BELT LINE RD. SURFACE STUDY

[illegible]

MARSH LANE TO DALLAS NORTH TOLLWAY

[illegible]

[illegible]

To: All Bidders

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

[illegible]

5. [illegible] include an additional pavement wedge milling item. Replace the existing sheet 2 with the new sheet 2 Rev. 1 provided with this addendum.

6. [illegible] add the following sentences: "Any lateral Butt Joint or Wedge Milled edge will [illegible] Temporary asphalt fillets will be either a paper joint with asphalt or cold mix. No [illegible] surfaces will be covered at the end of each day's work." Replace the existing sheet 2 with the new sheet 2 Rev. 1 provided with this addendum.

7. [illegible] Note 7 as follows: "7. Maintain positive drainage. Contractor will phase [illegible] with the new sheet 2 Rev. 1 provided with this addendum.

<u>Items of Clarification:</u>

1. [illegible] of millings at the Arapaho Road Construction site. Arapaho Road is located to [illegible] Road is currently under construction. Archer-Western is the contractor for the [illegible] Western. The Belt Line Road Contractor will need to contact and coordinate [illegible] Contractor responsible for shaping and maintaining milling stockpile(s).

END OF ADDENDUM

SECTION IV

PROPOSAL FORM

[illegible]

PROPOSAL FORM

_____, 20___

To: The Honorable Mayor and Town Council
Town of Addison, Texas

[illegible]

The undersigned bidder, having examined the plans, specifications and contract documents, and [illegible] and [illegible] to furnish all materials and to perform labor and work necessary for completion of the work described by and in accordance with the Plans, Specifications and Contract for the following prices, to wit:

Signed By: _____

[illegible]

The Bidder acknowledges receipt of the following addenda:

Addendum No. 1 Dated: _____

Addendum No. 2 Dated: _____

Addendum No. 3 Dated: _____

Addendum No. 4 Dated: _____

Addendum No. 5 Dated: _____

Addendum No. 6 Dated: _____

[illegible]

PROPOSAL FORM

[illegible] ______________________________

Date ______________________________

[illegible] ______________________________,

a Corporation

organized and existing under the laws of the State of ______________________________.

OR

[illegible] ______________________________,

a partnership consisting of ______________________________

______________________________.

OR

[illegible] ______________________________,

an individual trading as ______________________________.

[illegible]

Proposal of ______________________________,

[illegible] ______________________________

and ______________________________.

TO: Town of Addison, Texas

[illegible] LINE ROAD PAVEMENT REHABILITATION FROM MARSH LANE TO THE DALLAS NORTH TOLLWAY for the Town of Addison, Texas, hereinafter called "Town", in accordance with the plans, specifications and contract documents prepared by HNTB Corporation, will be received at the office of Ms. Minok Suh, Purchasing Coordinator, Finance Building, 5350 Belt Line Road, Addison, Texas until [illegible] p.m. on Tuesday, the [illegible] day of September, [illegible]. Bids received by the appointed time will be opened and read aloud. Any bids received after stated time will be returned unopened.

The undersigned Bidder, having visited the site of the work, having examined the Plans, Specifications, and other Contract Documents, including all Addenda, and being familiar with all of the conditions relating to the proposed project, hereby proposes to furnish all material, supplies, equipment, and appliances specified for the project and to furnish all labor, tools, equipment and incidentals to complete the work in accordance with the Specifications and other Contract Documents at and for the unit prices proposed herein:

The undersigned Bidder agrees that this bid may not be withdrawn for a period of sixty (60) days after the opening of the bids.

In submitting this bid, it is understood by the undersigned Bidder that the right is reserved by the Town of Addison to reject any and all bids.

Name of Bidder

By: _____
(Signature)

_____

Witness: _____
(Signature)

_____
(Office Address of Bidder)

Bidder's Tax I.D. No. or Employer No. _____

SEAL (If Bidder is a Corporation)

NOTES: Sign in ink. Do not detach.

BELTLINE ROAD
PAVEMENT REHABILITATION
MARSH LANE TO DALLAS NORTH TOLLWAY

ITEM NO.	DESCRIPTION & UNIT PRICE IN WORDS	UNIT	UNIT PRICE	EST. QTY.	AMOUNT BID
1	Remove and Replace 6" Thick Reinf. Conc. Pavement	SY		35	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
2	Hot Mix Asphalt, Type D, 2" (PG 76-22)	SY		100,300	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
3	Prime Coat	Gal.		8,100	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
4	Pavement Wedge Milling (6' Milling Limit)	LF		20,100	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
5	Pavement Wedge Milling (10' min. Milling Limit)	LF		18,300	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
6	Pavement Butt Joint and Intersection Milling	SY		6,600	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				

BELTLINE ROAD
PAVEMENT REHABILITATION
MARSH LANE TO DALLAS NORTH TOLLWAY

ITEM NO.	DESCRIPTION & UNIT PRICE IN WORDS	UNIT	UNIT PRICE	EST. QTY.	AMOUNT BID
7	Reinforced High Density Stress Relief Interlayer	LF		59,250	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
8	Adjust Manhole Castings	Ea.		15	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
9	Adjust Valve Boxes	Ea.		64	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
10	Traffic Control	LS		1	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
11	Traffic Markers (4" Lead Acrylic Reflectorized)	Ea.		950	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
12	Traffic Markers (4" Round Ceramic Buttons)	Ea.		7,850	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				

ITEM NO.	DESCRIPTION & UNIT PRICE IN WORDS	UNIT	UNIT PRICE	EST. QTY.	AMOUNT BID
13	Thermoplastic Reflectorized Stop Bars (24" Wide)	LF		1,755	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
14	Painted Reflectorized Crosswalks (6" Wide)	LF		2,960	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
15	Thermoplastic Reflectorized Puppy Tracks (6" Wide)	LF		1,120	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
16	Thermoplastic Reflectorized Words/Symbols	Ea.		31	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
17	Thermoplastic Reflectorized Left Turn Arrows	Ea.		56	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
18	Thermoplastic Reflectorized Right Turn Arrows	Ea.		16	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				

BELTLINE ROAD
PAVEMENT REHABILITATION
MARSH LANE TO DALLAS NORTH TOLLWAY

ITEM NO.	DESCRIPTION & UNIT PRICE IN WORDS	UNIT	UNIT PRICE	EST. QTY.	AMOUNT BID
19	Thermoplastic Reflectorized Straight Arrows	Ea.		6	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
20	Thermoplastic Reflectorized Combined Right	Ea.		3	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
21	Pavement Marking Contingency	LS	$ 4,000.00	1	$ 4,000.00
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				
22	Railroad Coordination	LS		1	
	Complete in Place, for the Sum of _____ _____Dollars and _____ Cents per unit				

TOTAL AMOUNT BID FOR MATERIALS AND SERVICES, ITEMS 1 THROUGH 22, INCLUSIVE $ _____

WRITTEN IN WORDS:

_____

_____

NOTES:

1. All items, labor, materials, equipment, facilities, incidentals, and work required for construction of the project are to be provided and installed by the Contractor as part of the project and payment for the cost of such shall be included in the price bid for the construction of the project.

2. Prices must be shown in words and figures for each item listed in this proposal. In the event of discrepancy, the words shall control.

3. It is understood the the Bid Security shall be collected and retained by the Owner as liquidated damages in the event a contract is made by the Owner based on this proposal within ninety (90) calendar days after receiving bids and the undersigned fails to execute the contract and required bonds within two (2) days from the date the Contractor is notified and has received the conformed documents. After this period, if the contract has been executed and the required bonds have been submitted, the said Bid Security shall be returned to the undersigned upon demand.

Bidder's Tax I.D. No. or Employer No.: _____

(g) Placing. The asphaltic mixture shall be placed on the approved base course with the previously specified spreading and finishing machine in such manner that, when properly compacted, the finished course shall comply with the maximum thickness requirements, be smooth and of uniform density, and meet the requirements of the typical cross sections and the surface test. During the placing and spreading of the asphaltic material, care shall be taken to prevent the spilling of the material onto adjacent pavement, gutters or structures.

In small areas, which are inaccessible to the spreading and finishing machine, hand spreading may be authorized by the OWNER, provided an acceptable surface can be obtained.

(h) Compaction. Rolling with the 3-wheel and tandem roller shall start longitudinally at the sides and proceed toward the center of the surface course, overlapping on successive trips by at least half the width of the rear wheels. Alternate trips of the roller shall be slightly different in length. Rolling with the pneumatic tire roller shall be done as directed by the OWNER. Rolling shall continue until no further compression can be obtained and all roller marks are eliminated. The motion of the rollers shall be slow enough at all times to avoid displacement of the asphaltic surface material. If displacement should occur, it shall be corrected at once by the use of rakes and fresh asphaltic mixtures where required. The roller shall not be allowed to stand on the surface course when it has not been fully compacted and allowed to cool. To prevent adhesion of the surface course to the roller, the wheels shall be kept thoroughly moistened with water, but an excess of water shall not be permitted. All rollers must be in good mechanical condition. All necessary precautions shall be taken to prevent the dripping of gasoline, oil, grease or other foreign matter on the surface course while the rollers are in motion or when standing. In areas where the surface course cannot be compacted with the rollers, hand tamps, lightly oiled, shall be used to secure the required compaction.

With approval by the OWNER, the virbratory steel wheel roller may be substituted for the 3-wheel roller and tandem roller. Each course, after final compaction, shall have a density of not less than 95 percent of the density developed in the laboratory test method outlined in Texas State Department of Highways and Public Transportation Bulletin C-14.

(i) Surface Tests. The finished surface of the pavement after compression shall be smooth and true to the established line, grade and cross section. When tested with a 16 ft. (5 m) straightedge placed parallel to the centerline of the roadway, the finished surface shall have no deviation in excess of $^1/_{16}$ in per foot (5 mm per m) from the nearest point of contact. The maximum ordinate measured from the face of the straightedge shall not exceed $^1/_4$ in. (6 mm) at any point. Any point in the pavement surface not meeting these requirements shall be immediately corrected.

(j) Pavement Thickness Test. Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness test shall be made by the OWNER or his authorized representative unless otherwise specified in the special provisions or in the plans. The number and location of tests shall be at the discretion of the OWNER. The cost for the initial pavement thickness test shall be at the expense of the OWNER. In the event a deficiency in thickness of pavement is revealed during normal testing operations, subsequent tests necessary to isolate the deficiency shall be at the CONTRACTOR'S expense. The cost for the additional coring test shall be at the same rate charged by commercial laboratories.

5.7.5. MEASUREMENT AND PAYMENT

Prime coat and tack coat shall not be measured for direct payment but shall be considered as subsidiary work pertaining to the placing of asphaltic mixtures of the type specified.

Hot-mix asphaltic concrete material shall be measured by the ton complete in place, of 2,000 lb. (900 kg), computed at 110 lb./S.Y. per inch or by the square yard (m^2) of the type or types used in the completed and accepted work. Weight shall be determined by a certified scale approved by the OWNER and recorded on serially numbered weight tickets, identifying the vehicle and presented to the OWNER'S representative on the job. Work performed and

GENERAL NOTES:

CONTRACTOR SHALL PREPARE AND IMPLEMENT A TRAFFIC CONTROL PLAN FOR ALL WORK WITHIN STREET RIGHT-OF-WAY. TRAFFIC CONTROL PLAN SHALL CONFORM TO THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES. CONTRACTOR AT ALL TIMES SHALL PROVIDE BARRICADES, WARNING SIGNS, FLAGGERS AND LIGHTING ADEQUATE TO SAFEGUARD THE PUBLIC FROM ANY HAZARDS.

ANY STREET RIGHT-OF-WAY, OR OTHER PROPERTY DAMAGED BY THE CONTRACTOR OR HIS SUBCONTRACTOR SHALL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER AT NO ADDITIONAL COST TO THE CONTRACT.

ALL ADJACENT PROPERTY DAMAGE BY THE PROPOSED CONSTRUCTION SHALL BE RESTORED TO EQUAL OR BETTER CONDITION THAN WHICH IT WAS FOUND BEFORE SUCH WORK WAS UNDERTAKEN (NON-PAY ITEM).

CONTRACTOR SHALL EMPLOY A QUALIFIED ENGLISH SPEAKING PROJECT MANAGER WHO WILL BE RESPONSIBLE FOR DIRECTING ALL WORK CREWS. PROJECT MANAGER SHALL REMAIN ON THE JOB AT ALL TIMES, IN ORDER TO SUPERVISE THE WORK OF ALL SUB-CONTRACTORS, AS WELL AS THE CONTRACTOR'S OWN WORK CREWS.

CONTRACTOR SHALL REMOVE ALL SURPLUS DIRT, DEBRIS, TRASH, ETC., FROM THE SITE AND DISPOSE OF IT LEGALLY OFFSITE. REMOVE ALL EQUIPMENT AT THE COMPLETION OF EACH DAY'S WORK. ALL WORK AREAS SHALL BE CLEANED UP AT THE COMPLETION OF EACH DAY'S WORK.

TRAFFIC AND ACCESS CONTROL:

THE CONTRACTOR, AT ALL TIMES SHALL PROVIDE BARRICADES, WARNING SIGNS, FLAGGERS AND LIGHTING ADEQUATE TO SAFEGUARD THE PUBLIC FROM ANY HAZARDS.

THE CONTRACTOR SHALL MAINTAIN, AT ALL TIMES, AT LEAST ONE LANE OF TRAFFIC OPEN IN EACH DIRECTION TO PERMIT LOCAL TRAFFIC FLOW.

THE CONTRACTOR SHALL PROVIDE ACCESS TO ALL BUSINESS LOCATIONS AT ALL TIMES DURING THE CONSTRUCTION. CLOSURE OF DRIVEWAYS DUE TO CONSTRUCTION OPERATIONS WILL BE ALLOWED ON A LIMITED TIME BASIS SUBJECT TO APPROVAL OF THE OWNER AND ENGINEER.

THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL CROSS STREETS. CLOSURE OF CROSS STREETS DUE TO CONSTRUCTION OPERATIONS WILL BE ALLOWED ON A LIMITED TIME BASIS SUBJECT TO APPROVAL OF THE OWNER AND ENGINEER.

RAISED TRAFFIC MARKERS:

CONTRACTOR TO REMOVE AND REPLACE ALL RAISED TRAFFIC MARKERS ON THIS PROJECT. REMOVE EXISTING RAISED TRAFFIC MARKERS IN ACCORDANCE WITH TXDOT STANDARD SPECIFICATION ITEM 677 OR LATEST REVISION. COST OF REMOVAL IS SUBSIDIARY TO CONSTRUCTION.

REVIEW EXISTING RAISED TRAFFIC MARKER LOCATIONS WITH ENGINEER PRIOR TO REMOVAL. UNLESS OTHERWISE DIRECTED BY ENGINEER, PROVIDE NEW RAISED TRAFFIC MARKERS TO MATCH PREVIOUSLY REMOVED RAISED TRAFFIC MARKERS).

PREPARE PAVEMENT SURFACE FOR NEW RAISED TRAFFIC MARKERS IN ACCORDANCE WITH TXDOT STANDARD SPECIFICATION ITEM 678 OR LATEST REVISION. COST IS SUBSIDIARY TO CONSTRUCTION.

CONTRACTOR TO USE NEW RAISED TRAFFIC MARKER PATTERN, SEE DETAIL ON PAGE 3 OF THIS SET OF PLANS. INSTALL RAISED TRAFFIC MARKERS IN ACCORDANCE WITH TXDOT SPECIFICATION ITEM 672 OR LATEST REVISION. INSTALL RAISED TRAFFIC MARKERS USING TRAFFIC MARKER ADHESIVE.

NON-REFLECTORIZED MARKERS: 4" ROUND CERAMIC; WHITE.

REFLECTORIZED MARKER: 4"X4"X0.70"; WHITE WITH ONE SIDE REFLECTIVE.

TRAFFIC MARKER ADHESIVE: BITUMINOUS ADHESIVE MEETING TXDOT MATERIAL SPECIFICATION DMS-6130.

PAVEMENT MARKINGS:

CONTRACTOR TO REMOVE AND REPLACE PAVEMENT MARKINGS ON THE PROJECT. REMOVE EXISTING PAVEMENT MARKINGS IN ACCORDANCE WITH TXDOT STANDARD SPECIFICATION ITEM 677 OR LATEST REVISION. COST IS SUBSIDIARY TO CONSTRUCTION.

REVIEW EXISTING PAVEMENT MARKING LOCATIONS WITH OWNER AND ENGINEER PRIOR TO REMOVAL. PROVIDE NEW PAVEMENT MARKINGS TO MATCH PREVIOUSLY REMOVED PAVEMENT MARKER LOCATIONS UNLESS OTHERWISE DIRECTED BY OWNER AND ENGINEER.

PREPARE PAVEMENT SURFACE FOR NEW PAVEMENT MARKINGS IN ACCORDANCE WITH TXDOT STANDARD SPECIFICATION ITEM 678 OR LATEST REVISION. COST IS SUBSIDIARY TO CONSTRUCTION.

INSTALL PAVEMENT MARKINGS IN ACCORDANCE WITH TXDOT STANDARD SPECIFICATION ITEM 668 OR LATEST REVISION.

PAVEMENT MARKINGS (CROSSWALK DELINEATIONS, STOP BARS AND TRAFFIC SYMBOLS SHALL BE THERMOPLASTIC MATERIAL MEETING TXDOT MATERIALS SPECIFICATION DMS-8220.

CONTRACTOR SHALL USE ITEM 20 - PAVEMENT MARKING CONTINGENCY FOR REPLACEMENT AND MATCHING OF ALL EXISTING TRAFFIC MARKERS/BUTTONS AND STRIPES REMOVED ON SIDE STREETS AND DRIVES.

TEMPORARY PAVEMENT MARKINGS:

WHEN EXISTING PAVEMENT MARKINGS ARE REMOVED FOR CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE TEMPORARY PAVEMENT MARKINGS AT THE END OF EACH NIGHT'S WORK BEFORE OPENING THE STREET TO MORNING TRAFFIC. COST IS SUBSIDIARY TO BID ITEM FOR TRAFFIC CONTROL.

CONTRACTOR TO PROVIDE TEMPORARY MARKINGS IN ACCORDANCE WITH THE REQUIREMENTS OF ITEM 662 OF THE TXDOT STANDARD SPECIFICATIONS.

CONTRACTOR TO REMOVE TEMPORARY PAVEMENT MARKINGS AT THE CONTRACTOR'S EXPENSE IN ACCORDANCE WITH ITEM 677 OF THE TXDOT STANDARD SPECIFICATIONS. COST IS SUBSIDIARY TO BID ITEM FOR TRAFFIC CONTROL.

CONSTRUCTION PHASING:

1. THE CONTRACTOR SHALL SUBMIT AN ASPHALT PAVING PLAN TO THE ENGINEER FOR APPROVAL. SCHEDULE EACH DAY'S WORK TO COMPLETE ASPHALT PAVING TO LIMITS OF PAVEMENT WEDGE MILLING OR INTERSECTION MILLING FOR THAT DAY OR PROVIDE TEMPORARY ASPHALT FILLET AT PAVEMENT WEDGE MILLING OR INTERSECTION
⚠ MILLING EDGE. ANY LATERAL BUTT JOINT OR WEDGE MILLED EDGE WILL NOT HAVE A STANDING EDGE AND WILL BE FILLED WITH A TEMPORARY ASPHALT FILLET. TEMPORARY ASPHALT FILLETS WILL EITHER BE A PAPER JOINT WITH ASPHALT OR COLD MIX. NO MILLED CONCRETE WILL BE USED FOR THE TEMPORARY FILLET. ALL MAIN LANE MILLED SURFACES WILL BE COVERED AT THE END OF EACH DAY'S WORK. THE COST OF TEMPORARY FILLET IS SUBSIDIARY TO CONSTRUCTION.

2. SIGNS, BARRICADES, FLAGGERS AND WARNING DEVICES, AS NECESSARY FOR CONSTRUCTION, SHALL CONFORM TO THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

3. CONSTRUCTION SHOULD BE IN ACCORDANCE WITH ALL TOWN OF ADDISON CONSTRUCTION SPECIFICATIONS, THE THIRD EDITION OF THE NCTCOG STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, AND AS DESCRIBED IN THE SPECIFICATIONS.

4. THE CONTRACTOR SHALL KEEP OPEN, ALONG ENTIRE PROJECT, THE SAME TRAFFIC LANE SO AS TO MAINTAIN TRAFFIC CONSISTENCY AND PREVENT MOTORISTS FROM HAVING TO SWITCH LANES AND WEAVE IN AND OUT AND AROUND BARRELS OR BARRICADES.

5. LIMIT COMPLETE ACCESS CLOSURE TO BUSINESSES LIMITED TO AFTER HOURS OF OPERATION. SCHEDULE WORK ALONG OPEN BUSINESS LOCATIONS TO MINIMIZE ACCESS CLOSURE TIMEFRAMES. PROVIDE ADDITIONAL FLAGGERS AS NECESSARY.

6. CONSTRUCTION SIGNS SHALL BE REMOVED UPON COMPLETION OF THE WORK. INDIVIDUAL WARNING SIGNS SHALL BE REMOVED, TURNED AWAY FROM THE VIEW OF TRAFFIC, OR COVERED WHENEVER THE SPECIFIC DANGER OF WHICH THE PARTICULAR SIGN WARNS HAS CEASED TO EXIST, EITHER PERMANENTLY OR TEMPORARILY. THE SIGN MUST BE PROMPTLY REPLACED, TURNED INTO VIEW, OR UNCOVERED WHEN THE SITUATION AGAIN BECOMES A POTENTIAL DANGER.

⚠ 7. MAINTAIN POSITIVE DRAINAGE. CONTRACTOR WILL PHASE CONSTRUCTION IN SUCH A WAY THAT WILL NOT POND WATER.

SUMMARY OF QUANTITIES

NO.	DESCRIPTION	QUANTITY	UNIT
1	REMOVE AND REPLACE 8" THICK REINFORCED CONCRETE PAVEMENT	35	S.Y.
2	HOT MIX ASPHALT, TYPE D, 2", QPC 76-22I	100,300	S.Y.
3	PRIME COAT	8,900	GAL.
⚠ 4	PAVEMENT WEDGE MILLING (8" MILLING LIMIT)	29,100	L.F.
⚠ 5	PAVEMENT WEDGE MILLING (10" MILLING LIMIT)	16,300	L.F.
6	PAVEMENT BUTT JOINT AND INTERSECTION MILLING	6,600	S.Y.
7	REINFORCED HIGH DENSITY STRESS RELIEF INTERLAYER	58,250	L.F.
8	ADJUST MANHOLE CASTINGS	15	EA.
9	ADJUST VALVE BOXES	84	EA.
10	TRAFFIC CONTROL	1	L.S.
11	TRAFFIC MARKERS (4" LEAD ACRYLIC REFLECTORIZED)	950	EA.
12	TRAFFIC MARKERS (4" ROUND CERAMIC BUTTONS)	7,800	EA.
13	THERMOPLASTIC REFLECTORIZED STOP BARS (24" WIDE)	1,755	L.F.
14	PAINTED REFLECTORIZED CROSSWALKS (6" WIDE)	2,950	L.F.
15	THERMOPLASTIC REFLECTORIZED PUPPY TRACKS (6" WIDE)	1,120	L.F.
16	THERMOPLASTIC REFLECTORIZED WORDS / SYMBOLS	31	EA.
17	THERMOPLASTIC REFLECTORIZED LEFT TURN ARROWS	58	EA.
18	THERMOPLASTIC REFLECTORIZED RIGHT TURN ARROWS	18	EA.
19	THERMOPLASTIC REFLECTORIZED STRAIGHT ARROWS	6	EA.
20	THERMOPLASTIC REFLECTORIZED COMBINED RIGHT	3	EA.
21	PAVEMENT MARKING CONTINGENCY	1	L.S.
22	RAILROAD COORDINATION	1	L.S.

PAVEMENT REPAIR:

1. THE CONTRACTOR SHALL REPAIR PAVEMENT AREAS AHEAD OF PAVEMENT MILLING AND ASPHALT PAVING.

2. PAVEMENT REMOVAL AND REPLACEMENT SHALL BE FULL DEPTH. MINIMUM PAVEMENT REMOVAL SIZE SHALL BE 4'X4' TO ALLOW FOR PAVEMENT DOWELS.

3. PROVIDE FULL-DEPTH PAVEMENT REPAIR IN ACCORDANCE WITH THE TOWN OF ADDISON FULL-DEPTH REPAIR OF EXISTING CONCRETE PAVEMENT.

4. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROTECT ALL PUBLIC UTILITIES IN THE CONSTRUCTION OF THIS PROJECT. ALL MANHOLES, CLEANOUTS, VALVE BOXES, ETC., MUST BE ADJUSTED TO PROPER LINE AND GRADE BY THE CONTRACTOR AFTER THE PLACING OF PERMANENT PAVING.

THE SEAL ON THIS DOCUMENT WAS AUTHORIZED BY W.M. SCOTT FORBES P.E.# 97223 ON 23-SEP-2004

NO.	DATE	REVISION	APPROV.
1	9/29/04	ADDENDUM NO. 1	WSF

HNTB

BELT LINE ROAD

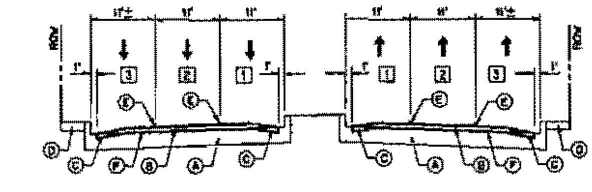
MARSH LANE TO DALLAS NORTH TOLLWAY

GENERAL NOTES AND QUANTITIES

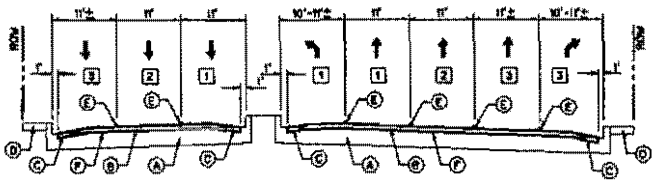
TOWN OF ADDISON, TEXAS

Design WSF	Drawn DFB	DATE	SCALE	PROJECT NO.	SHEET NO.
Check JSH	Drawn WSF	SEPT 21	AS N	02218	2 REV. 1

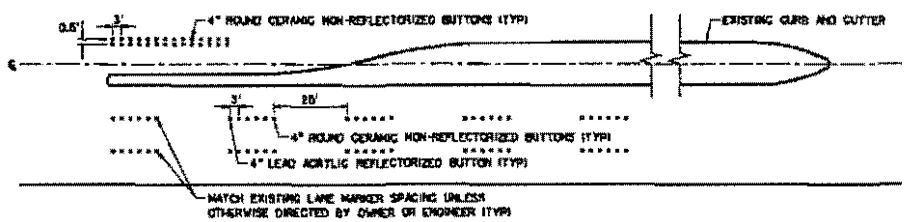
1 OF 1



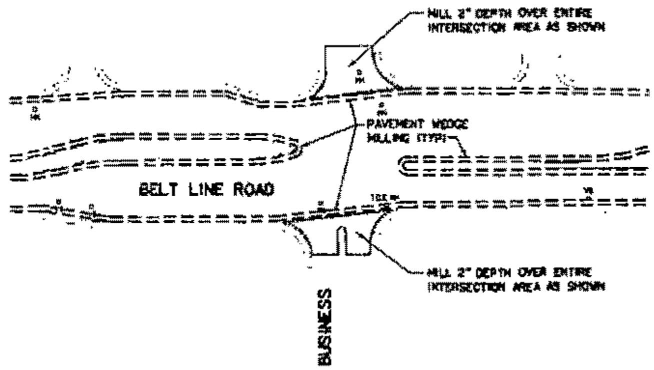
TYPICAL SECTION AT MIDBLOCK
NTS



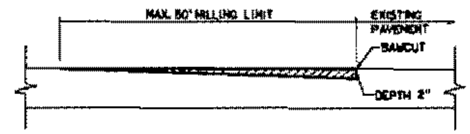
TYPICAL SECTION AT INTERSECTION
NTS



TRAFFIC BUTTONS/MARKERS
NTS

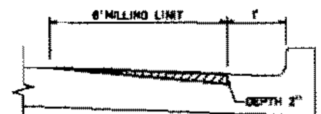


TYPICAL SECTION - PAVEMENT MILLING THROUGH INTERSECTION
NTS



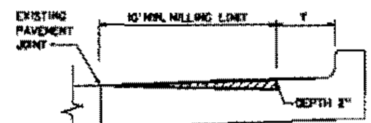
NOTE:
COST FOR SAWCUT FOR BUTT JOINT IS SUBSIDIARY TO PAVEMENT MILLING.

BUTT JOINT PAVEMENT MILLING
VARIABLE DEPTH 0" TO 2"
NTS



NOTE:
USE FOR OUTSIDE TRAVEL LANES.

6' WEDGE MILLING △
VARIABLE DEPTH 0" TO 2"
NTS



NOTE:
USE FOR INTERNAL TRAVEL LANES, LEFT TURN LANES, USE FOR RIGHT TURN LANES AT STA 98+00 TO MAINTAIN POSITIVE DRAINAGE.

10' WEDGE MILLING △
VARIABLE DEPTH 0" TO 2"
NTS

LEGEND:

- (A) EXISTING PORTLAND CEMENT CONCRETE PAVEMENT
- (B) 2" THICK ASPHALTIC CEMENT CONCRETE PAVEMENT, TYPE D
- (C) PAVEMENT PLANING, VARIABLE DEPTH
- (D) EXISTING SIDEWALK
- (E) PAVEMENT MARKING
- (F) PRIME COAT

CONSTRUCTION PHASING INDEX*

- [1] INTERIOR TRAVEL LANE AND LEFT TURN LANES
- [2] MIDDLE TRAVEL LANES
- [3] OUTSIDE TRAVEL LANE AND RIGHT TURN LANES

*SEE SPECIFICATIONS FOR NIGHT CONSTRUCTION HOURS OF OPERATION FOR EACH LANE.

THE SEAL ON THIS DOCUMENT WAS AUTHORIZED BY WM. SCOTT FORBES P.E.# 87723 ON 23-SEP-2004

NO.	DATE	REVISION	APPR.
1	8/23/04	ADDENDUM NO. 1	

HNTB

BELT LINE ROAD
MARSH LANE TO DALLAS NORTH TOLLWAY
TYPICAL SECTIONS AND DETAILS
TOWN OF ADDISON, TEXAS

1 OF 1

TOWN OF ADDISON
BELT LINE ROAD PAVEMENT REHABILITATION
PRE-BID MEETING AGENDA

September 21, 2004; 2:00 PM

1. Introductions

2. General Project Discussion and Review of Project Limits

3. Staging Area

4. Nighttime Construction (Hours of Operation)

5. Construction Phasing

6. Railroad Coordination

7. Traffic Control
   - Access Control
   - Intersection Control

8. PCC Pavement Repair

9. Milling
   - Disposal Site
   - Protection of Standing Edge
   - Traffic Signal Loops

10. Transverse Joint and Random Crack Protection
    - Material
    - Installation

11. Manhole and Valve Box Adjustment

12. Final Pavement Markings
    - Coordinate in Field

13. Contract Period and Schedule
    - Start: October 17th
    - 25 Calendar Days
    - Contractor's Bond Requirements

14. Incentive/Disincentive

15. Questions/Comments

ADVERTISEMENT FOR BIDS
Bid # 04-33

The Town of Addison is requesting bids for **Resurfacing Belt Line Rd., Bid No. 04-33**. MANDATORY Pre Bid meeting Tuesday, September 21, 2004 2:00pm at, Service Center, 16801 Westgrove Dr. Bids will be accepted until 2:00pm, Tuesday, September 28, 2004 at the office of the Purchasing Coordinator, 5350 Belt Line Rd., Addison, Texas 75254 at which time they will be publicly opened and read aloud. Late bids will not be considered and will be returned unopened.

The Town of Addison reserves the right to waive any formalities and to reject any or all bids and to select the bid deemed most advantageous to the City. Bid information is available on www.demandstar.com or www.ci.addison.tx.us.

54210 OK To Pay RJ

PBS&J

May 15, 2002
Project No: 450868.00
Invoice No: 0160131

Town of Addison
Attn: Steven Z. Chutchian
PO Box 9010
Addison TX 75001

Project: 450868.00 Beltline Surface Condition Study

Professional Services: April 1, 2002 through April 30, 2002

Task: 01 Project Management

Fee

Total Fee	14,900.00			
Percent Complete	93.00	Total Earned	13,857.00	
		Previous Fee Billing	12,963.00	
		Current Fee Billing	894.00	
		Total Fee		894.00
			Total this task	$894.00
			Total this invoice	$894.00

Billings to date	**Current**	**Prior**	**Total**
Fee	894.00	12,963.00	13,857.00
Totals	**894.00**	**12,963.00**	**13,857.00**

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: 5/20/02 Claim # _____ Check $ 894.00

Vendor No. _____
Vendor Name PBS & J
Address P.O. Box 951422
Address DALLAS, TX
Address 75395-1422
Zip Code _____

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
INV. 0160131	01	411	54210	00000		894.00

894.00
TOTAL 0.00

EXPLANATION Belt Line Condition Study

Authorized Signature

Finance

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: 2/20/02 **Claim #** _____ **Check $** 4,470.00

Vendor No. _____

Vendor Name PBSJ

Address P.O. BOX 951422

Address DALLAS, TEXAS

Address _____

Zip Code 75395-1422

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
# 0153000	01	411	56570			4,470.00

TOTAL 4,470.00

EXPLANATION BELT LINE RD. CONDITION STUDY

Steve Chutchian
Authorized Signature

Finance

PBS&J

February 15, 2002
Project No: 450868.00
Invoice No: 0153000

Town of Addison
Attn: Steven Z. Chutchian
PO Box 9010
Addison TX 75001

Project: 450868.00 Beltline Surface Condition Study

Professional Services: January 1, 2002 through January 31, 2002

Task: 01 Project Management

Fee

Total Fee	14,900.00			
Percent Complete	80.00	Total Earned	11,920.00	
		Previous Fee Billing	7,450.00	
		Current Fee Billing	4,470.00	
		Total Fee		**4,470.00**

Total this task **$4,470.00**

Total this invoice **$4,470.00**

Billings to date	**Current**	**Prior**	**Total**
Fee	4,470.00	7,450.00	11,920.00
Totals	**4,470.00**	**7,450.00**	**11,920.00**

O.K. to PAY. SZC 2/20/02

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: 2/5/02 **Claim #** _____ **Check $** 7,450.00

Vendor No. _____

Vendor Name PBS & J

Address P. O. BOX 951422

Address DALLAS, TEXAS

Address _____

Zip Code 75395-1422

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
	01	411	56570			7,450.00

TOTAL 7,450.00

EXPLANATION BELT LINE RD. CONDITION STUDY.

Steve Chutchian
Authorized Signature

Finance

PBS&J

January 31, 2002
Project No: 450868.00
Invoice No: 0151528

Town of Addison
Attn: Steven Z. Chutchian
PO Box 9010
Addison TX 75001

Project: 450868.00 Beltline Surface Condition Study

Professional Services: November 1, 2001 through December 31, 2001

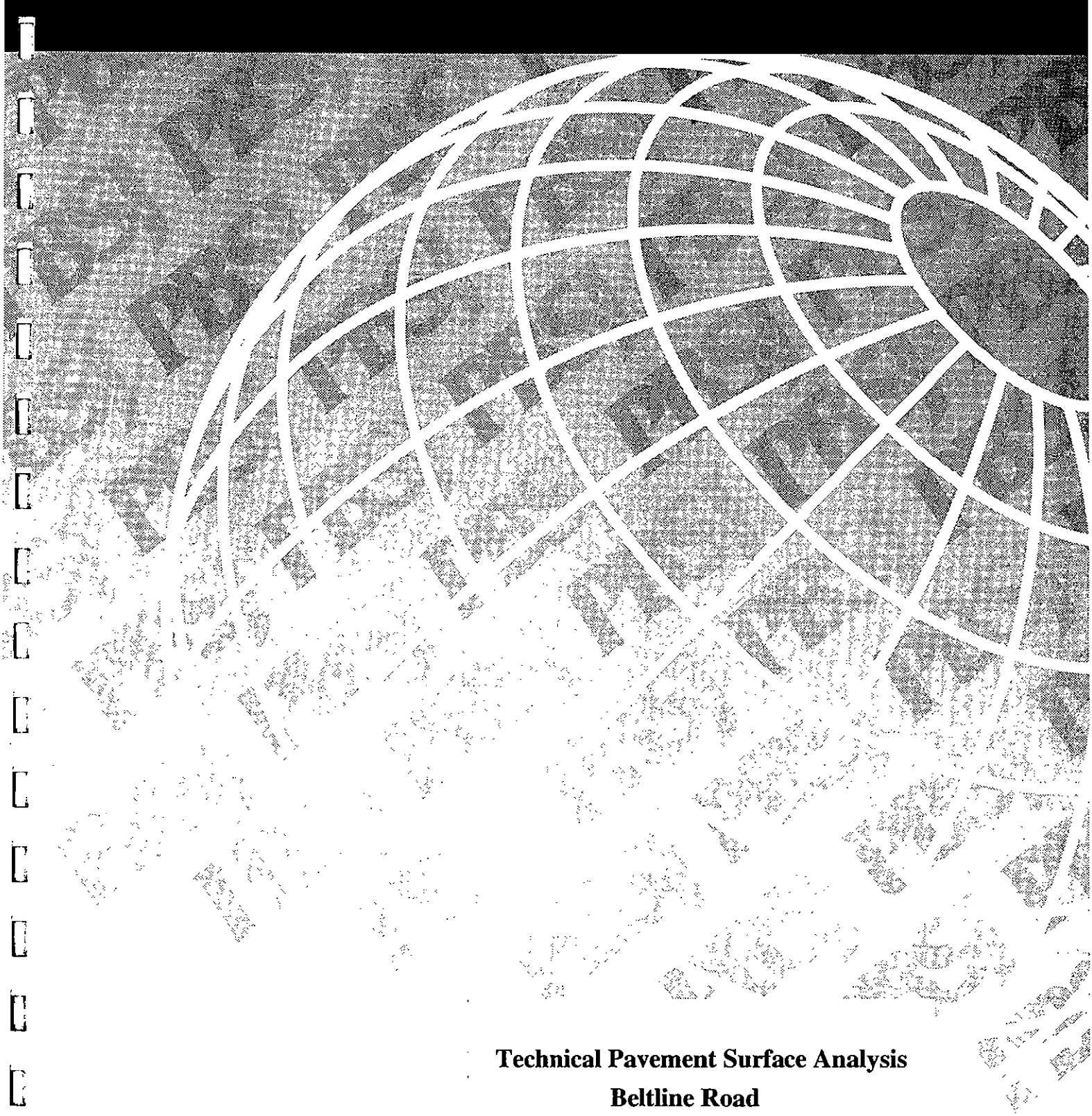
Task: 01 Project Management

Fee

Total Fee	14,900.00			
Percent Complete	50.00	Total Earned	7,450.00	
		Previous Fee Billing	0.00	
		Current Fee Billing	7,450.00	
		Total Fee		**7,450.00**
			Total this task	**$7,450.00**
			Total this invoice	**$7,450.00**

Billings to date	**Current**	**Prior**	**Total**
Fee	7,450.00	0.00	7,450.00
Totals	**7,450.00**	**0.00**	**7,450.00**

O.K. to PAY
SZ
2/5/2



Technical Pavement Surface Analysis
Beltline Road
Town of Addison

PBS&J

Technical Pavement Surface Analysis – Beltline Road

Prepared for the

Town of Addison

by

Doug Dillon, P.E. and Clarence Daugherty, P.E.

