1993 AASHTO Empirical Equation, Appendix B)

5) Composite asphalt/base course section

Minimum HMA thickness = $D_1 = 4$ inches (Table D-2)

ABC thickness = $D_2 = \{SN - (D_1 \times a_1)\} / a_2 = \{1.95 - (4 \times 0.44)\} / 0.11 = 1.7$ inches

Use Minimum ABC thickness, $D_2 = 8.0$ -inches

Check SN = $(4.0 \times 0.44) + (8.0 \times 0.11) = 2.64 > 1.95$ (Min. SN required) => OK

- 6) Developer desires to use 4.5-inches of HMA over 8-inches ABC
 Check SN = (4.5 x 0.44) + (8.0 x 0.11) = 2.86 > 1.95 (Min. SN required) => OK

Pavement Thickness

Based on the soil types and the design calculations, the recommended pavement section is presented below.

Recommended Pavement Section

Street	HMA (in)	ABC (in)	Subgrade Class I Structural Fill (in)
Lorson Boulevard over ConSpan Bridge Approx. Sta. 82+25 to Sta. 82+75	4.5	8.0	7.5

Pavement Materials

Pavement materials should be selected, prepared, and placed in accordance with El Paso County specifications and the *Pikes Peak Region Asphalt Paving Specifications*. Tests should be performed in accordance with the applicable procedures presented in the specifications.

Soil Mitigation

The PDCM notes that mitigation measures may be required for expansive soils, shallow ground water, subgrade instability, etc. Based on the laboratory test results, the subgrade soils evaluated for this pavement design are expected to have no expansive potential. Groundwater or wet and unstable soil will not be present. Therefore, special mitigation measures do not appear to be necessary for subgrade preparation.

Subgrade Preparation

Subgrade for Lorson Boulevard over the ConSpan Arch Bridge shall be CDOT Class I Structural Backfill. RMG understands the structural fill has been placed and compacted to 95 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D-1557). Prior to installation of the composite pavement section, the subgrade should be proof-rolled to a firm and unyielding condition. Areas which deform under wheel loads should be removed and replaced.

Surface Drainage

Surface drainage is important for the satisfactory performance of pavement. Wetting of the subgrade soils or base course will cause a loss of strength which can result in pavement distress. Surface drainage should provide for efficient removal of storm-water runoff. Water should not pond on the pavement or at the edges of the pavement.

Subgrade Observations and Testing

The pavement thicknesses presented above assume pavement construction is completed in accordance with El Paso County specifications and the *Pikes Peak Region Asphalt Paving Specifications*. RMG should be present at the site during subgrade preparation, placement of fill, and construction of pavements to perform site observations and testing.

CLOSING

This report has been prepared for the exclusive purpose of providing geotechnical engineering information and recommendations for development described in this report. RMG should be retained to review the final construction documents prior to construction to verify our findings, conclusions and recommendations have been appropriately implemented.

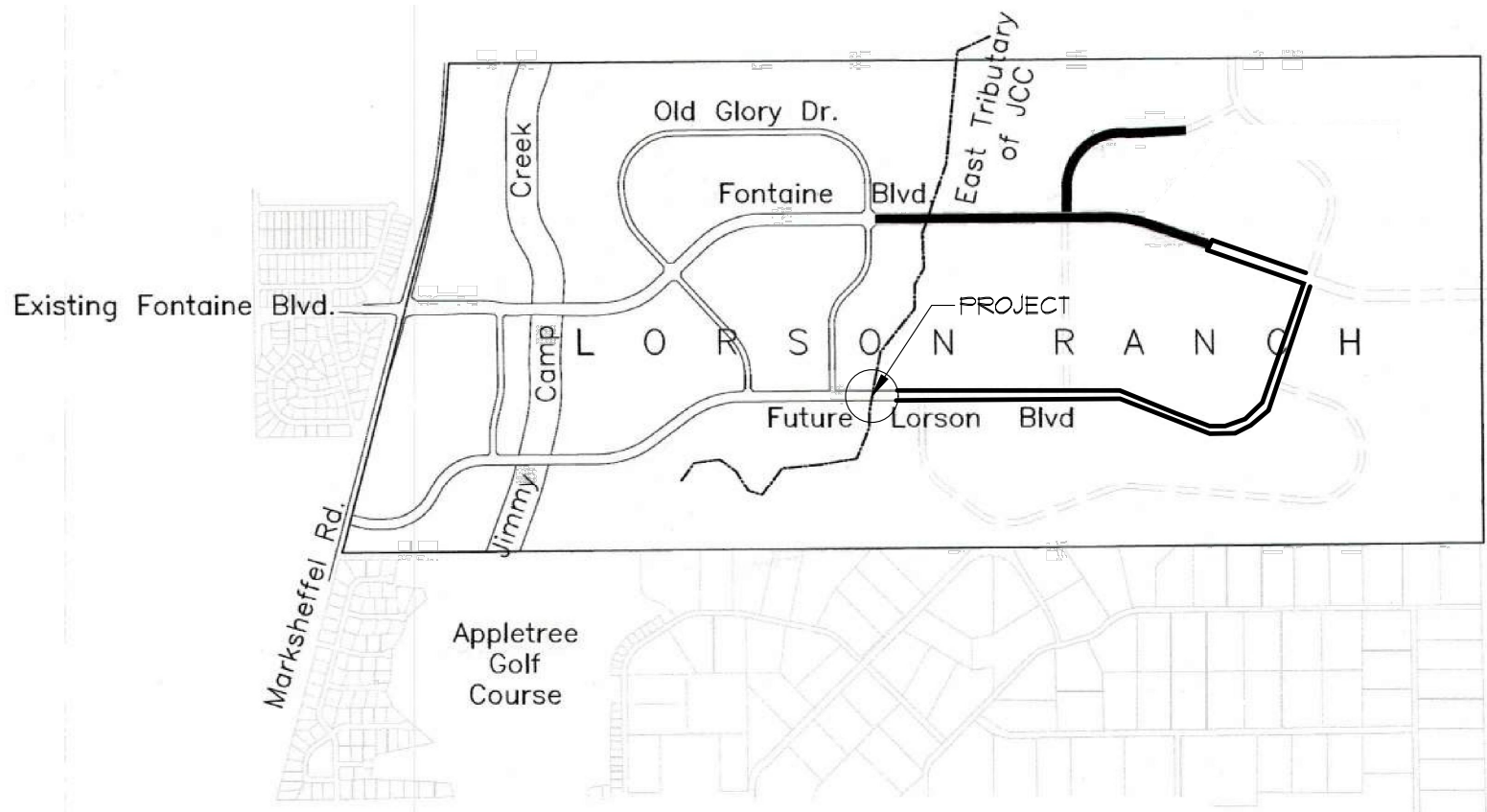
This report has been prepared for the exclusive use by the **Landhuis Company** for application as an aid in the design and construction of the proposed development in accordance with generally accepted geotechnical engineering practices. The analyses and recommendations in this report are based in part upon data obtained from test borings, site observations and the information presented in referenced reports. The nature and extent of variations may not become evident until construction. If variations then become evident, RMG should be retained to review the recommendations presented in this report considering the varied condition, and either verify or modify them in writing.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

