HENLEY
JOHNSTON
& ASSOCIATES, INC.
engineering geoscience consultants

01 April 2004

City of Dallas
Public Works and Transportation Department
320 E. Jefferson Blvd.
Room 321
Dallas, Texas 75203

Attention: Ms. Liong T. So, P.E.

Re: Sundial Alley
Geotechnical Testing - ROADBOND EN-1
HJA 7811

Dear Ms. So:

We have completed the testing for the investigation of the effects of Roadbond EN-1 on the soils present at Sundial Alley. One bulk sample of material was obtained from the alley on 17 December 2004. Samples were mixed and allowed to sit for 28 days before testing was started. The materials tested were:

001 Dark gray clay
002 Dark gray clay with 3% Roadbond EN-1
003 Dark gray clay with 3% Roadbond EN-1 and 3% Lime
004 Dark gray clay with 6% Lime

Tests performed on the specimens include: Atterberg Limits (ASTM D 4318), pH (ASTM G 51), Moisture-Density Relationship (ASTM D 698), Permeability (ASTM D 5084) and Pressure-Swell Tests (ASTM D 4546 - modified Method A). Tests were performed at least 28 days after the sample specimens were mixed with the Roadbond EN-1 and/or lime.

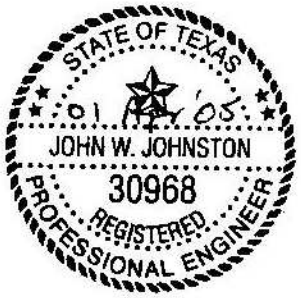
The Atterberg Limits indicate that the Roadbond EN-1 slightly reduced the Liquid Limit and the Plasticity Index (PI) of the material; the lime had a much greater effect in reducing the Plasticity Index of the soil. The pH values tend to reflect that reduction in Plasticity Index, as the natural material had a pH of 8, the material with just Roadbond EN-1 had a pH of 9.1 and the material with lime increased the pH to 11.7 and 12.4 for the Roadbond/lime and the lime mixtures, respectively.

Despite the low permeability of the raw material, 2.4 x 10^{-8} cm/sec, the Roadbond alone reduced the permeability by almost 50 percent. The 3% lime increased the permeability of the 3% Roadbond EN-1 mixture by about two orders of magnitude to about 10^{-6} cm/sec and the 6% lime increased the permeability another two orders of magnitude to nearly 10^{-4} cm/sec.

The swell test results indicate that the Roadbond EN-1 reduced the potential swell by more than 40 percent. Both samples with lime had balancing loads less than the 200 psf minimum pressure utilized for determining swell potential, so the swell is very low on the lime treated specimens.

It does appear that the Roadbond EN-1 has some beneficial effects on expansive soils, and the reduction in permeability may be part of the reason that this soil additive is beneficial. By creating a low permeability zone under pavement, the potential for water accessing the expansive soils below is reduced. In addition, previous testing on another project has shown a long-term strength gain in Roadbond-treated material.

We trust this provides the information you need at this time. Please call us if you have any questions or need additional information.



Sincerely,

John W. Johnston, P.E.
Executive Vice President
Henley-Johnston & Associates, Inc.

Enclosures

SUNDIAL ALLEY
DALLAS, TEXAS

SUMMARY OF LABORATORY TESTS

MATERIAL DESCRIPTIONS

SAMPLE NUMBER	DESCRIPTION
001	Dark gray clay
002	Dark gray clay, with 3% Roadbond EN-1
003	Dark gray clay, with 3% Roadbond EN-1 and 3% Lime
004	Dark gray clay, with 6% Lime

SUMMARY OF INDEX PROPERTIES

SAMPLE NUMBER	LIQUID LIMIT (%)	PLASTICITY INDEX	pH	OPTIMUM MOISTURE (%)	MAXIMUM DRY UNIT WEIGHT (pcf)
001	70	47	8.0	25.8	91.0
002	60	38	9.1	26.9	90.3
003	50	15	11.7	30.3	86.6
004	39	0	12.4	30.4	85.8

SUMMARY OF PERMEABILITY TESTS

SAMPLE NUMBER	MOISTURE CONTENT (AS MOLDED, %)	DRY UNIT WEIGHT (AS MOLDED, pcf)	% MAXIMUM DRY DENSITY	PERMEABILITY (cm/sec)
001	26.0	96.0	100+	2.4E-08
002	27.4	95.9	100+	1.3E-08
003	29.2	77.6	89.6	9.5E-05
004	26.9	77.1	89.9	2.1E-04

SUMMARY OF PRESSURE - SWELL TESTS

SAMPLE NUMBER	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	% MAXIMUM DRY DENSITY	SWELL (%)	SWELL PRESSURE (psf)
001	26.6	92.6	100+	2.26	2069.6
002	27.4	93.8	100+	1.27	1681.5
003	30.0	83.3	96.2	*	64.7
004	28.7	77.0	89.7	*	51.7

* NOTE: BALANCING LOAD LESS THAN 200 psf.