PBS&J

February 1, 2002

The Town of Addison requested that PBS&J evaluate the pavement on Beltline Road from Dallas Parkway (Dallas North Tollway) to Marsh Lane to determine the cause of and solutions to the poor skid resistance of the pavement. This report provides some background, the methodology of the evaluation, alternative solutions and PBS&J's recommendation for improving this dangerous condition.

Background

The section of roadway studied is a six-lane arterial that is one of the main thoroughfares for the Town of Addison. The current pavement was constructed in 1980 and consists of an 8-inch jointed reinforced concrete pavement; three lanes in each direction with both interior and exterior protected turn bays at multiple locations, some of which have been added since the original pavement was constructed. No original construction records or materials records, other than the as-built plans, were available for review and analysis. "Polishing" of the surface was evident as early as the mid-to-late '80s. Testing by use of the TxDOT skid resistance trailer in 1989 indicated a "too slick" finding. Transverse grooving was performed at the Midway Road intersection for 200 feet in each direction. The entire pavement surface was ground in 1995 from Dallas Parkway to Midway and in 1996 from Midway to Marsh Lane to a depth of 1/4 to 1/2 inches (with 1/8 inches between blades), to remove the polished surface. The joints (both longitudinal and transverse) were sawed, cleaned and sealed with silicone in conjunction with those projects. By 2000 the surface had become polished again.

The current traffic volume is over 50,000 vehicles per day, which is an extremely high volume of traffic for an urban arterial. Developed property adjacent to the roadway is almost entirely commercial establishments. Obviously, traffic is heavy all day long, but the peaks are during morning and evening rush hours as well as during the lunch hour. During these peaks, traffic is typically stop-and-go with several cycles required to clear intersection signals. Off-peak daytime hours exhibit moderate traffic volumes, usually clearing intersections with each signal cycle. Evening rush hour extends to approximately 8 p.m. on weekdays due to the number of restaurants that are along the project.

Pavement Condition Assessment

The existing pavement was evaluated both visually and physically. The visual inspection indicates that the pavement is in generally good structural condition, with only a few isolated locations exhibiting full depth failures that will need to be repaired. There are no indications of faulting at the transverse joints. This indicator is affected by the grinding application that was performed in 1995 and 1996. It should be noted that no additional faulting has been exhibited since that time. Reportedly, the grinding was performed to address surface texture, not joint faulting. The current ride profile is very good to excellent.

Longitudinal joints appear to be in good condition, as well. There were no locations observed that had abnormal joint widths. This leads to the conclusion that tie-bars are installed properly and in sufficient quantity to resist the lateral stresses. The visual inspection did confirm that there was some differential wearing between the wheel paths and the non-travel areas. This wearing is projected to continue and factors heavily into the evaluation of corrective actions.

Since no original materials records were available for review and analysis, we requested that three concrete core samples be taken and analyzed in an attempt to quantify the physical characteristics of the concrete. The sample retrieval and physical evaluation of the pavement cores was performed by our laboratory sub-consultant, PSI, Inc. Core samples were evaluated by petrographic analysis to determine: a likely range of water/cement ratio, depth of carbonation, and air content - both entrained and entrapped. Samples were also subjected to an acid insoluble analysis to predict the durability of the composite materials used in the pavement. While the solubility results are not a direct predictor of pavement performance, it does reveal that aggregate and paste quality will contribute to continued surface polishing. Technical results from these tests and analysis are included as Attachment "A".

The critical results gleaned from the report are that the components of the concrete (aggregate, sand, cement) are of satisfactory quality. However, the quality of the composite combination is less than desirable. The water cement ratios of up to .60 explain the concrete's wearing characteristics. The mortar paste is of marginal strength to be able to resist short-term wear, and will probably not provide satisfactory long-term durability or resistance to wear. This weakness of the mortar paste weakens the overall pavement surface's ability to withstand the forces that wear away the surface. This results in the "polishing" observed and the inability of the subsequent transverse sawed tining to provide the long-term skid resistance desired.

Possible Solutions

There are several courses of action that may be implemented to improve the surface skid resistance of the roadway. These options will be described, including the pros and cons that must be considered in selecting the appropriate solution. None of the options should be considered "permanent" solutions. The pavement surface will continue to wear and polish, requiring additional actions at some point in the future. These approaches are summarized in a tabular format in Attachment "B" including a weighting matrix of characteristics and approaches.

Sawed Surface Grooving (Longitudinal or Transverse) – This procedure consists of diamond saw blades mounted in a "gang" arrangement with spacers between the blades to provide the desirable groove separation. The blades are mounted on a heavy frame self-propelled device that includes grade control averaging to minimize the effect of deviations in surface elevations. The primary benefit of this approach is to provide gaps for water to flow under pressure exerted by vehicle tires. A secondary benefit is to increase the macro-texture of the pavement surface, thus improving resistance in dry and damp conditions. The effectiveness of this approach is heavily dependant on the depth, width, and spacing of the sawed grooves.

Transverse grooving has already been applied in limited areas at two intersections on the project. Longitudinal grooving is an option that would provide the same benefits, would be much faster and, therefore, more cost effective, to install. This solution was utilized in Dallas on IH 635 between Skillman and Abrams Road to resolve similar pavement issues.

> *Pros* – Improved skid resistance; relatively inexpensive; installation can be done at night regardless of temperature; leaves surface the same color already present; minimal re-work required on signal loops if loops are currently installed at least ¾ inch below the current surface; work in process at the end of each "day" leaves no differences discernable to the traveling public.
>
> *Cons* – Given the composite concrete water-cement ratio characteristic, the realistic life expectancy would be 5 to 7 years; the slurry produced during sawing may have to be picked up in a vacuum truck and disposed off-site.

Hot Mix Asphaltic Concrete Pavement Overlay – This solution is typically utilized to provide additional structural pavement support as well as increased skid resistance. Lift thickness is dependant on the nominal maximum size of the coarse aggregate. Installations over Jointed (Reinforced or Plain) Concrete Pavement typically exhibit reflective cracking at the joints within a year. The width of the reflected crack is dependant on the amount of movement (expansion and contraction) of the concrete sections. This is a direct function of the joint spacing in the concrete pavement. Steps taken to minimize reflective cracking include sawing and sealing mirror joints in the overlay, using geotextile fabric applied over the joints prior to overlay, using a rubber modified stress absorbing membrane (SAMI) applied to the full width of the roadway

under the overlay, or a rubber modified asphalt in a high void mix designed for the application.

Pros – Improved skid resistance; easily accommodates irregular surfaces, both vertically and horizontally; results in a uniform appearance of the finished product; appropriate mix design will result in dramatically improved surface macro- and micro-texture; in future maintenance cycles, it can be overlaid for continued service.

Cons – Relatively expensive due to additional expense in treating reflective cracking; requires a bonding application (seal coat, etc.) to promote adequate adhesion; extensive sprinkler systems on adjoining properties contribute water onto the roadway, increasing threat of de-bonding; the bonding is not expected to hold more than about 6-7 years, limiting the life of each application; while the surface application is rapid, the preparation steps required would take a substantial amount of time; work in progress leaves both longitudinal and transverse joint elevation differentials.

Micro-surfacing – This is a durable asphalt surface that can be applied in thinner sections than hot mix asphaltic concrete. It is typically applied to rutted flexible pavements with an initial pass to fill ruts up to 1/4-inch in depth, followed by a surface application that covers the full lane width. It also can be applied to rigid pavements.

Pros – Improved skid resistance; relatively inexpensive; thinner layer than the hot mix overlay; durable surface.

Cons – Allows reflective cracking of joints; subject to de-bonding at the end of its useful life, probably 5-6 years - this results from the intrusion of moisture over time into the interlayer between the existing concrete pavement and the micro-surfacing.

Thin-bonded Concrete Overlay – Application of approximately 2" of concrete over the existing concrete pavement structure.

Pros – Improved skid resistance; results in renewed concrete surface appearance.

Cons – Expensive; requires extensive surface preparation; environmental requirements at time of placement are extremely sensitive (humidity, air temperature, wind, surface cleanliness); requires lane closures for surface preparation, installation, and curing; extended time for installation; low probability of a quality installation.

Recommendations

Based on a review of the test data, field observations, costs (including inconvenience to traveling public), and benefits, PBS&J recommends the installation of sawed longitudinal grooving. This solution provides a desirable blend of cost effectiveness, minimal disruption of traffic, and serviceability. Its desirability is also enhanced because it requires minimal additional activities such as re-striping. The lane striping and buttons can be saved by not grooving along the edge of the lanes. Not grooving at the longitudinal joints also preserves the joint filler material, which is, for the most part, still in good condition.

The concrete in the pavement of Beltline Road is simply not durable enough to withstand almost 60,000 vpd without wearing. The longitudinal texturing will have to be carefully specified to make sure that there is adequate depth to the grooves and adequate width between the grooves. The actual depth and spacing can be determined later, but a typical application would be ¼-inch deep grooves spaced ¾ inches apart. This will maximize the impact of skid resistance and will provide the longest "life" of the grooves that is possible. But even with careful specification, and with careful installation, there is a limit to how long this grooving will be effective. The Town should incorporate into their life-cycle maintenance program grooving again in 5-7 years. None of the alternatives offer any advantages in this regard. The only way to prevent the need for periodic improvement is to re-build the pavement. This was not included as an alternative because re-building the pavement would so costly and the process would be so disruptive, it was felt that there were definitely better solutions on the short term. Addressing the problem every 5-7 years is more economical and more practical.

This solution should be able to be applied at least three times before the pavement thickness is reduced enough to be concerned about structural strength. It is our understanding that improvements to Arapaho over the next two years are expected to reduce traffic on Beltline by perhaps 10,000 to 12,000. This reduction in traffic may help the grooving last longer than five years. Applying the grooving three times should allow 15 to 20 years of reasonable service. In the meantime, the Town should plan to replace the pavement. It would be 35 to 40 years old by then.

It is also recommended that the few pavement failures that currently exist be repaired as part of this project, as well. The structural integrity of this pavement is very good (it is surprising that there have been so few structural failures with this age street and such high traffic volumes). Therefore, it is our conclusion that Beltline Road will be very serviceable for a long period of time if the actions recommended in this report are taken and an appropriate maintenance program is followed.

Attachment "A"
Laboratory Reports

Information To Build On
Engineering • Consulting • Testing

JAN 0 9 2002

PETROGRAPHIC ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

BACKGROUND

This report presents the results of petrographic analysis of three (3) concrete core samples, submitted by Mr. Robert Nance of PSI's Dallas, Texas Office. Reportedly, the samples were retrieved from a concrete pavement that was constructed in 1982. Identification of the samples along with their location is as follows:

Sample Identification	Sample Location
#1	395 ft. from Quorum Drive and Beltline Intersection Far Left Lane, Eastbound
#2	297 ft. East from Beltway Drive and Beltline Road Intersection Far Left Lane, Westbound
#3	170 ft. at Beltline Road and Motel 6 Entrance Far Left Lane, Eastbound

It was reported that the concrete pavement started exhibiting deterioration in the form of spalling and surface polishing in 1987, five years after its construction. The objective of the analysis was to determine the general overall quality of concrete represented by the analyzed samples, and determine the possible cause(s) of its deterioration.

SUMMARY OF FINDINGS

The findings of our petrographic analysis are summarized below:

1. The coarse aggregates in the analyzed samples were primarily composed of limestone and dolomite. Whereas, the fine aggregates in the analyzed samples were primarily composed of quartz, feldspar, limestone, and dolomite. The aggregates were generally sound.

2. The water-to-cement ratio (w/c) in the bulk portion of the analyzed samples was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in all the analyzed samples.

3. Cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20% in the analyzed samples.

4. The air void system of Sample #1 and Sample #3 was adequate for resisting freezing and thawing damage. However, Sample #2 did not have an adequate air void system for resisting freezing and thawing damage.

5. Ettringite crystals were observed lining few air voids in Sample #2 and Sample #3.

CONCLUSIONS

The general overall quality of the analyzed samples was rated as fair to poor, as evidenced by their relatively high and non-uniform w/c ratio, which was estimated to be as high as 0.60. Concrete with such w/c is prone to surface polishing.

Sample #2 did not have an adequate air void system for resisting freezing and thawing damage. Concrete represented by this sample is susceptible to freeze-thaw damage.

Ettringite crystals were observed lining few air voids in Sample #2 and Sample #3. However, it is not believed that ettringite has caused any significant damage in the samples. The formation of ettringite in hardened concrete is initiated by a reaction between external sulfate ions and calcium hydroxide of concrete, which produces gypsum. This gypsum reacts with monosulfoaluminate in concrete, in the presence of moisture, and produces "6-calcium aluminate trisulfate 32-hydrate" that is the chemical name of ettringite. The formation of ettringite in hardened concrete is detrimental because ettringite is expansive and hardened concrete cannot accommodate this expansion.

TEST PROCEDURES

Petrographic analysis

The petrographic analysis was performed in general accordance with ASTM C856-95. The analysis included examining a thick polished section using a stereo microscope and a blue-dyed thin section using a polarized light microscope. Depth of carbonation was determined using a 0.15% phenolphthalein solution. Water-to-cement ratio was estimated based upon the appearance of a finely lapped sample surface, cement reaction to needle scratching, absorption of a water drop, and examination of a thin section under a polarized light microscope.

Air content testing

Air content testing was performed in general accordance with ASTM C457-90, Procedure A—Linear Traverse Method. A thick polished section cut from the concrete core was examined using a stereo microscope at a magnification of 100x.

REMARKS

The test sample will be retained for a period of 30 days from the date of this report. Unless further instructions are received by that time, the samples will be discarded.

Respectfully Submitted,
Professional Service Industries, Inc.

Thomas H. Suthers, P.E.
Department Manager
Structural Investigation & Petrography

PETROGRAPHIC ANALYSIS DATA SHEET

Petrographic Lab Report No.: 807-I-16151 #1

A. General Observations

1. Sample Dimensions: The sample was a 3 ¼-in. diameter concrete core, about 4 ¼-in. long. One polished section was examined under a stereo microscope, and one thin section with blue epoxy impregnation was studied under a polarized light microscope.

2. Surface Conditions: Tined surface.

3. Reinforcement: None observed.

4. General Conditions: The concrete sample appeared to be in stable condition. No segregation or cracking was observed. Aggregates were well oriented and well distributed.

B. Aggregate

1. Coarse : The coarse aggregates in the analyzed sample were primarily composed of limestone and dolomite. They were mostly subrounded to subangular. The maximum size of the aggregates was about 1 ½-in. The aggregates were generally sound.

2. Fine: The fine aggregates in the analyzed sample were primarily composed of quartz, feldspar, limestone, and dolomite. They are mostly subangular to angular, and generally sound.

C. Cementitious Paste

1.	Paste Content:	30.1%.
2.	Air Content:	5.3% total; 3.9% entrained, 1.4% entrapped.
3.	Depth of Carbonation:	Up to a depth of 1/8 in. from the surface.
4.	Pozzolan Presence:	None observed.
5.	Paste/Aggregate Bonding:	Moderate.
6.	Paste Color:	Gray.
7.	Paste Hardness:	Moderate.
8.	Secondary Deposits:	None observed
9.	Water-to-Cement Ratio (W/C):	Average w/c in the bulk portion of the analyzed sample was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in the sample.
10.	Paste Quality:	The cement paste was generally sound; the cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20%.
11.	Microcracks:	Microcracks were observed in the cement paste.

PETROGRAPHIC ANALYSIS DATA SHEET

Petrographic Lab Report No.: 807-I-16151 #2

A. General Observations

1. Sample Dimensions: The sample was a 3 ¾-in. diameter concrete core, about 3 ¾-in. long. One polished section was examined under a stereo microscope, and one thin section with blue epoxy impregnation was studied under a polarized light microscope.

2. Surface Conditions: Irregular.

3. Reinforcement: None observed.

4. General Conditions: The concrete sample appeared to be in stable condition. No segregation or cracking was observed. Aggregates were well oriented and well distributed.

B. Aggregate

1. Coarse : The coarse aggregates in the analyzed sample were primarily composed of limestone and dolomite. They were mostly subrounded to subangular. The maximum size of the aggregates was about 1 ½-in. The aggregates were generally sound.

2. Fine: The fine aggregates in the analyzed sample were primarily composed of quartz, feldspar, limestone, and dolomite. They are mostly subangular to angular, and generally sound.

C. Cementitious Paste

1.	Paste Content:	21.9%.
2.	Air Content:	3.6% total; 2.7% entrained, 0.9% entrapped.
3.	Depth of Carbonation:	Up to a depth of 1/8 in. from the surface.
4.	Pozzolan Presence:	None observed.
5.	Paste/Aggregate Bonding:	Moderate.
6.	Paste Color:	Gray.
7.	Paste Hardness:	Moderate.
8.	Secondary Deposits:	Ettringite crystals were observed lining few air voids.
9.	Water-to-Cement Ratio (W/C):	Average w/c in the bulk portion of the analyzed sample was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in the sample.
10.	Paste Quality:	The cement paste was generally sound; the cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20%.
11.	Microcracks:	Microcracks were observed in the cement paste.

PETROGRAPHIC ANALYSIS DATA SHEET

Petrographic Lab Report No.: 807-I-16151 #3

A. General Observations

1. Sample Dimensions: The sample was a 3 ¾-in. diameter concrete core, about 4-in. long. One polished section was examined under a stereo microscope, and one thin section with blue epoxy impregnation was studied under a polarized light microscope.

2. Surface Conditions: Tined surface.

3. Reinforcement: None observed.

4. General Conditions: The concrete sample appeared to be in stable condition. No segregation or cracking was observed. Aggregates were well oriented and well distributed.

B. Aggregate

1. Coarse : The coarse aggregates in the analyzed sample were primarily composed of limestone and dolomite. They were mostly subrounded to subangular. The maximum size of the aggregates was about 1 ½-in. The aggregates were generally sound.

2. Fine: The fine aggregates in the analyzed sample were primarily composed of quartz, feldspar, limestone, and dolomite. They are mostly subangular to angular, and generally sound.

C. Cementitious Paste

1.	Paste Content:	24.9%.
2.	Air Content:	6.2% total; 5.4% entrained, 0.8% entrapped.
3.	Depth of Carbonation:	Up to a depth of 1/8 in. from the surface.
4.	Pozzolan Presence:	None observed.
5.	Paste/Aggregate Bonding:	Moderate.
6.	Paste Color:	Gray.
7.	Paste Hardness:	Moderate.
8.	Secondary Deposits:	Ettringite crystals were observed lining few air voids.
9.	Water-to-Cement Ratio (W/C):	Average w/c in the bulk portion of the analyzed sample was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in the sample.
10.	Paste Quality:	The cement paste was generally sound; the cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20%.
11.	Microcracks:	Microcracks were observed in the cement paste.

AIR VOID SYSTEM ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

Sample No.: #1

Sample Data:

Sample Description:	Concrete Core
Sample Dimensions:	3 ¾-in. Diameter, 4 ¼-in. Long

Test Data:

Air Void Content (%)	5.3
Entrained (%)	3.9
Entrapped (%)	1.4
Air Voids/inch	6.21
Average Void Length (in.)	0.009
Specific Surface (in^2/in^3)	464.1
Spacing Factor	0.010
Paste Content (%)	30.1
Magnification	100x
Traverse Length (in.)	90
Test Date	December 17, 2001

Conformance: The air void system of the analyzed sample was adequate to resist freezing and thawing damage.

Remarks:

1. The analysis was performed in general accordance with ASTM C-457, Procedure A—Linear Traverse Method.
2. The test sample will be retained for 30 days from the date of this report. After 30 days, the sample will be discarded unless other instructions are received.

AIR VOID SYSTEM ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

Sample No.: #2

Sample Data:

Sample Description:	Concrete Core
Sample Dimensions:	3 ¾-in. Diameter, 3 ¾-in. Long

Test Data:

Air Void Content (%)	3.6
Entrained (%)	2.7
Entrapped (%)	0.9
Air Voids/inch	4.36
Average Void Length (in.)	0.008
Specific Surface (in^2/in^3)	487.8
Spacing Factor	0.010
Paste Content (%)	21.9
Magnification	100x
Traverse Length (in.)	90
Test Date	December 17, 2001

Conformance: The air void system of the analyzed sample was inadequate to resist freezing and thawing damage.

Remarks:

1. The analysis was performed in general accordance with ASTM C-457, Procedure A—Linear Traverse Method.
2. The test sample will be retained for 30 days from the date of this report. After 30 days, the sample will be discarded unless other instructions are received.

AIR VOID SYSTEM ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

Sample No.: #3

Sample Data:

Sample Description:	Concrete Core
Sample Dimensions:	3 ¾-in. Diameter, 4-in. Long

Test Data:

Air Void Content (%)	6.2
Entrained (%)	5.4
Entrapped (%)	0.8
Air Voids/inch	6.91
Average Void Length (in.)	0.009
Specific Surface (in^2/in^3)	445.7
Spacing Factor	0.009
Paste Content (%)	24.9
Magnification	100x
Traverse Length (in.)	90
Test Date	December 17, 2001

Conformance: The air void system of the analyzed sample was adequate to resist freezing and thawing damage.

Remarks:

1. The analysis was performed in general accordance with ASTM C-457, Procedure A—Linear Traverse Method.
2. The test sample will be retained for 30 days from the date of this report. After 30 days, the sample will be discarded unless other instructions are received.

psi Information To Build On
Engineering • Consulting • Testing

TESTED FOR: PBS&J
13800 Monfort Drive
Suite 230
Addison, TX 75240

PROJECT: Pavement Concrete Evaluation
Beltline Rd. to Marsh Rd.
Addison, Texas

DATE: January 21, 2001

REPORT NO: 341-10088-3

REPORT OF ACID SOLUBLE MATTER

SAMPLE LOCATION	PERCENT LOSS
Core #1, 395 ft. from Quorum Drive and Beltline Intersection, Far Left Lane, Eastbound	94.8
Core #2, 297 ft. East from Beltline Drive and Beltline Road Intersection, Far Left Lane, Westbound	94.3
Core #3, 170 ft. at Beltline Road and Motel 6 Entrance Far Left Lane, Eastbound	95.2

BACKGROUND

The client had requested that the percentage of fine material soluble in a sulfuric acid solution be determined on the samples of existing concrete collected on this project. The client was aware of the limitations of the test method and that this may or may not be possible depending on the composition of the coarse aggregate contained in the existing concrete.

TEST PRODCEURE

A representative portion of the core sample was collected and immersed in a dilute solution of sulfuric acid. After all signs of reaction had ceased the sample was removed from this solution, washed and dried. The remaining material was crushed in a manner that would not reduce the size of the remaining particles of aggregate. This remaining material was immersed in a solution of concentrated sulfuric acid until all signs of reaction had ceased. The sample was washed, dried and crushed as previously reported and re-immersed in a fresh solution of concentrated sulfuric acid. This process was continued until any signs of a reaction with the acid was not observed upon immersion in a fresh solution of sulfuric acid. At this point the sample was removed from the acid, washed, dried and percent loss by weight determined.

CONCLUSIONS

The client had requested that the percentage of fine material contained in samples of existing concrete be determined and was aware that this may or may be possible to determine depending on the solubility of the coarse aggregate contained in the samples. The percentage of material dissolved by the sulfuric acid exceeds the quantity of fine aggregate and cement that would be expected in concrete. At the end of the test procedure no particles of large aggregate were visually observed and for these reasons we believe that the large aggregate was composed of material that was also soluble in sulfuric acid. Clearly the percent of acid soluble in the fine aggregate of these concrete samples could not be determined given these factors and the percent loss reported above should be interpreted as the percentage of total acid soluble material in the concrete.

Respectfully Submitted:
Professional Service Industries, Inc.

Jonathan J. Szostek
District Manager
Construction Services

Attachment "B"
Cost Estimates

Attachment "B"

Treatment Option	Performance	Service Life	Constructability	Appearance	Score	Cost ($/sy)
Longitudinal Texturing	5	4	5	5	19	$2.50
Hot Mix Asphalt Pavement	4	4	4	2	14	$6.00
Microsurfacing	3	3	5	2	13	$2.50
Thin Bonded Concrete Overlay	1	4	1	5	11	N/A

Ratings are on a scale of 1 to 5 with 1 being the lowest or least acceptable and 5 being the highest or most desireable. These scores are highly subjective in nature.
Performance rating includes weighting for issues affecting chances of a successful implementation and appropriateness for this project.
The appearance rating is applied based on previous indications that Addison prefers concrete over hot mix appearances on their main thoroughfare.
Cost data represents average prices that include a wide range of conditions, project issues, and levels of competition. These are intended only for comparison purposes, not to establish a project estimate. Specific project costs may vary based on the issues listed above as well as contract requirements.
Cost for HMACP includes overlay, seal coat, and fabric treatment for existing cracks. Combination represents the minimum serviceability that would be acceptable, given the project location. Based on Hot Mix, TxDOT Ty D, 1 inch lift at $50/ton = $2.75/sy plus seal $1.25, plus fabric $2.
Cost for Thin Bonded Concrete Overlay is not included. Data available was not comparable to the project installation - high volume arterial with many intersections and drive access points.

Estimated Total Cost.

The pavement surface is approximately 90,000 square yards. At $2.50 per square yard, the cost would be roughly $225,000 or $675,000 over 15-20 years.

Attachment "C"
Surface Texture Illustrations

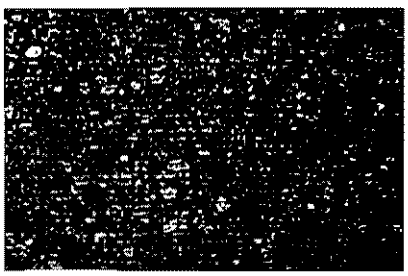
Surface Texture

(an excerpt from the website of the American Concrete Pavement Association http://www.pavement.com/PavTech/Tech/Fundamentals/fundtexture.html)

Surface textures are usually made during construction by dragging various materials or tools across the fresh concrete. This imparts a continuous series of undulations, or grooves, in the surface before the concrete hardens. The spacing, width and depth of the grooves affect surface friction, skid resistance and tire/road noise. The purpose of a surface texture is to reduce wet-weather accidents caused by skidding and hydroplaning.

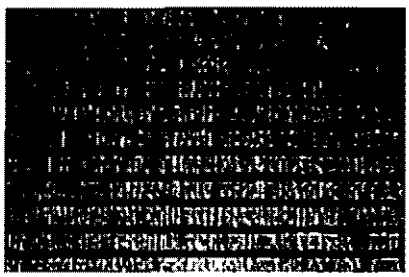
Over the past 40 years there have been several shifts in the most commonly applied texture. For concrete streets and local roads, where vehicle speeds are not great enough to cause hydroplaning, burlap-drag or broom textures are typical. The most common texture on high-speed road and highway pavements in North America remains transverse tining. However, a shift is underway to longitudinal tining which has been shown to produce excellent long-term skid resistance and much lower tire/road noise qualities both in a vehicle and along the roadway.

Hardened Concrete Textures



Diamond Ground

Longitudinal, corduroy-like surface made by equipment using diamond saw blades gang-mounted on a cutting head. The cutting head produces 164-197 grooves/meter (50-60 grooves/foot) and can remove 3-20 mm (1/8-3/4 in.) from the pavement surface.



Diamond Groove

Grooves sawed into surface longitudinally for highways, and transversely for airports. Made by same equipment used for diamond grinding. Typically, the grooves are 6 mm (1/4 in.) deep, 3 mm (1/8 in.) wide and spaced 20 mm (3/4 in.) apart. On airports, grooves are 6 mm (1/4 in.) deep, 6 mm (1/4 in.) wide and spaced 40 mm (1-1/2 in.) apart.

STEVE

PBS&J

An employee-owned company

Received SZC 1/29/02

January 24, 2002

Mr. Steven Z. Chutchian
Assistant City Engineer
Town of Addison
16801 Westgrove Dr.
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Chutchian:

We are happy to submit the attached report of our evaluation of the surface conditions of Beltline Road. The report is submitted in "draft" form because we think there may be form or other changes or additions that you may want us to include in the final report. We have attached an excerpt about surface texturing from the website of the American Concrete Association. Let us know if you think it would be helpful to include this in the report. We will also include photos of the existing conditions to illustrate appropriate points.

We look forward to you reviewing the report and informing us of any changes that you desire.

Sincerely,

Clarence Daugherty

Clarence Daugherty, P.E.
Director of Municipal Services

Enclosure

CD/eo

we need associated construction costs w/ each alternative

we want to work toward the long. texturing for a 3-4 year temporary fix & get council opinion on doing H.M.A.C. overlay or total reconstruction in a future bond program

K:\UI\450868.00\Beltline draft 1-24-02.doc

13800 Montfort Drive, Suite 230, Dallas, Texas 75240-4347 • Telephone: 972.387.0771 • Fax: 972.387.9714 • www.pbsj.com

Technical Pavement Analysis – Beltline Road
Town of Addison

The Town of Addison requested that PBS&J evaluate the pavement on Beltline Road from Dallas Parkway (Dallas North Tollway) to Marsh Lane to determine the cause of and solutions to the poor skid resistance of the pavement. This report provides some background, the methodology of the evaluation, alternative solutions and PBS&J's recommendation for improving this dangerous condition.

Background

The section of roadway studied is a six-lane arterial that is one of the main thoroughfares for the Town of Addison. The current pavement was constructed in 1980 and consists of an 8-inch jointed reinforced concrete pavement; three lanes in each direction with both interior and exterior protected turn bays at multiple locations, some of which have been added since the original pavement was constructed. No original construction records or materials records, other than the as-built plans, were available for review and analysis. "Polishing" of the surface was evident as early as the mid-to-late '80s. Testing by use of the TxDOT skid resistance trailer in 1989 indicated a "too slick" finding. Transverse grooving was performed at the Midway Road intersection for 200 feet in each direction. The pavement surface was ground in 1996 to a depth of 1/4 to 1/2 inches (with 1/8 inches between blades), the full length and width, to remove the polished surface. By 2000 the surface had become polished again.

The current traffic volume is over 50,000 vehicles per day, which is an extremely high volume of traffic for an urban arterial. Developed property adjacent to the roadway is almost entirely commercial establishments. Obviously, traffic is heavy all day long, but the peaks are during morning and evening rush hours as well as during the lunch hour. During these peaks, traffic is typically stop-and-go with several cycles required to clear intersection signals. Off-peak daytime hours exhibit moderate traffic volumes, usually clearing intersections with each signal cycle. Evening rush hour extends to approximately 8 p.m. on weekdays due to the number of restaurants that are along the project.

Pavement Condition Assessment

The existing pavement was evaluated both visually and physically. The visual inspection indicates that the pavement is in generally good structural condition, with only a few isolated locations exhibiting full depth failures that will need to be repaired. There are no indications of faulting at the transverse joints. This indicator is affected by the grinding application that was performed in 1996. It should be noted that no additional faulting has been exhibited since that time. Reportedly, the grinding was performed to address surface texture, not joint faulting. The current ride profile is very good to excellent.

THE JOINTS WERE SAWED & SEALED IN 1996, AT THAT TIME.

PBSJ

Longitudinal joints appear to be in good condition, as well. There were no locations observed that had abnormal joint widths. This leads to the conclusion that tie-bars are installed properly and in sufficient quantity to resist the lateral stresses. The visual inspection did confirm that there was some differential wearing between the wheel paths and the non-travel areas. This wearing is projected to continue and factors heavily into the evaluation of corrective actions.

Since no original materials records were available for review and analysis, we requested that three concrete core samples be taken and analyzed in an attempt to quantify the physical characteristics of the concrete. The sample retrieval and physical evaluation of the pavement cores was performed by our laboratory sub-consultant, PSI, Inc. Core samples were evaluated by petrographic analysis to determine: a likely range of water/cement ratio, depth of carbonation, and air content - both entrained and entrapped. Samples were also subjected to an acid insoluble analysis to predict the durability of the composite materials used in the pavement. While the solubility results are not a direct predictor of pavement performance, it does reveal that aggregate and paste quality will contribute to continued surface polishing. Technical results from these tests and analysis are included as Attachment "A".

AGGREGATE IS ALSO POLISHED!!

The critical results gleaned from the report are that the components of the concrete (aggregate, sand, cement) are of satisfactory quality. However, the quality of the composite combination is less than desirable. The water cement ratios of up to .60 explain the concrete's wearing characteristics. The mortar paste is of marginal strength to be able to resist short-term wear, and will probably not provide satisfactory long-term durability or resistance to wear. This confirms the initial "polishing" observed and the inability of the subsequent transverse sawed tining to provide the long-term skid resistance desired.

Possible Solutions

There are several courses of action that may be implemented to improve the surface skid resistance of the roadway. These options will be described, including the pros and cons that must be considered in selecting the appropriate solution. None of the options should be considered "permanent" solutions. The pavement surface will continue to wear and polish, requiring additional actions at some point in the future. These approaches are summarized in a tabular format in Attachment "B" including a weighting matrix of characteristics and approaches.

Sawed Surface Texture (Longitudinal or Transverse) – This procedure consists of diamond saw blades mounted in a "gang" arrangement with spacers between the blades to provide the desirable groove separation. The blades are mounted on a heavy frame self-propelled device that includes grade control averaging to minimize the effect of deviations in surface elevations. The primary benefit of this approach is to provide gaps for water to flow under pressure exerted by vehicle tires. A secondary benefit is to increase the macro-texture of the pavement surface, thus improving resistance in dry and

damp conditions. The effectiveness of this approach is heavily dependant on the depth, width, and spacing of the sawed grooves. This solution would be limited to primary travel lanes, due to the difficulty in installation in turn bays. Typically, turn bays are in good condition relative to surface texture, and speeds in them are slower than the travel lanes.

Transverse texture sawing has already been applied in limited areas at two intersections on the project. Longitudinal texturing is an option that would provide the same benefits, would be much faster and, therefore, more cost effective, to install. This solution was utilized in Dallas on IH 635 between Skillman and Abrams Road to resolve similar pavement issues.

Pros – Improved skid resistance; relatively inexpensive; installation can be done at night regardless of temperature; leaves surface the same color already present; minimal re-work required on signal loops if loops are currently installed at least ¾ inch below the current surface; work in process at the end of each "day" leaves no differences discernable to the traveling public.

Cons – Given the composite concrete water-cement ratio characteristic, the realistic life expectancy would be 5 to 7 years; the slurry produced during sawing may have to be picked up in a vacuum truck and disposed off-site.

Hot Mix Asphaltic Concrete Pavement Overlay – This solution is typically utilized to provide additional structural pavement support as well as increased skid resistance. Lift thickness is dependant on the nominal maximum size of the coarse aggregate. Installations over Jointed (Reinforced or Plain) Concrete Pavement typically exhibit reflective cracking at the joints within a year. The width of the reflected crack is dependant on the amount of movement (expansion and contraction) of the concrete sections. This is a direct function of the joint spacing in the concrete pavement. Steps taken to minimize reflective cracking include sawing and sealing mirror joints in the overlay, using geotextile fabric applied over the joints prior to overlay, using a rubber modified stress absorbing membrane (SAMI) applied to the full width of the roadway under the overlay, or a rubber modified asphalt in a high void mix designed for the application.