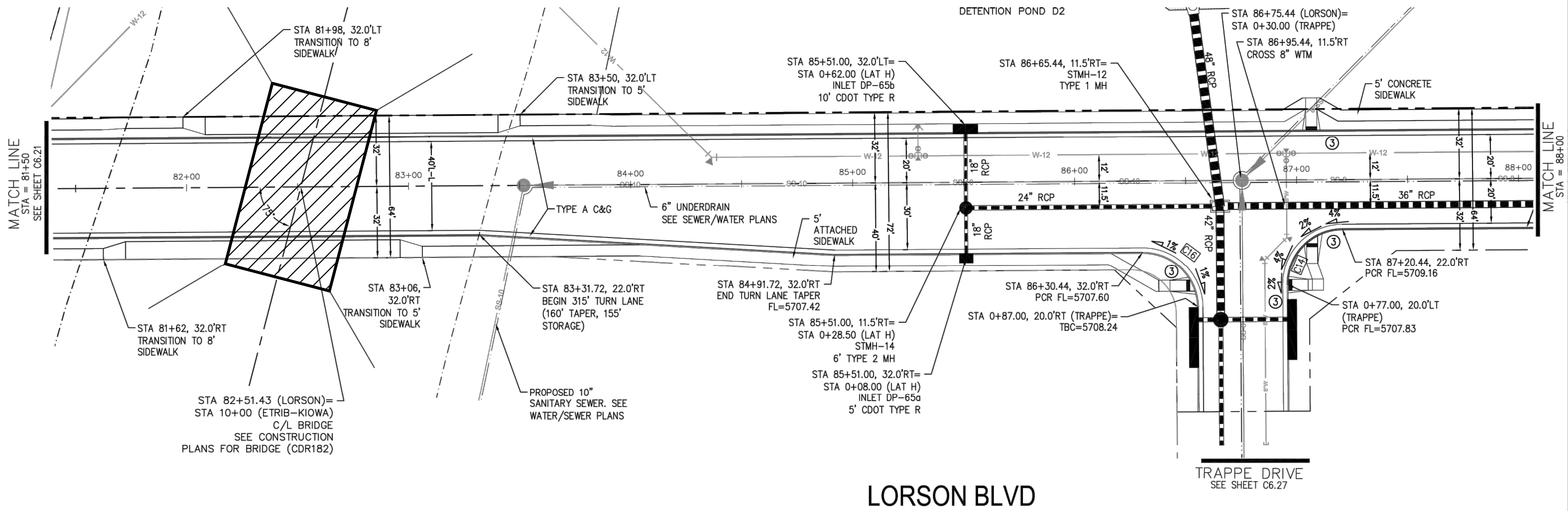
The scope of services for this project does not include, either specifically or by implication, environmental assessment of the site or identification of contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to biological or toxicological issues, are beyond the scope of this report. If the Client desires investigation into the potential for such contamination or conditions, other studies should be undertaken.

If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point-of-view, please feel free to contact us.

FIGURES



 CON SPAN ARCH BRIDGE
 APPROX. STATIONS 82+25 TO 82+75
 P.V.M.T SECTION: 4.5" HMA OVER 8"
 ABC ATOP 7.5' STRUCT. FILL



ROCKY MOUNTAIN GROUP

ENGINEERS ARCHITECTS

RMG

EMPLOYEE OWNED

Geotechnical
Materials, Testing
Civil, Planning

Architectural
Structural
Forensics

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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

SITE VICINITY MAP

LORSON BLVD CROSSING
EAST TRIB. JIMMY CAMP CREEK

LANDHUIS COMPANY

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ARCH/ENG:	GGW
DRAWN:	CXM
CHECKED:	GGW
DATE	11-30-18
# REVISION	DATE
△	
JOB NO.	162626
SHEET NAME	VICINITY MAP
SHEET NO.	FIG-1

APPENDIX A

Transit Mix Concrete Co. Materials Laboratory

444 East Costilla Avenue
Colorado Springs, Colorado 80903
Ph. (719) 475-0700 Fax (719) 475-0226

2596 Hwy 96 East
Pueblo, Colorado 81002
Ph. (719) 543-7898 Fax (719) 583-0345

February 12, 2018

RE: Class 1 Structure Backfill/Fine Fill
Daniels Sand Company
3710 Bradley Road
Colorado Springs, CO 80916

Gentlemen:

This letter presents the results of physical properties and deleterious substances tests performed on a Class 1 Structural Backfill that was sampled on January 17, 2018. Please be advised this is a raw bank product and variations may occur in test results. Testing was conducted to evaluate the suitability of the material for use as "Select Fill" for the City of Colorado Springs, CO. The results are as follows:

Test Procedure	Test Description	Test Results	Specifications
ASTM C 117	-200 Wash	8.4%	N/A
ASTM C 136	Gradation	Satisfactory	N/A
ASTM D 4318	Liquid Limit	No Value	N/A
ASTM D 4318	Plastic Index	Non-Plastic	N/A
ASTM D 1557	Moisture-Density Relationship (Modified)	131.8 pcf @ 8.0%	N/A
ASTM D 698	Moisture-Density Relationship (Standard)	124.0 pcf @ 9.2%	N/A
ASTM D 2844	Resistance R-Value/Expansion Pressure	75	Please see Table
CP-L 2103	Water Soluble Sulfate	0	Please see Table

More detailed test results are indicated on the attached tables. ACI Certified technicians performed all tests in accordance to procedures prescribed by the American Society for Testing and Materials (ASTM) and Colorado Procedures.

If you have any questions feel free to contact me at your convenience.

Respectfully Submitted,


Robert L. Montoya, BS CET
NICET Technologist #1001



Transit Mix Concrete Co. Materials Laboratory

444 East Costilla Avenue
 Colorado Springs, Colorado 80903
 Ph. (719) 475-0700 Fax (719) 475-0226

2596 Hwy 96 East
 Pueblo, Colorado
 Ph. (719) 543-7898 Fax (719) 583-0345

FINE AGGREGATE REPORT

No. 8069D-1-18

JOB NAME/SOURCE: Daniels Sand Pit

SAMPLE DESCRIPTION: Fine Fill
Tube Sample

DATE SAMPLED: January 17, 2018

TIME SAMPLED: 10:00 AM

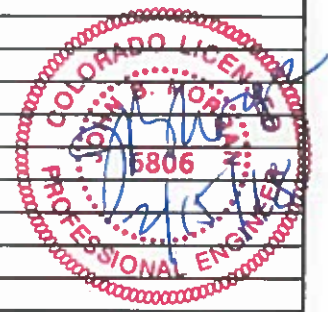
SAMPLED BY: MG

DATE TESTED: January 18, 2018

TIME TESTED: 2:00 PM

TESTED BY: MG

ASTM C 136	AASHTO T 27 & M 92				
SIEVE SIZE	INDIVIDUAL WEIGHT	CUMULATIVE WEIGHT	% RETAINED	% PASSING	
50.0 mm or 2"					
37.5 mm or 1.5"	0.0	0.0	0.0%	100.0%	
25.0 mm or 1"	0.0	0.0	0.0%	100.0%	
19.0 mm or 3/4"	0.0	0.0	0.0%	100.0%	
12.5 mm or 1/2"	0.0	0.0	0.0%	100.0%	
9.5 mm or 3/8"	0.0	0.0	0.0%	100.0%	
4.75 mm or 4	13.5	13.5	1.3%	98.7%	
2.36 mm or 8	72.7	86.2	8.6%	91.4%	
1.18 mm or 16	161.5	247.7	24.7%	75.3%	
600 um or 30	180.8	428.5	42.7%	57.3%	
300 um or 50	208.9	637.4	63.5%	36.5%	
150 um or 100	157.6	795.0	79.2%	20.8%	
75 um or 200	125.0	920.0	91.6%	8.4%	
Par/Oven Dry Wt.	920.0	1004.0			



FINENESS MODULUS: **2.2**

ASTM D 422 (0.075 mm)