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FIELD COMPACTION TESTS

PROJECT: SUNDIAL ALLEY – CHANNEL TO SUNDIAL
CONTRACTOR: JESKE CONSTRUCTION
LOCATION: DALLAS, TEXAS

HJA JOB No.: 8038
PROJECT No.: PB03R516
DATE: 10/26/05

UTILITY TRENCH		LABORATORY DATA ASTM D 698		FIELD TEST DATA DENSITY: ASTM D 2922 MOISTURE: ASTM D 3017			COMPLIES PROJECT SPECS.	
FIELD IDENT No.	LOCATION / LAYER	OPT MC (%)	STD DEN (pcf)	DRY DEN (pcf)	MC (%)	% DRY DEN	YES	NO
001	Treated Subgrade, Sta. 20+80	20.7	101.0	99.5	19.7	98.5	X	
002	Treated Subgrade, Sta. 22+80	20.7	101.0	101.1	21.1	100.1	X	
003	Treated Subgrade, Sta. 24+50	20.7	101.0	97.2	19.5	96.2	X	
004	Treated Subgrade, Sta. 26+80	20.7	101.0	96.6	22.6	95.6	X	
005	Treated Subgrade, Sta. 1+00	20.7	101.0	101.4	18.9	100.4	X	
006	Treated Subgrade, Sta. 2+25	20.7	101.0	102.0	21.0	101.0	X	
007	Treated Subgrade, Sta. 3+25	20.7	101.0	101.5	21.9	100.5	X	

PROJECT SPECIFICATIONS – Backfill, excludung base.
MOISTURE: RANGE FROM –2% TO +4% FROM OPTIMUM MOISTURE CONTENT
DENSITY: MINIMUM 95 % MAXIMUM DRY DENSITY (ASTM D 698)

WEATHER: CLEAR AND COOL
COMPACTION METHOD:
REMARKS:

TECHNICIAN JAMES R. WESBERRY
ENGINEER
REPORT No. 004D

SHEET 2 OF 2

telephone (214) 941–3808 fax (214) 943–7645 235 Morgan Ave., Dallas, Texas 75203–1025

Monday, October 31st

Tuesday, November 1st

Tuesday November 8th

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FIELD COMPACTION TESTS

PROJECT: SUNDIAL ALLEY – CHANNEL TO SUNDIAL
CONTRACTOR: JESKE CONSTRUCTION
LOCATION: DALLAS, TEXAS

HJA JOB No.: 8038
PROJECT No.: PB03R516
DATE: 11/08/05

UTILITY TRENCH		LABORATORY DATA ASTM D 698		FIELD TEST DATA DENSITY: ASTM D 2922 MOISTURE: ASTM D 3017			COMPLIES PROJECT SPECS.	
FIELD IDENT No.	LOCATION / LAYER	OPT MC (%)	STD DEN (pcf)	DRY DEN (pcf)	MC (%)	% DRY DEN	YES	NO
001	Treated Subgrade, Sta. 10+80	21.4	101.4	104.6	21.5	103.2	X	
002	Treated Subgrade, Sta. 11+60	21.4	101.4	104.9	22.3	103.5	X	
003	Treated Subgrade, Sta. 13+80	21.4	101.4	98.6	24.3	97.2	X	

PROJECT SPECIFICATIONS – Backfill, excludung base.
MOISTURE: RANGE FROM –2% TO +4% FROM OPTIMUM MOISTURE CONTENT
DENSITY: MINIMUM 95 % MAXIMUM DRY DENSITY (ASTM D 698)

WEATHER: CLEAR, SUNNY, 80's

COMPACTION METHOD:

REMARKS:

TECHNICIAN DOUG MATHIES
ENGINEER
REPORT No. 005D

SHEET 2 OF 2

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