Pros – Improved skid resistance; easily accommodates irregular surfaces, both vertically and horizontally; results in a uniform appearance of the finished product; appropriate mix design will result in dramatically improved surface macro- and micro-texture; in future maintenance cycles, it can be overlaid for continued service.

Cons – Relatively expensive due to additional expense in treating reflective cracking; requires a bonding application (seal coat, etc.) to promote adequate adhesion; extensive sprinkler systems on adjoining properties contribute water onto the roadway, increasing threat of de-bonding; while the surface application is rapid, the preparation steps required would take a substantial amount of time;

work in progress leaves both longitudinal and transverse joint elevation differentials.

Polymer Modified Slurry Seal – This slurry seal is a 1/4 to 3/8-inch thick application of a mixture of a very small aggregate suspended in a polymer modified emulsified asphalt.

Pros – Improved skid resistance; relatively inexpensive; resultant layer is *resistant* to moisture; macro-texture results from aggregate "points" that protrude above the asphalt layer.

Cons - Durability is a concern in this high volume application (typical application is low volume residential streets, parking lots, etc.); although resistant to moisture, it is not water proof.

Micro-surfacing – Similar to the PMSS, but uses cement as the mineral filler. It is typically applied to rutted flexible pavements with an initial pass to fill ruts up to 1/4-inch in depth, followed by a surface application that covers the full lane width. It also can be applied to rigid pavements.

Pros – Improved skid resistance; relatively inexpensive; results in a finished product that is more durable than PMSS, but less flexible than a PMSS, which is desirable on this project due to the high traffic volumes.

Cons – More rigid than PMSS, allowing reflective cracking of joints; subject to de-bonding at the end of its useful life - this results from the intrusion of moisture over time into the interlayer between the existing concrete pavement and the micro-surfacing.

Seal Coat – An application of liquid asphalt, either hot AC or emulsion, with a layer of aggregate spread over the top and seated by rolling. Serves to waterproof underlying pavement layers from water intrusion from the surface as well as to enhance the bonding of HMACP overlays.

Pros – Improved skid resistance; the least expensive of the alternatives.

Cons – Durability is not good in this high traffic application; does not result in good appearance; there will be some loose aggregate; aggregate is unstable under heavy traffic and turning movements.

Thin-bonded Concrete Overlay – Application of approximately 2" of concrete over the existing concrete pavement structure.

Pros – Improved skid resistance; results in renewed concrete surface appearance.

Cons – Expensive; requires extensive surface preparation; environmental requirements at time of placement are extremely sensitive (humidity, air

temperature, wind, surface cleanliness); requires lane closures for surface preparation, installation, and curing; extended time for installation; low probability of a quality installation.

Recommendations

Based on a review of the test data, field observations, costs (including inconvenience to traveling public), and benefits, PBS&J recommends the installation of longitudinal concrete texturing. This solution provides a desirable blend of cost effectiveness, minimal disruption of traffic, and serviceability. Its desirability is also enhanced because it requires minimal additional activities such as re-striping. While this solution is not "permanent", it meets the service needs while minimizing the future cost of pursuing another option, such as an overlay. Other options considered would include some cost to remove or re-mediate in order to install another surfacing in the future.

The concrete in the pavement of Beltline Road is simply not durable enough to withstand almost 60,000 vpd without wearing. The longitudinal texturing will have to be carefully specified to make sure that there is adequate depth to the grooves and adequate width between the grooves. This will maximize the impact of skid resistance and will provide the longest "life" of the grooves that is possible. But even with careful specification, and with careful installation, there is a limit to how long this texturing will be effective. The Town should incorporate into their life-cycle maintenance program additional improvements in 5-7 years. None of the alternatives offer any advantages in this regard. The only way to prevent the need for periodic improvement is to re-build the pavement. This was not included as an alternative because re-building the pavement would be far too costly and the process would be far too disruptive to be worthwhile. Addressing the problem every 5-7 years is more economical and more practical.

There are some other needs that could be incorporated into this project. It is recommended that the longitudinal and transverse joints be cleaned and re-sealed to maintain the resistance to water penetration into the subgrade if that has not been done in recent years. It is also recommended that the few pavement failures that currently exist be repaired as part of this project, as well. The structural integrity of this pavement is very good (it is surprising that there have been so few structural failures with this age street and such high traffic volumes). Therefore, it is our conclusion that Beltline Road will be very serviceable for a long period of time if the actions recommended in this report are taken and an appropriate maintenance program is followed.

Attachment "A"

Laboratory Reports

PSI Information To Build On
Engineering • Consulting • Testing

JAN 0 9 2002

PETROGRAPHIC ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

BACKGROUND

This report presents the results of petrographic analysis of three (3) concrete core samples, submitted by Mr. Robert Nance of PSI's Dallas, Texas Office. Reportedly, the samples were retrieved from a concrete pavement that was constructed in 1982. Identification of the samples along with their location is as follows:

Sample Identification	Sample Location
#1	395 ft. from Quorum Drive and Beltline Intersection Far Left Lane, Eastbound
#2	297 ft. East from Beltway Drive and Beltline Road Intersection Far Left Lane, Westbound
#3	170 ft. at Beltline Road and Motel 6 Entrance Far Left Lane, Eastbound

It was reported that the concrete pavement started exhibiting deterioration in the form of spalling and surface polishing in 1987, five years after its construction. The objective of the analysis was to determine the general overall quality of concrete represented by the analyzed samples, and determine the possible cause(s) of its deterioration.

SUMMARY OF FINDINGS

The findings of our petrographic analysis are summarized below:

1. The coarse aggregates in the analyzed samples were primarily composed of limestone and dolomite. Whereas, the fine aggregates in the analyzed samples were primarily composed of quartz, feldspar, limestone, and dolomite. The aggregates were generally sound.

2. The water-to-cement ratio (w/c) in the bulk portion of the analyzed samples was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in all the analyzed samples.

3. Cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20% in the analyzed samples.

4. The air void system of Sample #1 and Sample #3 was adequate for resisting freezing and thawing damage. However, Sample #2 did not have an adequate air void system for resisting freezing and thawing damage.

5. Ettringite crystals were observed lining few air voids in Sample #2 and Sample #3.

CONCLUSIONS

The general overall quality of the analyzed samples was rated as fair to poor, as evidenced by their relatively high and non-uniform w/c ratio, which was estimated to be as high as 0.60. Concrete with such w/c is prone to surface polishing.

Sample #2 did not have an adequate air void system for resisting freezing and thawing damage. Concrete represented by this sample is susceptible to freeze-thaw damage.

Ettringite crystals were observed lining few air voids in Sample #2 and Sample #3. However, it is not believed that ettringite has caused any significant damage in the samples. The formation of ettringite in hardened concrete is initiated by a reaction between external sulfate ions and calcium hydroxide of concrete, which produces gypsum. This gypsum reacts with monosulfoaluminate in concrete, in the presence of moisture, and produces "6-calcium aluminate trisulfate 32-hydrate" that is the chemical name of ettringite. The formation of ettringite in hardened concrete is detrimental because ettringite is expansive and hardened concrete cannot accommodate this expansion.

TEST PROCEDURES

Petrographic analysis

The petrographic analysis was performed in general accordance with ASTM C856-95. The analysis included examining a thick polished section using a stereo microscope and a blue-dyed thin section using a polarized light microscope. Depth of carbonation was determined using a 0.15% phenolphthalein solution. Water-to-cement ratio was estimated based upon the appearance of a finely lapped sample surface, cement reaction to needle scratching, absorption of a water drop, and examination of a thin section under a polarized light microscope.

Air content testing

Air content testing was performed in general accordance with ASTM C457-90, Procedure A—Linear Traverse Method. A thick polished section cut from the concrete core was examined using a stereo microscope at a magnification of 100x.

REMARKS

The test sample will be retained for a period of 30 days from the date of this report. Unless further instructions are received by that time, the samples will be discarded.

Respectfully Submitted,
Professional Service Industries, Inc.

Thomas H. Suthers, P.E.
Department Manager
Structural Investigation & Petrography

PETROGRAPHIC ANALYSIS DATA SHEET

Petrographic Lab Report No.: 807-I-16151 #1

A. General Observations

1. Sample Dimensions: The sample was a 3 ¾-in. diameter concrete core, about 4 ¼-in. long. One polished section was examined under a stereo microscope, and one thin section with blue epoxy impregnation was studied under a polarized light microscope.

2. Surface Conditions: Tined surface.

3. Reinforcement: None observed.

4. General Conditions: The concrete sample appeared to be in stable condition. No segregation or cracking was observed. Aggregates were well oriented and well distributed.

B. Aggregate

1. Coarse : The coarse aggregates in the analyzed sample were primarily composed of limestone and dolomite. They were mostly subrounded to subangular. The maximum size of the aggregates was about 1 ½-in. The aggregates were generally sound.

2. Fine: The fine aggregates in the analyzed sample were primarily composed of quartz, feldspar, limestone, and dolomite. They are mostly subangular to angular, and generally sound.

C. Cementitious Paste

1.	Paste Content:	30.1%.
2.	Air Content:	5.3% total; 3.9% entrained, 1.4% entrapped.
3.	Depth of Carbonation:	Up to a depth of 1/8 in. from the surface.
4.	Pozzolan Presence:	None observed.
5.	Paste/Aggregate Bonding:	Moderate.
6.	Paste Color:	Gray.
7.	Paste Hardness:	Moderate.
8.	Secondary Deposits:	None observed
9.	Water-to-Cement Ratio (W/C):	Average w/c in the bulk portion of the analyzed sample was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in the sample.
10.	Paste Quality:	The cement paste was generally sound; the cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20%.
11.	Microcracks:	Microcracks were observed in the cement paste.

PETROGRAPHIC ANALYSIS DATA SHEET

Petrographic Lab Report No.: 807-I-16151 #2

A. General Observations

1. Sample Dimensions: The sample was a 3 ¾-in. diameter concrete core, about 3 ¾-in. long. One polished section was examined under a stereo microscope, and one thin section with blue epoxy impregnation was studied under a polarized light microscope.

2. Surface Conditions: Irregular.

3. Reinforcement: None observed.

4. General Conditions: The concrete sample appeared to be in stable condition. No segregation or cracking was observed. Aggregates were well oriented and well distributed.

B. Aggregate

1. Coarse : The coarse aggregates in the analyzed sample were primarily composed of limestone and dolomite. They were mostly subrounded to subangular. The maximum size of the aggregates was about 1 ½-in. The aggregates were generally sound.

2. Fine: The fine aggregates in the analyzed sample were primarily composed of quartz, feldspar, limestone, and dolomite. They are mostly subangular to angular, and generally sound.

C. Cementitious Paste

1.	Paste Content:	21.9%.
2.	Air Content:	3.6% total; 2.7% entrained, 0.9% entrapped.
3.	Depth of Carbonation:	Up to a depth of 1/8 in. from the surface.
4.	Pozzolan Presence:	None observed.
5.	Paste/Aggregate Bonding:	Moderate.
6.	Paste Color:	Gray.
7.	Paste Hardness:	Moderate.
8.	Secondary Deposits:	Ettringite crystals were observed lining few air voids.
9.	Water-to-Cement Ratio (W/C):	Average w/c in the bulk portion of the analyzed sample was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in the sample.
10.	Paste Quality:	The cement paste was generally sound; the cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20%.
11.	Microcracks:	Microcracks were observed in the cement paste.

PETROGRAPHIC ANALYSIS DATA SHEET

Petrographic Lab Report No.: 807-I-16151 #3

A. General Observations

1. Sample Dimensions: The sample was a 3 ¾-in. diameter concrete core, about 4-in. long. One polished section was examined under a stereo microscope, and one thin section with blue epoxy impregnation was studied under a polarized light microscope.

2. Surface Conditions: Tined surface.

3. Reinforcement: None observed.

4. General Conditions: The concrete sample appeared to be in stable condition. No segregation or cracking was observed. Aggregates were well oriented and well distributed.

B. Aggregate

1. Coarse : The coarse aggregates in the analyzed sample were primarily composed of limestone and dolomite. They were mostly subrounded to subangular. The maximum size of the aggregates was about 1 ½-in. The aggregates were generally sound.

2. Fine: The fine aggregates in the analyzed sample were primarily composed of quartz, feldspar, limestone, and dolomite. They are mostly subangular to angular, and generally sound.

C. Cementitious Paste

1.	Paste Content:	24.9%.
2.	Air Content:	6.2% total; 5.4% entrained, 0.8% entrapped.
3.	Depth of Carbonation:	Up to a depth of 1/8 in. from the surface.
4.	Pozzolan Presence:	None observed.
5.	Paste/Aggregate Bonding:	Moderate.
6.	Paste Color:	Gray.
7.	Paste Hardness:	Moderate.
8.	Secondary Deposits:	Ettringite crystals were observed lining few air voids.
9.	Water-to-Cement Ratio (W/C):	Average w/c in the bulk portion of the analyzed sample was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in the sample.
10.	Paste Quality:	The cement paste was generally sound; the cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20%.
11.	Microcracks:	Microcracks were observed in the cement paste.

AIR VOID SYSTEM ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

Sample No.: #1

Sample Data:

Sample Description: Concrete Core

Sample Dimensions: 3 ¾-in. Diameter, 4 ¼-in. Long

Test Data:

Air Void Content (%)	5.3
Entrained (%)	3.9
Entrapped (%)	1.4
Air Voids/inch	6.21
Average Void Length (in.)	0.009
Specific Surface (in^2/in^3)	464.1
Spacing Factor	0.010
Paste Content (%)	30.1
Magnification	100x
Traverse Length (in.)	90
Test Date	December 17, 2001

Conformance: The air void system of the analyzed sample was adequate to resist freezing and thawing damage.

Remarks:
1. The analysis was performed in general accordance with ASTM C-457, Procedure A—Linear Traverse Method.
2. The test sample will be retained for 30 days from the date of this report. After 30 days, the sample will be discarded unless other instructions are received.

AIR VOID SYSTEM ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

Sample No.: #2

Sample Data:

Sample Description: Concrete Core

Sample Dimensions: 3 ¾-in. Diameter, 3 ¾-in. Long

Test Data:

Air Void Content (%)	3.6
Entrained (%)	2.7
Entrapped (%)	0.9
Air Voids/inch	4.36
Average Void Length (in.)	0.008
Specific Surface (in^2/in^3)	487.8
Spacing Factor	0.010
Paste Content (%)	21.9
Magnification	100x
Traverse Length (in.)	90
Test Date	December 17, 2001

Conformance: The air void system of the analyzed sample was inadequate to resist freezing and thawing damage.

Remarks:

1. The analysis was performed in general accordance with ASTM C-457, Procedure A—Linear Traverse Method.
2. The test sample will be retained for 30 days from the date of this report. After 30 days, the sample will be discarded unless other instructions are received.

AIR VOID SYSTEM ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

Sample No.: #3

Sample Data:

Sample Description:	Concrete Core
Sample Dimensions:	3 ¾-in. Diameter, 4-in. Long

Test Data:

Air Void Content (%)	6.2
Entrained (%)	5.4
Entrapped (%)	0.8
Air Voids/inch	6.91
Average Void Length (in.)	0.009
Specific Surface (in^2/in^3)	445.7
Spacing Factor	0.009
Paste Content (%)	24.9
Magnification	100x
Traverse Length (in.)	90
Test Date	December 17, 2001

Conformance: The air void system of the analyzed sample was adequate to resist freezing and thawing damage.

Remarks:

1. The analysis was performed in general accordance with ASTM C-457, Procedure A—Linear Traverse Method.
2. The test sample will be retained for 30 days from the date of this report. After 30 days, the sample will be discarded unless other instructions are received.

psi

psi Information To Build On
Engineering • Consulting • Testing

TESTED FOR: PBS&J
13800 Monfort Drive
Suite 230
Addison, TX 75240

PROJECT: Pavement Concrete Evaluation
Beltline Rd. to Marsh Rd.
Addison, Texas

DATE: January 21, 2001

REPORT NO: 341-10088-3

REPORT OF ACID SOLUBLE MATTER

SAMPLE LOCATION	PERCENT LOSS
Core #1, 395 ft. from Quorum Drive and Beltline Intersection, Far Left Lane, Eastbound	94.8
Core #2, 297 ft. East from Beltline Drive and Beltline Road Intersection, Far Left Lane, Westbound	94.3
Core #3, 170 ft. at Beltline Road and Motel 6 Entrance Far Left Lane, Eastbound	95.2

BACKGROUND

The client had requested that the percentage of fine material soluble in a sulfuric acid solution be determined on the samples of existing concrete collected on this project. The client was aware of the limitations of the test method and that this may or may not be possible depending on the composition of the coarse aggregate contained in the existing concrete.

TEST PRODCEURE

A representative portion of the core sample was collected and immersed in a dilute solution of sulfuric acid. After all signs of reaction had ceased the sample was removed from this solution, washed and dried. The remaining material was crushed in a manner that would not reduce the size of the remaining particles of aggregate. This remaining material was immersed in a solution of concentrated sulfuric acid until all signs of reaction had ceased. The sample was washed, dried and crushed as previously reported and re-immersed in a fresh solution of concentrated sulfuric acid. This process was continued until any signs of a reaction with the acid was not observed upon immersion in a fresh solution of sulfuric acid. At this point the sample was removed from the acid, washed, dried and percent loss by weight determined.

CONCLUSIONS

The client had requested that the percentage of fine material contained in samples of existing concrete be determined and was aware that this may or may be possible to determine depending on the solubility of the coarse aggregate contained in the samples. The percentage of material dissolved by the sulfuric acid exceeds the quantity of fine aggregate and cement that would be expected in concrete. At the end of the test procedure no particles of large aggregate were visually observed and for these reasons we believe that the large aggregate was composed of material that was also soluble in sulfuric acid. Clearly the percent of acid soluble in the fine aggregate of these concrete samples could not be determined given these factors and the percent loss reported above should be interpreted as the percentage of total acid soluble material in the concrete.

Respectfully Submitted:
Professional Service Industries, Inc.

Jonathan J. Szostek
District Manager
Construction Services

Attachment "B"

Treatment Option	Performance	Service Life	Constructability	Appearance	Score	Cost ($/sy)
Longitudinal Texturing	5	4	5	5	19	$2.50
Hot Mix Asphalt Pavement	4	4	4	2	14	$6.00
Slurry Seal	2	2	5	2	11	$2.10
Microsurfacing	3	3	5	2	13	$2.50
Seal Coat	1	1	5	1	8	$1.75
Thin Bonded Concrete Overlay	1	4	1	5	11	N/A

Ratings are on a scale of 1 to 5 with 1 being the lowest or least acceptable and 5 being the highest or most desireable. These scores are highly subjective in nature.
Performance rating includes weighting for issues affecting chances of a successful implementation and appropriateness for this project.
The appearance rating is applied based on previous indications that Addison prefers concrete over hot mix appearances on their main thoroughfare.
Cost data represents average prices that include a wide range of conditions, project issues, and levels of competition. These are intended only for comparison purposes, not to establish a project estimate. Specific project costs may vary based on the issues listed above as well as contract requirements.
Cost for HMACP includes overlay, seal coat, and fabric treatment for existing cracks. Combination represents the minimum serviceability that would be acceptable, given the project location. Based on Hot Mix, TxDOT Ty D, 1 inch lift at $50/ton = $2.75/sy plus seal $1.25, plus fabric $2.
Cost for Thin Bonded Concrete Overlay is not included. Data available was not comparable to the project installation - high volume arterial with many intersections and drive access points.

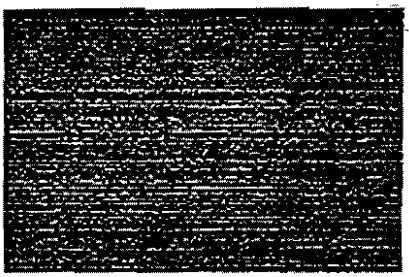
Surface Texture

(an excerpt from the website of the American Concrete Pavement Association http://www.pavement.com/PavTech/Tech/Fundamentals/fundtexture.html)

Surface textures are usually made during construction by dragging various materials or tools across the fresh concrete. This imparts a continuous series of undulations, or grooves, in the surface before the concrete hardens. The spacing, width and depth of the grooves affect surface friction, skid resistance and tire/road noise. The purpose of a surface texture is to reduce wet-weather accidents caused by skidding and hydroplaning.

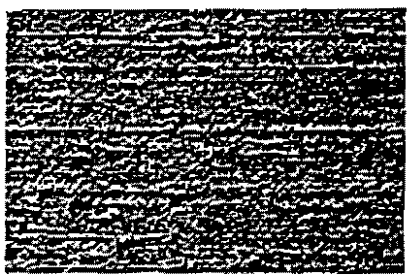
Over the past 40 years there have been several shifts in the most commonly applied texture. For concrete streets and local roads, where vehicle speeds are not great enough to cause hydroplaning, burlap-drag or broom textures are typical. The most common texture on high-speed road and highway pavements in North America remains transverse tining. However, a shift is underway to longitudinal tining which has been shown to produce excellent long-term skid resistance and much lower tire/road noise qualities both in a vehicle and along the roadway.

Drag Textures



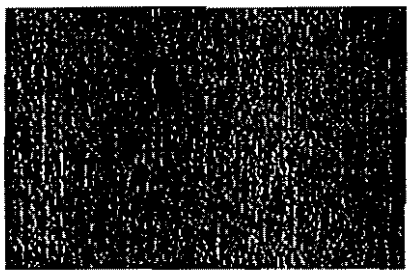
Broomed Surface

Obtained using either a hand broom or mechanical broom device that lightly drags the stiff bristles across the surface. Produces 1.5-3 mm (1/16-1/8 in.) deep striations. Can be oriented either longitudinal or transverse to centerline of roadway.



Turf Drag Surface

Produced by trailing an inverted section of artificial turf from a device that allows control of the time and rate of texturing - usually a construction bridge that spans the pavement. Produces 1.5-3 mm (1/16-1/8 in.) deep striations when using turf with 77,500 blades/m3 (xxxxx blades ft3).

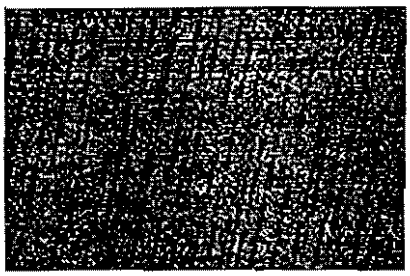


Burlap Drag Surface

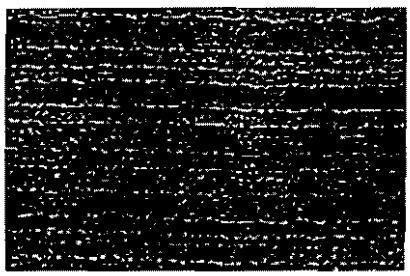
Produced by trailing moistened coarse burlap from a device that allows control of the time and rate of texturing - usually a construction bridge that spans the pavement. Produces 1.5-3 mm (1/16-1/8 in.) deep striations.

Tine Textures

Transverse Tine



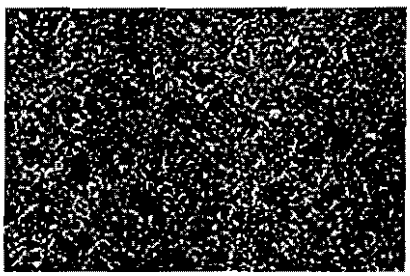
Achieved by a mechanical device equipped with a tining head (metal rake) that moves laterally across the width of the paving surface (a hand tool is sufficient on smaller areas.) Optimal dimensions are: random tine spacing 10 to 40-mm (1/2 to 1-1/2 in.) with no more than 50% above 25 mm (1 in.), 3-6 mm (1/8-1/4 in.) tine depth, and 3 mm (1/8 in.) tine width. Skewing, as shown, has been found to reduce tire/road noise.



Longitudinal Tine

Achieved in similar manner as transverse tining, except that tines are pulled in a line parallel to the pavement centerline. Optimal dimensions are: 20-mm (3/4-in.) uniform tine spacing, 3-6 mm (1/8-1/4 in.) tine depth, and 3 mm (1/8 in.) tine width.

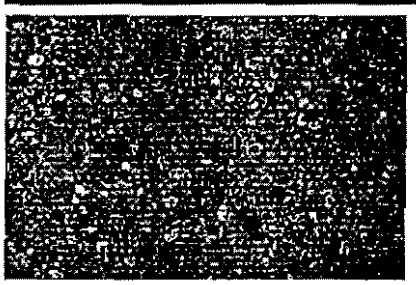
Exposed Aggregate



Exposed Aggregate

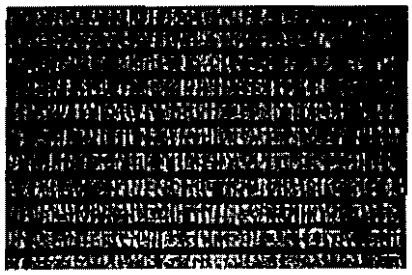
A mostly European practice of applying a set retarder to the new concrete surface, and then washing away surface mortar to expose durable chip-size aggregates. Requires uniformly applying chips to fresh surface and mechanically abrading surface to wash away still-wet mortar.

Hardened Concrete Textures



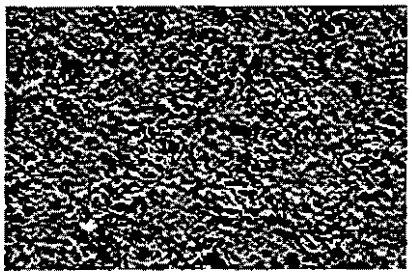
Diamond Ground

Longitudinal, corduroy-like surface made by equipment using diamond saw blades gang-mounted on a cutting head. The cutting head produces 164-197 grooves/meter (50-60 grooves/foot) and can remove 3-20 mm (1/8-3/4 in.) from the pavement surface.



Diamond Groove

Grooves sawed into surface longitudinally for highways, and transversely for airports. Made by same equipment used for diamond grinding. Typically, the grooves are 6 mm (1/4 in.) deep, 3 mm (1/8 in.) wide and spaced 20 mm (3/4 in.) apart. On airports, grooves are 6 mm (1/4 in.) deep, 6 mm (1/4 in.) wide and spaced 40 mm (1-1/2 in.) apart.



Abrated (Shot Blasted)

Etched surface produced by equipment that hurls abrasive media within an enclosed housing. The abrasive media impacts the surface and removes a thin layer of mortar and aggregate. The depth of the removal is controllable and the dust is vacuumed into a baghouse.

PBS&J

An employee-owned company

January 24, 2002

Mr. Steven Z. Chutchian
Assistant City Engineer
Town of Addison
16801 Westgrove Dr.
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Chutchian:

We are happy to submit the attached report of our evaluation of the surface conditions of Beltline Road. The report is submitted in "draft" form because we think there may be form or other changes or additions that you may want us to include in the final report. We have attached an excerpt about surface texturing from the website of the American Concrete Association. Let us know if you think it would be helpful to include this in the report. We will also include photos of the existing conditions to illustrate appropriate points.

We look forward to you reviewing the report and informing us of any changes that you desire.

Sincerely,

Clarence Daugherty

Clarence Daugherty, P.E.
Director of Municipal Services

Enclosure

CD/eo

K:\UII\450868.00\Beltline draft 1-24-02.doc

13800 Montfort Drive, Suite 230, Dallas, Texas 75240-4347 • Telephone: 972.387.0771 • Fax: 972.387.9714 • www.pbsj.com

Technical Pavement Analysis – Beltline Road
Town of Addison

The Town of Addison requested that PBS&J evaluate the pavement on Beltline Road from Dallas Parkway (Dallas North Tollway) to Marsh Lane to determine the cause of and solutions to the poor skid resistance of the pavement. This report provides some background, the methodology of the evaluation, alternative solutions and PBS&J's recommendation for improving this dangerous condition.

Background

The section of roadway studied is a six-lane arterial that is one of the main thoroughfares for the Town of Addison. The current pavement was constructed in 1980 and consists of an 8-inch jointed reinforced concrete pavement; three lanes in each direction with both interior and exterior protected turn bays at multiple locations, some of which have been added since the original pavement was constructed. No original construction records or materials records, other than the as-built plans, were available for review and analysis. "Polishing" of the surface was evident as early as the mid-to-late '80s. Testing by use of the TxDOT skid resistance trailer in 1989 indicated a "too slick" finding. Transverse grooving was performed at the Midway Road intersection for 200 feet in each direction. The pavement surface was ground in 1996 to a depth of 1/4 to 1/2 inches (with 1/8 inches between blades), the full length and width, to remove the polished surface. By 2000 the surface had become polished again.

The current traffic volume is over 50,000 vehicles per day, which is an extremely high volume of traffic for an urban arterial. Developed property adjacent to the roadway is almost entirely commercial establishments. Obviously, traffic is heavy all day long, but the peaks are during morning and evening rush hours as well as during the lunch hour. During these peaks, traffic is typically stop-and-go with several cycles required to clear intersection signals. Off-peak daytime hours exhibit moderate traffic volumes, usually clearing intersections with each signal cycle. Evening rush hour extends to approximately 8 p.m. on weekdays due to the number of restaurants that are along the project.

Pavement Condition Assessment

The existing pavement was evaluated both visually and physically. The visual inspection indicates that the pavement is in generally good structural condition, with only a few isolated locations exhibiting full depth failures that will need to be repaired. There are no indications of faulting at the transverse joints. This indicator is affected by the grinding application that was performed in 1996. It should be noted that no additional faulting has been exhibited since that time. Reportedly, the grinding was performed to address surface texture, not joint faulting. The current ride profile is very good to excellent.

Longitudinal joints appear to be in good condition, as well. There were no locations observed that had abnormal joint widths. This leads to the conclusion that tie-bars are installed properly and in sufficient quantity to resist the lateral stresses. The visual inspection did confirm that there was some differential wearing between the wheel paths and the non-travel areas. This wearing is projected to continue and factors heavily into the evaluation of corrective actions.

Since no original materials records were available for review and analysis, we requested that three concrete core samples be taken and analyzed in an attempt to quantify the physical characteristics of the concrete. The sample retrieval and physical evaluation of the pavement cores was performed by our laboratory sub-consultant, PSI, Inc. Core samples were evaluated by petrographic analysis to determine: a likely range of water/cement ratio, depth of carbonation, and air content - both entrained and entrapped. Samples were also subjected to an acid insoluble analysis to predict the durability of the composite materials used in the pavement. While the solubility results are not a direct predictor of pavement performance, it does reveal that aggregate and paste quality will contribute to continued surface polishing. Technical results from these tests and analysis are included as Attachment "A".

The critical results gleaned from the report are that the components of the concrete (aggregate, sand, cement) are of satisfactory quality. However, the quality of the composite combination is less than desirable. The water cement ratios of up to .60 explain the concrete's wearing characteristics. The mortar paste is of marginal strength to be able to resist short-term wear, and will probably not provide satisfactory long-term durability or resistance to wear. This confirms the initial "polishing" observed and the inability of the subsequent transverse sawed tining to provide the long-term skid resistance desired.

Possible Solutions

There are several courses of action that may be implemented to improve the surface skid resistance of the roadway. These options will be described, including the pros and cons that must be considered in selecting the appropriate solution. None of the options should be considered "permanent" solutions. The pavement surface will continue to wear and polish, requiring additional actions at some point in the future. These approaches are summarized in a tabular format in Attachment "B" including a weighting matrix of characteristics and approaches.

Sawed Surface Texture (Longitudinal or Transverse) – This procedure consists of diamond saw blades mounted in a "gang" arrangement with spacers between the blades to provide the desirable groove separation. The blades are mounted on a heavy frame self-propelled device that includes grade control averaging to minimize the effect of deviations in surface elevations. The primary benefit of this approach is to provide gaps for water to flow under pressure exerted by vehicle tires. A secondary benefit is to increase the macro-texture of the pavement surface, thus improving resistance in dry and

damp conditions. The effectiveness of this approach is heavily dependant on the depth, width, and spacing of the sawed grooves. This solution would be limited to primary travel lanes, due to the difficulty in installation in turn bays. Typically, turn bays are in good condition relative to surface texture, and speeds in them are slower than the travel lanes.

Transverse texture sawing has already been applied in limited areas at two intersections on the project. Longitudinal texturing is an option that would provide the same benefits, would be much faster and, therefore, more cost effective, to install. This solution was utilized in Dallas on IH 635 between Skillman and Abrams Road to resolve similar pavement issues.

> *Pros* – Improved skid resistance; relatively inexpensive; installation can be done at night regardless of temperature; leaves surface the same color already present; mimimal re-work required on signal loops if loops are currently installed at least ¾ inch below the current surface; work in process at the end of each "day" leaves no differences discernable to the traveling public.
>
> *Cons* – Given the composite concrete water-cement ratio characteristic, the realistic life expectancy would be 5 to 7 years; the slurry produced during sawing may have to be picked up in a vacuum truck and disposed off-site.

Hot Mix Asphaltic Concrete Pavement Overlay – This solution is typically utilized to provide additional structural pavement support as well as increased skid resistance. Lift thickness is dependant on the nominal maximum size of the coarse aggregate. Installations over Jointed (Reinforced or Plain) Concrete Pavement typically exhibit reflective cracking at the joints within a year. The width of the reflected crack is dependant on the amount of movement (expansion and contraction) of the concrete sections. This is a direct function of the joint spacing in the concrete pavement. Steps taken to mimimize reflective cracking include sawing and sealing mirror joints in the overlay, using geotextile fabric applied over the joints prior to overlay, using a rubber modified stress absorbing membrane (SAMI) applied to the full width of the roadway under the overlay, or a rubber modified asphalt in a high void mix designed for the application.

> *Pros* – Improved skid resistance; easily accommodates irregular surfaces, both vertically and horizontally; results in a uniform appearance of the finished product; appropriate mix design will result in dramatically improved surface macro- and micro-texture; in future maintenance cycles, it can be overlaid for continued service.
>
> *Cons* – Relatively expensive due to additional expense in treating reflective cracking; requires a bonding application (seal coat, etc.) to promote adequate adhesion; extensive sprinkler systems on adjoining properties contribute water onto the roadway, increasing threat of de-bonding; while the surface application is rapid, the preparation steps required would take a substantial amount of time;

work in progress leaves both longitudinal and transverse joint elevation differentials.

Polymer Modified Slurry Seal – This slurry seal is a 1/4 to 3/8-inch thick application of a mixture of a very small aggregate suspended in a polymer modified emulsified asphalt.

Pros – Improved skid resistance; relatively inexpensive; resultant layer is *resistant* to moisture; macro-texture results from aggregate "points" that protrude above the asphalt layer.

Cons - Durability is a concern in this high volume application (typical application is low volume residential streets, parking lots, etc.); although resistant to moisture, it is not water proof.

Micro-surfacing – Similar to the PMSS, but uses cement as the mineral filler. It is typically applied to rutted flexible pavements with an initial pass to fill ruts up to 1/4-inch in depth, followed by a surface application that covers the full lane width. It also can be applied to rigid pavements.

Pros – Improved skid resistance; relatively inexpensive; results in a finished product that is more durable than PMSS, but less flexible than a PMSS, which is desirable on this project due to the high traffic volumes.

Cons – More rigid than PMSS, allowing reflective cracking of joints; subject to de-bonding at the end of its useful life - this results from the intrusion of moisture over time into the interlayer between the existing concrete pavement and the micro-surfacing.

Seal Coat – An application of liquid asphalt, either hot AC or emulsion, with a layer of aggregate spread over the top and seated by rolling. Serves to waterproof underlying pavement layers from water intrusion from the surface as well as to enhance the bonding of HMACP overlays.

Pros – Improved skid resistance; the least expensive of the alternatives.

Cons – Durability is not good in this high traffic application; does not result in good appearance; there will be some loose aggregate; aggregate is unstable under heavy traffic and turning movements.

Thin-bonded Concrete Overlay – Application of approximately 2" of concrete over the existing concrete pavement structure.

Pros – Improved skid resistance; results in renewed concrete surface appearance.

Cons – Expensive; requires extensive surface preparation; environmental requirements at time of placement are extremely sensitive (humidity, air

temperature, wind, surface cleanliness); requires lane closures for surface preparation, installation, and curing; extended time for installation; low probability of a quality installation.

Recommendations

Based on a review of the test data, field observations, costs (including inconvenience to traveling public), and benefits, PBS&J recommends the installation of longitudinal concrete texturing. This solution provides a desirable blend of cost effectiveness, minimal disruption of traffic, and serviceability. Its desirability is also enhanced because it requires minimal additional activities such as re-striping. While this solution is not "permanent", it meets the service needs while minimizing the future cost of pursuing another option, such as an overlay. Other options considered would include some cost to remove or re-mediate in order to install another surfacing in the future.

The concrete in the pavement of Beltline Road is simply not durable enough to withstand almost 60,000 vpd without wearing. The longitudinal texturing will have to be carefully specified to make sure that there is adequate depth to the grooves and adequate width between the grooves. This will maximize the impact of skid resistance and will provide the longest "life" of the grooves that is possible. But even with careful specification, and with careful installation, there is a limit to how long this texturing will be effective. The Town should incorporate into their life-cycle maintenance program additional improvements in 5-7 years. None of the alternatives offer any advantages in this regard. The only way to prevent the need for periodic improvement is to re-build the pavement. This was not included as an alternative because re-building the pavement would be far too costly and the process would be far too disruptive to be worthwhile. Addressing the problem every 5-7 years is more economical and more practical.