ASTM C 566	AASHTO T 255					
Max. Nominal Size (in)	4.75 mm (#4)	9.5 mm (3/8 in)	12.5 mm (1/2 in)	19.0 mm (3/4 in)	25.0 mm (1 in)	37.5 mm (1 1/2 in)
Min. Sample Size (g)	500	1500	2000	3000	4000	6000
Mass of Original Sample (W)	1056.7					Moisture Content 5.2%
Mass of Dried Sample (D,B)	1004.0					
$p = 100 (W - D)/D$						

ASTM C 117	AASHTO T 11				
Max. Nominal Size (in)	≤ 4.75 mm (#4)		> 4.75 mm (#4) to 9.5 mm (3/8 in)	> 9.5 mm (3/8 in) to 19.0 mm (3/4 in)	> 19.0 mm (3/4 in)
Min. Sample Size (g)	300		1000	2500	5000
Mass of Dried Sample (D,B)	1004.0				% Mat. Finer than #200 Sieve 8.4%
Dry Mass of Sample-Washed (C)	920.0				
$A = [(B - C)/B] \times 100$					

ASTM D 2419		AASHTO T 176					
Solution Temperature (72° +/- 5°F)							
Sample Identification	Sample Weight	Clay Reading	Sand Reading	Actual SE	Adjusted SE	Average SE	Reported Sand Equivalent Value
A	109.5	3.3	2.2	66.7	67	65.3	66
B	109.1	2.9	1.8	62.1	63		
C	110.4	3.2	2.1	65.6	66		

Moisture Density Relationship

Curve No.: DFF-S

Project No.: 2017
Project: VARIOUS

Date: 2-11-2018

Location: Daniels Sand Pit
Elev./Depth: Stockpile
Remarks: Daniels Fine Fill/ Structural Fill 9D-698)



MATERIAL DESCRIPTION

Description: Daniels Fine Fill/ Structural Fill

Classifications -

Nat. Moist. = 5.2 %
Liquid Limit = NV
% > No.4 = 1.3 %

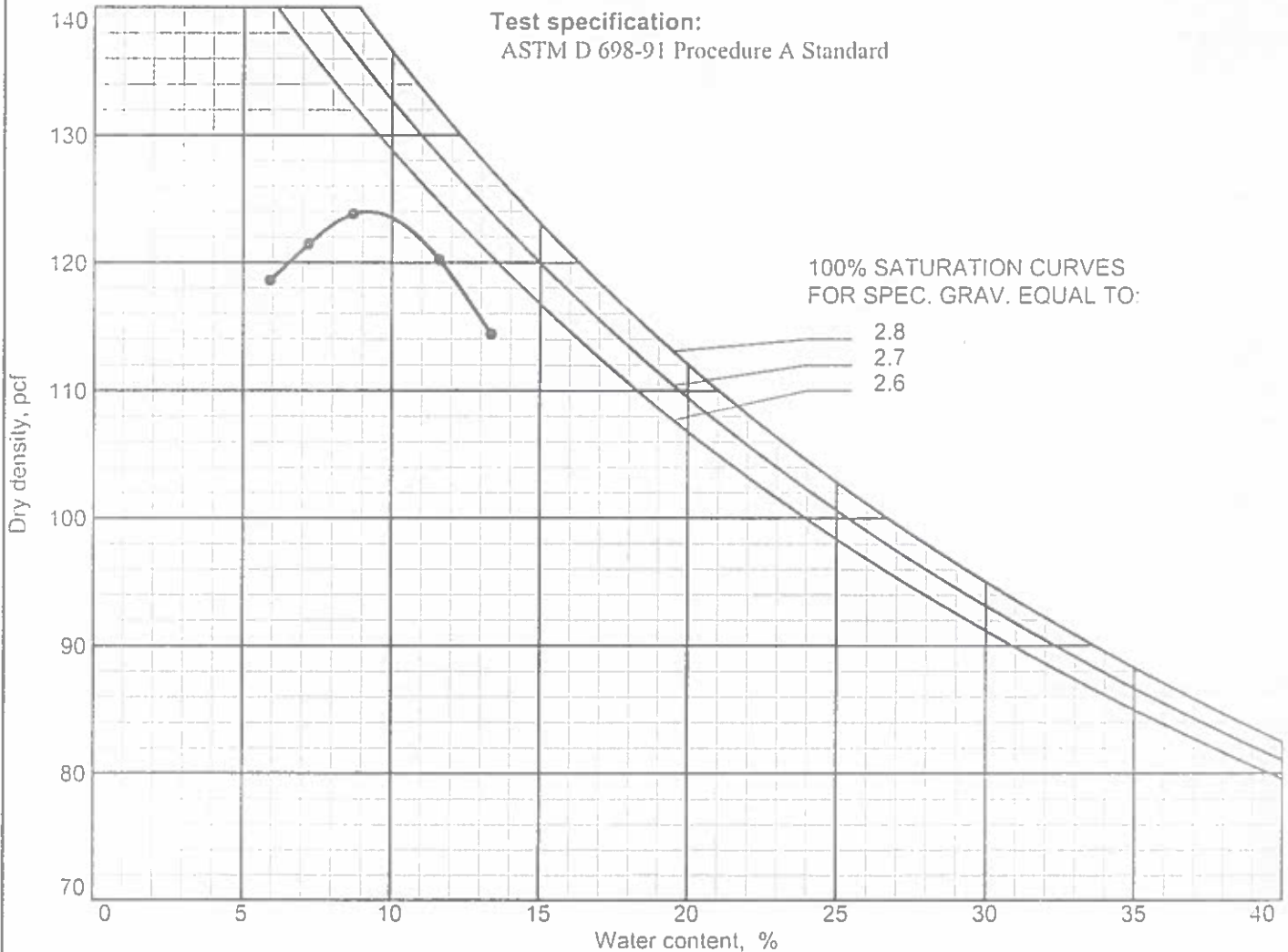
USCS:

AASHTO:

Sp.G. =
Plasticity Index = NP
% < No.200 = 8.4 %

TEST RESULTS

Maximum dry density = 124.0 pcf
Optimum moisture = 9.2 %



Plate

MOISTURE DENSITY TEST DATA

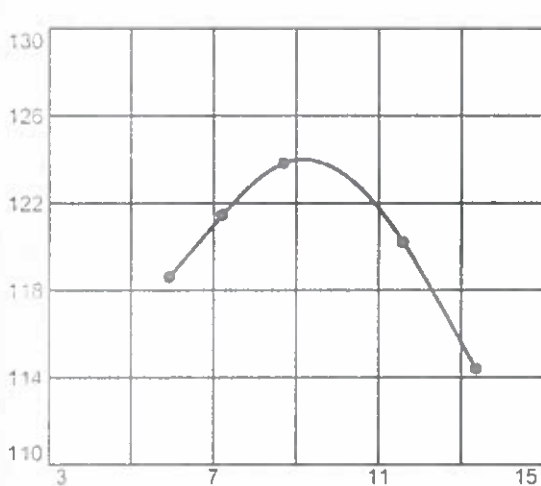
Client: VARIOUS
 Project: VARIOUS
 Project Number: 2017

Specimen Data

Source: Dan's Fine Fill 2018
 Sample No.: D-FF-Std.
 Elev. or Depth: Stockpile Sample Length (in./cm.): Stockpile
 Location: Daniels Sand Pit
 Description: Daniels Fine Fill/ Structural Fill
 Liquid Limit: NV Plasticity Index: NP Natural Moisture: 5.2
 Date: 2-11-2018 USCS Classification: AASHTO Classification:
 Testing Remarks: Daniels Fine Fill/ Structural Fill 9D-698)
 Percent retained on No.4 sieve: 1.3
 Percent passing No. 200 sieve: 8.4 Specific gravity:

Test Data And Results For Curve DFF-S

Type of test: ASTM D 698-91 Procedure A Standard
 Mold Dia.: 4.00 in. Hammer Wt.: 5.5 lb. Drop: 12 in.
 Layers: three Blows per Layer: 25



POINT NO.	1	2	3	4	5
WM + WS	6152.5	6221.6	6287.9	6281.1	6213.5
WM	4253.0	4253.0	4253.0	4253.0	4253.0
WW+T	610.20	684.20	537.40	649.80	675.40
WD+T	576.10	638.20	494.40	582.30	595.80
TARE	0.00	0.00	0.00	0.00	0.00
MOIST	5.9	7.2	8.7	11.6	13.4
MOISTURE	5.9	7.2	8.7	11.6	13.4
DRY DEN	118.6	121.5	123.8	120.2	114.4

Max dry den= 124.0 pcf Opt moisture= 9.2 %

Oversize Correction Not Applied



Moisture Density Relationship

Curve No.: DFF-M

Project No.: 2017
Project: VARIOUS

Date: 2-11-2018

Location: Daniels Sand Pit
Elev./Depth: Stockpile
Remarks: Daniels Fine Fill Structural Fill (D-1557-A)

MATERIAL DESCRIPTION

Description: Daniels Fine Fill (Structural Fill)

Classifications -
Nat. Moist. = 5.2 %
Liquid Limit = NV
% > No.4 = 1.3 %

USCS:

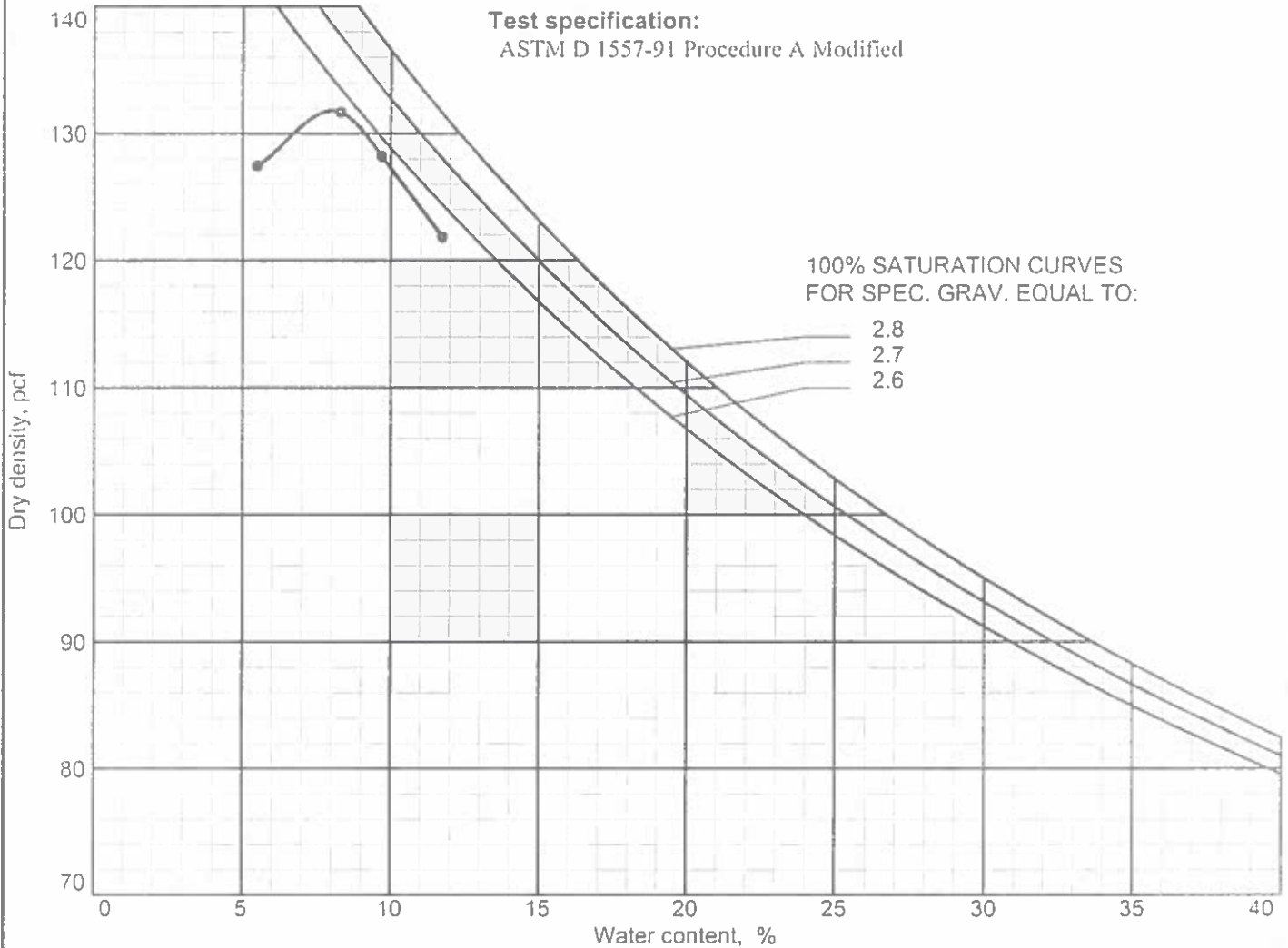
AASHTO:

Sp.G. =
Plasticity Index = NP
% < No.200 = 8.4 %



TEST RESULTS

Maximum dry density = 131.8 pcf
Optimum moisture = 8.0 %



Plate

MOISTURE DENSITY TEST DATA

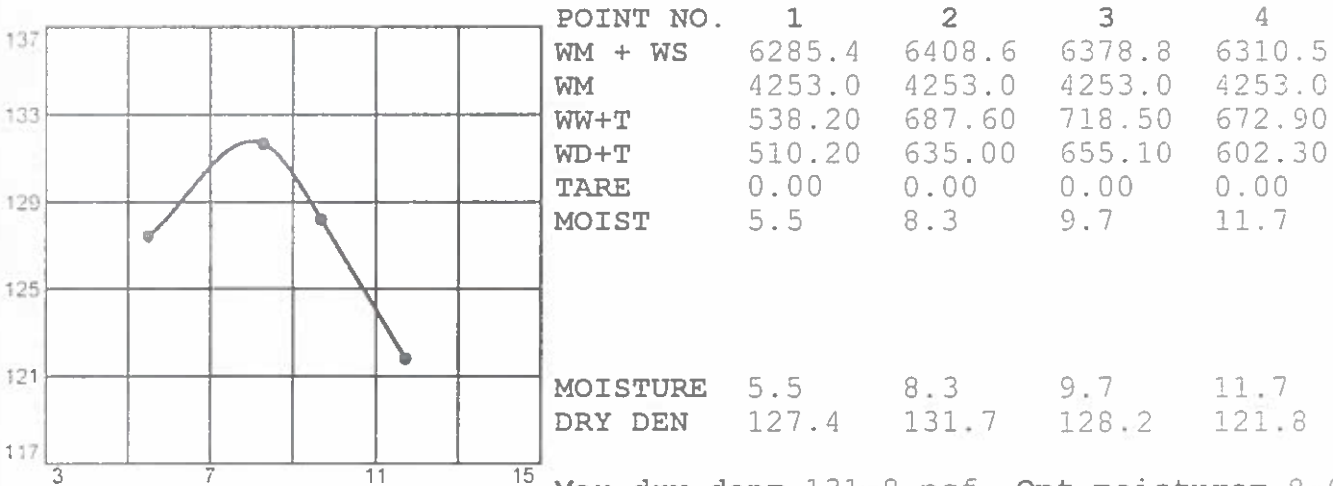
Client: VARIOUS
 Project: VARIOUS
 Project Number: 2017