There are some other needs that could be incorporated into this project. It is recommended that the longitudinal and transverse joints be cleaned and re-sealed to maintain the resistance to water penetration into the subgrade if that has not been done in recent years. It is also recommended that the few pavement failures that currently exist be repaired as part of this project, as well. The structural integrity of this pavement is very good (it is surprising that there have been so few structural failures with this age street and such high traffic volumes). Therefore, it is our conclusion that Beltline Road will be very serviceable for a long period of time if the actions recommended in this report are taken and an appropriate maintenance program is followed.

Attachment "A"

Laboratory Reports

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JAN 0 9 2002

PETROGRAPHIC ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

BACKGROUND

This report presents the results of petrographic analysis of three (3) concrete core samples, submitted by Mr. Robert Nance of PSI's Dallas, Texas Office. Reportedly, the samples were retrieved from a concrete pavement that was constructed in 1982. Identification of the samples along with their location is as follows:

Sample Identification	Sample Location
#1	395 ft. from Quorum Drive and Beltline Intersection Far Left Lane, Eastbound
#2	297 ft. East from Beltway Drive and Beltline Road Intersection Far Left Lane, Westbound
#3	170 ft. at Beltline Road and Motel 6 Entrance Far Left Lane, Eastbound

It was reported that the concrete pavement started exhibiting deterioration in the form of spalling and surface polishing in 1987, five years after its construction. The objective of the analysis was to determine the general overall quality of concrete represented by the analyzed samples, and determine the possible cause(s) of its deterioration.

SUMMARY OF FINDINGS

The findings of our petrographic analysis are summarized below:

1. The coarse aggregates in the analyzed samples were primarily composed of limestone and dolomite. Whereas, the fine aggregates in the analyzed samples were primarily composed of quartz, feldspar, limestone, and dolomite. The aggregates were generally sound.

2. The water-to-cement ratio (w/c) in the bulk portion of the analyzed samples was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in all the analyzed samples.

3. Cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20% in the analyzed samples.

4. The air void system of Sample #1 and Sample #3 was adequate for resisting freezing and thawing damage. However, Sample #2 did not have an adequate air void system for resisting freezing and thawing damage.

5. Ettringite crystals were observed lining few air voids in Sample #2 and Sample #3.

CONCLUSIONS

The general overall quality of the analyzed samples was rated as fair to poor, as evidenced by their relatively high and non-uniform w/c ratio, which was estimated to be as high as 0.60. Concrete with such w/c is prone to surface polishing.

Sample #2 did not have an adequate air void system for resisting freezing and thawing damage. Concrete represented by this sample is susceptible to freeze-thaw damage.

Ettringite crystals were observed lining few air voids in Sample #2 and Sample #3. However, it is not believed that ettringite has caused any significant damage in the samples. The formation of ettringite in hardened concrete is initiated by a reaction between external sulfate ions and calcium hydroxide of concrete, which produces gypsum. This gypsum reacts with monosulfoaluminate in concrete, in the presence of moisture, and produces "6-calcium aluminate trisulfate 32-hydrate" that is the chemical name of ettringite. The formation of ettringite in hardened concrete is detrimental because ettringite is expansive and hardened concrete cannot accommodate this expansion.

TEST PROCEDURES

Petrographic analysis

The petrographic analysis was performed in general accordance with ASTM C856-95. The analysis included examining a thick polished section using a stereo microscope and a blue-dyed thin section using a polarized light microscope. Depth of carbonation was determined using a 0.15% phenolphthalein solution. Water-to-cement ratio was estimated based upon the appearance of a finely lapped sample surface, cement reaction to needle scratching, absorption of a water drop, and examination of a thin section under a polarized light microscope.

Air content testing

Air content testing was performed in general accordance with ASTM C457-90, Procedure A—Linear Traverse Method. A thick polished section cut from the concrete core was examined using a stereo microscope at a magnification of 100x.

REMARKS

The test sample will be retained for a period of 30 days from the date of this report. Unless further instructions are received by that time, the samples will be discarded.

Respectfully Submitted,
Professional Service Industries, Inc.

Thomas H. Suthers, P.E.
Department Manager
Structural Investigation & Petrography

psi

PETROGRAPHIC ANALYSIS DATA SHEET

Petrographic Lab Report No.: 807-I-16151 #1

A. General Observations

1. Sample Dimensions: The sample was a 3 ¾-in. diameter concrete core, about 4 ¼-in. long. One polished section was examined under a stereo microscope, and one thin section with blue epoxy impregnation was studied under a polarized light microscope.

2. Surface Conditions: Tined surface.

3. Reinforcement: None observed.

4. General Conditions: The concrete sample appeared to be in stable condition. No segregation or cracking was observed. Aggregates were well oriented and well distributed.

B. Aggregate

1. Coarse : The coarse aggregates in the analyzed sample were primarily composed of limestone and dolomite. They were mostly subrounded to subangular. The maximum size of the aggregates was about 1 ½-in. The aggregates were generally sound.

2. Fine: The fine aggregates in the analyzed sample were primarily composed of quartz, feldspar, limestone, and dolomite. They are mostly subangular to angular, and generally sound.

C. Cementitious Paste

1.	Paste Content:	30.1%.
2.	Air Content:	5.3% total; 3.9% entrained, 1.4% entrapped.
3.	Depth of Carbonation:	Up to a depth of 1/8 in. from the surface.
4.	Pozzolan Presence:	None observed.
5.	Paste/Aggregate Bonding:	Moderate.
6.	Paste Color:	Gray.
7.	Paste Hardness:	Moderate.
8.	Secondary Deposits:	None observed
9.	Water-to-Cement Ratio (W/C):	Average w/c in the bulk portion of the analyzed sample was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in the sample.
10.	Paste Quality:	The cement paste was generally sound; the cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20%.
11.	Microcracks:	Microcracks were observed in the cement paste.

PETROGRAPHIC ANALYSIS DATA SHEET

Petrographic Lab Report No.: 807-I-16151 #2

A. General Observations

1. Sample Dimensions: The sample was a 3 ¾-in. diameter concrete core, about 3 ¾-in. long. One polished section was examined under a stereo microscope, and one thin section with blue epoxy impregnation was studied under a polarized light microscope.

2. Surface Conditions: Irregular.

3. Reinforcement: None observed.

4. General Conditions: The concrete sample appeared to be in stable condition. No segregation or cracking was observed. Aggregates were well oriented and well distributed.

B. Aggregate

1. Coarse : The coarse aggregates in the analyzed sample were primarily composed of limestone and dolomite. They were mostly subrounded to subangular. The maximum size of the aggregates was about 1 ½-in. The aggregates were generally sound.

2. Fine: The fine aggregates in the analyzed sample were primarily composed of quartz, feldspar, limestone, and dolomite. They are mostly subangular to angular, and generally sound.

C. Cementitious Paste

1.	Paste Content:	21.9%.
2.	Air Content:	3.6% total; 2.7% entrained, 0.9% entrapped.
3.	Depth of Carbonation:	Up to a depth of 1/8 in. from the surface.
4.	Pozzolan Presence:	None observed.
5.	Paste/Aggregate Bonding:	Moderate.
6.	Paste Color:	Gray.
7.	Paste Hardness:	Moderate.
8.	Secondary Deposits:	Ettringite crystals were observed lining few air voids.
9.	Water-to-Cement Ratio (W/C):	Average w/c in the bulk portion of the analyzed sample was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in the sample.
10.	Paste Quality:	The cement paste was generally sound; the cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20%.
11.	Microcracks:	Microcracks were observed in the cement paste.

PETROGRAPHIC ANALYSIS DATA SHEET

Petrographic Lab Report No.: 807-l-16151 #3

A. General Observations

1. Sample Dimensions: The sample was a 3 ¾-in. diameter concrete core, about 4-in. long. One polished section was examined under a stereo microscope, and one thin section with blue epoxy impregnation was studied under a polarized light microscope.

2. Surface Conditions: Tined surface.

3. Reinforcement: None observed.

4. General Conditions: The concrete sample appeared to be in stable condition. No segregation or cracking was observed. Aggregates were well oriented and well distributed.

B. Aggregate

1. Coarse : The coarse aggregates in the analyzed sample were primarily composed of limestone and dolomite. They were mostly subrounded to subangular. The maximum size of the aggregates was about 1 ½-in. The aggregates were generally sound.

2. Fine: The fine aggregates in the analyzed sample were primarily composed of quartz, feldspar, limestone, and dolomite. They are mostly subangular to angular, and generally sound.

C. Cementitious Paste

1.	Paste Content:	24.9%.
2.	Air Content:	6.2% total; 5.4% entrained, 0.8% entrapped.
3.	Depth of Carbonation:	Up to a depth of 1/8 in. from the surface.
4.	Pozzolan Presence:	None observed.
5.	Paste/Aggregate Bonding:	Moderate.
6.	Paste Color:	Gray.
7.	Paste Hardness:	Moderate.
8.	Secondary Deposits:	Ettringite crystals were observed lining few air voids.
9.	Water-to-Cement Ratio (W/C):	Average w/c in the bulk portion of the analyzed sample was estimated to be in the range of 0.47 to 0.52. However, patches of w/c as high as 0.60 were observed in the sample.
10.	Paste Quality:	The cement paste was generally sound; the cementitious material was reasonably hydrated. Unhydrated cementitious particles were estimated to be about 20%.
11.	Microcracks:	Microcracks were observed in the cement paste.

AIR VOID SYSTEM ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

Sample No.: #1

Sample Data:

Sample Description:	Concrete Core
Sample Dimensions:	3 ¾-in. Diameter, 4 ¼-in. Long

Test Data:

Air Void Content (%)	5.3
Entrained (%)	3.9
Entrapped (%)	1.4
Air Voids/inch	6.21
Average Void Length (in.)	0.009
Specific Surface (in^2/in^3)	464.1
Spacing Factor	0.010
Paste Content (%)	30.1
Magnification	100x
Traverse Length (in.)	90
Test Date	December 17, 2001

Conformance: The air void system of the analyzed sample was adequate to resist freezing and thawing damage.

Remarks:

1. The analysis was performed in general accordance with ASTM C-457, Procedure A—Linear Traverse Method.
2. The test sample will be retained for 30 days from the date of this report. After 30 days, the sample will be discarded unless other instructions are received.

AIR VOID SYSTEM ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

Sample No.: #2

Sample Data:

Sample Description:	Concrete Core
Sample Dimensions:	3 ¾-in. Diameter, 3 ¾-in. Long

Test Data:

Air Void Content (%)	3.6
Entrained (%)	2.7
Entrapped (%)	0.9
Air Voids/inch	4.36
Average Void Length (in.)	0.008
Specific Surface (in^2/in^3)	487.8
Spacing Factor	0.010
Paste Content (%)	21.9
Magnification	100x
Traverse Length (in.)	90
Test Date	December 17, 2001

Conformance: The air void system of the analyzed sample was inadequate to resist freezing and thawing damage.

Remarks:
1. The analysis was performed in general accordance with ASTM C-457, Procedure A—Linear Traverse Method.
2. The test sample will be retained for 30 days from the date of this report. After 30 days, the sample will be discarded unless other instructions are received.

psi

AIR VOID SYSTEM ANALYSIS REPORT

PROJECT:
Pavement Concrete Evaluation

REPORTED TO:
PSI
4087 Shilling Way
Dallas, TX 75237
Attention: Mr. Robert Nance

Petrographic Lab No.: 807-I-16151

Date: December 20, 2001

Sample No.: #3

Sample Data:

Sample Description:	Concrete Core
Sample Dimensions:	3 ¾-in. Diameter, 4-in. Long

Test Data:

Air Void Content (%)	6.2
Entrained (%)	5.4
Entrapped (%)	0.8
Air Voids/inch	6.91
Average Void Length (in.)	0.009
Specific Surface (in^2/in^3)	445.7
Spacing Factor	0.009
Paste Content (%)	24.9
Magnification	100x
Traverse Length (in.)	90
Test Date	December 17, 2001

Conformance: The air void system of the analyzed sample was adequate to resist freezing and thawing damage.

Remarks:

1. The analysis was performed in general accordance with ASTM C-457, Procedure A—Linear Traverse Method.
2. The test sample will be retained for 30 days from the date of this report. After 30 days, the sample will be discarded unless other instructions are received.

Information To Build On
Engineering • Consulting • Testing

TESTED FOR: PBS&J
13800 Monfort Drive
Suite 230
Addison, TX 75240

PROJECT: Pavement Concrete Evaluation
Beltline Rd. to Marsh Rd.
Addison, Texas

DATE: January 21, 2001

REPORT NO: 341-10088-3

REPORT OF ACID SOLUBLE MATTER

SAMPLE LOCATION	PERCENT LOSS
Core #1, 395 ft. from Quorum Drive and Beltline Intersection, Far Left Lane, Eastbound	94.8
Core #2, 297 ft. East from Beltline Drive and Beltline Road Intersection, Far Left Lane, Westbound	94.3
Core #3, 170 ft. at Beltline Road and Motel 6 Entrance Far Left Lane, Eastbound	95.2

BACKGROUND

The client had requested that the percentage of fine material soluble in a sulfuric acid solution be determined on the samples of existing concrete collected on this project. The client was aware of the limitations of the test method and that this may or may not be possible depending on the composition of the coarse aggregate contained in the existing concrete.

TEST PRODCEURE

A representative portion of the core sample was collected and immersed in a dilute solution of sulfuric acid. After all signs of reaction had ceased the sample was removed from this solution, washed and dried. The remaining material was crushed in a manner that would not reduce the size of the remaining particles of aggregate. This remaining material was immersed in a solution of concentrated sulfuric acid until all signs of reaction had ceased. The sample was washed, dried and crushed as previously reported and re-immersed in a fresh solution of concentrated sulfuric acid. This process was continued until any signs of a reaction with the acid was not observed upon immersion in a fresh solution of sulfuric acid. At this point the sample was removed from the acid, washed, dried and percent loss by weight determined.

CONCLUSIONS

The client had requested that the percentage of fine material contained in samples of existing concrete be determined and was aware that this may or may be possible to determine depending on the solubility of the coarse aggregate contained in the samples. The percentage of material dissolved by the sulfuric acid exceeds the quantity of fine aggregate and cement that would be expected in concrete. At the end of the test procedure no particles of large aggregate were visually observed and for these reasons we believe that the large aggregate was composed of material that was also soluble in sulfuric acid. Clearly the percent of acid soluble in the fine aggregate of these concrete samples could not be determined given these factors and the percent loss reported above should be interpreted as the percentage of total acid soluble material in the concrete.

Respectfully Submitted:
Professional Service Industries, Inc.

Jonathan J. Szostek
District Manager
Construction Services

Attachment "B"

Treatment Option	Performance	Service Life	Constructability	Appearance	Score	Cost ($/sy)
Longitudinal Texturing	5	4	5	5	19	$2.50
Hot Mix Asphalt Pavement	4	4	4	2	14	$6.00
Slurry Seal	2	2	5	2	11	$2.10
Microsurfacing	3	3	5	2	13	$2.50
Seal Coat	1	1	5	1	8	$1.75
Thin Bonded Concrete Overlay	1	4	1	5	11	N/A

Ratings are on a scale of 1 to 5 with 1 being the lowest or least acceptable and 5 being the highest or most desireable. These scores are highly subjective in nature.
Performance rating includes weighting for issues affecting chances of a successful implementation and appropriateness for this project.
The appearance rating is applied based on previous indications that Addison prefers concrete over hot mix appearances on their main thoroughfare.
Cost data represents average prices that include a wide range of conditions, project issues, and levels of competition. These are intended only for comparison purposes, not to establish a project estimate. Specific project costs may vary based on the issues listed above as well as contract requirements.
Cost for HMACP includes overlay, seal coat, and fabric treatment for existing cracks. Combination represents the minimum serviceability that would be acceptable, given the project location. Based on Hot Mix, TxDOT Ty D, 1 inch lift at $50/ton = $2.75/sy plus seal $1.25, plus fabric $2.
Cost for Thin Bonded Concrete Overlay is not included. Data available was not comparable to the project installation - high volume arterial with many intersections and drive access points.

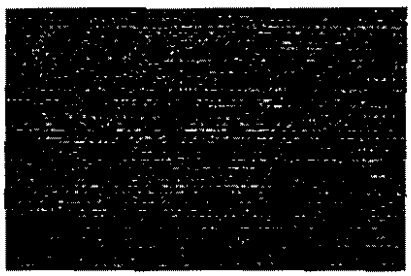
Surface Texture

(an excerpt from the website of the American Concrete Pavement Association http://www.pavement.com/PavTech/Tech/Fundamentals/fundtexture.html)

Surface textures are usually made during construction by dragging various materials or tools across the fresh concrete. This imparts a continuous series of undulations, or grooves, in the surface before the concrete hardens. The spacing, width and depth of the grooves affect surface friction, skid resistance and tire/road noise. The purpose of a surface texture is to reduce wet-weather accidents caused by skidding and hydroplaning.

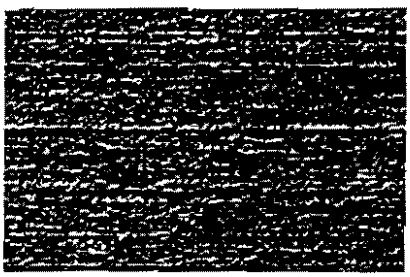
Over the past 40 years there have been several shifts in the most commonly applied texture. For concrete streets and local roads, where vehicle speeds are not great enough to cause hydroplaning, burlap-drag or broom textures are typical. The most common texture on high-speed road and highway pavements in North America remains transverse tining. However, a shift is underway to longitudinal tining which has been shown to produce excellent long-term skid resistance and much lower tire/road noise qualities both in a vehicle and along the roadway.

Drag Textures



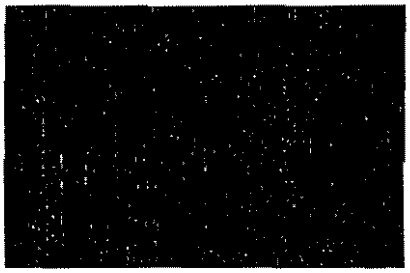
Broomed Surface

Obtained using either a hand broom or mechanical broom device that lightly drags the stiff bristles across the surface. Produces 1.5-3 mm (1/16-1/8 in.) deep striations. Can be oriented either longitudinal or transverse to centerline of roadway.



Turf Drag Surface

Produced by trailing an inverted section of artificial turf from a device that allows control of the time and rate of texturing - usually a construction bridge that spans the pavement. Produces 1.5-3 mm (1/16-1/8 in.) deep striations when using turf with 77,500 blades/m3 (xxxxx blades ft3).

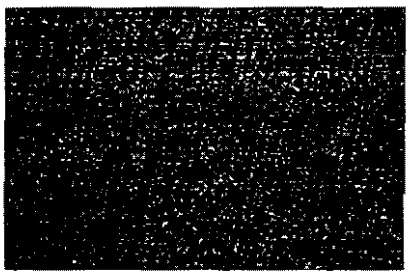


Burlap Drag Surface

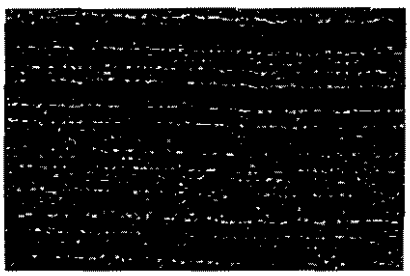
Produced by trailing moistened coarse burlap from a device that allows control of the time and rate of texturing - usually a construction bridge that spans the pavement. Produces 1.5-3 mm (1/16-1/8 in.) deep striations.

Tine Textures

Transverse Tine



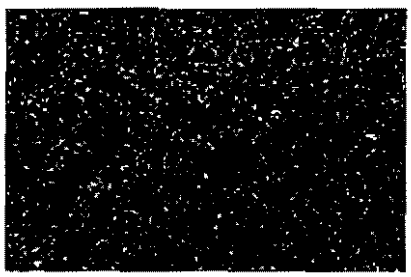
Achieved by a mechanical device equipped with a tining head (metal rake) that moves laterally across the width of the paving surface (a hand tool is sufficient on smaller areas.) Optimal dimensions are: random tine spacing 10 to 40-mm (1/2 to 1-1/2 in.) with no more than 50% above 25 mm (1 in.), 3-6 mm (1/8-1/4 in.) tine depth, and 3 mm (1/8 in.) tine width. Skewing, as shown, has been found to reduce tire/road noise.



Longitudinal Tine

Achieved in similar manner as transverse tining, except that tines are pulled in a line parallel to the pavement centerline. Optimal dimensions are: 20-mm (3/4-in.) uniform tine spacing, 3-6 mm (1/8-1/4 in.) tine depth, and 3 mm (1/8 in.) tine width.

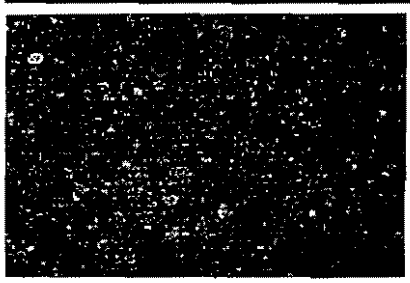
Exposed Aggregate



Exposed Aggregate

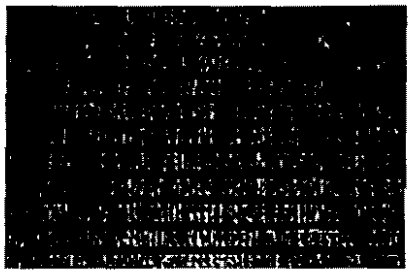
A mostly European practice of applying a set retarder to the new concrete surface, and then washing away surface mortar to expose durable chip-size aggregates. Requires uniformly applying chips to fresh surface and mechanically abrading surface to wash away still-wet mortar.

Hardened Concrete Textures



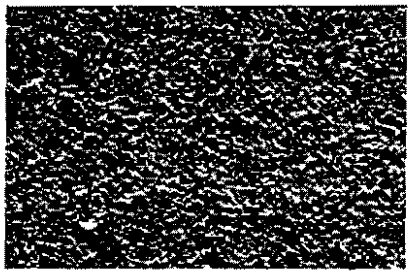
Diamond Ground

Longitudinal, corduroy-like surface made by equipment using diamond saw blades gang-mounted on a cutting head. The cutting head produces 164-197 grooves/meter (50-60 grooves/foot) and can remove 3-20 mm (1/8-3/4 in.) from the pavement surface.



Diamond Groove

Grooves sawed into surface longitudinally for highways, and transversely for airports. Made by same equipment used for diamond grinding. Typically, the grooves are 6 mm (1/4 in.) deep, 3 mm (1/8 in.) wide and spaced 20 mm (3/4 in.) apart. On airports, grooves are 6 mm (1/4 in.) deep, 6 mm (1/4 in.) wide and spaced 40 mm (1-1/2 in.) apart.



Abrated (Shot Blasted)

Etched surface produced by equipment that hurls abrasive media within an enclosed housing. The abrasive media impacts the surface and removes a thin layer of mortar and aggregate. The depth of the removal is controllable and the dust is vacuumed into a baghouse.

PBS&J

An employee-owned company

October 10, 2001

Mr. Steven Z. Chutchian
Assistant City Engineer
Town of Addison
16801 Westgrove Dr.
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Chutchian:

PBS&J is very pleased to be able to provide the Town of Addison with this proposal concerning a study of the surface conditions of Beltline Road. We appreciate the fact that Addison has recognized PBS&J as a company that has the resources to assist the Town in this way.

Explanations of the proposed scope, fee and time of completion are included in the appropriate sections of this proposal. We propose that Clarence Daugherty, P.E., be the Project Manager and that Doug Dillon, P.E., Manager of our Construction Services Division, perform the technical analysis and develop the report. Resumes of these professionals are attached to this proposal.

Our proposed approach utilizes all the historical information that is available regarding Beltline Road. Specifically, it appears that the testing performed in the past should provide us with the information needed, and we do not propose to do additional material testing. Therefore, our fee includes review and use of previous testing information only. If, after review of the previous testing information (at the beginning of the project), we and the Town conclude that additional tests are warranted, then this can be done by the Town, either directly or through PBS&J.

Thank you for your confidence in PBS&J. We look forward to discussing the project with you further after your review of this proposal. We are available to start the study at your convenience.

Sincerely,

Clarence Daugherty

Clarence Daugherty, P.E.
Director of Municipal Services

13800 Montfort Drive, Suite 230, Dallas, Texas 75240-4347 • Telephone: 972.387.0771 • Fax: 972.387.9714 • www.pbsj.com

SURFACE CONDITION STUDY
BELTLINE ROAD FROM DALLAS PARKWAY TO MARSH LANE
ADDISON, TEXAS

SCOPE OF SERVICES

PBS&J proposes to perform a study of the surface conditions of Beltline Road from Dallas Parkway to Marsh Lane. It is PBS&J's understanding that the surface of Beltline became slick or "polished" many years ago and that several attempts have been made to solve the problem. The purpose of this study will be to identify a definitive method to overcome the surface problems of this pavement. This would be done by providing to the Town the results of the analyses of several alternative strategies so that the Town can decide the strategy that best fits the Town.

It is proposed that PBS&J perform the following tasks:

- Gather detailed information about the history of the pavement: accidents, studies and material tests, potential contributing factors, previous improvements, etc.
- Make field observations
- Identify potential improvement strategies to restore desired skid resistance properties
- Determine what each strategy accomplishes, or fails to accomplish, and the characteristics of each strategy that may make a difference to the Town's final decision
- Estimate the construction and life cycle cost of each strategy
- Develop a matrix that indicates a rating for each strategy in the areas of pavement surface performance, service life, cost effectiveness, constructability and community acceptability
- Present the resulting report to the Town in draft form and then in final form after review and discussion with the Town staff

It is proposed that the Town

- make available all information pertinent to the analysis of the pavement
- review partial study information submitted by consultant as needed and provide consultant appropriate direction
- review draft report and provide feedback in a timely manner to facilitate completion of the final report

PBSJ

COMPENSATION

PBS&J proposes to prepare this study for a fixed fee of $8500. This fee includes all labor and expenses, but does not include any laboratory testing. Any testing that is required can either be contracted by the Town directly or by PBS&J as an additional fee.

TIME OF COMPLETION

PBS&J proposes to perform the work and submit a draft report within 20 working days. Converting this time to calendar days will depend on the date of the notice to proceed, whether or not any holidays fall within the project time and any time required by the Town to gather information needed by PBS&J. A Final Report will be completed one week after PBS&J receives comments regarding the draft report.

Clarence Travis Daugherty, P.E.

Senior Program Manager
PBS&J

Education

M.E., Public Works Administration, Texas A&M University, 1970
B.S., Civil Engineering, Texas A&M University, 1969

Registrations

Professional Engineer
Texas

Professional Affiliations

Association of County Engineers, Texas, President, 1993
American Public Works Association (APWA), Texas Chapter
- President, 1985
- Chapter Service Award, 1986
- One of top three Leaders of the Year, 1981

American Public Works Association (APWA), North Central Texas Branch
- Leader of the Year, 1978

Mr. Daugherty has 30 years of public works experience with cities and counties in Texas. He now directs PBS&J's services for municipalities in the greater Dallas area. PBS&J's projects in the Dallas area consist of a wide range of types and sizes of projects. The size of projects varies from a large water line replacement project for the City of Dallas to small street, drainage, water and sewer projects in the surrounding cities and counties. PBS&J (specifically Mr. Daugherty) serves as the City Engineer for the City of Kaufman.

Mr Daugherty was Assistant Director of Public Works for the City of San Antonio from 1995 to 1998, providing a wide spectrum of city services. Prior to San Antonio, he was Director of Public Works in Collin County and the City of Plano, Assistant City Manager in the City of DeSoto as well as a capital project manager/engineer for the City of Dallas and a design engineer-in-training with the City of Bryan. His primary responsibilities throughout his career have been managing capital projects, growth management and the general business management of the operations of the city or county. All of the cities and the county in which Mr. Daugherty was employed were high growth areas that required attention to planning, management of new development, construction of new infrastructure, rehabilitation of old infrastructure and careful management of operations to respond to growth. His experience results in a keen sensitivity to planning, an appreciation for the need for projects to be managed well and the recognition of the maintenance needs in the design of new projects.

As Assistant Director of Public Works for the City of San Antonio, Mr. Daugherty was directly responsible for Capital Programs Management, Drainage Engineering, Streets and Drainage Maintenance, Building Maintenance and Downtown Parking. In addition he was "second in command" to the Director over the entire department which also included Solid Waste Management, Environmental Services and Streets and Traffic Engineering. One of Mr. Daugherty's accomplishments was the re-structuring of the Capital Programs Division. His insight from many years of project management experience guided the development of teams of project managers, engineers, public information specialists and technicians to properly manage $30-$40 million in streets and drainage projects annually. The re-organization and direction by Mr. Daugherty has resulted in the close attention to project schedules, budgets, design issues and conflict resolution necessary to initiate and complete the projects on time and within budget. Mr. Daugherty also directly managed projects that were sensitive due to public interest and environmental concerns. Examples of such projects are Woodlawn/Lake Streets reconstruction - $2,400,000 (environment concerns about storm water discharge into municipal lake) and the proposal and ultimate adoption of increased street standards for new developments. Mr. Daugherty also personally coordinated the various aspects of the NPDES Storm Water Phase I permit program, including the regulatory, engineering, operations, maintenance and budgetary aspects.

As Director of Public Works for Collin County, Mr. Daugherty was responsible for planning, subdivision regulations, the capital improvements program, road maintenance, the Open Space Program, building facilities management, the Fire Marshal's Office and building inspections. Under his direction the County's first transportation and bridge bond program was developed and implemented and the only rural building inspection program in the State was established. The $55 million transportation and bridge bond program was a combination of

County-administered projects and coordinated efforts with the Texas Department of Transportation and the Cities within the County. A high level of project management and coordination was required for the successful implementation of the bond program. Mr. Daugherty led a task force made up of the cities, counties, TxDOT and the property owners along S.H. 121 for four years to coordinate the planning and development of S.H. 121 from a two-lane rural highway through staged improvements that will ultimately be a freeway section.

All aspects of the development of a new "justice center" for Collin County was implemented under Mr. Daugherty's direction. The project included site alternative analysis and selection, development of a master plan, installation of utilities, design and construction of access streets and the design and construction of the first phase of the buildings, a $32 million adult detention facility. Mr. Daugherty's guidance included aligning the thoroughfare to maximize the preservation of the large trees on the site and optimization of the terrain and vegetation on the entire site.

Mr. Daugherty was responsible for the County Open Space Program approved by the Collin County voters. An Open Space Plan was developed as well as an award-winning public information video. Implementation included the acquisition and development of a rare virgin blackland prairie, the construction of an equestrian trail in the Corps of Engineers easement adjacent to Lake Lavon and the participation with cities in acquisition of open space and green belts.

When Mr. Daugherty was Director of Public Works for the City of Plano, he was actually serving as one of five "Executive Directors" answering directly to the City Manager. His responsibilities included Water and Wastewater Operations, Street Maintenance, Solid Waste Management, Equipment Maintenance, Building Maintenance and Traffic Control. The result of his four-year tenure was the development of each of these functions into a well-managed organization that was able to handle the current operational demands while planning for the record-setting growth that was occurring. Mr. Daugherty also managed associated special projects such as the planning, acquisition and development of a master-planned service center designed to be able to respond to the growing needs of the Public Works operations.

As Assistant City Manager in the City of DeSoto, Mr. Daugherty was responsible for all planning & zoning, engineering (he was the City's first City Engineer) and general operations, including animal control, building inspection and facility and equipment maintenance. He was heavily involved with the Planning and Zoning Commission, the City Council and citizen groups in responding to the pressures of growth.

During the early 1970s the City of Dallas Public Works Department established a new project management system to respond to the need to more adequately manage the streets and drainage bond program. Mr. Daugherty was one of the four project managers appointed to manage the Dallas program.

Mr. Daugherty began his career as a design engineer for the City of Bryan while getting his Master of Engineering at Texas A&M. This experience included design of streets, storm sewers and sanitary sewers as well as coordination with the Texas Department of Transportation.

William D. Dillon, P.E.

Vice President - Division Manager
PBS&J

Education

MBA, Business Administration, Baylor University, 1999
B.S., Civil Engineering, Louisiana Tech University, 1984

Registrations

Professional Engineer
Texas, 1989, #65704

As Division Manager for PBS&J Construction Services, Inc. in the Central United States region, Mr. Dillon is responsible for the development and oversight of construction program including business development, contract administration, scheduling, claims analysis, constructability reviews, expert testimony, construction inspection and other services as requested by our clients. Mr. Dillon is presently serving as Project Director for the Texas Turnpike Authority Division of Texas Department of Transportation's $800 million Central Texas Turnpike Project. In this position, he is assisting in the design & implementation of the project controls management system along with development of the program's management guidelines, policies, and procedures.

Mr. Dillon has managed construction programs and projects for the Texas Department of Transportation (TxDOT) in the Dallas and Waco Districts for the past 15 years. These have included hundreds of roadway reconstruction and rehabilitation, preventative maintenance, transportation enhancement, bridge replacement, public transportation, signal and signing, ITS, drainage, and tunnel projects. Mr. Dillon has performed and taught Primavera scheduling as it relates to construct project monitoring and claims analysis. He was also responsible for all Laboratory functions, materials testing, materials selection, and implementation of new pavement specifications, design and installation.

Director of Construction, Waco District, TxDOT – Responsible for administering the Construction program for the eight counties in the Waco District. Over the six years in this position, over 200 projects valued at more than $300 million were completed. In August 1999, this included over $140 million on 42 active projects. These responsibilities include monitoring construction inspection, contract administration, materials selection and testing, laboratory technicians, dispute resolution, construction project schedule analysis, developing and maintaining working relationships with the contracting community and other governmental agencies. Mr. Dillon was instrumental in the development and utilization of Superpave design, testing, and installation in the District's pavement program. He initiated the usage of Material Transfer Vehicles as a requirement in the District's overlay program in 1997. As a result, the District has won the THMAPA's Quality Award for Large Overlays for 1998 and 1999 in addition to the THMAPA's Quality Award for Small Full Depth Project in 1999.

Assistant District Construction Engineer, Dallas District, TxDOT – Mr. Dillon was responsible for assisting in administering the Construction program for the six counties in the Dallas District. Over the three years in this position, approximately 180 projects valued at more than $500 million were completed. In January 1993, this included $485 million on 87 active projects. These responsibilities included coordination of construction scheduling and traffic control review for the US 75 (North Central Expressway) Corridor reconstruction from IH 635 south to the Central Business District. Provided staff level review of consultant's traffic control plans and constructability review. Represented TxDOT in coordination with multiple agencies on the Traffic Management Team in planning for the reconstruction effort. Reviewed plans by Dallas Area Rapid Transit (DART) for constructability and traffic control concerning the construction of the light rail stations and tunnel within the right-of-way and adjacent to the US 75 roadway construction. Also provided expertise in traffic control and construction litigation to the Staff Attorney. In

addition, provided field reviews and monitored construction inspection, contract administration, and materials testing district wide.

Project Engineer, Northside Area Office, Dallas District, TxDOT – Mr. Dillon was responsible for managing project level construction inspection, contract administration, and materials testing on projects as listed:

- **US 75, Dallas County, Texas** – 2 mile, $42.5 million, 3 ½ year reconstruction project including 6 lanes of continuously reinforced concrete pavement (CRCP) mainlanes, IS & OS tied concrete shoulders, 6 lanes of jointed reinforced concrete pavement (JRCP) continuous frontage roads, structures (prestressed beams up to 142 feet with pre-cast deck panels & 8" decks), Railroad shoofly bridge construction, permanent railroad bridge replacement (12 span steel beam), pre-cast reinforced earth walls, HMACP, drainage (box culverts & RCP storm sewer), traffic signals & signing. Developed and trained new inspectors in a rotational program including all types of construction inspection and materials testing. Mr. Dillon was Project Engineer on this job from January 1987 to November 1989.

- **Loop 12, Dallas County, Texas** – 9 mile, $3.1 million, 1 year rehabilitation project including repairing deteriorated jointed plain concrete pavement (JPCD), seal coat, overlay with latex modified hot mix asphalt pavement the entire 6 lanes by 9 miles. Also included upgrades to safety end treatment and retrofit bridge rail to T501 shape. Mr. Dillon was Project Engineer on this job from January 1986 to December 1986.

- **IH 30 Rockwall County, Texas** – 11 mile, $24 million, 5 year project consisting of 11" Jointed Reinforced Concrete Pavement placed on a 2" minimum asphalt bond breaker over the existing pavement. Included reconstruction of 10 bridge structures. Mr. Dillon served as the Project Engineer on this job from June 1985 to January 1986.

- **Loop 12, Dallas County, Texas** – Performed basic design activities as a part of the Area Office design group, including quantity calculations, physical inventory, centerline station conversion from multiple previous projects. Mr. Dillon worked in this capacity from January 1985 to June 1985.