Specimen Data

Source: Dan's Fine Fill 2018
 Sample No.: D-FF-Mod.
 Elev. or Depth: Stockpile Sample Length (in./cm.): Stockpile
 Location: Daniels Sand Pit
 Description: Daniels Fine Fill (Structural Fill)
 Liquid Limit: NV Plasticity Index: NP Natural Moisture: 5.2
 Date: 2-11-2018 USCS Classification: AASHTO Classification:
 Testing Remarks: Daniels Fine Fill/Structural Fill (D-1557-A)
 Percent retained on No.4 sieve: 1.3
 Percent passing No. 200 sieve: 8.4 Specific gravity:

Test Data And Results For Curve DFF-M

Type of test: ASTM D 1557-91 Procedure A Modified
 Mold Dia.: 4.00 in. Hammer Wt.: 10 lb. Drop: 18 in.
 Layers: five Blows per Layer: 25



Max dry den= 131.8 pcf Opt moisture= 8.0 %

Oversize Correction Not Applied



February 8, 2018

Transit Mix Concrete Company
 2596 Highway 96 East
 Pueblo, Colorado 81006

Attention: Mr. Robert Montoya

Subject: Laboratory Test Results
 Hveem Stabilometer and Sulfate Testing
 Project No. DN48,806.001-300

This letter transmits the results of laboratory tests performed on samples delivered to our office on January 23, 2018. The test results transmitted at this time are those requested by Mr. Robert Montoya when the samples were submitted.

The samples were tested in accordance with American Association of State Highway and Transportation Offices (AASHTO). Test results are presented in Table 1 and 1A and in Figs. 1 through 6. Gradation analysis, used in Hveem stabilometer tests were performed by Transit Mix Concrete Company's material laboratory.

TABLE 1

Sample ID	R-Value	Sulfate (%) CDOT Method
Fine Fill, Daniels Sand Pit	75	0.00
Class 1, Pikeview Quarry	83	0.00
Colorado White Fines, Pikeview Quarry	61	0.00
Class 6, Rec. Concrete, Daniels Sand	82	0.02
Class 6 Roadbase, Pikeview Quarry	80	0.01
Class 5 Roadbase, Pikeview Quarry	87	0.02

Should you have any questions regarding these test results, please call.

Very truly yours,

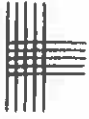
CTL THOMPSON, INC.