- **IH 30 Rockwall County, Texas** – Performed inspection activities on various operations on this project including Hot Mix Asphalt Plant testing, concrete batch plant testing, concrete paving inspection, Hot Mix Asphalt Concrete Pavement inspection, bridge inspection, storm sewer installation, earthwork, etc. Mr. Dillon served as an inspector on this project from May 1984 to January 1985.

CERTIFICATE OF INSURANCE

ISSUE DATE (MM/DD/YY) 11/15/01

PRODUCER

Collinsworth, Alter, Nielson,
Fowler & Dowling,Inc.(WMC/DIA)
5979 NW 151 Street, Suite 105
Miami Lakes, FL 33014

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW

INSURED

Post, Buckley, Schuh &
Jernigan, Inc. d/b/a PBS&J
2001 NW 107 Avenue
Miami FL 33172

COMPANIES AFFORDING COVERAGE

COMPANY LETTER	A	Continental Casualty Co A XV
COMPANY LETTER	B	Nat'l Union Fire Ins Co A+ + XV
COMPANY LETTER	C	American Casualty Co A XV
COMPANY LETTER	D	Lloyds of London A- XV
COMPANY LETTER	E	

COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFF. DATE (MM/DD/YY)	POLICY EXP. DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY X COMM. GENERAL LIABILITY CLAIMS MADE X OCC. OWNER'S & CONTRACT'S PROT X Per Project Agg	GL247B43206	9/30/01	9/30/02	GENERAL AGGREGATE PROD-COMP/OP AGG. PERS. & ADV. INJURY EACH OCCURRENCE FIRE DAMAGE(One Fire) MED. EXP. (One Per)	2000000 2000000 1000000 1000000 1000000 25000
A	AUTOMOBILE LIABILITY X ANY AUTO X ALL OWNED AUTOS SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS GARAGE LIABILITY	BUA247B43223	9/30/01	9/30/02	COMBINED SINGLE LIMIT BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE	1000000
B	EXCESS LIABILITY X UMBRELLA FORM OTHER THAN UMBRELLA FORM	BE8718931	9/30/01	9/30/02	EACH OCCURRENCE AGGREGATE	10000000 10000000
C	WORKERS' COMPENSATION AND EMPLOYER'S LIABILITY	WC247843268	9/30/01	9/30/02	X STATUTORY LIMITS EACH ACCIDENT DISEASE-POLICY LIMIT DISEASE-EACH EMP.	 1000000 1000000 1000000
D	OTHER Professional / Pollution Liab Claims-Made Form	P42399	9/30/99	9/30/02	$1,000,000 Limits ea claim/annual agg 11/11/61 retrodate	

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS
RE: Beltline Surface Condition Study

CERTIFICATE HOLDER

Town of Addison
Attn: Steven Z Chutchian
P.O. Box 9010
Addison, TX 75001

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

PBS&J

Rev. 10/00

Public Client

PROFESSIONAL SERVICE AGREEMENT

THIS AGREEMENT, made and entered into _____, by and between Post, Buckley, Schuh & Jernigan, Inc. (PBS&J) and the Client identified herein, provides for the Professional Services described under Item 2 of this Agreement.

CLIENT: Town of Addison, Texas

ADDRESS: P.O. Bo x 9010
Addison, Texas 75001

PHONE NUMBER: 972-450-2886

FAX NUMBER: 972-450-2837

CONTACT PERSON: Steven Z. Chutchian

PROJECT NUMBER: 450868.00

SHORT TITLE: Beltline Surface Condition Study

1. DESCRIPTION OF PROJECT SITE:

PBS&J will determine a definitive method to improve the skid resistance of the pavement of Beltline Rd. from Dallas Parkway to Marsh Lane.

2. SCOPE OF SERVICES TO BE PROVIDED BY PBS&J (If additional pages are necessary, they are identified as Attachment A):

See Attachment A

3. THE COMPENSATION TO BE PAID PBS&J for providing the requested services shall be (If additional pages are necessary, they are identified as Attachment B):

☐ **Direct personnel expense plus a surcharge of _____ %, plus reimbursable costs.***

☐ **A Lump-Sum charge of $ _____, plus out-of-pocket expenses.***

☐ **Unit Cost/Time Charges identified in Attachment B, plus reimbursable costs.***

☒ **Other - See Attachment B.**
*** See explanation under Item 5 below.**

4. IF PBS&J's SERVICES UNDER THIS AGREEMENT ARE DELAYED for reasons beyond PBS&J's control, the time of performance shall be adjusted appropriately. Except where the services provided are under a continuous service contract for more than one year, if the services under this Agreement are delayed for a period of more than one (1) year from the beginning date (as above provided), the fees shall be subject to renegotiation; any change in such fees shall apply only to the unfinished services as of the effective date of such change.

IN WITNESS WHEREOF, this Agreement is accepted on the date written above and subject to the terms and conditions set forth above.

(SIGN WITH BALL POINT PEN)

CLIENT:	POST, BUCKLEY, SCHUH & JERNIGAN, INC.
SIGNED:	SIGNED:
TYPED NAME: [illegible] E. Murphy	TYPED NAME: John R. Schenck
TITLE: Director of Public Works	TITLE: Senior Vice President
DATE: 11/15/01	DATE: November 15, 2001

Distribution: **Copy 1** - PBS&J; **Copy 2** - Client; **Copy 3** - PBS&J Accounting

5. **COMPENSATION:** Direct personnel expense shall be defined as: the cost of salaries and fringe benefit costs related to vacation, holiday, and sick leave pay; contributions for Social Security, Workers' Compensation Insurance, retirement benefits, and medical and insurance benefits; unemployment and payroll taxes; and other allowed benefits of those employees directly engaged in the performance of the requested service.

   Reimbursable costs include: fees of Professional Associates (whose expertise is required to complete the project) and out-of-pocket expenses, the cost of which shall be charged at actual costs plus an administrative charge of 18% and shall be itemized and included in the invoice.

   Typical out-of-pocket expenses shall include, but not be limited to, travel expenses (lodging, meals, etc.), job-related mileage at the prevailing Company rate, long distance telephone calls, courier, printing and reproduction costs, and survey supplies and materials. In the event the requested service involves the use of electronic measuring equipment, computers, plotters, and other special equipment such as boats, swamp buggies, etc., an additional direct charge shall be made for the use of this equipment.

   It is understood and agreed that PBS&J's services under this Agreement are limited to those described in Item 2 hereof (and Attachment A, if applicable) and do not include participation in or control over the operation of any aspect of the project. Compensation under this Agreement does not include any amount for participating in or controlling any such operation.

6. **INVOICE PROCEDURES AND PAYMENT:** PBS&J shall submit invoices to the Client for work accomplished during each calendar month. For services provided on a Lump Sum basis, the amount of each monthly invoice shall be determined on the "percentage of completion method" whereby PBS&J will estimate the percentage of the total work (provided on a Lump Sum basis) accomplished during the invoicing period. Monthly invoices shall include, separately listed, any charges for services for which time charges and/or unit costs shall apply. Such invoices shall also include, separately listed, any charges for Professional Associates and reimbursable costs. Such invoices shall be submitted by PBS&J as soon as possible after the end of the month in which the work was accomplished and shall be due and payable by the client upon receipt.

   The Client, as owner or authorized agent for the owner, hereby agrees that payment as provided herein will be made for said work within 30 days from the date the invoice for same is mailed to the Client at the address set out herein or is otherwise delivered, and, in default of such payment, hereby agrees to pay all costs of collection, including reasonable attorney's fees, regardless of whether legal action is initiated. The Client hereby acknowledges that unpaid invoices shall accrue interest at the maximum retailed by law after they have been outstanding for over 30 days. PBS&J reserves the right to suspend all services on the Client's project without notice if an invoice remains unpaid 45 days after date of invoice. This suspension shall remain in effect until all unpaid invoices are paid in full.

   It is understood and agreed that PBS&J's services under this Agreement do not include participation, whatsoever, in any litigation. Should such services be required, a supplemental Agreement may be negotiated between the Client and PBS&J describing the services desired and providing a basis for compensation to PBS&J.

7. **COST ESTIMATES:** Client hereby acknowledges that PBS&J cannot warrant that any cost estimates provided by PBS&J will not vary from actual costs incurred by the Client.

8. **LIMIT OF LIABILITY:** The limit of liability of PBS&J to the Client for any cause or combination of causes shall be, in total amount, limited to the fees paid under this Agreement.

9. **CONSTRUCTION SERVICES:** If, under this Agreement, professional services are provided during the construction phase of the project, PBS&J shall not be responsible for or have control over means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work; nor shall PBS&J be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents or for the Contractor's failure to comply with applicable laws, ordinances, rules or regulations.

10. **INSURANCE:** PBS&J shall at all times carry Workers' Compensation insurance as required by statute; commercial general liability insurance including bodily injury and property damage; automobile liability coverage; and professional liability coverage. Insurance certificates will be provided to the Client upon request. Client agrees to require that PBS&J be named as an additional insured on insurance coverages provided by contractors on the project.

11. **ASSIGNMENT:** Neither the Client nor PBS&J will assign or transfer its interest in this Agreement without the written consent of the other.

12. **SUSPENSION, TERMINATION, CANCELLATION OR ABANDONMENT:** In the event the project described in Attachment A, or the services of PBS&J called for under this Agreement, is/are suspended, cancelled, terminated or abandoned by the Client, PBS&J shall be given seven (7) days prior written notice of such action and shall be compensated for the professional services provided up to the date of suspension, termination, cancellation or abandonment in accordance with the provisions of this Agreement for all work performed up to the date of suspension, termination, cancellation or abandonment, including reimbursable expenses.

13. **ENTIRETY OF AGREEMENT:** This writing, including attachments and addenda, if any, embodies the entire agreement and understanding between the parties hereto, and there are no other agreements and understandings, oral or written, with reference to the subject matter hereof that are not merged herein and superseded hereby. No alteration, change or modification of the terms of this Agreement shall be valid unless made in writing signed by both parties hereto.

14. **DOCUMENTS:** Any reuse by the client or others of documents and plans that result from PBS&J's services under this agreement shall be at the Client's or others' sole risk without liability to PBS&J.

15. **WAIVER:** Any failure by PBS&J to require strict compliance with any provision of this contract shall not be construed as a waiver of such provision, and PBS&J may subsequently require strict compliance at any time, notwithstanding any prior failure to do so.

16. **DISPUTE RESOLUTION:** If a dispute arises out of or relates to this Agreement or the breach thereof, the parties will attempt to settle the matter between themselves. If no agreement can be reached the parties agree to use mediation with a mutually agreed upon mediator before resorting to a judicial forum. The cost of a third party mediator will be shared equally by the parties. In the event of litigation, the prevailing party will be entitled to reimbursement of all reasonable costs and attorneys' fees. The parties mutually agree that a similar dispute resolution clause will be contained in all other contracts executed by Client concerning or related to this contract and all subcontracts executed by PBS&J.

17. **HAZARDOUS WASTE, MATERIALS OR SUBSTANCES:** Unless otherwise specifically provided in this Agreement, PBS&J shall not be responsible for or have control over the discovery, presence, handling, removal, transport or disposal of hazardous waste, materials or substances in any form on the project site.

18. **GOVERNING LAW:** This Agreement shall be governed by and construed according to the laws of the State where the situs of the work is located.

19. **LIMITED COPYRIGHT LICENSE:** PBS&J grants Client a paid-up, non-transferable, non-exclusive license to make or have made copies of any copyrightable materials delivered under this Agreement and specifically marked by PBS&J as "Reproduction Authorized".

20. **INTELLECTUAL PROPERTY:** With the sole exception of specifically marked reproducible materials subject to the Limited Copyright License herein, all worldwide right, title and interest in and to any and all Intellectual Property conceived, invented, authored or otherwise made by or on this Agreement shall remain the sole and exclusive property of PBS&J, its successors and assigns unless licensed or assigned by PBS&J pursuant to a separate written instrument. The term "Intellectual Property shall be construed broadly to include all forms of intellectual property including without limitation all inventions, discoveries, designs, plans, improvements, trademarks, service marks and copyrights in drawings, computer programs, architectural works and in all other original works of authorship.

ATTACHMENT- Scope of Services
ATTACHMENT B-Compensation
ADDENDA A (if required)

ATTACHMENT A

SURFACE CONDITION STUDY
BELTLINE ROAD FROM DALLAS PARKWAY TO MARSH LANE
ADDISON, TEXAS

SCOPE OF SERVICES

PBS&J shall perform a study of the surface conditions of Beltline Road from Dallas Parkway to Marsh Lane. It is PBS&J's understanding that the surface of Beltline became slick or "polished" many years ago and that several attempts have been made to solve the problem. The purpose of this study will be to identify a definitive method to overcome the surface problems of this pavement. This will be done by providing to the Town the results of the analyses of several alternative strategies so that the Town can decide the strategy that best fits the Town.

PBS&J will perform the following tasks:

- Gather detailed information about the history of the pavement: accidents, studies and material tests, potential contributing factors, previous improvements, etc.
- Make field observations
- Perform tests of concrete related to skid resistance characteristics (sub-contract for three cores for petrographic analysis and acid solubility tests)
- Identify potential improvement strategies to restore desired skid resistance properties
- Determine what each strategy accomplishes, or fails to accomplish, and the characteristics of each strategy that may make a difference to the Town's final decision
- Estimate the construction and life cycle cost of each strategy
- Develop a matrix that indicates a rating for each strategy in the areas of pavement surface performance, service life, cost effectiveness, constructability and community acceptability
- Present the resulting report to the Town in draft form and then in final form after review and discussion with the Town staff

The Town will

- make available all information pertinent to the analysis of the pavement
- review partial study information submitted by consultant as needed and provide consultant appropriate direction
- review draft report and provide feedback in a timely manner to facilitate completion of the final report

ATTACHMENT B

COMPENSATION FOR SERVICES

BASIC SERVICES

PBS&J shall prepare this study for a fixed fee of $14,900. This fee includes all labor and expenses as well as laboratory testing. The fee includes obtaining and testing three cores of the concrete pavement. If it is determined and agreed to by the Town that additional cores and/or testing is required, those will be performed for an additional amount by prior written agreement between the Town of Addison and PBS&J.

TIME OF COMPLETION

PBS&J shall perform the work and submit a draft report within 40 working days. Converting this time to calendar days will depend on the date of the notice to proceed, whether or not any holidays fall within the project time and any time required by the Town to gather information needed by PBS&J. A Final Report will be completed one week after PBS&J receives comments regarding the draft report.

PBS&J

An employee-owned company

I agree with Robins comments- lets get testing included
J.P. 10/23/01

CLARENCE DAUGHERTY WAS CALLED ON 10/23/01 & ASKED TO REVISE PROPOSAL. SZC

October 10, 2001

Mr. Steven Z. Chutchian
Assistant City Engineer
Town of Addison
16801 Westgrove Dr.
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Chutchian:

PBS&J is very pleased to be able to provide the Town of Addison with this proposal concerning a study of the surface conditions of Beltline Road. We appreciate the fact that Addison has recognized PBS&J as a company that has the resources to assist the Town in this way.

Explanations of the proposed scope, fee and time of completion are included in the appropriate sections of this proposal. We propose that Clarence Daugherty, P.E., be the Project Manager and that Doug Dillon, P.E., Manager of our Construction Services Division, perform the technical analysis and develop the report. Resumes of these professionals are attached to this proposal.

Our proposed approach utilizes all the historical information that is available regarding Beltline Road. Specifically, it appears that the testing performed in the past should provide us with the information needed, and we do not propose to do additional material testing. Therefore, our fee includes review and use of previous testing information only. If, after review of the previous testing information (at the beginning of the project), we and the Town conclude that additional tests are warranted, then this can be done by the Town, either directly or through PBS&J.

LITTLE OR NO TESTING INFORMATION AVAILABLE

WHAT TESTS + COST ?

Thank you for your confidence in PBS&J. We look forward to discussing the project with you further after your review of this proposal. We are available to start the study at your convenience.

Sincerely,

Clarence Daugherty

Clarence Daugherty, P.E.
Director of Municipal Services

13800 Montfort Drive, Suite 230, Dallas, Texas 75240-4347 • Telephone: 972.387.0771 • Fax: 972.387.9714 • www.pbsj.com

SURFACE CONDITION STUDY
BELTLINE ROAD FROM DALLAS PARKWAY TO MARSH LANE
ADDISON, TEXAS

SCOPE OF SERVICES

PBS&J proposes to perform a study of the surface conditions of Beltline Road from Dallas Parkway to Marsh Lane. It is PBS&J's understanding that the surface of Beltline became slick or "polished" many years ago and that several attempts have been made to solve the problem. The purpose of this study will be to identify a definitive method to overcome the surface problems of this pavement. This would be done by providing to the Town the results of the analyses of several alternative strategies so that the Town can decide the strategy that best fits the Town.

It is proposed that PBS&J perform the following tasks:

- Gather detailed information about the history of the pavement: accidents, studies and material tests, potential contributing factors, previous improvements, etc.
- Make field observations
- Identify potential improvement strategies to restore desired skid resistance properties
- Determine what each strategy accomplishes, or fails to accomplish, and the characteristics of each strategy that may make a difference to the Town's final decision
- Estimate the construction and life cycle cost of each strategy
- Develop a matrix that indicates a rating for each strategy in the areas of pavement surface performance, service life, cost effectiveness, constructability and community acceptability
- Present the resulting report to the Town in draft form and then in final form after review and discussion with the Town staff

add testing needed →

It is proposed that the Town

- make available all information pertinent to the analysis of the pavement
- review partial study information submitted by consultant as needed and provide consultant appropriate direction
- review draft report and provide feedback in a timely manner to facilitate completion of the final report

PBS&J

COMPENSATION

PBS&J proposes to prepare this study for a fixed fee of $8500. This fee includes all labor and expenses, but does not include any laboratory testing. Any testing that is required can either be contracted by the Town directly or by PBS&J as an additional fee.

TIME OF COMPLETION

PBS&J proposes to perform the work and submit a draft report within 20 working days. Converting this time to calendar days will depend on the date of the notice to proceed, whether or not any holidays fall within the project time and any time required by the Town to gather information needed by PBS&J. A Final Report will be completed one week after PBS&J receives comments regarding the draft report.

Clarence Travis Daugherty, P.E.

Senior Program Manager
PBS&J

Education

M.E., Public Works Administration, Texas A&M University, 1970
B.S., Civil Engineering, Texas A&M University, 1969

Registrations

Professional Engineer
Texas

Professional Affiliations

Association of County Engineers, Texas, President, 1993
American Public Works Association (APWA), Texas Chapter
- President, 1985
- Chapter Service Award, 1986
- One of top three Leaders of the Year, 1981

American Public Works Association (APWA), North Central Texas Branch
- Leader of the Year, 1978

Mr. Daugherty has 30 years of public works experience with cities and counties in Texas. He now directs PBS&J's services for municipalities in the greater Dallas area. PBS&J's projects in the Dallas area consist of a wide range of types and sizes of projects. The size of projects varies from a large water line replacement project for the City of Dallas to small street, drainage, water and sewer projects in the surrounding cities and counties. PBS&J (specifically Mr. Daugherty) serves as the City Engineer for the City of Kaufman.

Mr Daugherty was Assistant Director of Public Works for the City of San Antonio from 1995 to 1998, providing a wide spectrum of city services. Prior to San Antonio, he was Director of Public Works in Collin County and the City of Plano, Assistant City Manager in the City of DeSoto as well as a capital project manager/engineer for the City of Dallas and a design engineer-in-training with the City of Bryan. His primary responsibilities throughout his career have been managing capital projects, growth management and the general business management of the operations of the city or county. All of the cities and the county in which Mr. Daugherty was employed were high growth areas that required attention to planning, management of new development, construction of new infrastructure, rehabilitation of old infrastructure and careful management of operations to respond to growth. His experience results in a keen sensitivity to planning, an appreciation for the need for projects to be managed well and the recognition of the maintenance needs in the design of new projects.

As Assistant Director of Public Works for the City of San Antonio, Mr. Daugherty was directly responsible for Capital Programs Management, Drainage Engineering, Streets and Drainage Maintenance, Building Maintenance and Downtown Parking. In addition he was "second in command" to the Director over the entire department which also included Solid Waste Management, Environmental Services and Streets and Traffic Engineering. One of Mr. Daugherty's accomplishments was the re-structuring of the Capital Programs Division. His insight from many years of project management experience guided the development of teams of project managers, engineers, public information specialists and technicians to properly manage $30-$40 million in streets and drainage projects annually. The re-organization and direction by Mr. Daugherty has resulted in the close attention to project schedules, budgets, design issues and conflict resolution necessary to initiate and complete the projects on time and within budget. Mr. Daugherty also directly managed projects that were sensitive due to public interest and environmental concerns. Examples of such projects are Woodlawn/Lake Streets reconstruction - $2,400,000 (environment concerns about storm water discharge into municipal lake) and the proposal and ultimate adoption of increased street standards for new developments. Mr. Daugherty also personally coordinated the various aspects of the NPDES Storm Water Phase I permit program, including the regulatory, engineering, operations, maintenance and budgetary aspects.

As Director of Public Works for Collin County, Mr. Daugherty was responsible for planning, subdivision regulations, the capital improvements program, road maintenance, the Open Space Program, building facilities management, the Fire Marshal's Office and building inspections. Under his direction the County's first transportation and bridge bond program was developed and implemented and the only rural building inspection program in the State was established. The $55 million transportation and bridge bond program was a combination of

County-administered projects and coordinated efforts with the Texas Department of Transportation and the Cities within the County. A high level of project management and coordination was required for the successful implementation of the bond program. Mr. Daugherty led a task force made up of the cities, counties, TxDOT and the property owners along S.H. 121 for four years to coordinate the planning and development of S.H. 121 from a two-lane rural highway through staged improvements that will ultimately be a freeway section.

All aspects of the development of a new "justice center" for Collin County was implemented under Mr. Daugherty's direction. The project included site alternative analysis and selection, development of a master plan, installation of utilities, design and construction of access streets and the design and construction of the first phase of the buildings, a $32 million adult detention facility. Mr. Daugherty's guidance included aligning the thoroughfare to maximize the preservation of the large trees on the site and optimization of the terrain and vegetation on the entire site.

Mr. Daugherty was responsible for the County Open Space Program approved by the Collin County voters. An Open Space Plan was developed as well as an award-winning public information video. Implementation included the acquisition and development of a rare virgin blackland prairie, the construction of an equestrian trail in the Corps of Engineers easement adjacent to Lake Lavon and the participation with cities in acquisition of open space and green belts.

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During the early 1970s the City of Dallas Public Works Department established a new project management system to respond to the need to more adequately manage the streets and drainage bond program. Mr. Daugherty was one of the four project managers appointed to manage the Dallas program.

Mr. Daugherty began his career as a design engineer for the City of Bryan while getting his Master of Engineering at Texas A&M. This experience included design of streets, storm sewers and sanitary sewers as well as coordination with the Texas Department of Transportation.

William D. Dillon, P.E.

Vice President - Division Manager
PBS&J

Education

MBA, Business Administration, Baylor University, 1999
B.S., Civil Engineering, Louisiana Tech University, 1984

Registrations

Professional Engineer
Texas, 1989, #65704

As Division Manager for PBS&J Construction Services, Inc. in the Central United States region, Mr. Dillon is responsible for the development and oversight of construction program including business development, contract administration, scheduling, claims analysis, constructability reviews, expert testimony, construction inspection and other services as requested by our clients. Mr. Dillon is presently serving as Project Director for the Texas Turnpike Authority Division of Texas Department of Transportation's $800 million Central Texas Turnpike Project. In this position, he is assisting in the design & implementation of the project controls management system along with development of the program's management guidelines, policies, and procedures.

Mr. Dillon has managed construction programs and projects for the Texas Department of Transportation (TxDOT) in the Dallas and Waco Districts for the past 15 years. These have included hundreds of roadway reconstruction and rehabilitation, preventative maintenance, transportation enhancement, bridge replacement, public transportation, signal and signing, ITS, drainage, and tunnel projects. Mr. Dillon has performed and taught Primavera scheduling as it relates to construct project monitoring and claims analysis. He was also responsible for all Laboratory functions, materials testing, materials selection, and implementation of new pavement specifications, design and installation.

Director of Construction, Waco District, TxDOT – Responsible for administering the Construction program for the eight counties in the Waco District. Over the six years in this position, over 200 projects valued at more than $300 million were completed. In August 1999, this included over $140 million on 42 active projects. These responsibilities include monitoring construction inspection, contract administration, materials selection and testing, laboratory technicians, dispute resolution, construction project schedule analysis, developing and maintaining working relationships with the contracting community and other governmental agencies. Mr. Dillon was instrumental in the development and utilization of Superpave design, testing, and installation in the District's pavement program. He initiated the usage of Material Transfer Vehicles as a requirement in the District's overlay program in 1997. As a result, the District has won the THMAPA's Quality Award for Large Overlays for 1998 and 1999 in addition to the THMAPA's Quality Award for Small Full Depth Project in 1999.

Assistant District Construction Engineer, Dallas District, TxDOT – Mr. Dillon was responsible for assisting in administering the Construction program for the six counties in the Dallas District. Over the three years in this position, approximately 180 projects valued at more than $500 million were completed. In January 1993, this included $485 million on 87 active projects. These responsibilities included coordination of construction scheduling and traffic control review for the US 75 (North Central Expressway) Corridor reconstruction from IH 635 south to the Central Business District. Provided staff level review of consultant's traffic control plans and constructability review. Represented TxDOT in coordination with multiple agencies on the Traffic Management Team in planning for the reconstruction effort. Reviewed plans by Dallas Area Rapid Transit (DART) for constructability and traffic control concerning the construction of the light rail stations and tunnel within the right-of-way and adjacent to the US 75 roadway construction. Also provided expertise in traffic control and construction litigation to the Staff Attorney. In

addition, provided field reviews and monitored construction inspection, contract administration, and materials testing district wide.

Project Engineer, Northside Area Office, Dallas District, TxDOT – Mr. Dillon was responsible for managing project level construction inspection, contract administration, and materials testing on projects as listed:

- **US 75, Dallas County, Texas** – 2 mile, $42.5 million, 3 ½ year reconstruction project including 6 lanes of continuously reinforced concrete pavement (CRCP) mainlanes, IS & OS tied concrete shoulders, 6 lanes of jointed reinforced concrete pavement (JRCP) continuous frontage roads, structures (prestressed beams up to 142 feet with pre-cast deck panels & 8" decks), Railroad shoofly bridge construction, permanent railroad bridge replacement (12 span steel beam), pre-cast reinforced earth walls, HMACP, drainage (box culverts & RCP storm sewer), traffic signals & signing. Developed and trained new inspectors in a rotational program including all types of construction inspection and materials testing. Mr. Dillon was Project Engineer on this job from January 1987 to November 1989.

- **Loop 12, Dallas County, Texas** – 9 mile, $3.1 million, 1 year rehabilitation project including repairing deteriorated jointed plain concrete pavement (JPCD), seal coat, overlay with latex modified hot mix asphalt pavement the entire 6 lanes by 9 miles. Also included upgrades to safety end treatment and retrofit bridge rail to T501 shape. Mr. Dillon was Project Engineer on this job from January 1986 to December 1986.

- **IH 30 Rockwall County, Texas** – 11 mile, $24 million, 5 year project consisting of 11" Jointed Reinforced Concrete Pavement placed on a 2" minimum asphalt bond breaker over the existing pavement. Included reconstruction of 10 bridge structures. Mr. Dillon served as the Project Engineer on this job from June 1985 to January 1986.

- **Loop 12, Dallas County, Texas** – Performed basic design activities as a part of the Area Office design group, including quantity calculations, physical inventory, centerline station conversion from multiple previous projects. Mr. Dillon worked in this capacity from January 1985 to June 1985.

- **IH 30 Rockwall County, Texas** – Performed inspection activities on various operations on this project including Hot Mix Asphalt Plant testing, concrete batch plant testing, concrete paving inspection, Hot Mix Asphalt Concrete Pavement inspection, bridge inspection, storm sewer installation, earthwork, etc. Mr. Dillon served as an inspector on this project from May 1984 to January 1985.

PBS&J

An employee-owned company

October 10, 2001

Mr. Steven Z. Chutchian
Assistant City Engineer
Town of Addison
16801 Westgrove Dr.
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Chutchian:

PBS&J is very pleased to be able to provide the Town of Addison with this proposal concerning a study of the surface conditions of Beltline Road. We appreciate the fact that Addison has recognized PBS&J as a company that has the resources to assist the Town in this way.

Explanations of the proposed scope, fee and time of completion are included in the appropriate sections of this proposal. We propose that Clarence Daugherty, P.E., be the Project Manager and that Doug Dillon, P.E., Manager of our Construction Services Division, perform the technical analysis and develop the report. Resumes of these professionals are attached to this proposal.

Our proposed approach utilizes all the historical information that is available regarding Beltline Road. Specifically, it appears that the testing performed in the past should provide us with the information needed, and we do not propose to do additional material testing. Therefore, our fee includes review and use of previous testing information only. If, after review of the previous testing information (at the beginning of the project), we and the Town conclude that additional tests are warranted, then this can be done by the Town, either directly or through PBS&J.

Thank you for your confidence in PBS&J. We look forward to discussing the project with you further after your review of this proposal. We are available to start the study at your convenience.

Sincerely,

Clarence Daugherty

Clarence Daugherty, P.E.
Director of Municipal Services

13800 Montfort Drive, Suite 230, Dallas, Texas 75240-4347 • Telephone: 972.387.0771 • Fax: 972.387.9714 • www.pbsj.com

SURFACE CONDITION STUDY
BELTLINE ROAD FROM DALLAS PARKWAY TO MARSH LANE
ADDISON, TEXAS

SCOPE OF SERVICES

PBS&J proposes to perform a study of the surface conditions of Beltline Road from Dallas Parkway to Marsh Lane. It is PBS&J's understanding that the surface of Beltline became slick or "polished" many years ago and that several attempts have been made to solve the problem. The purpose of this study will be to identify a definitive method to overcome the surface problems of this pavement. This would be done by providing to the Town the results of the analyses of several alternative strategies so that the Town can decide the strategy that best fits the Town.

It is proposed that PBS&J perform the following tasks:

- Gather detailed information about the history of the pavement: accidents, studies and material tests, potential contributing factors, previous improvements, etc.
- Make field observations
- Identify potential improvement strategies to restore desired skid resistance properties
- Determine what each strategy accomplishes, or fails to accomplish, and the characteristics of each strategy that may make a difference to the Town's final decision
- Estimate the construction and life cycle cost of each strategy
- Develop a matrix that indicates a rating for each strategy in the areas of pavement surface performance, service life, cost effectiveness, constructability and community acceptability
- Present the resulting report to the Town in draft form and then in final form after review and discussion with the Town staff

It is proposed that the Town

- make available all information pertinent to the analysis of the pavement
- review partial study information submitted by consultant as needed and provide consultant appropriate direction
- review draft report and provide feedback in a timely manner to facilitate completion of the final report

COMPENSATION

PBS&J proposes to prepare this study for a fixed fee of $8500. This fee includes all labor and expenses, but does not include any laboratory testing. Any testing that is required can either be contracted by the Town directly or by PBS&J as an additional fee.

TIME OF COMPLETION

PBS&J proposes to perform the work and submit a draft report within 20 working days. Converting this time to calendar days will depend on the date of the notice to proceed, whether or not any holidays fall within the project time and any time required by the Town to gather information needed by PBS&J. A Final Report will be completed one week after PBS&J receives comments regarding the draft report.

Clarence Travis Daugherty, P.E.

Senior Program Manager
PBS&J

Education

M.E., Public Works Administration, Texas A&M University, 1970
B.S., Civil Engineering, Texas A&M University, 1969

Registrations

Professional Engineer
Texas

Professional Affiliations

Association of County Engineers, Texas, President, 1993
American Public Works Association (APWA), Texas Chapter
- President, 1985
- Chapter Service Award, 1986
- One of top three Leaders of the Year, 1981

American Public Works Association (APWA), North Central Texas Branch
- Leader of the Year, 1978

Mr. Daugherty has 30 years of public works experience with cities and counties in Texas. He now directs PBS&J's services for municipalities in the greater Dallas area. PBS&J's projects in the Dallas area consist of a wide range of types and sizes of projects. The size of projects varies from a large water line replacement project for the City of Dallas to small street, drainage, water and sewer projects in the surrounding cities and counties. PBS&J (specifically Mr. Daugherty) serves as the City Engineer for the City of Kaufman.

Mr Daugherty was Assistant Director of Public Works for the City of San Antonio from 1995 to 1998, providing a wide spectrum of city services. Prior to San Antonio, he was Director of Public Works in Collin County and the City of Plano, Assistant City Manager in the City of DeSoto as well as a capital project manager/engineer for the City of Dallas and a design engineer-in-training with the City of Bryan. His primary responsibilities throughout his career have been managing capital projects, growth management and the general business management of the operations of the city or county. All of the cities and the county in which Mr. Daugherty was employed were high growth areas that required attention to planning, management of new development, construction of new infrastructure, rehabilitation of old infrastructure and careful management of operations to respond to growth. His experience results in a keen sensitivity to planning, an appreciation for the need for projects to be managed well and the recognition of the maintenance needs in the design of new projects.

As Assistant Director of Public Works for the City of San Antonio, Mr. Daugherty was directly responsible for Capital Programs Management, Drainage Engineering, Streets and Drainage Maintenance, Building Maintenance and Downtown Parking. In addition he was "second in command" to the Director over the entire department which also included Solid Waste Management, Environmental Services and Streets and Traffic Engineering. One of Mr. Daugherty's accomplishments was the re-structuring of the Capital Programs Division. His insight from many years of project management experience guided the development of teams of project managers, engineers, public information specialists and technicians to properly manage $30-$40 million in streets and drainage projects annually. The re-organization and direction by Mr. Daugherty has resulted in the close attention to project schedules, budgets, design issues and conflict resolution necessary to initiate and complete the projects on time and within budget. Mr. Daugherty also directly managed projects that were sensitive due to public interest and environmental concerns. Examples of such projects are Woodlawn/Lake Streets reconstruction - $2,400,000 (environment concerns about storm water discharge into municipal lake) and the proposal and ultimate adoption of increased street standards for new developments. Mr. Daugherty also personally coordinated the various aspects of the NPDES Storm Water Phase I permit program, including the regulatory, engineering, operations, maintenance and budgetary aspects.

As Director of Public Works for Collin County, Mr. Daugherty was responsible for planning, subdivision regulations, the capital improvements program, road maintenance, the Open Space Program, building facilities management, the Fire Marshal's Office and building inspections. Under his direction the County's first transportation and bridge bond program was developed and implemented and the only rural building inspection program in the State was established. The $55 million transportation and bridge bond program was a combination of

County-administered projects and coordinated efforts with the Texas Department of Transportation and the Cities within the County. A high level of project management and coordination was required for the successful implementation of the bond program. Mr. Daugherty led a task force made up of the cities, counties, TxDOT and the property owners along S.H. 121 for four years to coordinate the planning and development of S.H. 121 from a two-lane rural highway through staged improvements that will ultimately be a freeway section.