Frank Schenck
 Asphalt Laboratory Supervisor

FS/bg

Via email: robert_montoya@transitmix.com



CLIENT NAME Transit Mix Concrete Company

Project No. DN48806.001-300

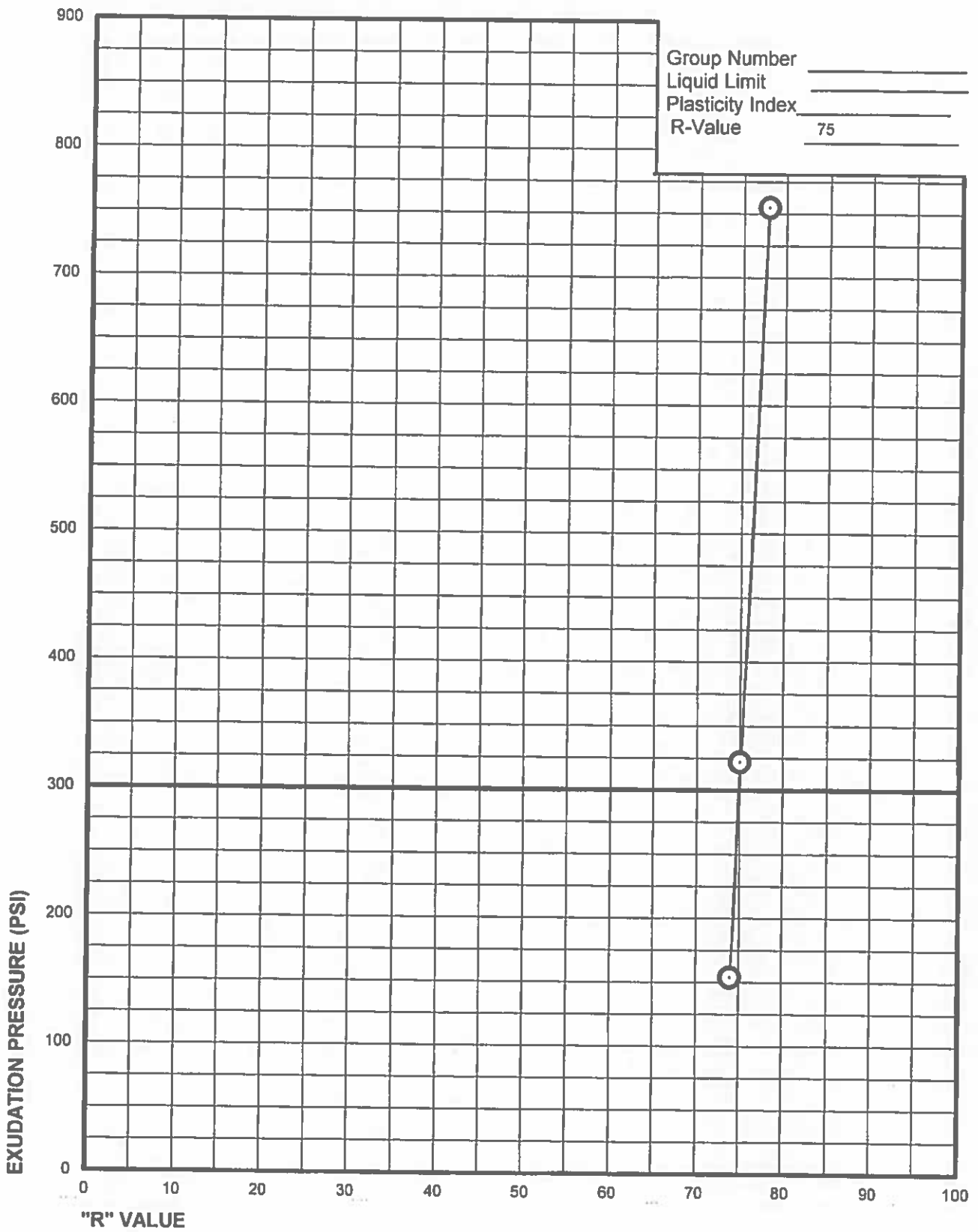
Date Submitted: January 23, 2018

**TABLE 1A
HVEEMSTABILOMETER DATA**

SAMPLE DESIGNATION	COMPACTION PRESSURE (PSI)	ELAPSED TIME TO REACH EXUDATION	SAMPLE DATA		EXUDATION PRESSURE (LBS)	EXPANSION PRESSURE (PSI)	HORIZONTAL PRESSURE AT 2000 LBS	NUMBER OF TURNS (D)	SAMPLE HEIGHT (INCHES)	UNCORRECTED R-VALUE *	CORRECTED R-VALUE
			DENSITY (PCF)	WATER (%)							
Fine Fill	105	0.97	113.2	12.7	1940	154	26	5.04	2.63	72	74
Daniels	105	2.02	114.1	12.0	4040	322	24	5.19	2.63	73	75
Sand Pit	105	4.74	113.9	11.4	9480	755	24	4.75	2.73	75	78
Class 1	200	0.99	131.8	9.9	1980	158	22	4.30	2.54	78	78
Pikeview	200	1.60	131.7	9.6	3200	255	17	4.51	2.55	82	82
Quarry	200	2.35	131.8	8.9	4700	374	15	4.36	2.56	85	85
Colorado White Fines	50	0.89	130.9	10.4	1780	142	121	3.62	2.62	18	19
Pikeview	125	1.90	134.6	8.3	3800	302	47	3.86	2.49	61	61
Quarry	200	2.69	135.8	8.1	5380	428	34	3.84	2.49	71	71
Class 6 Rec. Concrete	200	1.07	103.3	17.1	2140	170	21	7.52	2.56	69	71
Daniels	200	1.82	104.8	16.3	3640	290	14	5.63	2.54	82	82
Sand	200	2.51	105.2	15.2	5020	400	13	6.12	2.56	82	83
Class 6 Roadbase	200	1.74	130.3	9.1	3480	277	14	6.53	2.56	79	80
Pikeview	200	2.90	132.0	8.9	5800	462	13	6.14	2.54	82	82
Quarry	200	3.75	132.3	8.3	7500	597	11	6.62	2.55	84	84
Class 5 Roadbase	200	1.70	137.9	8.0	3400	270	9	5.98	2.45	87	87
Pikeview	200	2.49	137.2	7.5	4980	396	9	5.49	2.49	88	88
Quarry	200	3.50	138.8	6.9	7000	557	10	5.21	2.48	88	88

100
2.5 160-1 +1
D Ph

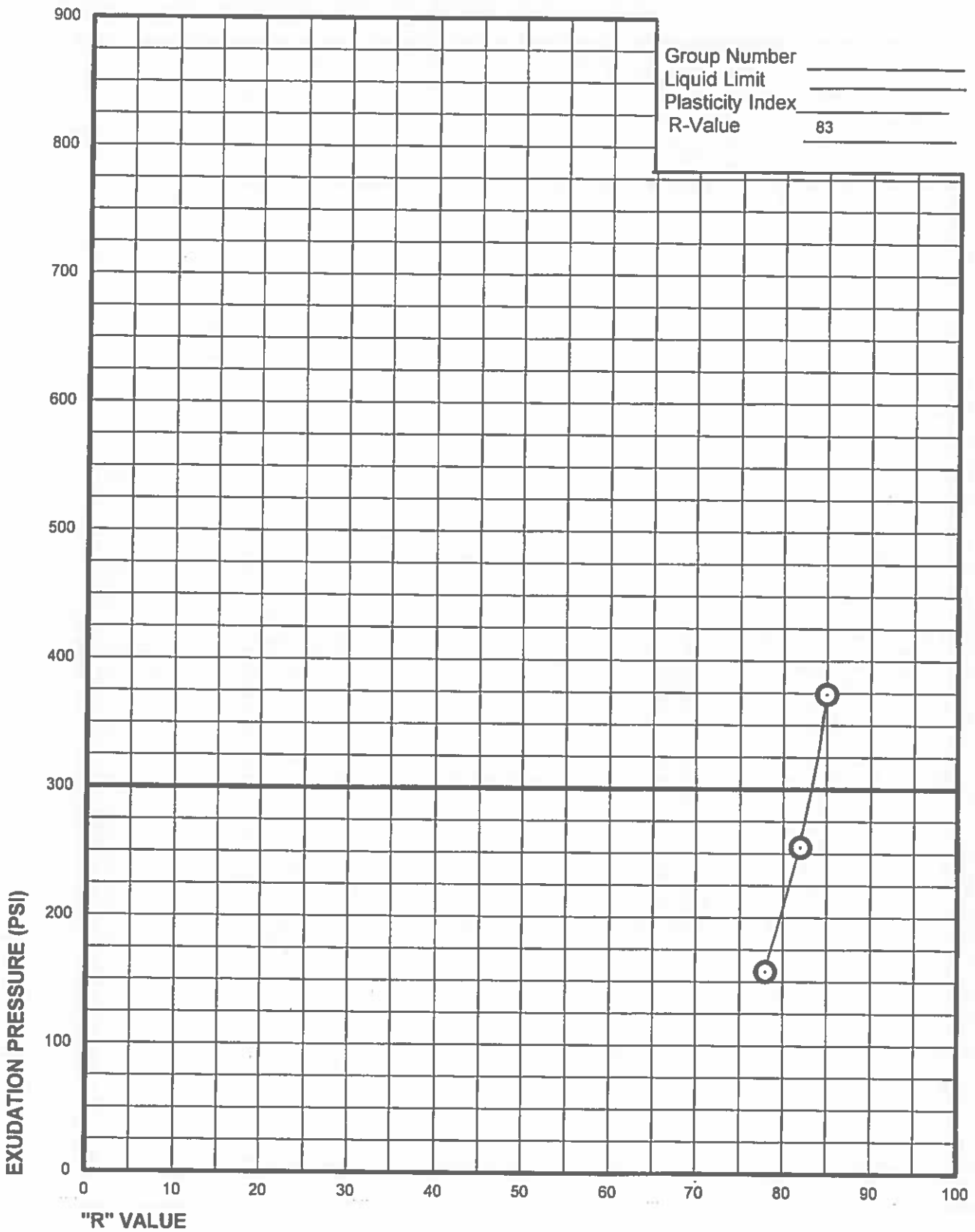
** AT 2,000 Lb. VERTICAL LOAD



Transit Mix Concrete Co.
 Fine Fill, Daniels Sand Pit
 Submitted: January 23rd, 2018

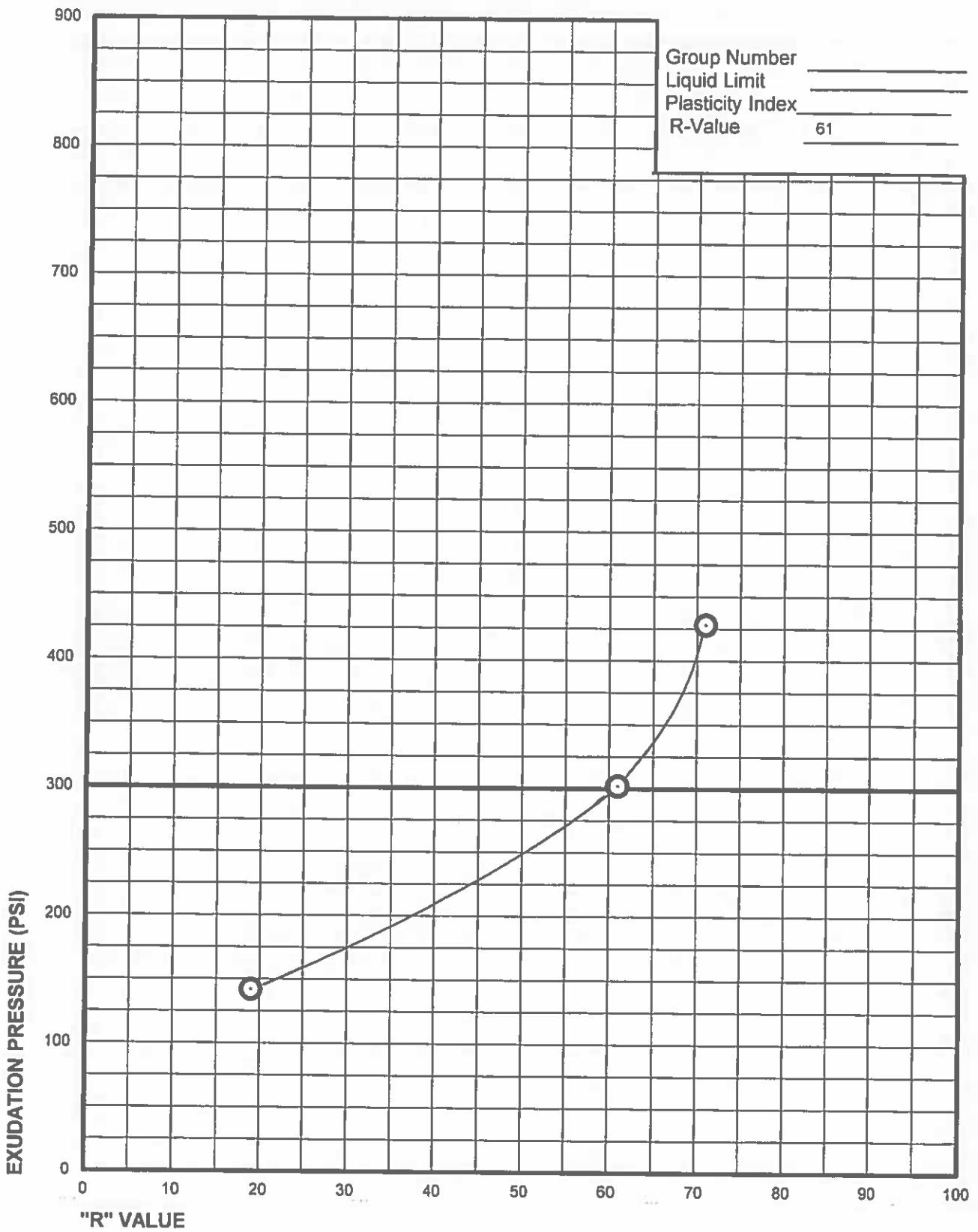
Hveem Stabilometer

Project No. DN48,806.001-300



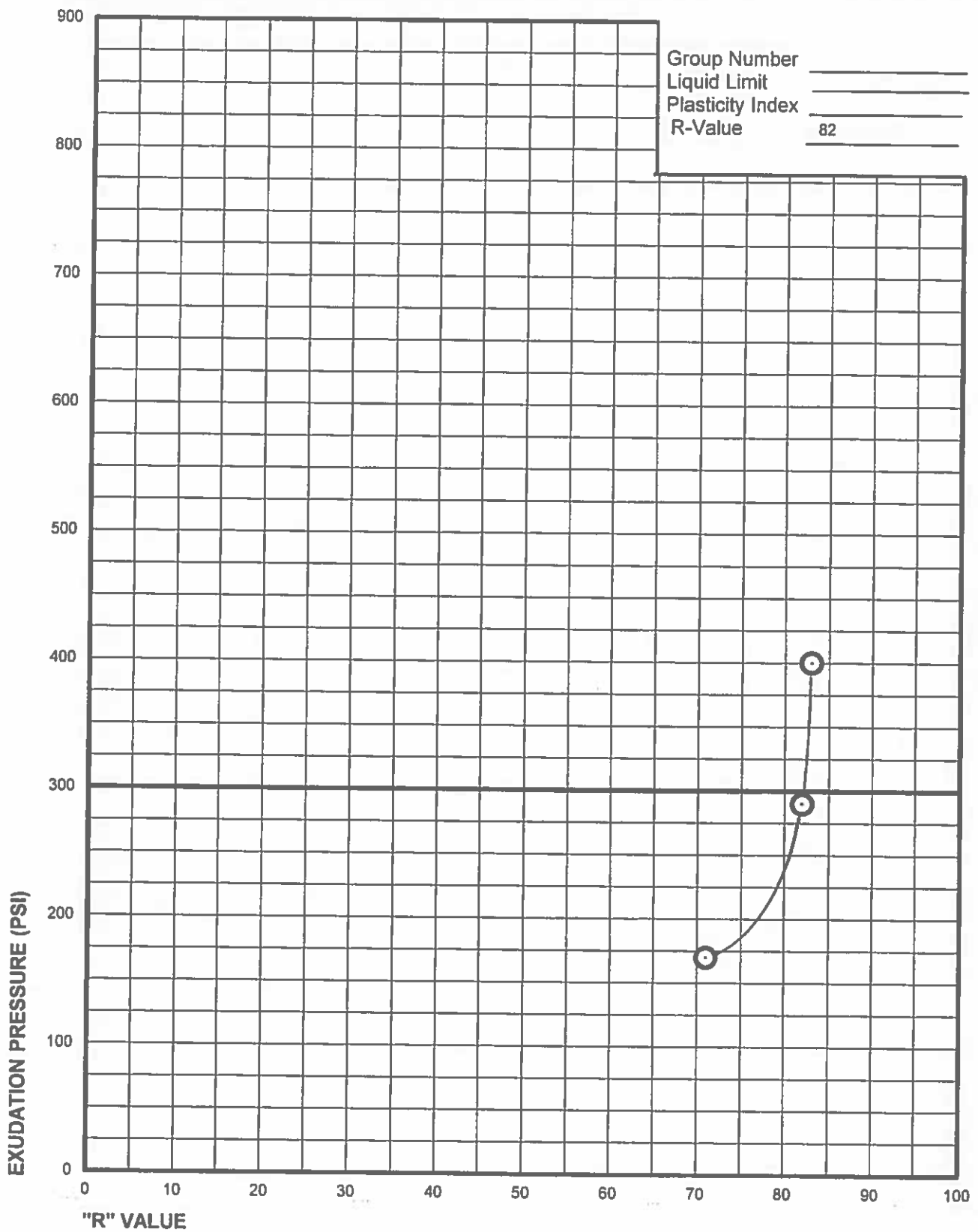
Transit Mix Concrete Co.
 Class 1, Pikeview Quarry
 Submitted: January 23rd, 2018