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PBS&J

Education

MBA, Business Administration,
Baylor University, 1999
B.S., Civil Engineering, Louisiana
Tech University, 1984

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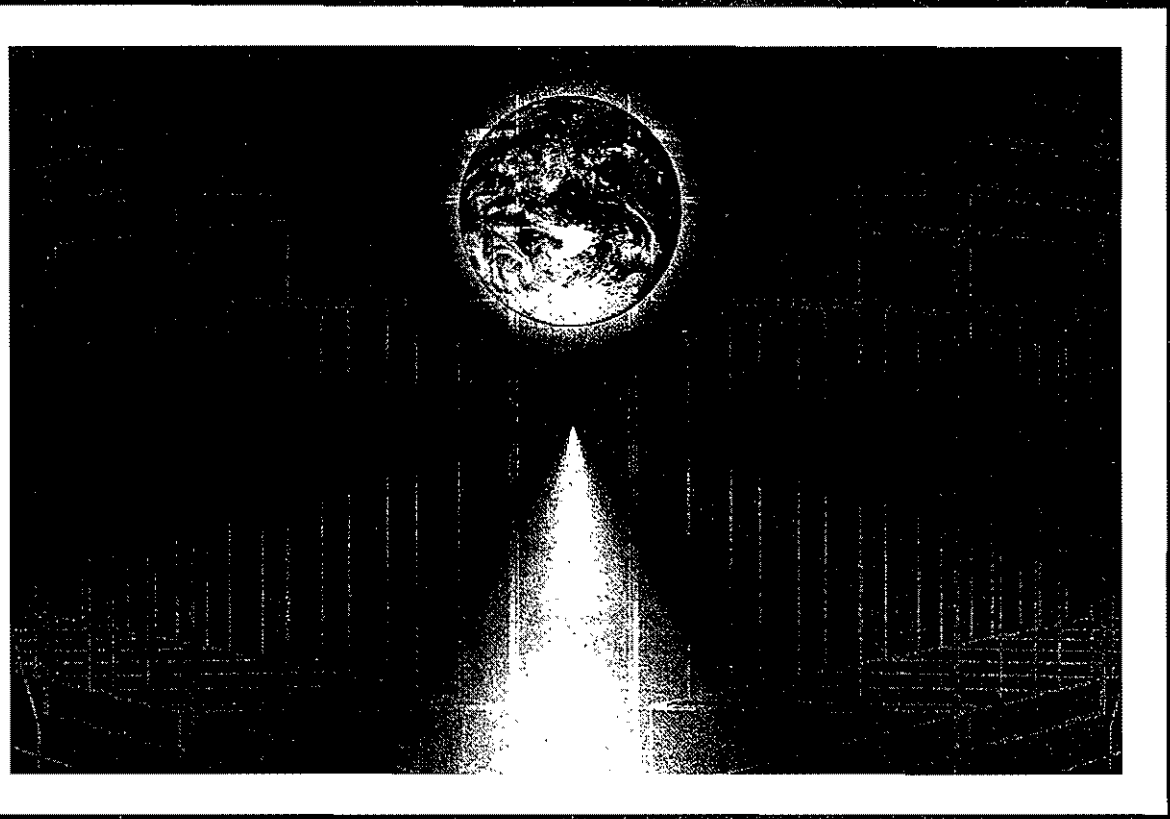
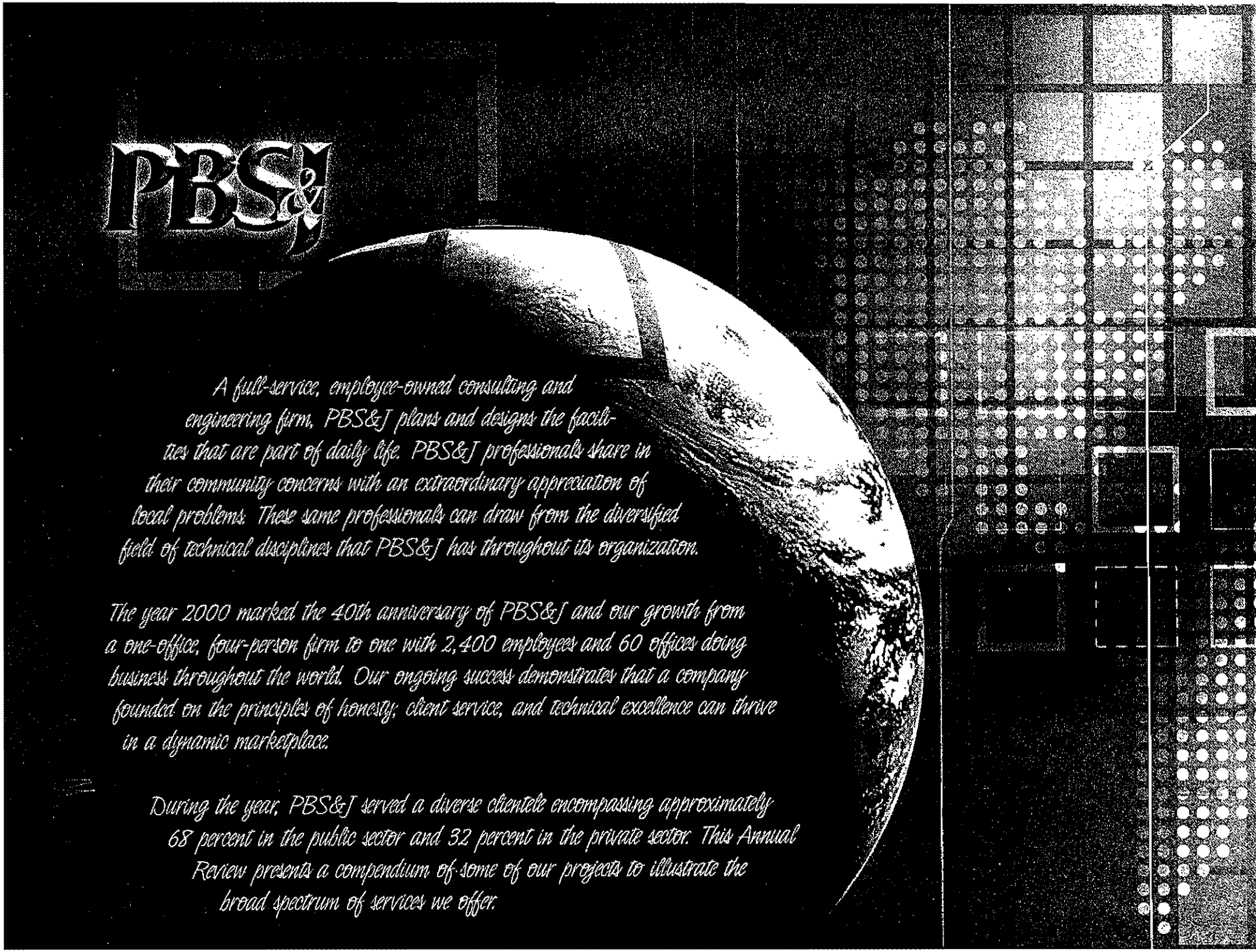


PBS&J



A full-service, employee-owned consulting and engineering firm, PBS&J plans and designs the facilities that are part of daily life. PBS&J professionals share in their community concerns with an extraordinary appreciation of local problems. These same professionals can draw from the diversified field of technical disciplines that PBS&J has throughout its organization.

The year 2000 marked the 40th anniversary of PBS&J and our growth from a one-office, four-person firm to one with 2,400 employees and 60 offices doing business throughout the world. Our ongoing success demonstrates that a company founded on the principles of honesty, client service, and technical excellence can thrive in a dynamic marketplace.

During the year, PBS&J served a diverse clientele encompassing approximately 68 percent in the public sector and 32 percent in the private sector. This Annual Review presents a compendium of some of our projects to illustrate the broad spectrum of services we offer.

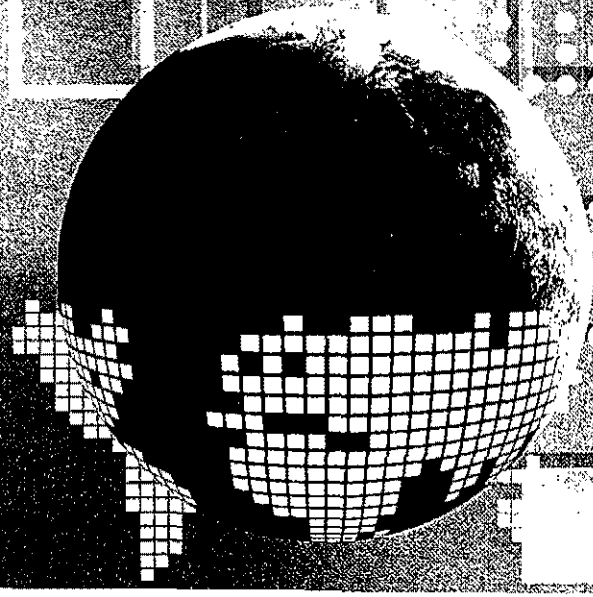
PBS&J's Vision: To be recognized nationally as the consultant of choice.

Engineering News-Record Year 2000 Rankings

(Based on 1999 revenues for design/consulting)

List	Rank
Overall	33
Pure Design	12
Highways	6
Transportation	9
Transmission Lines and Aqueducts	9
Entertainment	9
Water Treatment/Desalination Plants	12
Transit/Light Rail	12
Sanitary/Storm Sewers	12
Water Supply	13
Airports	14
Sewerage/Solid Waste	17
Bridges	17
Wastewater Treatment	18
Government Offices	22
Retail	24
Construction Management	31
Environmental	59

PBS&J's Mission: To provide professional services to our clients through technical excellence and innovation

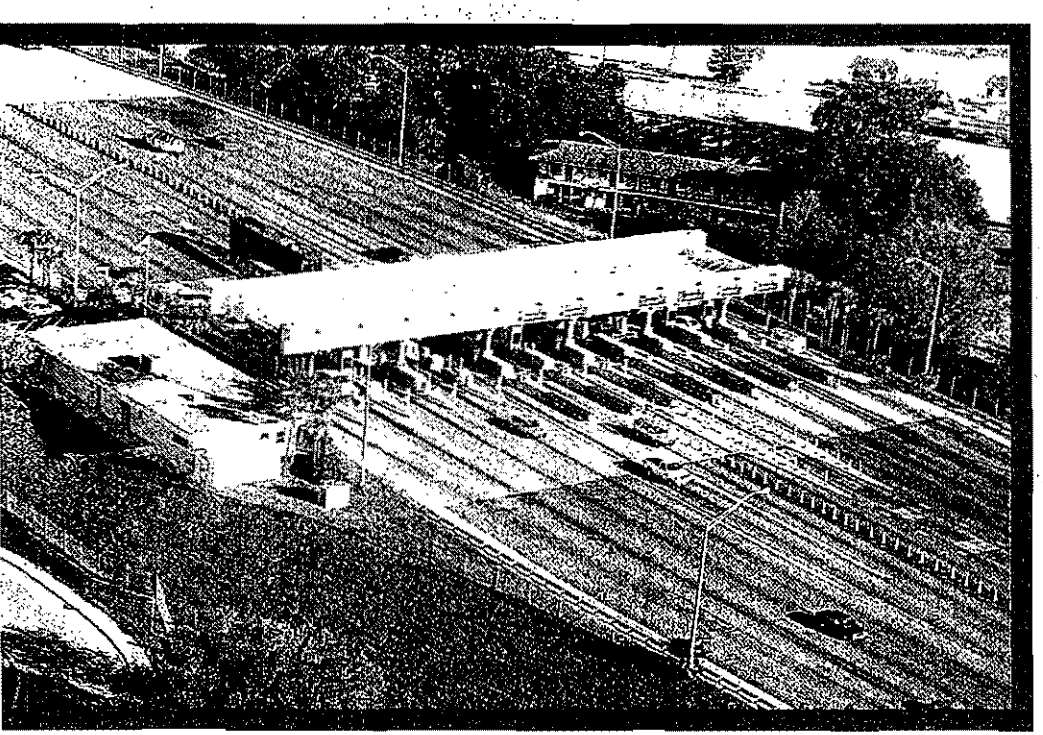


Continued as managing general partner of the joint venture that serves as general engineering consultant to the Miami-Dade Expressway Authority. The $30-million effort includes toll plaza reconstruction and the implementation of electronic toll collection technology using innovative contracting methods to expedite construction. Other key accomplishments included the sale of $160 million in bonds for capital improvements and initiation of a program to privatize toll collection.

- *Planning*
- *Finance and Programming*
- *Contracts Support*
  - *Scope Development*
  - *Negotiation*
  - *Management*
- *Production Design/Management*
  - *Project Concept Studies*
  - *Design Standards*
  - *Scheduling*
  - *Management Information Services*
  - *Project Management*
  - *Design Reviews*
  - *Cost Estimates*
  - *Quality Assurance and Control*
  - *Value Engineering*
  - *Environmental*
  - *Utilities*
  - *Right-of-Way*
- *Construction Management*

Provided general engineering consulting services to the Orlando-Orange County Expressway Authority under PBS&J's ongoing contract with the Authority. Showcase projects included the opening of SR 429, Part A; the initiation of construction on SR 429 Part C; and beginning of construction on the Goldenrod Extension and SR 528 interchange, which will help to provide better access to Orlando International Airport.

Reselected to serve another five-year term as general engineering consultant to Florida Department of Transportation District Seven. Continued to provide similar services for Districts One and Three as well.

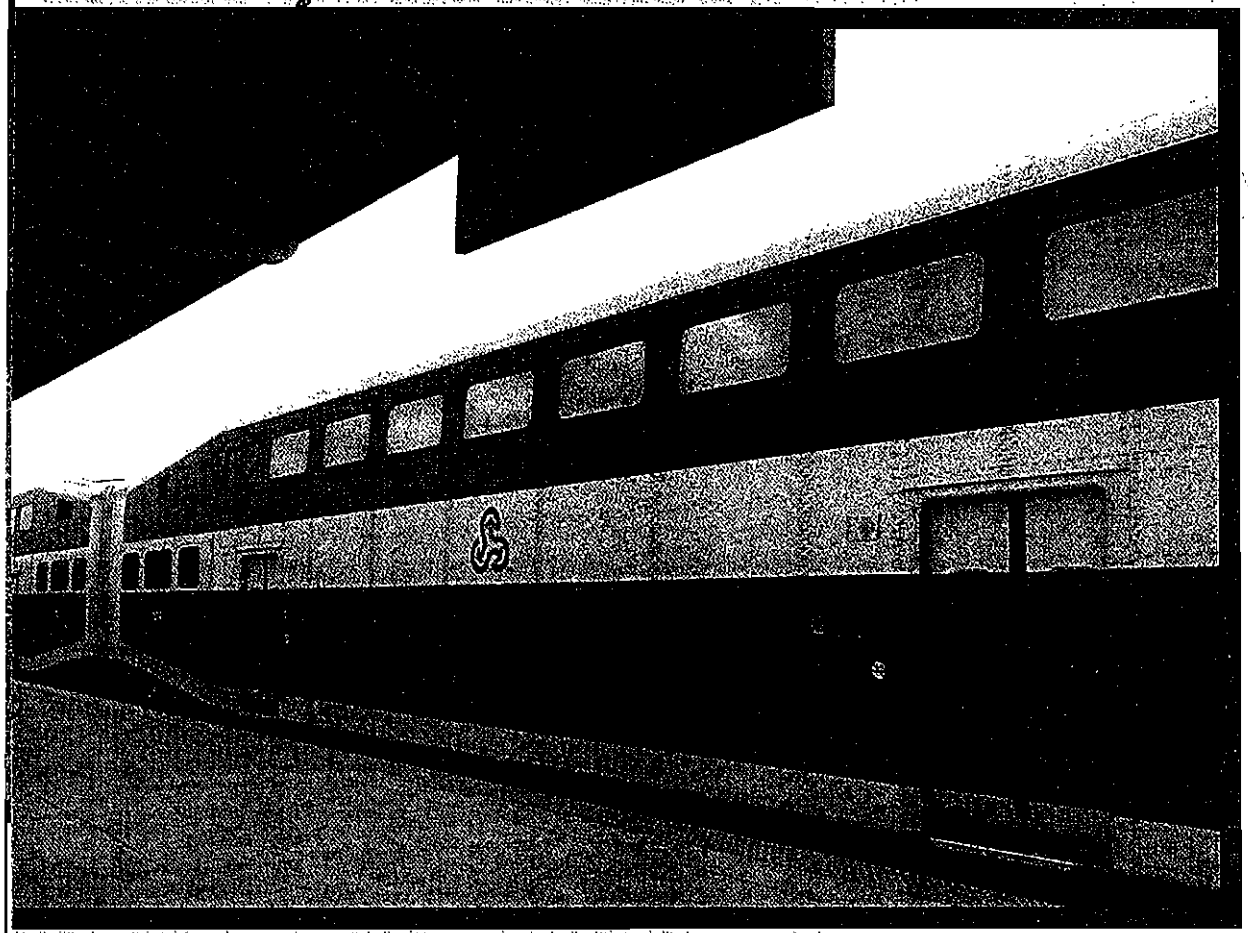


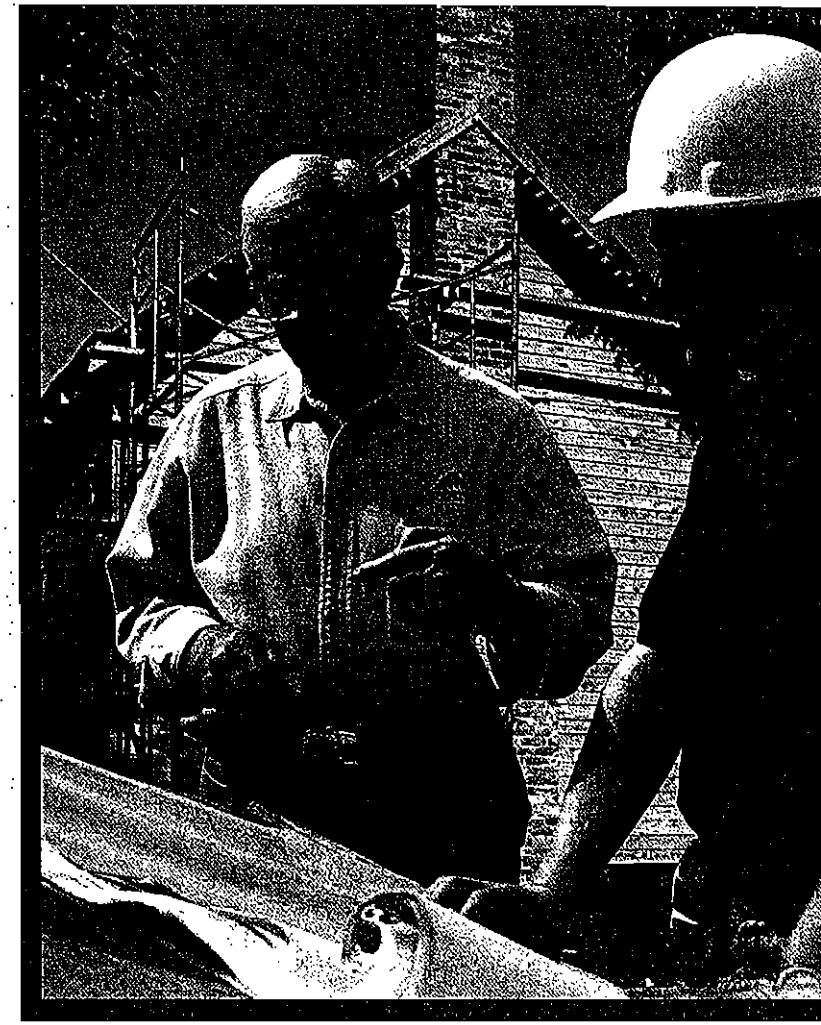
Assisted the Bureau of Waste Cleanup in directing and overseeing 10 contractors that are performing work under the Florida Department of Environmental Protection's Dry Cleaning Solvent Cleanup Program.

In support of the program management consultant contract with the Tri-County commuter Rail Authority, developed design-build documents for the double tracking of the final legs of the TRI-RAIL system in South Florida.

Under ongoing general consultant contract with the Florida Department of Transportation, Turnpike District, completed the relocation of district headquarters from Tallahassee to Orlando. Key project accomplishments for the year included the start of construction for the Seminole Expressway, Project 2; executed a joint partnership agreement for SR 429, Part C; and assisted in the advance acquisition of seven critical right-of-way parcels for that project.

Continued to provide construction program management services to the National Park Service (NPS) for projects across the United States. During 2000, completed oversight of the construction of a new visitor and transportation system at Zion National Park (Utah), the rehabilitation of Jimmy Carter's boyhood farm (Georgia), water treatment and waterline projects at Carlsbad Caverns (New Mexico), and new NPS headquarters building on the Blue Ridge Parkway (North Carolina).





Continued the second year as York County, South Carolina's program manager for its $100-million, one-cent sales tax transportation capital improvement program. The program saw the completion of the first major roadway project, the new $3.4-million SC Highway 5 East project, in addition to the paving of 170 county roads and three school access projects. Other major efforts included the adoption of a right-of-way relocation policy, beginning of construction on India Hook Road, and start of right-of-way acquisition for three other key projects.

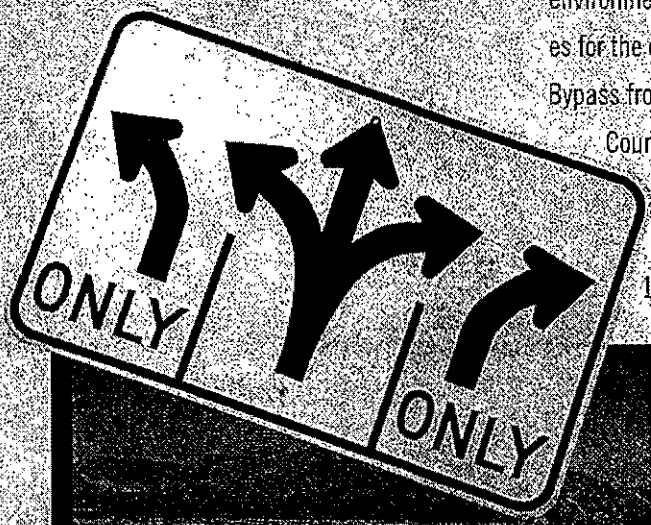
Continued to serve as transportation program manager for the expansion of the Orange County (Florida) Convention Center. In this role, also developed the International Drive Resort Area transportation master plan, studied transit alternatives, developed an ITS plan, and commenced construction engineering and inspection for the widening of International Drive.

Program Management

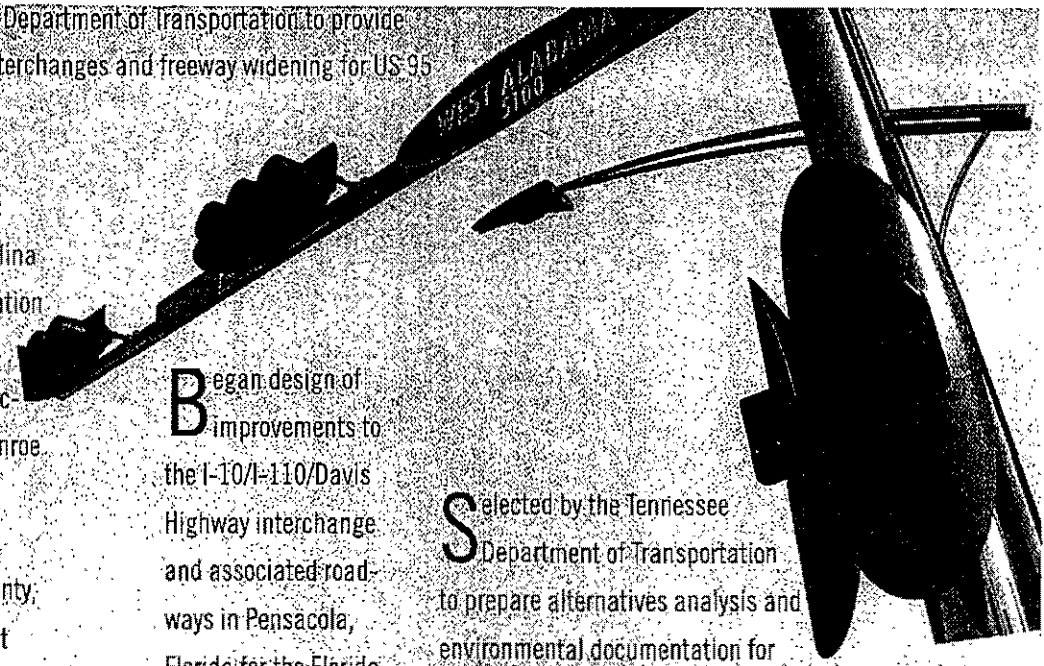
Completed design of the new 1,000-foot Dairy Mart Road bridge over the Tijuana River in San Diego, California. The bridge, which carries four large pipes, received an award from local ASCE, ACI, and APWA organizations.

Selected by the Nevada Department of Transportation to provide final design for two interchanges and freeway widening for US 95 in Las Vegas.

Selected by the North Carolina Department of Transportation to provide engineering and environmental planning services for the extension of the Monroe Bypass from US 601 in Union County to I-485 in Mecklenberg County, a distance of about 10 miles.



Began design of improvements to the I-10/I-110/Davis Highway interchange and associated roadways in Pensacola, Florida for the Florida Department of Transportation, District Three.



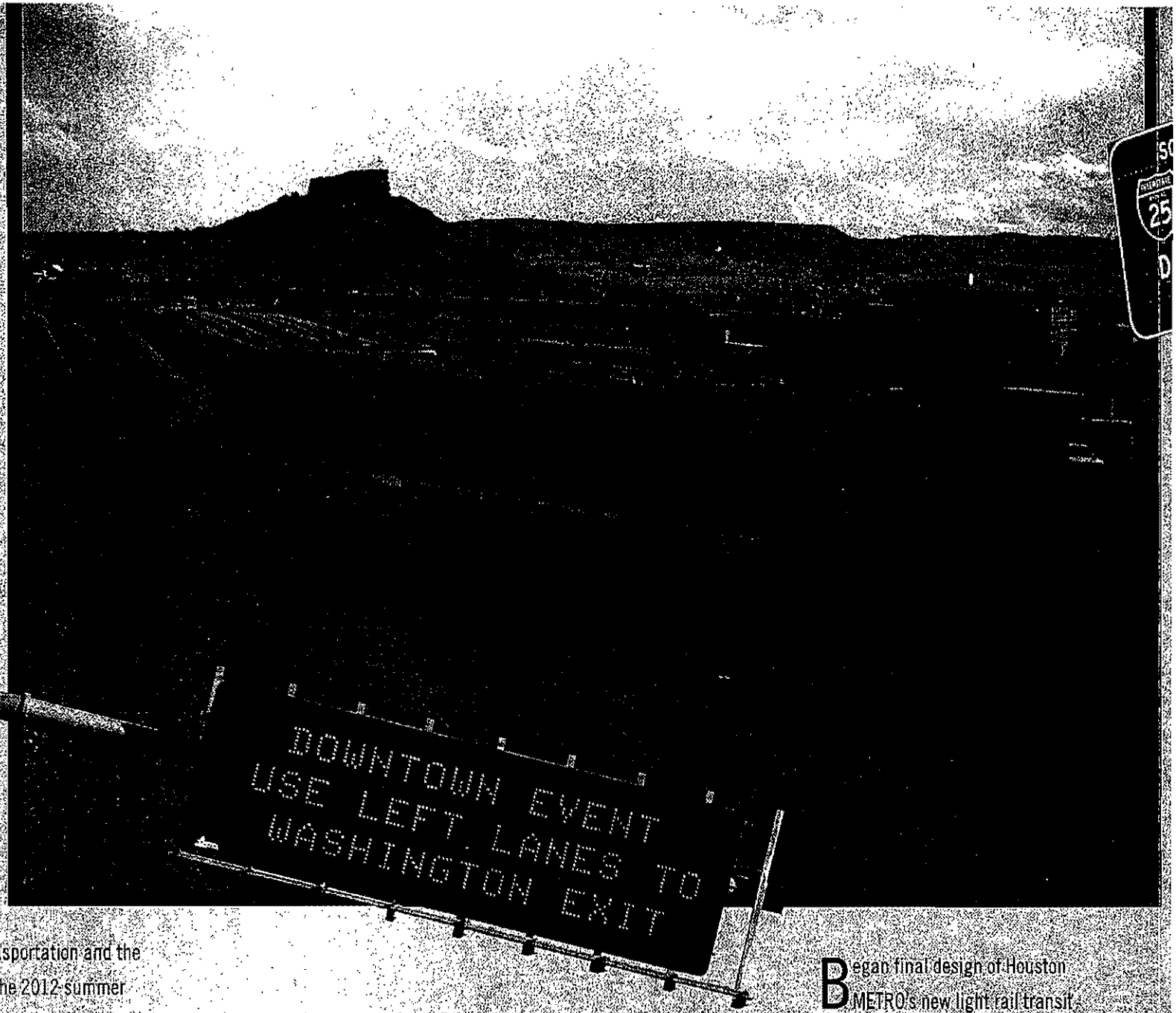
Selected by the Tennessee Department of Transportation to prepare alternatives analysis and environmental documentation for the portion of I-69 located in the Memphis area. Coordination with the Mississippi Department of Transportation will also be maintained for the southern 25 miles of the study corridor located in Mississippi.

Continued to provide fast-track survey and design services for safety and operational improvements of 89 intersections in North Georgia for the Georgia Department of Transportation.

Selected by the Pennsylvania Turnpike Commission to provide on-call intelligent transportation system consulting services.

Conducting Environmental Impact Statement and Corridor Study for I-25 and US 85 for Colorado Department of Transportation.

For South Carolina Department of Transportation, began preparing right-of-way acquisition plans and construction documents for Conway Perimeter Road (Conway) and the widening of SC 5 (Cherokee County) to a multilane facility.



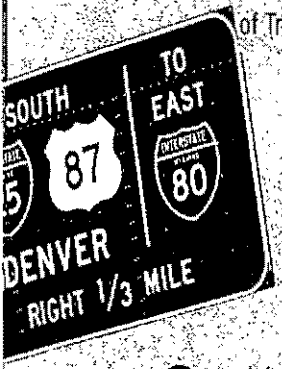
Transportation Planning
Traffic Engineering
Intelligent Transportation Systems
Corridor Planning
Highway Design
Structural Design
Financing & Strategic Planning
Toll Facility Design
Multimodal/Transit Systems
Right-of-Way Acquisition
Ports and Marinas

In support of the Florida Department of Transportation and the Florida 2012 Olympic Committee's bid for the 2012 summer Olympics, identified multimodal transportation solutions to link events planned along the I-4 corridor between Tampa and Orlando.

Selected to provide complete roadway and bridge design and geotechnical services for the widening and reconstruction of 17 miles of I-30 in Saline and Pulaski counties for the Arkansas State Highway and Transportation Department.

Began final design of Houston METRO's new light rail transit system between the Astrodome and the Texas Medical Center.

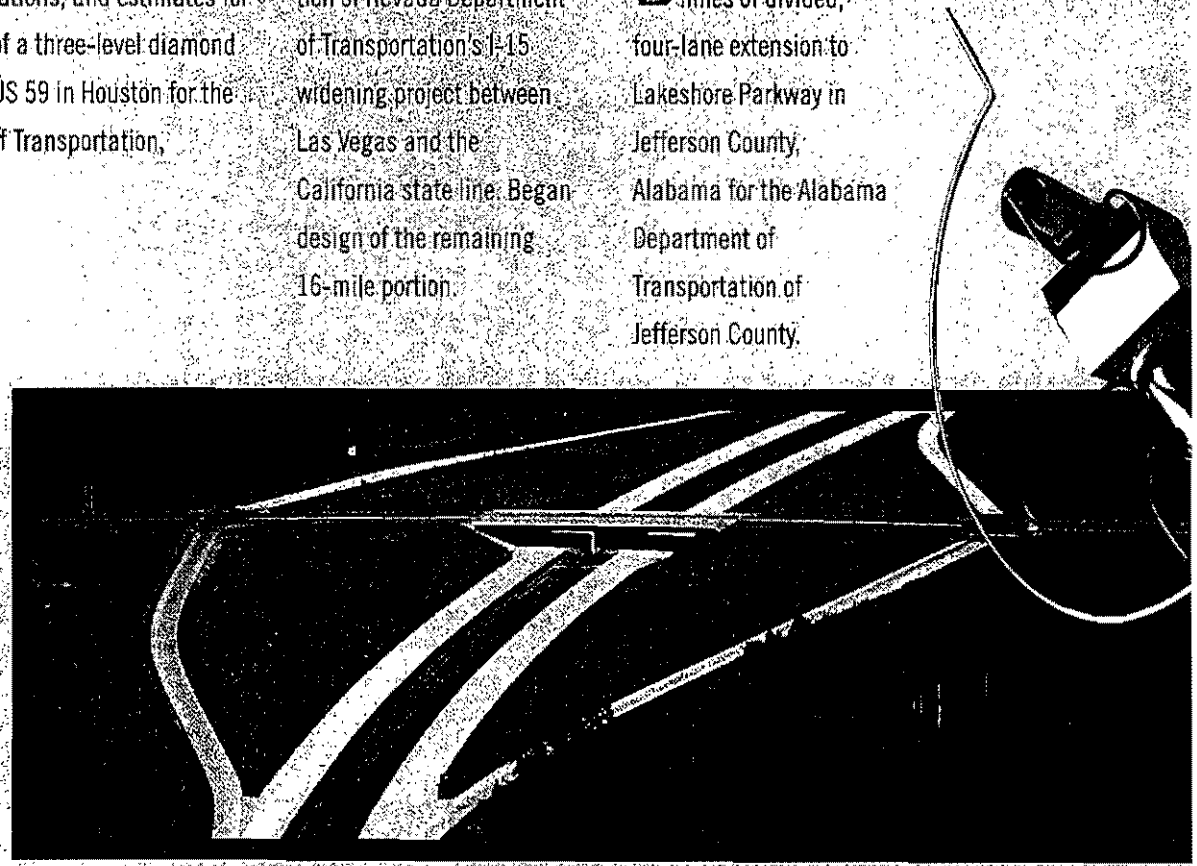
Initiated US 36 Boulder Turnpike Incident Management Study for Colorado Department of Transportation.



Completed preparation of construction plans, specifications, and estimates for the reconstruction of a three-level diamond interchange along US 59 in Houston for the Texas Department of Transportation, Houston District.

Completed design of the first nine-mile portion of Nevada Department of Transportation's I-15 widening project between Las Vegas and the California state line. Began design of the remaining 16-mile portion.

Began design of 3.5 miles of divided, four-lane extension to Lakeshore Parkway in Jefferson County, Alabama for the Alabama Department of Transportation of Jefferson County.



Completed main lane and frontage road plans and aesthetic design guidelines for SH 45 in Travis and Williamson Counties for the Texas Department of Transportation, Turnpike Division (TTA).

Selected by the Central Florida Regional Transportation Authority (Lynx) to provide general engineering consultant services in the areas of intelligent transportation systems and advanced public transit technology.

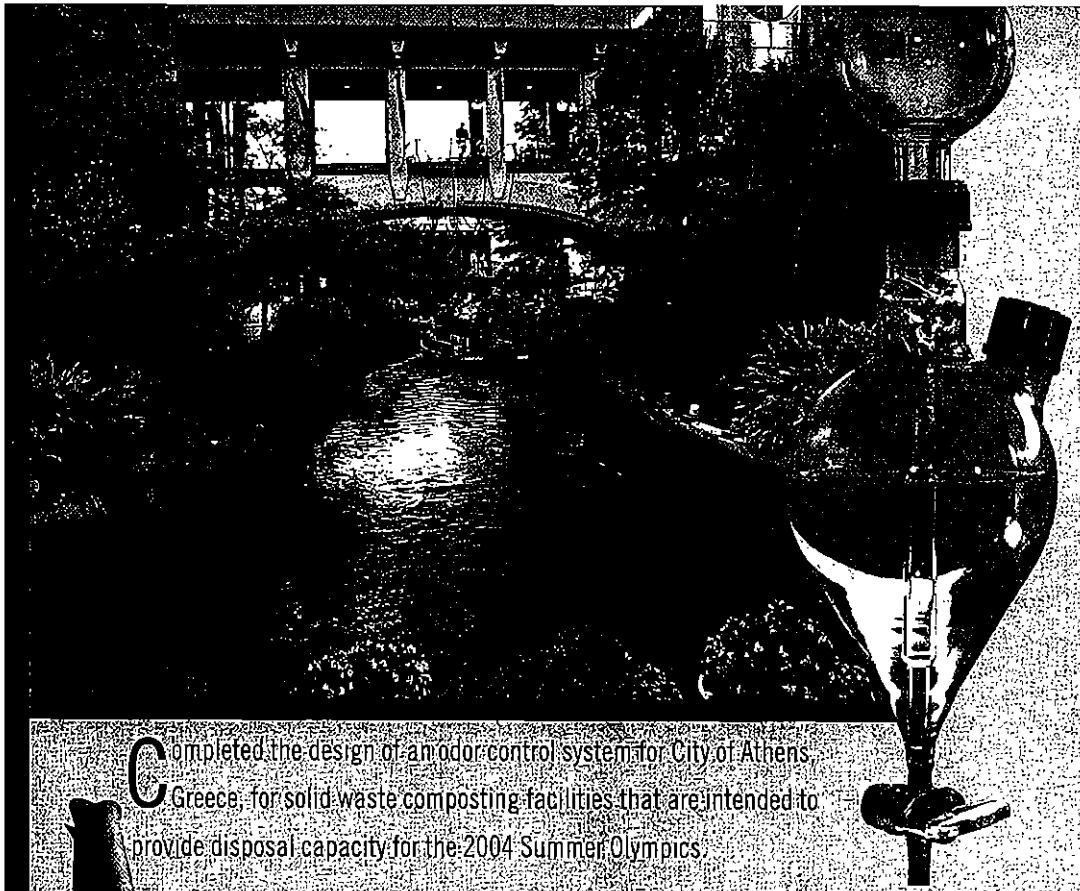
Selected for and began right-of-way acquisition and relocation assistance to the Florida Department of Transportation, District Seven for the widening of approximately two miles of I-4 east of Ybor City, Florida.

Selected by the Texas Department of Transportation, Houston District to prepare plans, specifications, and estimates for the reconstruction of approximately three miles of IH-10. Project includes a fully direction interchange at SH 99.

Began final design of phase one of the new Carson City Freeway (US 395) for the Nevada Department of Transportation.

Selected by the North Carolina Department of Transportation to provide right-of-way acquisition services for the second segment of the new I-485 in Mecklenburg County, North Carolina.

In support of the Charlotte Area Transit System, provided planning, environmental impact assessment, and public involvement services for new light rail and bus rapid transit corridors in the Mecklenburg County, North Carolina area.