Hveem Stabilometer



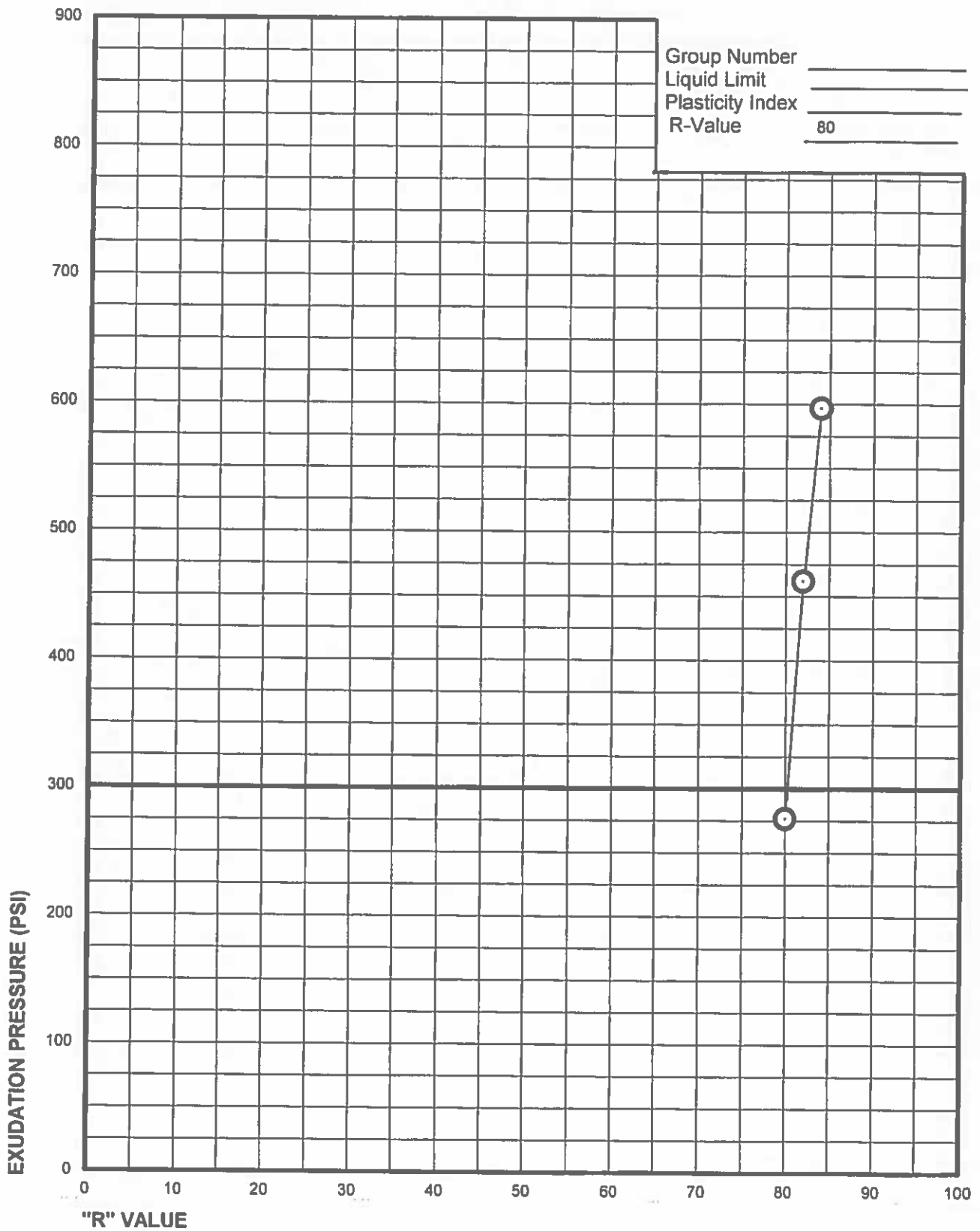
Transit Mix Concrete Co.
 Colorado White Fines, Pikeview Quarry
 Submitted: January 23rd, 2018

Hveem Stabilometer



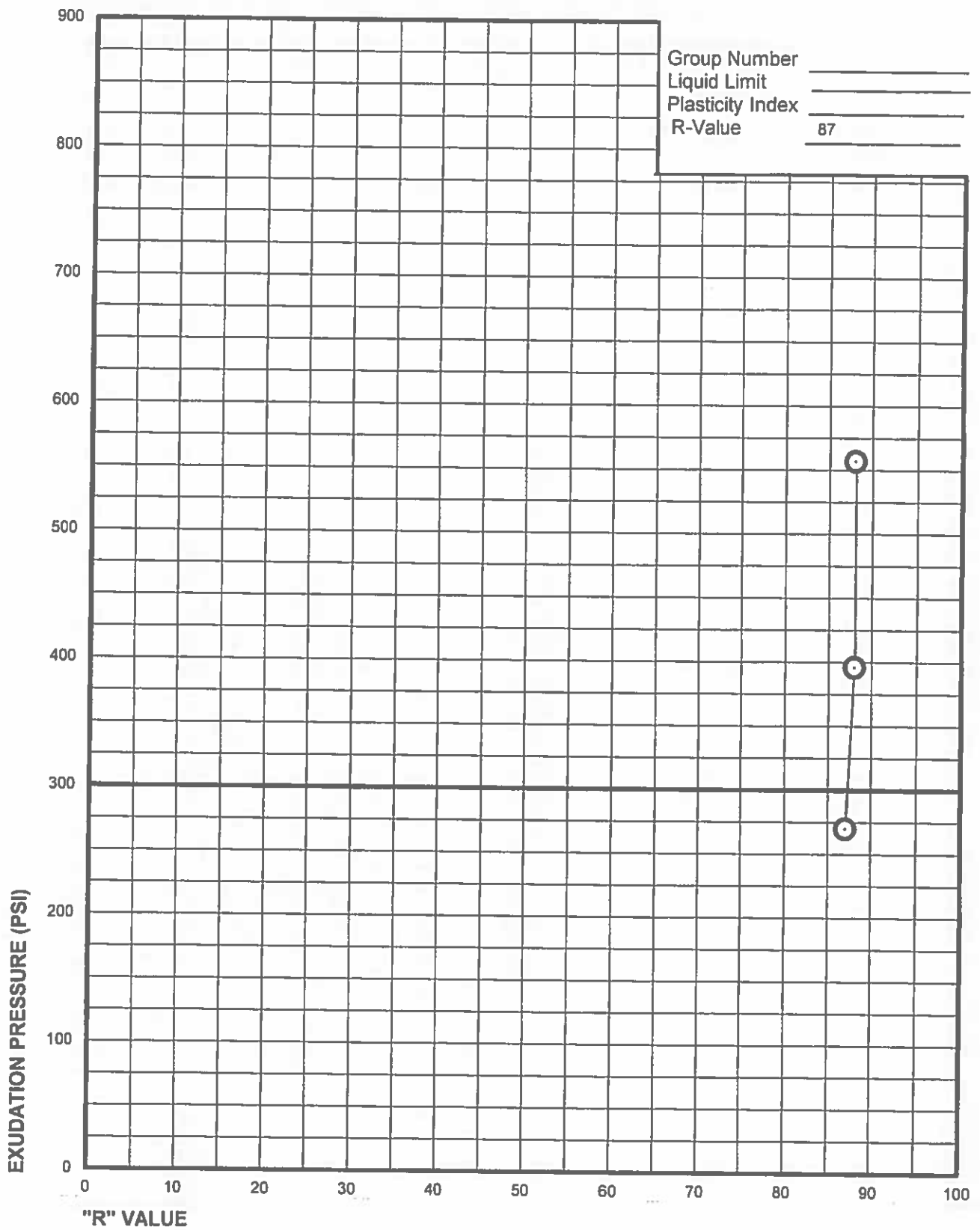
Transit Mix Concrete Co.
 Class 6 Recycled Concrete, Daniels Sand
 Submitted: January 23rd, 2018

Hveem Stabilometer



Transit Mix Concrete Co.
 Class 6 Roadbase, Pikeview Quarry
 Submitted: January 23rd, 2018

Hveem Stabilometer



Transit Mix Concrete Co.
 Class 5 Roadbase, Pikeview Quarry
 Submitted: January 23rd, 2018

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APPENDIX B

1993 AASHTO Empirical Equation for Flexible Pavements

Equation Solver

Variable Descriptions and Typical Values

Precautions

Type in data in the grey boxes and click the calculate button to see the output. To make additional calculations, change the desired input data and click the calculate button again. Click on the text descriptions of the input or output variables for more information.

INPUT

1. Loading

Total Design ESALs (W_{18}):

2. Reliability

Reliability Level in percent (R): ▼

Combined Standard Error (S_0):

3. Serviceability

Initial Serviceability Index (p_i):

Terminal Serviceability Index (p_t):

4. Layer Parameters

Number of Base Layers: ▼

	a	m	M_R	Min. Depth
Surface	<input type="text" value="0.44"/>	1.0	N/A	<input type="text" value="0"/>
Subgrade	N/A	N/A	<input type="text" value="29812"/>	N/A

OUTPUT

1. Calculation Parameters

Standard Normal Deviate (z_R):

Δ PSI:

Design Structural Number (SN):

2. Layer Depths (to the nearest 1/2 inch)

Surface:

Total SN based on layer depths:

[See Solution Details](#)

Comments

[Calculate](#)