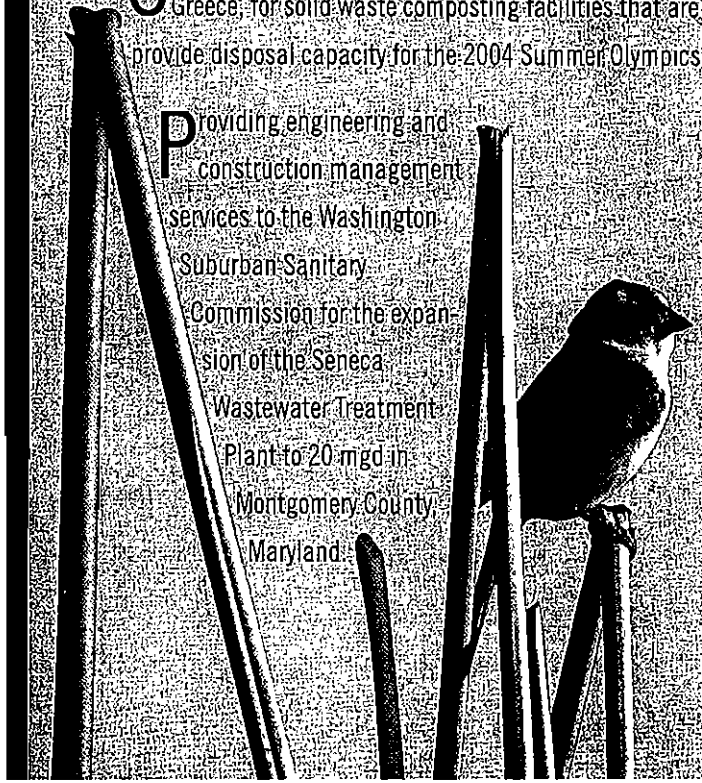
Completed water quality analyses and coordination with the Regional Water Quality Control Board and the California Coastal Commission for the final development phases of the Newport Coast Local Coastal Program for The Irvine Company, California.

Continued to support the New York Power Authority, Consolidated Edison Company for New York, Orange, and Rockland Utilities, and Central Hudson Gas and Electric Corporation for assessing the impacts of power plant operations on Hudson River fish populations.

Selected by CALPINE Corporation to prepare an Environmental Impact Statement and acquire environmental permits for a 760-megawatt, gas-fired power plant and transmission line. The project is situated on the Moapa Paiute tribal lands and federal lands in southern Nevada.

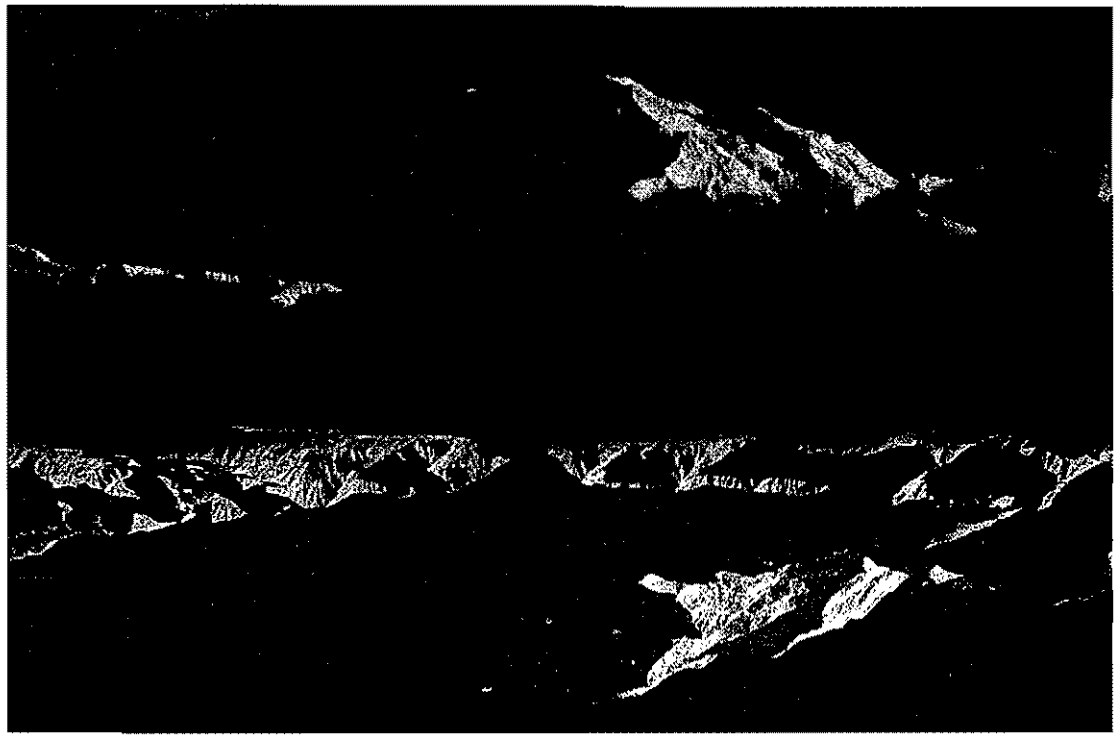
Completed the design of an odor control system for City of Athens, Greece, for solid waste composting facilities that are intended to provide disposal capacity for the 2004 Summer Olympics.

Providing engineering and construction management services to the Washington Suburban Sanitary Commission for the expansion of the Seneca Wastewater Treatment Plant to 20 mgd in Montgomery County, Maryland.



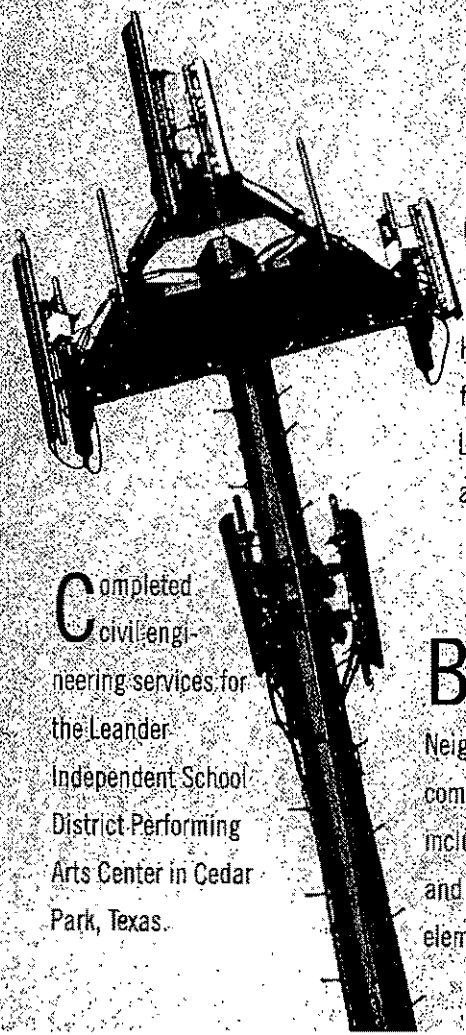
Completed the 15th year of operating the 1,200-acre Orlando, Florida Easterly Wetlands Treatment System, one of the largest such systems in the world. This project was showcased nationally by PBS on its "Planet Neighborhood" program.

Selected to design new biosolids dewatering and odor control facilities for two wastewater treatment plants in Mt. Pleasant, South Carolina. Also evaluating methods for controlling filamentous microorganisms in their activated sludge treatment process.



Civil Engineering Services
Site Suitability Studies
Master Infrastructure Engineering and Planning
Site Engineering
Municipal Engineering
Regulatory Permitting
Value Engineering
Construction Phase Services
Program Management
Disaster Planning and Response

Provided site engineering, survey, and landscape architecture services for Cypress Lake at Stonebriar, a 28-acre, 472-unit, multifamily development in Frisco. Bridges, and for phase seven of The Trails of West Frisco, a 145-lot single-family residential subdivision.



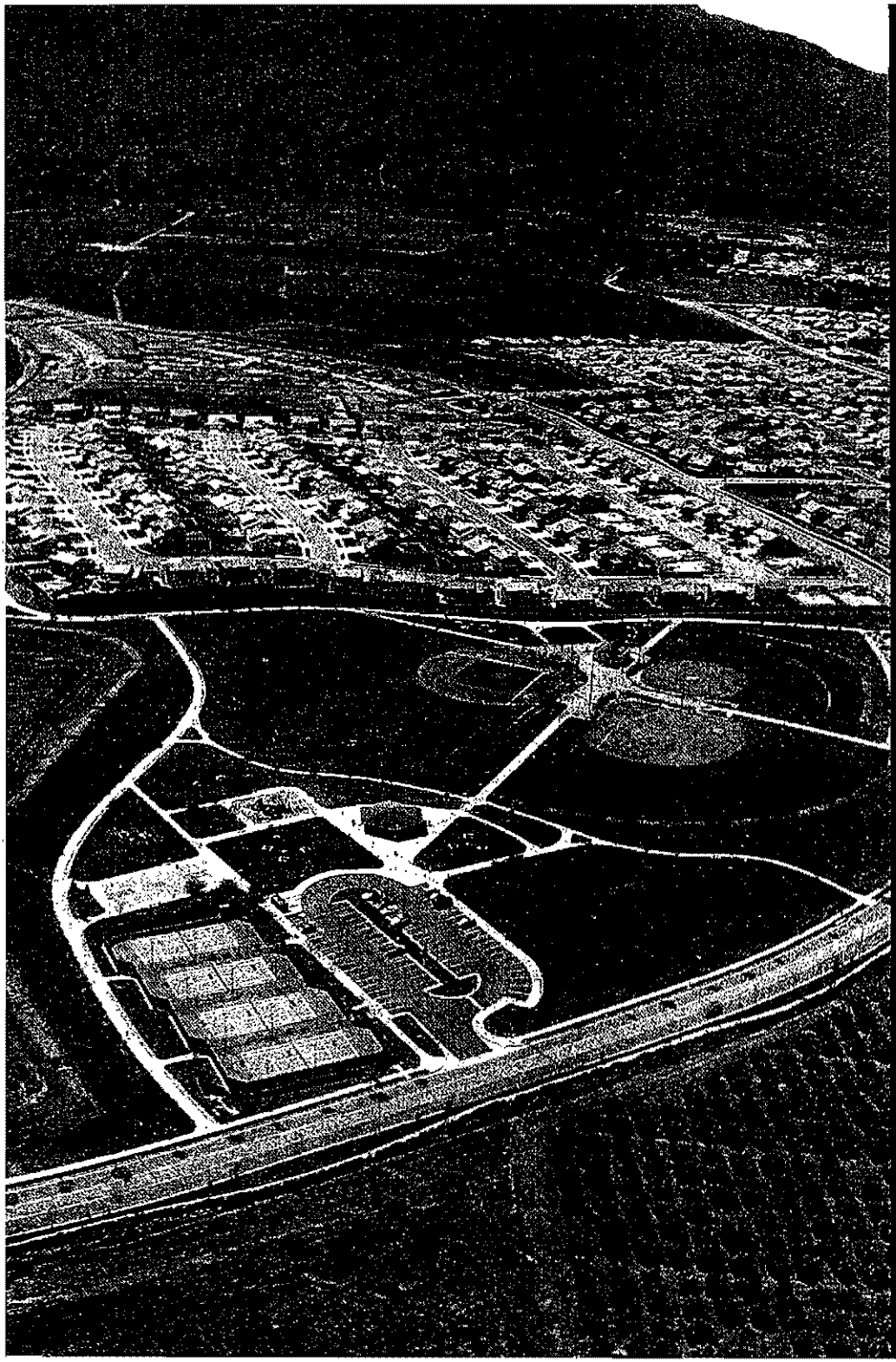
Completed civil engineering services for the Leander Independent School District Performing Arts Center in Cedar Park, Texas.

Continuing to provide site engineering for Home Depot USA for sites located in Casper, Wyoming; Lewiston, Idaho; and three locations around Denver, Colorado.

Began master infrastructure and site civil design for Lake Sawyer Neighborhood, a planned, neotraditional community in Orlando, Florida, that will include more than 1,600 single-family and townhome residences, and a 15-acre elementary school.

Providing full site development services for construction of Campus Connection, a 370-unit apartment complex that will provide off-campus student housing at the University of North Carolina-Charlotte.

For River Place Pointe in Austin, Texas, completed civil engineering services for the first three buildings of this seven-building, 600,000-square-foot office complex owned by Investors Life Insurance of North America



Selected by American West Homes, one of Las Vegas's premier homebuilders, to provide site, civil, and surveying for more than 540 lots within the Canyons III and Granbrooke subdivisions.

Continued to provide civil engineering and survey services for the Chick-fil-a restaurant chain for locations throughout the southeastern U.S.

Completed design, permitting, and limited construction administration services for Opryland Hotel Florida, a 1,400-room hotel and 380,000-square-foot convention center complex in Osceola County, Florida.

Selected by the City of Charlotte to develop a 16-acre, multiple-use driving facility to provide training for police, fire, transportation, and other city personnel.

Provided a wide range of services, including civil engineering design, surveying, construction plans, and structural analysis, for more than 600 telecommunications tower sites throughout the southeastern U.S.

Began preliminary engineering and site planning for the Colombia Ministry of Justice's proposed 4,000-inmate prison near Bogota. The project includes two medium- and two maximum-security facilities.

Selected by Town of Aspen, Colorado to provide civil engineering services for an affordable housing project with water storage and filtration and an onsite sanitary sewer package plant.

Providing engineering services for Hawks Pointe (Emery Ranch), a 139-acre planned hillside residential community in La Mirada and Fullerton, California.

Completed preliminary and final engineering services for PLC's 400-lot West Ridge planned community in Los Angeles County, California.

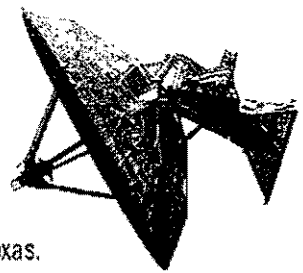
Completed design of the first four phases and the construction of the first two phases of Pulte Homes' new 166-acre Fairways residential development in Frisco, Texas.

Provided site planning, engineering, regulatory permitting and construction phase services for Centex Homes' 126-unit Westmont Oaks residential subdivision in Hillsborough County, Florida.

Selected for civil and site engineering for a 500-acre, mixed-use development in Horn Lake, Mississippi, for Parkwood Properties. The development will include a regional mall, shopping center, office development, and single-family and multifamily residential communities.

Provided engineering design services for two high schools, three middle schools, and five elementary schools for the Clark County School District in Nevada.

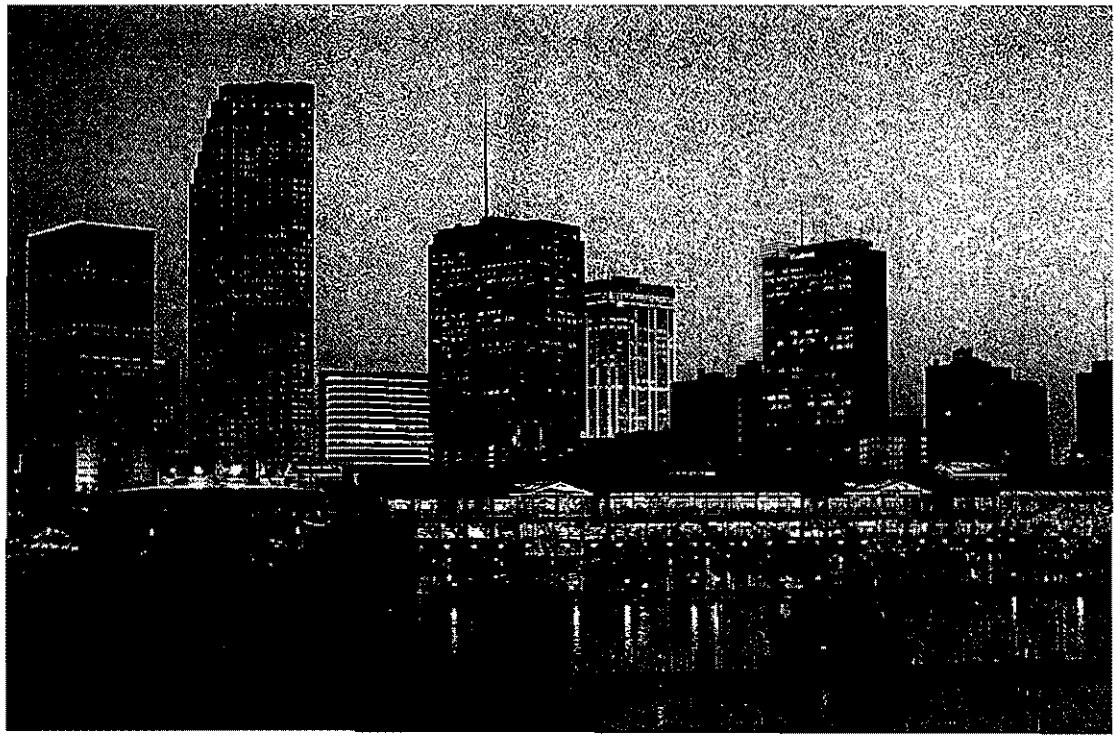
Continued to provide civil engineering and construction services to Herzog Development Corporation's Woodbridge project, a 1,200-acre master-planned community in Sachse and Wylie, Texas that includes a golf course, parks, lakes, and community trails.



Completed the feasibility study and entitlement phase for Cimarron Hills, a 813-acre master-planned community in Georgetown, Texas. The community features a Jack Nicklaus signature golf course.

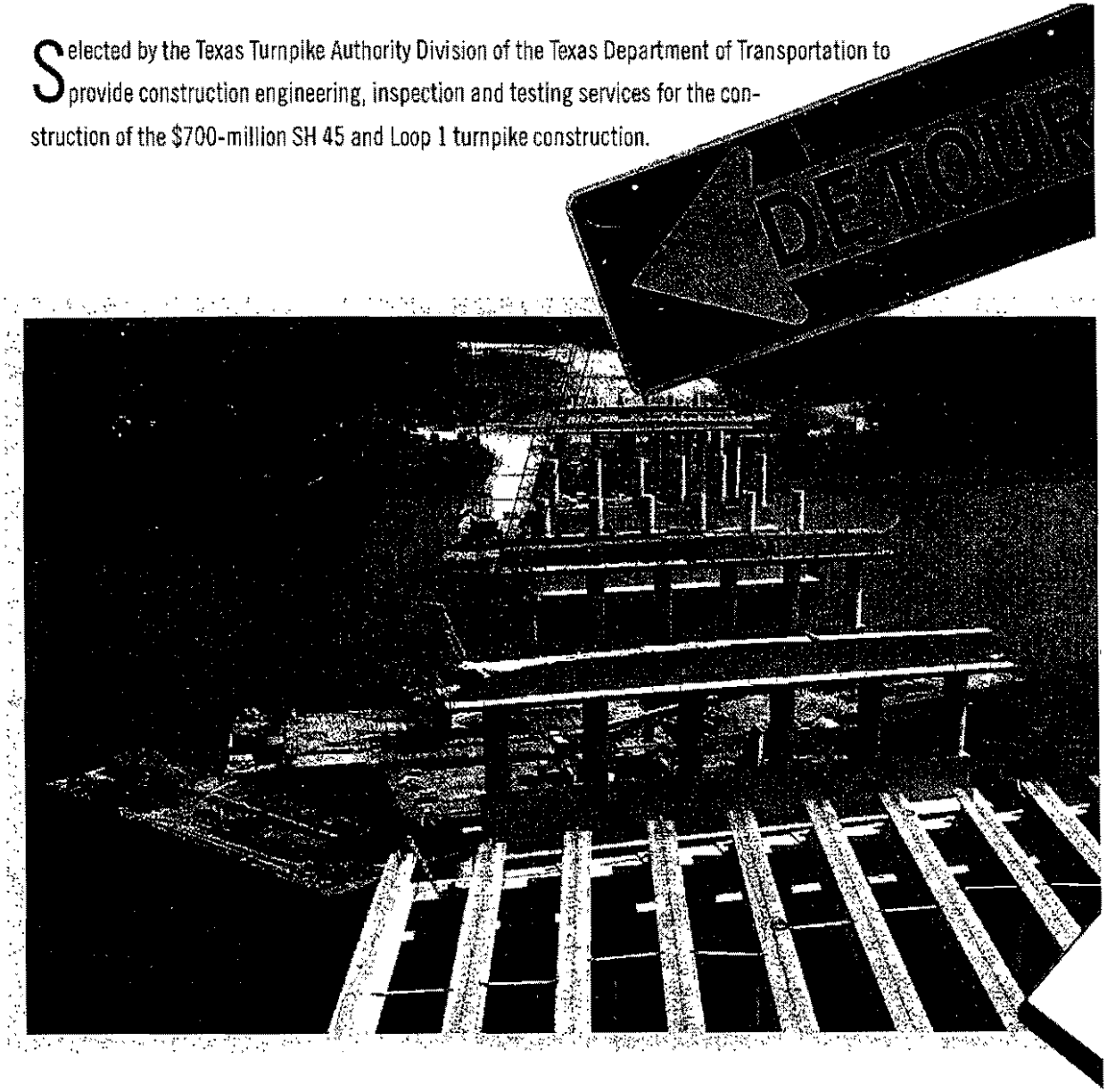
For Pritzker Residential, completed engineering design services for the first 287 units and began design services for another 439 units in the Centergate at Celebration apartment complex in Celebration, Florida.

Selected by The Landwell Company (TLC) to provide onsite design and development of commercial and residential properties in Henderson, Nevada.



Began providing independent quality control inspection and testing services for the interchange of I-25 and I-40 in Albuquerque, New Mexico. Reconstruction of the New Mexico State Highway and Transportation Department's "Big I" is the largest single highway construction project in state history.

Selected by the Texas Turnpike Authority Division of the Texas Department of Transportation to provide construction engineering, inspection and testing services for the construction of the $700-million SH 45 and Loop 1 turnpike construction.



Continued to provide construction engineering and inspection (CE&I) services for North Carolina Department of Transportation, Division Three's US 17 Jacksonville Bypass. The six-mile project traverses Camp Lejeune military base and has an 1800-foot bridge over Wilson Bay.

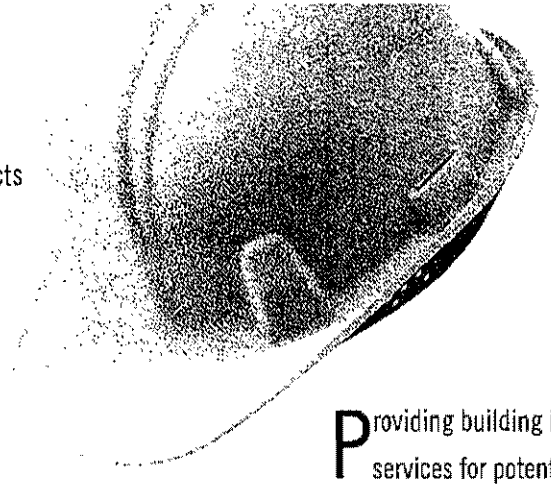
Reselected to continue providing construction-related services to BellSouth throughout Georgia and Florida. Services include quality assurance inspections, verification of contractor's invoices, damage inspection, and response to natural disasters.

Continued to provide CE&I services to the Florida Department of Transportation, District Seven for the widening of a 7.59-kilometer (4.7-mile) segment of I-275 between Busch Boulevard and Nebraska Avenue in Tampa, Florida.

Began providing CE&I services to Alabama Department of Transportation (ALDOT), Division Nine for Grelot Road in Mobile. Continued to provide CE&I services for the ALDOT, Division Four for improvements to SR 50, SR 280, Glenn Avenue, and the Phenix City Bypass.

For Cobb County, Georgia, continued to manage the Department of Transportation and Transit programs. Also provided complete program management services for Cobb County Water System.

Reselected by the school boards of Dade County and Broward County, Florida, two of the largest school districts in the U.S., to provide cost estimating, scheduling, and construction claims review services for ongoing improving efforts. Also began providing uniform building code inspection services (UBCI) for both districts.



For Clark County (Nevada) Public Works Department, providing construction administration for about 1.5 miles of 80- to 84-inch storm drain along Durango Drive in Las Vegas.

Began providing on-call CE&I services for Georgia Department of Transportation, Division Six for various road improvement projects in northwest Georgia.

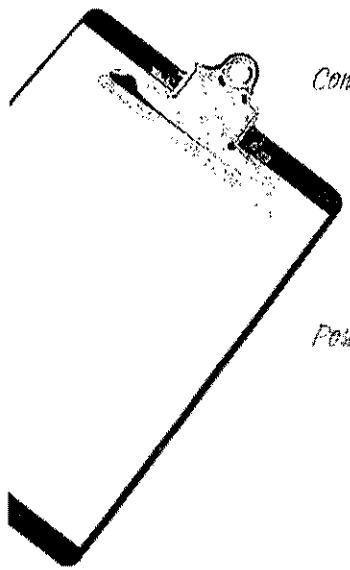
Program Support Services
- *Scheduling*
- *Estimating*
- *Value Engineering*
- *Project Controls*

Project Management Services
- *Conceptual and Planning Phase*
- *Programming Phase*
- *Design Phase*
- *Construction Phase*

Completed CE&I services for the reconstruction of a three-mile segment of I-4 near Tampa for the Florida Department of Transportation, District Seven, and continued to provide CE&I for the reconstruction of another five-mile segment.

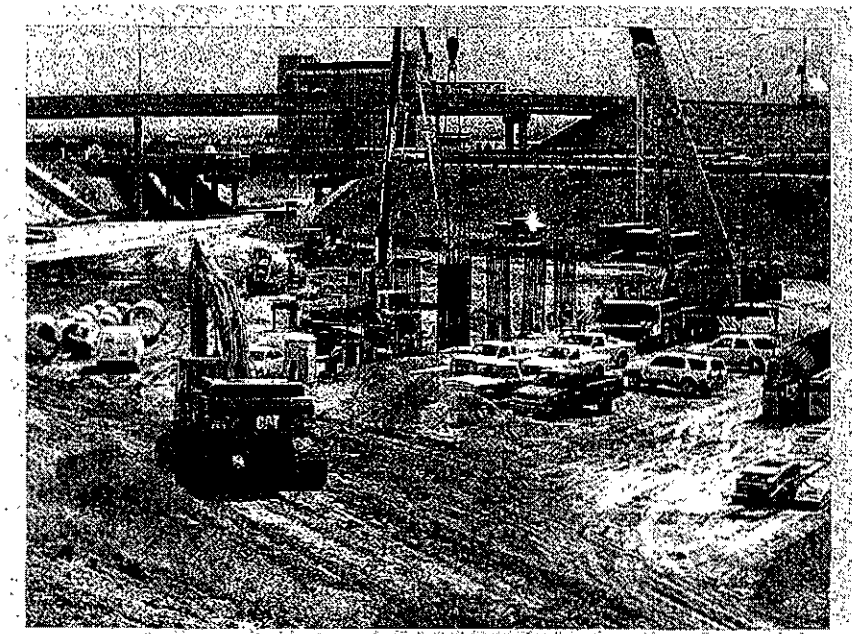
Providing building inspection services for potential and existing hurricane shelters throughout north Florida for the Florida Department of Management Services, Division of Emergency Management.

Selected as cost consultant for Florida International University's capital improvement program.



Construction Management Services
- *Contract Administration*
- *Construction Engineering and Inspection*
- *Quality Assurance*
- *Claims Management*

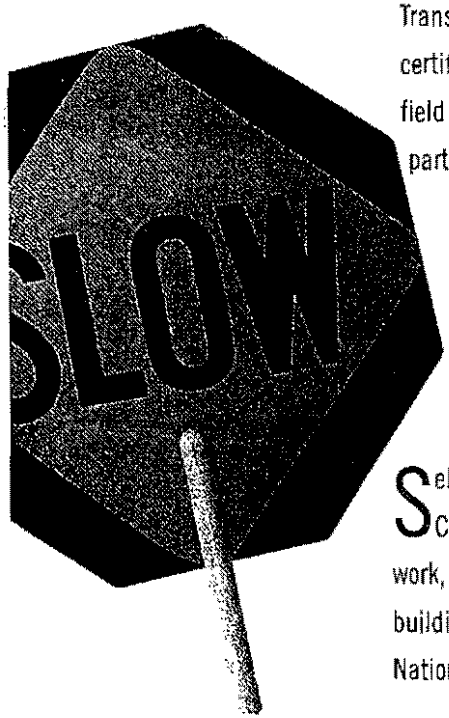
Post-Construction Services
- *Dispute Analysis/Resolution*
- *Maintenance Programming*
- *Warranty Inspection*
- *Financing Inspections*



Selected by Nevada Department of Transportation (NDOT) to provide full contract administration services for projects statewide. NDOT District II selected PBS&J to provide on-call CE&I for concrete rehabilitation of I-80 east of Reno.

Completed construction oversight of the new Florida Department of Transportation, Turnpike District headquarters complex at the Turkey Lake Service Plaza on Florida's Turnpike in Central Florida. The new facilities included a 104,800-square-foot administration building, 22,100-square-foot operations building, a 7,200-square-foot trades workshop, and a 22,500-square-foot law enforcement office building for the Florida Highway Patrol.

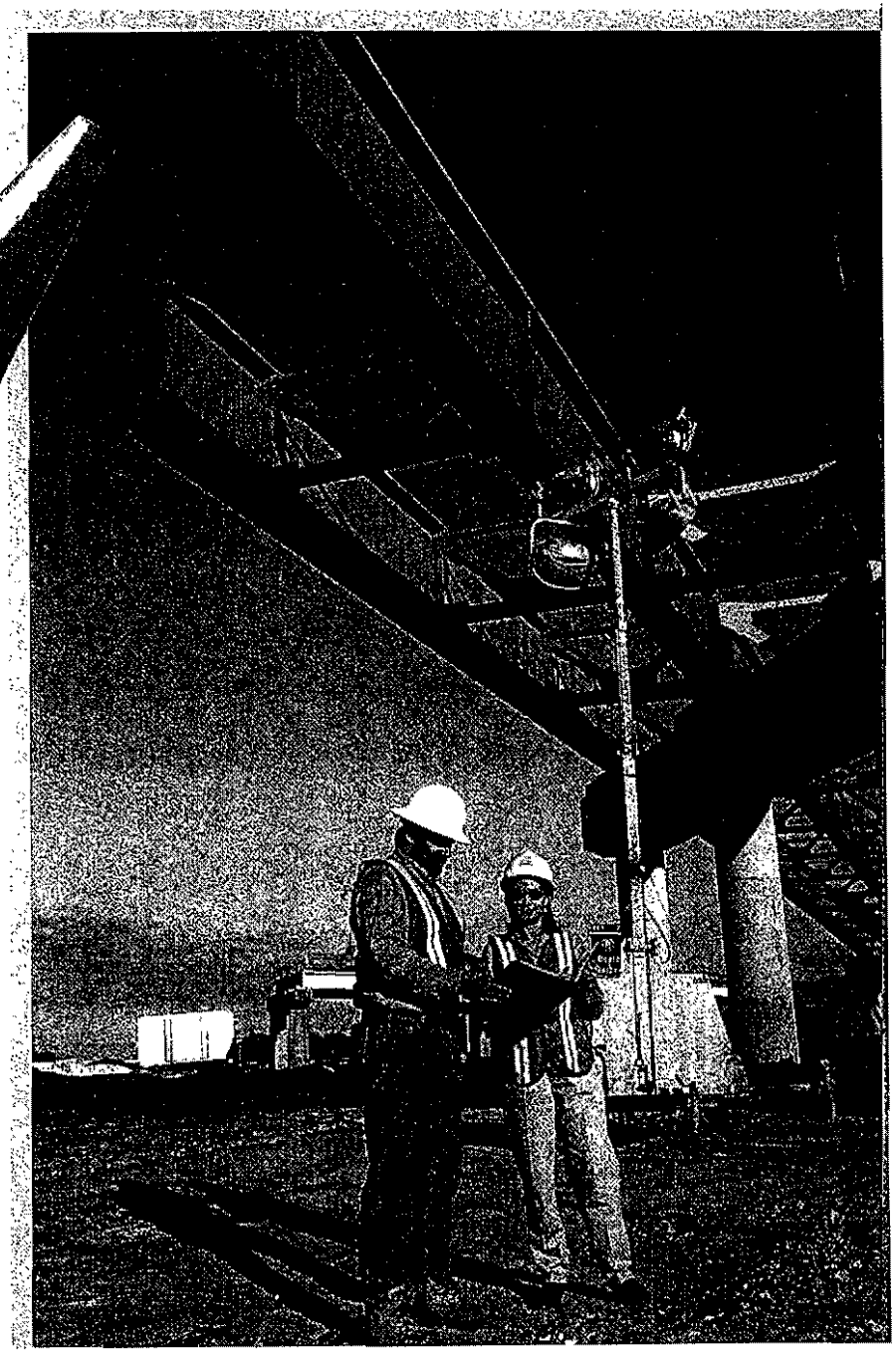
Provided construction oversight for PBS&J's new 90,000-square-foot office building in Orlando, Florida. The office houses more than 300 PBS&J civil engineering, transportation, environmental, construction, planning, and landscape architecture personnel. PBS&J also provided civil engineering and landscape architecture services for the project.

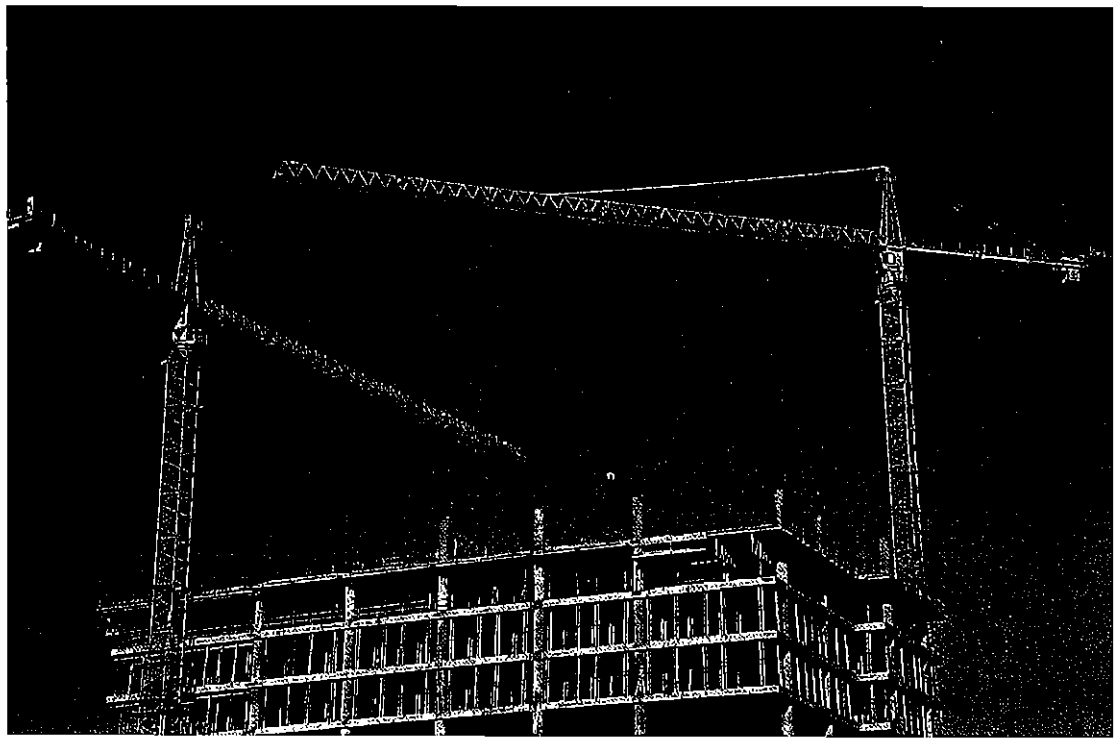


Selected by the Nevada Alliance for Quality Transportation Construction (NAQTC) to certify technicians responsible for materials field testing. NAQTC is a nonprofit organization that is part of the Western Alliance for Quality Transportation Construction.

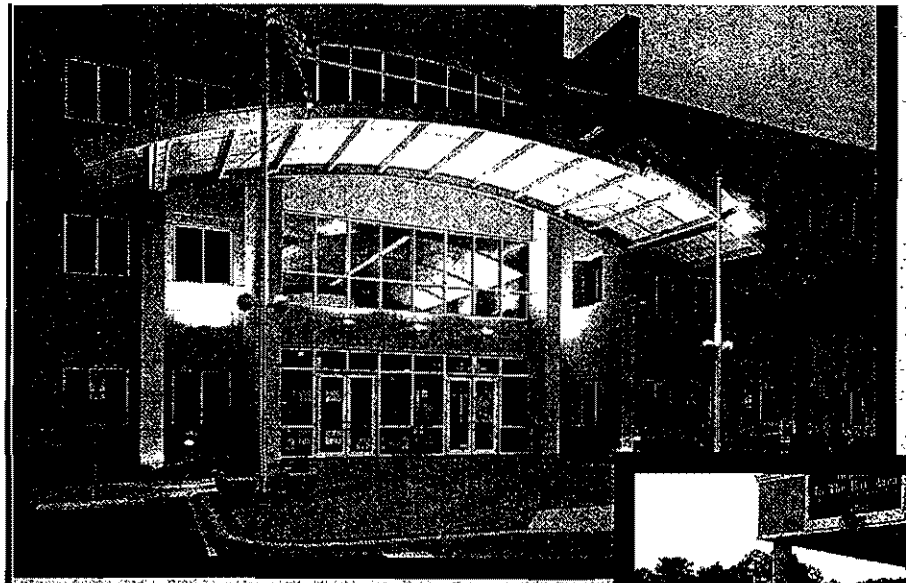
Selected by the Federal Highway Administration Central Lands to perform CE&I on a task order basis for five years. Projects have included earthwork, drainage, and pavement portions of roadway reconstruction, lagoons, buildings and other park infrastructure in northern California, Badlands National Park (South Dakota), and Bryce Canyon National Park (Utah).

For Clark County (Nevada) Public Works Department, providing construction administration for about 1.5 miles of 80- to 84-inch storm drain along Durango Drive in Las Vegas.





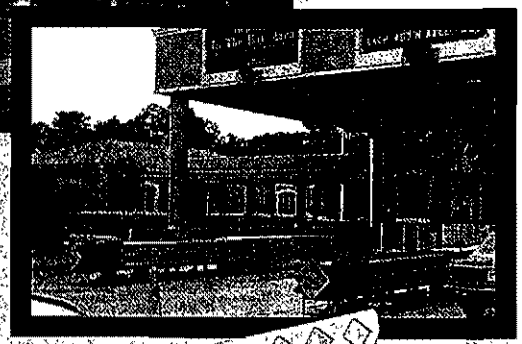
Planning & Landscape Architecture

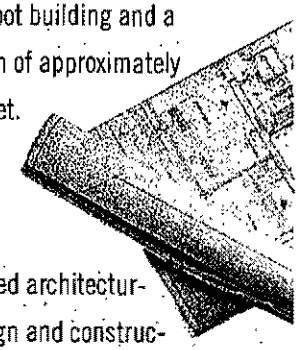


Continued providing architectural, mechanical, electrical, and plumbing services for the renovation of Publix Super Markets. To date, this assignment has included work for more than 50 stores.

Architecture
Programming and Design Studies, Investigations and Due Diligence
Interior Design
Space Planning
Mechanical Engineering
Design of HVAC, Plumbing, and Fire Protection
Energy Analysis/Audit
Electrical Engineering
Design of Lighting, Power Distribution, Fire Alarm, and Telecommunications systems
Site and Roadway Lighting
Cost Control, Budgeting, and Scheduling
Construction Administration
Design-Build Criteria Packages
3D Computer Images and Animation

Under general consultant contract, began developing design criteria package for improvements to the Florida Department of Transportation Office of Toll Operations Toll Data Center in Boca Raton, Florida. The project entails renovation of a 17,000-square-foot building and a two-story addition of approximately 14,000 square feet.

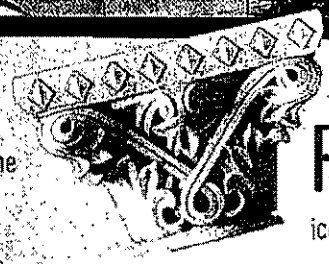




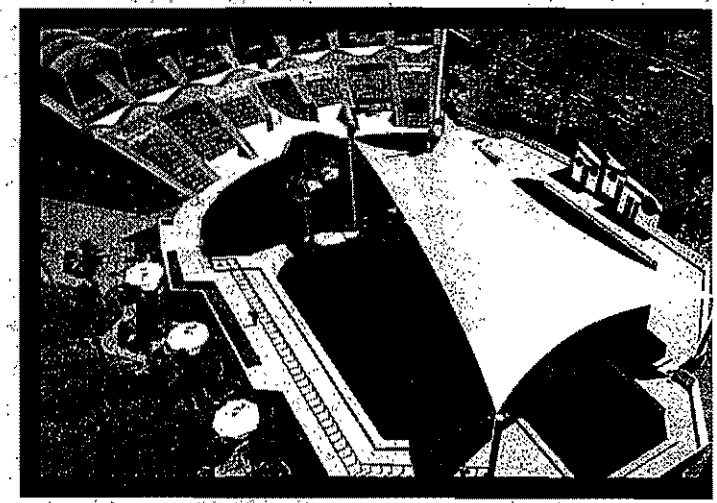
Completed architectural design and construction phase services for new swimming and related facilities at Sulphur Springs Park in Tampa, Florida.

Provided mechanical, electrical, and plumbing services for two new, 36,000-square-foot Whole Food Market stores in Houston, Texas and Denver, Colorado.

Continued architectural and landscape architectural design of the new whale and dolphin exhibition facility at the Miami Seaquarium in Biscayne Bay, Florida. The 1,996-seat, 2.5-million-gallon stadium and tank complex will be the centerpiece of aquatic features at the Seaquarium.



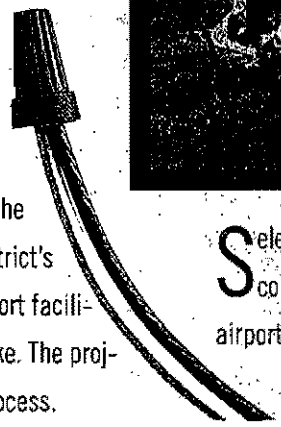
Provided mechanical, electrical, and plumbing services for two buildings and garage at the River Place Pointe office complex in Austin, Texas.



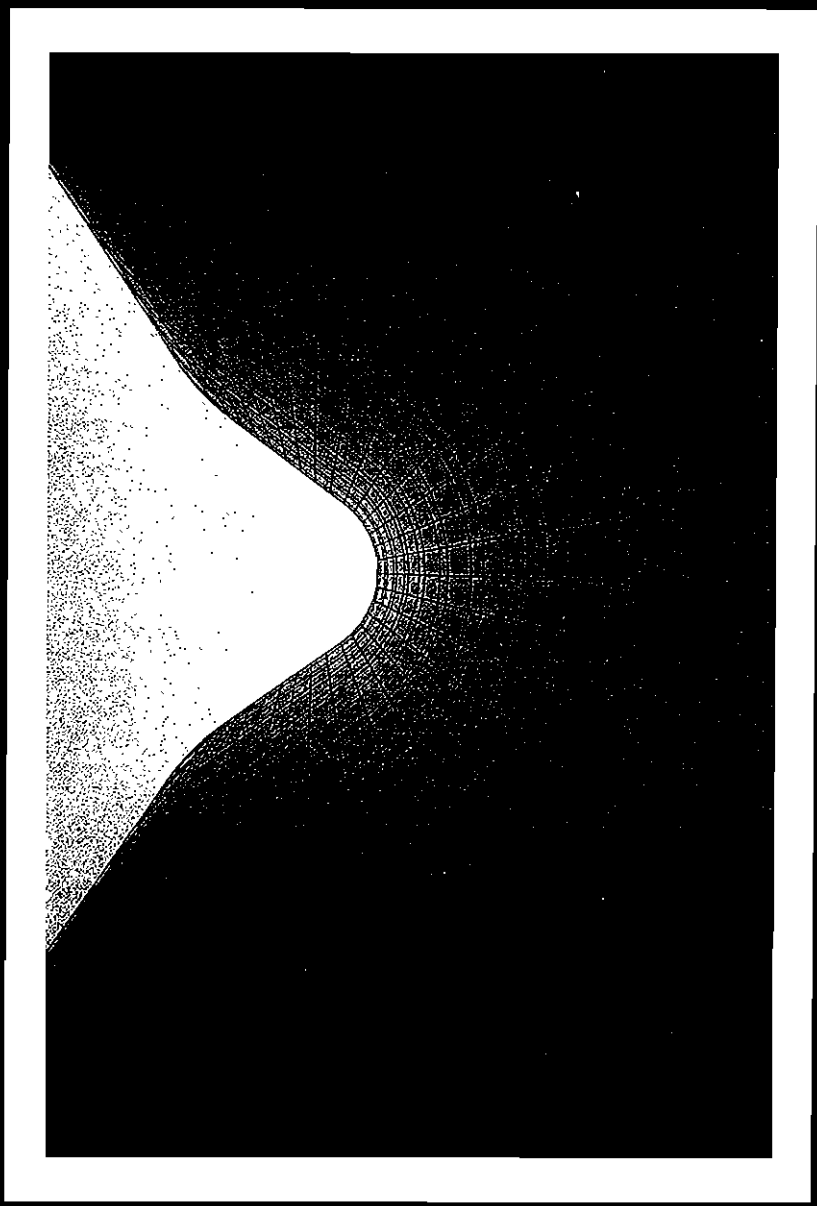
Selected to assist Saint Leo University with the retrofitting of up to six campus buildings to meet state hurricane evacuation shelter guidelines in order to provide a hurricane safe haven for the citizens of Pasco County, Florida.

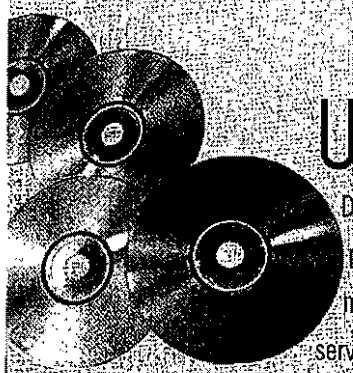
Completed mechanical, electrical, and plumbing design for the new concourse addition at the Tri-Cities Regional Airport, TN/VA.

Completed architecture design criteria package for the Florida Department of Transportation, Turnpike District's new 104,800-square-foot headquarters and three support facilities at the Turkey Lake Service Plaza on Florida's Turnpike. The project constructed under the design-build procurement process.



Selected as a sub to Bechtel Infrastructure Corporation completed phase (feasibility study) of developing a new airport in Bay County, Florida.





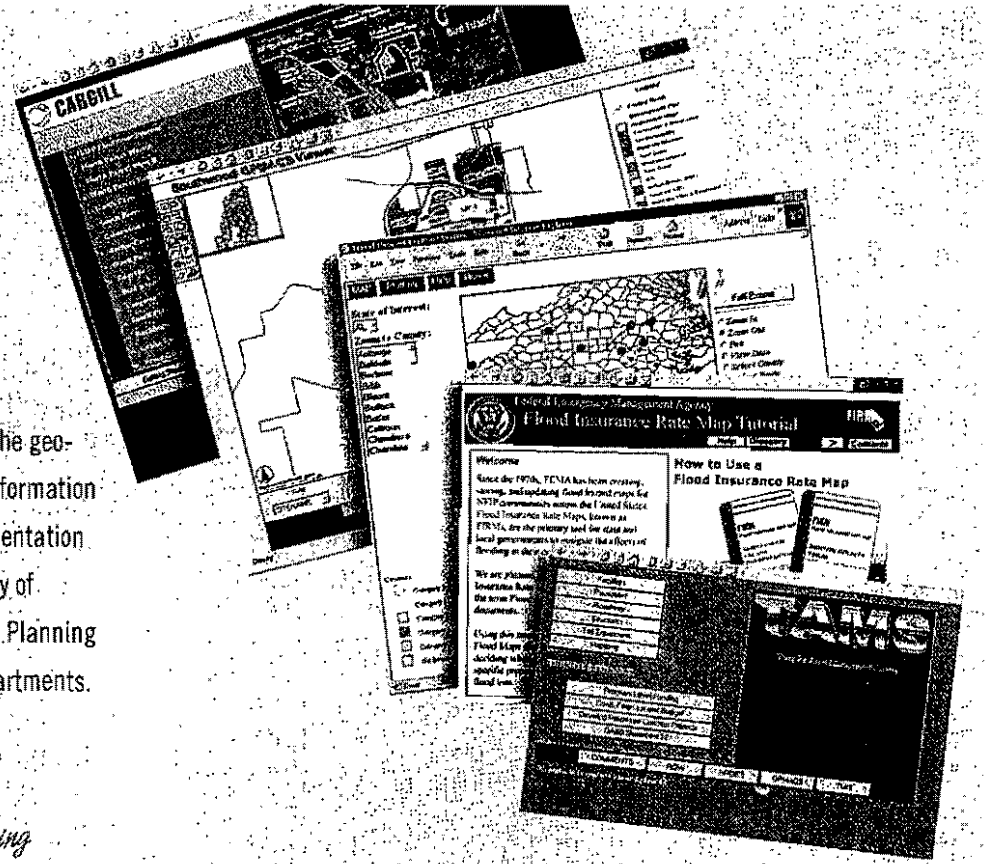
Under an ongoing contract with Walt Disney Imagineering provided environmental permitting services and developed a web-based mapping interface for the environmental permit tracking system.

Assisted Orange County Utilities with its master plan update through data collection, development of a data conversion tool, and flow projection analysis.

Completed a geographic permit management and compliance system for St. Joe/ARVIDA's Southwood mixed-use development in Leon County, Florida.

Selected to develop Cargill Incorporated's website for tracking its integrated land management plan related to a new gypsum stack facility in Hillsborough County, Florida.

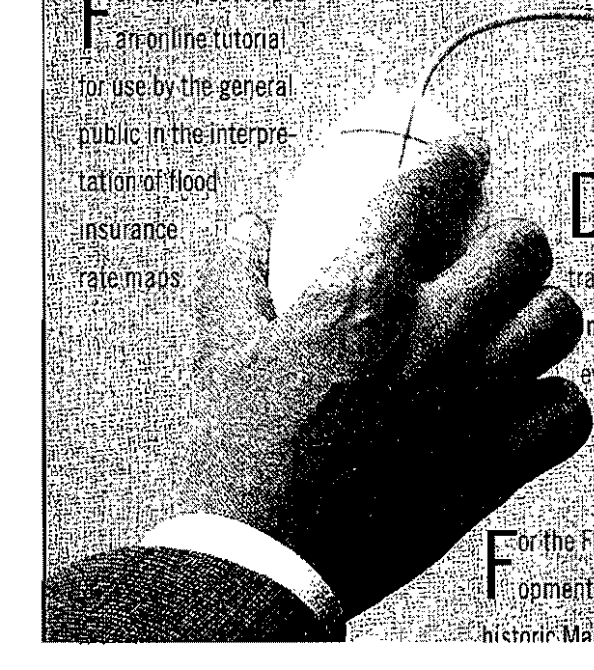
Completed a pilot project implementation of the Florida Department of Transportation, Turnpike District's asset management system.



Developed the geographic information system implementation plan for the City of Bastrop, Texas' Planning and Water departments.

Training
Database Analysis
System Programming
Transportation Applications
Environmental Applications
Construction Applications
Land Planning and Design
Geographic Information Systems

For FEMA, developed an online tutorial for use by the general public in the interpretation of flood insurance rate maps.

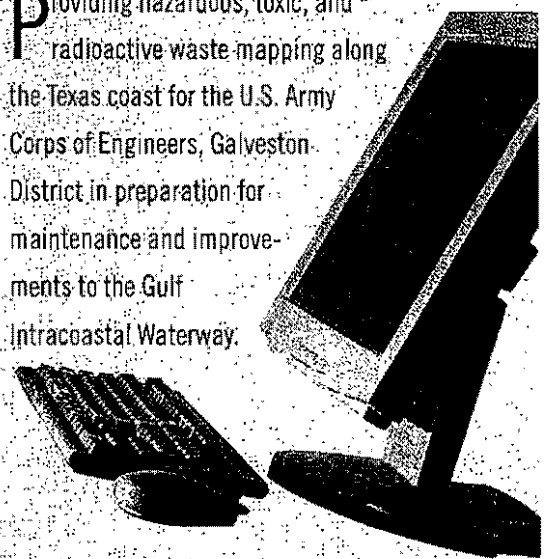


Developed and implemented for the Army Corps of Engineers a web-based travel demand forecast system to assist emergency management officials in anticipating cross-state line evacuation travel patterns and to track real-time traffic flows during an evacuation.

For the Florida Department of Environmental Protection, began development of a three-dimensional model of the shoreline protection at historic Marineland in Flagler County, Florida.

Providing GIS database development and a project-specific website for the Clark County (Nevada) Regional Flood Control District as part of its Las Vegas Valley master plan update.

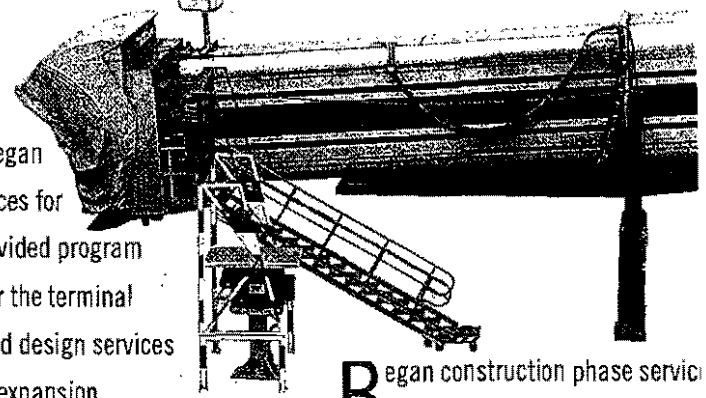
Providing hazardous, toxic, and radioactive waste mapping along the Texas coast for the U.S. Army Corps of Engineers, Galveston District in preparation for maintenance and improvements to the Gulf Intracoastal Waterway.



Selected by Arizona Department of Transportation to develop a database management system for tracking cultural resources information.

Selected to design Runway 8L-26R, a new air carrier runway at George Bush Intercontinental Airport in Houston, Texas. In other projects at Bush Intercontinental, continued construction phase services for parallel taxiway NA, and reconstruction of Runway 8-26. Also began construction phase services for air cargo facilities expansion.

Began service to the Orlando Sanford Airport Authority under a five-year general consulting contract at the Orlando Sanford Airport (Florida).



For the Okaloosa Regional Airport at Egland Air Force Base, began construction phase services for the apron expansion, provided program management services for the terminal expansion, and completed design services for the landside parking expansion.

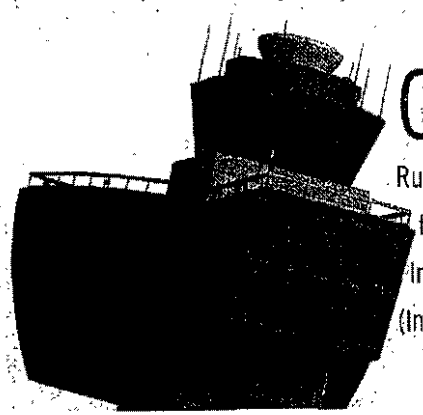
Began construction phase servic for the new 26,000-square-foot seven-gate concourse addition at Tri Cities Regional Airport, TN/VA. Also began construction phase of the airport's Runway 05 safety area.

Selected by the Palm Beach County Department of Airports to serve as general consultant for facilities development and improvements and for airfield and landside development and improvements at Palm Beach International Airport (Florida).

Completed design and reconstruction of the Runway 27 Departure End at Cincinnati/Northern Kentucky International Airport. Also completed the Environmental Impact Statement and began preliminary design of a new runway at the airport.

Performed detailed analyses of airspace capacity, environmental impacts, and ground transportation demand and capacity as a member of the overall New Airport Development Team for the Bay County (Florida) International Airport Feasibility Study.

Continued to provide design services for the expansion of McCarran International Airport's Concourse D (Las Vegas, Nevada), including final design of mass grading for the North Apron and an 800-foot people mover tunnel for the North Apron complex. Also provided design for an overnight aircraft parking apron at McCarran International Airport.

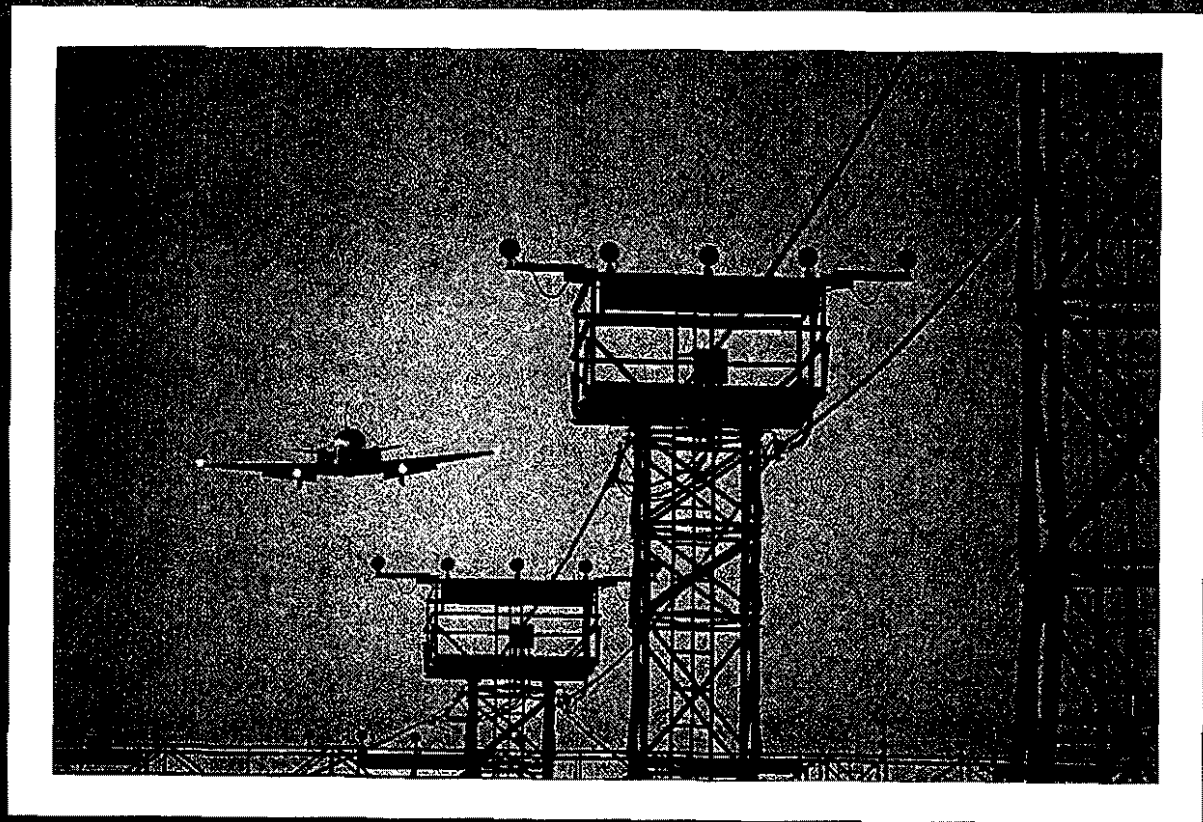


Completed design and construction of the Runway 5-23 rehabilitation at Fort Wayne International Airport (Indiana).

Selected by the Huntsville Madison County Airport Authority to design the Taxiway "C" Connector at the Huntsville International Airport (Alabama).

Airport Master Plans
Environmental Impact Statements
Master Drainage Plans
NAVAID Studies
Wetland Mitigation
Runways, Taxiways, Aprons
Deicing Facilities
Approach Surveys
Program/Construction Management
Resident Inspection

Completed design of the Northeast Deicing Apron and Southwest Terminal Apro expansion at the Dayton International Airport (Oh



PBS&J

Last, but not least, a vital project that never ends...PBS&J!

PBS&J is proud to showcase the depth and breadth of our project capability in this Annual Review. The world is changing rapidly, and PBS&J has constantly adjusted over our 40-year history to meet new client and project challenges and opportunities. This Annual Review highlights recent and current projects that represent our diverse technical and geographic base as we enter the new millennium.

All PBS&J projects begin with people...our hardworking employees embody the values and vision of our founders, the generation of leaders who followed, and the vision of leaders yet to come. At PBS&J, company leaders make way for a new generation of leaders, with each generation raising the bar on our own expectations, while more closely aligning the company with our workforce, our industry, and our clients.

We ask our employees to be influential, not just in marketing projects, but in bringing energy and enthusiasm to impact the entire assignment. Clients want our collaborative advice and counsel; they get it! Successful projects as seen in this Annual Review are clear indications that our people are hard at work making a difference in the communities in which we live.

PBS&J's vision is to be recognized nationally, not just by media advertising, but, more importantly, through business-to-business trust and people-to-people relationships. We pay for media, but we must earn trust and friendships. In any PBS&J engagement, an important intangible is lasting relationships with clients, peers, and other stakeholders.

Our employee-owned company continues to attract the best and the brightest talent to our ranks. **This Annual Review is a tribute to the hardworking people of PBS&J and to the people that made these projects possible...our clients.**

Our heritage continues! PBS&J's core values, forged from the personal and professional integrity of our founders, remain the guiding principles of PBS&J today.

Sincerely,

The Board of Directors
PBS&J

the PBS&J office network

Corporate Office
2001 N.W. 107th Avenue
Miami, Florida 33172-2507
305/592-7275
800/597-7275
Fax: 305/599-3809
www.pbsj.com
email: 9808@pbsj.com

Regional Offices

5665 New Northside Drive,
Suite 400
Atlanta, Georgia 30328
404/351-5608

206 Wild Basin Road, Suite 300
Austin, Texas 78746-3343
512/327-6840
Fax: 512/327-2453

12101 Indian Creek Court
Beltsville, Maryland 20716
301/210-6800
Fax: 301/210-5156

5999 Summerside Drive, Suite 202
Dallas, Texas 75252
972/380-2605
Fax: 972/380-2609

175 Calle Magdalena
Encinitas, California 92024
760/753-1120
Fax: 760/753-0730

901 North Green Valley Parkway,
Suite 100
Henderson, Nevada 89014
(Las Vegas)
702/263-7275
Fax: 702/263-7200

1880 South Dairy Ashford Road
Suite 300
Houston, Texas 77077-4760
281/493-5100

18022 Cowan, Suite 100A
Irvine, California 92614-6805
949/660-8600
800/398-8660
Fax: 949/440-8183

482 South Keller Road
Orlando, Florida 32810-6101
407/647-7275
800/284-5182
Fax: 407/740-8958

5300 W. Cypress Street, Suite 300
Tampa, Florida 33607-1712
813/282-7275
800/477-7275
Fax: 813/289-0397

Other Locations

Albuquerque, New Mexico
505/344-2484

Bartow, Florida
863/533-7000

Birmingham, Alabama
205/945-9260

Charlotte, North Carolina
704/522-7275

Chipley, Florida
850/638-2288

Columbia, South Carolina
803/806-8080

Dallas, Texas
972/387-0771

Englewood, Colorado
303/221-7275

Erlanger, Kentucky (Cincinnati)
859/371-9051

Fort Lauderdale, Florida
954/772-4995

Fort Myers, Florida
941/334-4452

Herndon, Virginia
703/471-7275

Jackson, Mississippi
601/936-7228

Jacksonville, Florida
904/367-8683

Jacksonville, North Carolina
910/346-5221

Lake City, Florida
904/961-9619

Lanette, Alabama
334/576-1966

Lumberton, North Carolina
910/737-6245

Marietta, Georgia
770/424-8800

Melbourne, Florida
407/242-4942

Mobile, Alabama
334/470-8323

Nashville, Tennessee
615/399-0298

Newport News, Virginia
757/596-8267

Orlando, Florida (Turnpike)
407/532-3999

Panama City Beach, Florida
850/236-8675

Pensacola, Florida
850/478-9844

Phoenix, Arizona
602/943-1003

Raleigh, North Carolina
919/876-6888

Reno, Nevada
775/828-1622

Richmond, Virginia
804/897-6460

Riverside, California
909/341-6380

San Diego, California
858/627-1750

San Juan, Puerto Rico
787/724-6860

Sarasota, Florida
941/954-4036

Tallahassee, Florida
850/575-1800

Tyler, Texas
903/509-1552

West Palm Beach, Florida
561/689-7275

Woodlands, Texas
281/363-0604

York, South Carolina
803/684-8582

International Offices

Buenos Aires, Argentina

Caracas, Venezuela

PBS&J Toxicology Laboratory

888 W. Sam Houston Parkway S.,
Suite 110
Houston, Texas 77042-1917

www.pbsj.com

PBS&J

An employee-owned company

Looks OK
JP

November 9, 2001

Mr. Steven Z. Chutchian
Assistant City Engineer
Town of Addison
16801 Westgrove Dr.
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Chutchian:

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We are available to start the study at your convenience. However, since we have proposed such a short timeframe to perform this work, we would appreciate being notified verbally as soon as the Town decides to proceed so we can make sure our schedules are ready when our contract time begins. Thank you for your confidence in PBS&J. We look forward to working with you.

Sincerely,

Clarence Daugherty

Clarence Daugherty, P.E.
Director of Municipal Services

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13800 Montfort Drive, Suite 230, Dallas, Texas 75240-4347 • Telephone: 972.387.0771 • Fax: 972.387.9714 • www.pbsj.com

SURFACE CONDITION STUDY
BELTLINE ROAD FROM DALLAS PARKWAY TO MARSH LANE
ADDISON, TEXAS

SCOPE OF SERVICES

PBS&J proposes to perform a study of the surface conditions of Beltline Road from Dallas Parkway to Marsh Lane. It is PBS&J's understanding that the surface of Beltline became slick or "polished" many years ago and that several attempts have been made to solve the problem. The purpose of this study will be to identify a definitive method to overcome the surface problems of this pavement. This would be done by providing to the Town the results of the analyses of several alternative strategies so that the Town can decide the strategy that best fits the Town.

It is proposed that PBS&J perform the following tasks:

- Gather detailed information about the history of the pavement: accidents, studies and material tests, potential contributing factors, previous improvements, etc.
- Make field observations
- Perform tests of concrete related to skid resistance characteristics (sub-contract for three cores for petrographic analysis and acid solubility tests)
- Identify potential improvement strategies to restore desired skid resistance properties
- Determine what each strategy accomplishes, or fails to accomplish, and the characteristics of each strategy that may make a difference to the Town's final decision
- Estimate the construction and life cycle cost of each strategy
- Develop a matrix that indicates a rating for each strategy in the areas of pavement surface performance, service life, cost effectiveness, constructability and community acceptability
- Present the resulting report to the Town in draft form and then in final form after review and discussion with the Town staff

It is proposed that the Town

- make available all information pertinent to the analysis of the pavement
- review partial study information submitted by consultant as needed and provide consultant appropriate direction
- review draft report and provide feedback in a timely manner to facilitate completion of the final report

COMPENSATION

PBS&J proposes to prepare this study for a fixed fee of $14,900. This fee includes all labor and expenses as well as laboratory testing. The fee includes obtaining and testing three cores of the concrete pavement. If it is determined and agreed to by the Town that additional cores and/or testing is required, those will be performed for an additional amount by prior written agreement between the Town of Addison and PBS&J.

TIME OF COMPLETION

PBS&J proposes to perform the work and submit a draft report within 40 working days. Converting this time to calendar days will depend on the date of the notice to proceed, whether or not any holidays fall within the project time and any time required by the Town to gather information needed by PBS&J. A Final Report will be completed one week after PBS&J receives comments regarding the draft report.

PSI Information To Build On
Engineering • Consulting • Testing

November 7, 2001

Mr. Doug Dillon
PBS&J
13800 Monfort Drive Suite 230
Addison, Texas 75240

Re: Proposal for Construction Materials
Testing and Inspection Services
Testing on Belt Line to Marsh lane
Addison, Texas

PSI Proposal No. 341-1085R-1

Dear Mr. Dillon,

Professional Service Industries, Inc. (PSI), is pleased to submit the following proposal for performing Construction Materials Testing and Inspection services on the project referenced above. Professional Service Industries, Inc. (PSI), understands that we have been selected based upon our qualifications in accordance with the Professional Service Procurement Act, Article 2254.004 of the Texas Government Code, to provide the above referenced services for this project. In accordance with this act, we are now submitting our proposed fee schedule as the second step or the negotiation phase of the contracting process.

As America's largest independent testing firm and the nations fourth largest consulting engineering firm, we bring extensive experience in providing professional engineering and materials testing services for clients in the Dallas/Fort Worth area, throughout the State of Texas and the nation. With four local offices servicing the metroplex, PSI has the technical capabilities, personnel and equipment resources and local expertise to provide you with superior testing services.

PSI proposes to provide experienced, technical personnel to perform testing and inspection services as requested in general accordance with project specifications. Provided herewith is our budgetary estimate of the anticipated testing and the associated estimated costs based on the project characteristics available at the time of this proposal. PSI proposes to accomplish the work on a unit price basis in accordance with the unit rates of this proposal. All work will be performed in accordance with the General Conditions attached herein and considered a part of this proposal.

The cost estimate was developed based on the estimated quantities, types of tests and the unit rates shown herein. This estimate was developed based on a defined scope of work as outlined in this proposal. Any work which is required beyond this estimate will be charged per the unit rates shown.

PSI will proceed with the work upon receipt of a signed proposal. Please sign and return one copy of this proposal intact. When returning this proposal, please complete the attached Project Data Sheet so that PSI may best serve your project and help distribute reports to the appropriate parties.

PSI looks forward to providing services to PBS&J during construction of the Belt Line to Marsh lane project. Once a detailed construction schedule and material quantity are available, we would be pleased to meet with you and refine the attached estimate and add or delete services as desired. Should you have any questions or wish to discuss this proposal further, please contact us at your earliest convenience at 214 330-9211.

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

Robert P. Nance
Department Manager
Construction Materials Testing

Thomas J. Hruby, Jr., P.E.
Vice President

Attachments: Project Information/Assumptions
Estimated Materials Testing Cost Summary
Estimated Materials Testing Cost Breakdown
Project Data Sheet
General Conditions

AGREED TO THIS _____ DAY OF _____, 2001

SIGNATURE: _____

TYPED/PRINTED NAME: _____

TITLE: _____

FIRM: _____

PROJECT INFORMATION/ASSUMPTIONS

Concrete Coring and Analysis

1. As requested a PSI representative will perform concrete coring and patching at three distinct areas of the main lanes of Belt Line road.

2. PSI will develop and implement a plan of traffic control during the coring operations at the three distinct locations.

3. At the request of the Town of Addison all concrete coring will be performed during night time hours in an effort to minimize the impact on the flow of traffic.

4. Three-petrography analysis and will be performed as requested and the report of finding will be sent to the client.

5. The three cores locations will be patched with quick set ready mix concrete.

6. One acid solubility test will be performed on each of the three concrete samples obtained from the coring operation. The amount of acid soluble material in the sample will be determined. The amount of acid soluble material in the fine aggregate portion of the concrete will be mathematically calculated by difference using the values of cement paste determined in the petrographic analysis and values of coarse and fine aggregate determined from a gradation analysis of the residue of the acid solubility test. It should be understood that the amount of soluble material calculated for the fine aggregate will be understated if there is acid insoluble material in the cement paste and will be overstated if there is acid soluble material in the coarse aggregate.

ESTIMATED TESTING SCHEDULE

PSI performs a complete range of Construction Materials Testing Inspection Services as well as Geotechnical and Environmental Consulting Services. In addition to those listed above, your project can be provided with the following:

- Fireproofing Inspection
- Environmental Site Assessments
- Asbestos Sampling & Testing
- Roof Testing & Inspections
- Wetland Investigation
- Geotechnical Services
- Indoor Air Quality Studies
- Lead Based Paint Testing
- Floor Flatness Testing
- Hydrologic/Hydraulic Engineering

Estimated Materials Testing Summary

The following is our estimate of the number, type, and cost of anticipated Construction Materials Testing and Inspection Services for the subject project. This estimate was developed based on assumptions made from current information available to us regarding expected work schedules, amount of materials, project requirements, etc. It should be recognized that variations in construction schedules, weather, etc., could result in differences between the actual and estimated testing costs. Although efforts will be made to maintain the testing costs within the estimated amount, charges will be computed based on actual services rendered.

Proposal excludes the following items:

X	Overtime	X	Cancellation without notice
X	Stabilization	X	Environmental Engineering
X	Re-testing	X	Waiver of Subrogation
X	Special Engineering Services		

Materials Testing Total Estimate	**$6,119.00**
Allowance for Steel Inspection ***	**$0.00**
Total Sum	**$6,119.00**

*** By Owner Direction

A. Concrete Coring and Analysis				
Concrete Compression Cylinders [illegible]	Each	0	$12.00	$0.00
Two Concrete Coring Technicians	Hour	16	$57.00	$912.00
Concrete Coring Rig	Day	1	$210.00	$210.00
Petrograghy Analysis	Each	3	$850.00	$2,550.00
Traffic Control Plan	Day	1	$1,500.00	$1,500.00
Acid Solubility	Each	3	$150.00	$450.00
Concrete Core Preparation	Each	18	$4.00	$72.00
	Sub-Total			$5,694.00

B. Special Testing				
Concrete Flatness (ACI 304) Per Hour On-Site +2 Hours Lab	Hour	0	$50.00	$0.00
Project Engineer/Manager Review of Reports	Hour	5	$85.00	$425.00
Fireproofing Inspection	Hour	0	$50.00	$0.00
Batch Plant Inspection	Hour	0	$50.00	$0.00
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Special Testing	Hour	0	$50.00	$0.00
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C. Trip Charges/Miscellaneous				
Site Visit/Sample Pick Up	Trip	0	$35.00	$0.00
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This proposal presents the typical construction materials testing required on area projects. If an increased or decreased scope of work is desired, we would be pleased to discuss this at the appropriate time. Additional services and fees not listed, will be quoted upon request.

SURFACE CONDITION STUDY
BELTLINE ROAD FROM DALLAS PARKWAY TO MARSH LANE
ADDISON, TEXAS

SCOPE OF SERVICES

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Engineering • Consulting • Testing

November 7, 2001

Mr. Doug Dillon
PBS&J
13800 Monfort Drive Suite 230
Addison, Texas 75240

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Department Manager
Construction Materials Testing

Thomas J. Hruby, Jr., P.E.
Vice President

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PBS&J

An employee-owned company

Need cost of this.

November 9, 2001

Mr. Steven Z. Chutchian
Assistant City Engineer
Town of Addison
16801 Westgrove Dr.
P.O. Box 9010
Addison, Texas 75001-9010

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Sincerely,

Clarence Daugherty

Clarence Daugherty, P.E.
Director of Municipal Services

K:\JI1\Proposals\Beltline Addison Proposal-Nov6.doc