

ADDENDUM NO. 1

**BUSINESS 50 WEST IMPROVEMENTS
PROJECT NO. 2018-301-0**

**COLE COUNTY DEPARTMENT OF PUBLIC WORKS
March 10, 2021**

PLAN SHEET CHANGES

The Bidder shall incorporate the following plan sheet changes into their bid:

SHEET 3

- Bituminous Pavement and Base (PG64-22)
 - Change Bituminous Pavement thickness from 1 ½" to 2".
 - Change Bituminous Base thickness from 4 ½" to 4".

BITUMINOUS PAVEMENT AND BASE (PG64-22)										
STATION TO STATION		LOCATION	LENGTH (FT)	2" BITUMINOUS PAVEMENT		4" BITUMINOUS BASE		3" BITUMINOUS BASE		RE OY SF
				WIDTH (FT)	AREA (SY)	WIDTH (FT)	AREA (SY)	WIDTH (FT)	AREA (SY)	
83+97.71	84+97.88	BUS. 50 W.	100.17	20	222.6					
83+97.71	84+97.88	BUS. 50 W. RT. SHOULDER	100.17	9.5	105.74	8.5	94.605			

- Sidewalks
 - Change sidewalk thickness from 4" to 6".

SIDEWALKS									
STATION TO STATION		LOCATION	LENGTH	WIDTH	6" THICK CONCRETE		TRUNCAT DOME PAI (SF)		
					SIDEWALK (SY)	SIDEWALK RAMP (SY)			
85+47.88	85+55.88	BUS. 50 W. RT.					7.11	16.00	
85+47.87	85+55.87	BUS. 50 W. LT.					7.11	16.00	

SHEET 4

- Storm Drainage Inlets
 - J-22 was listed twice, Delete second listing
 - Change 4'X4' Junction total to 5 each.

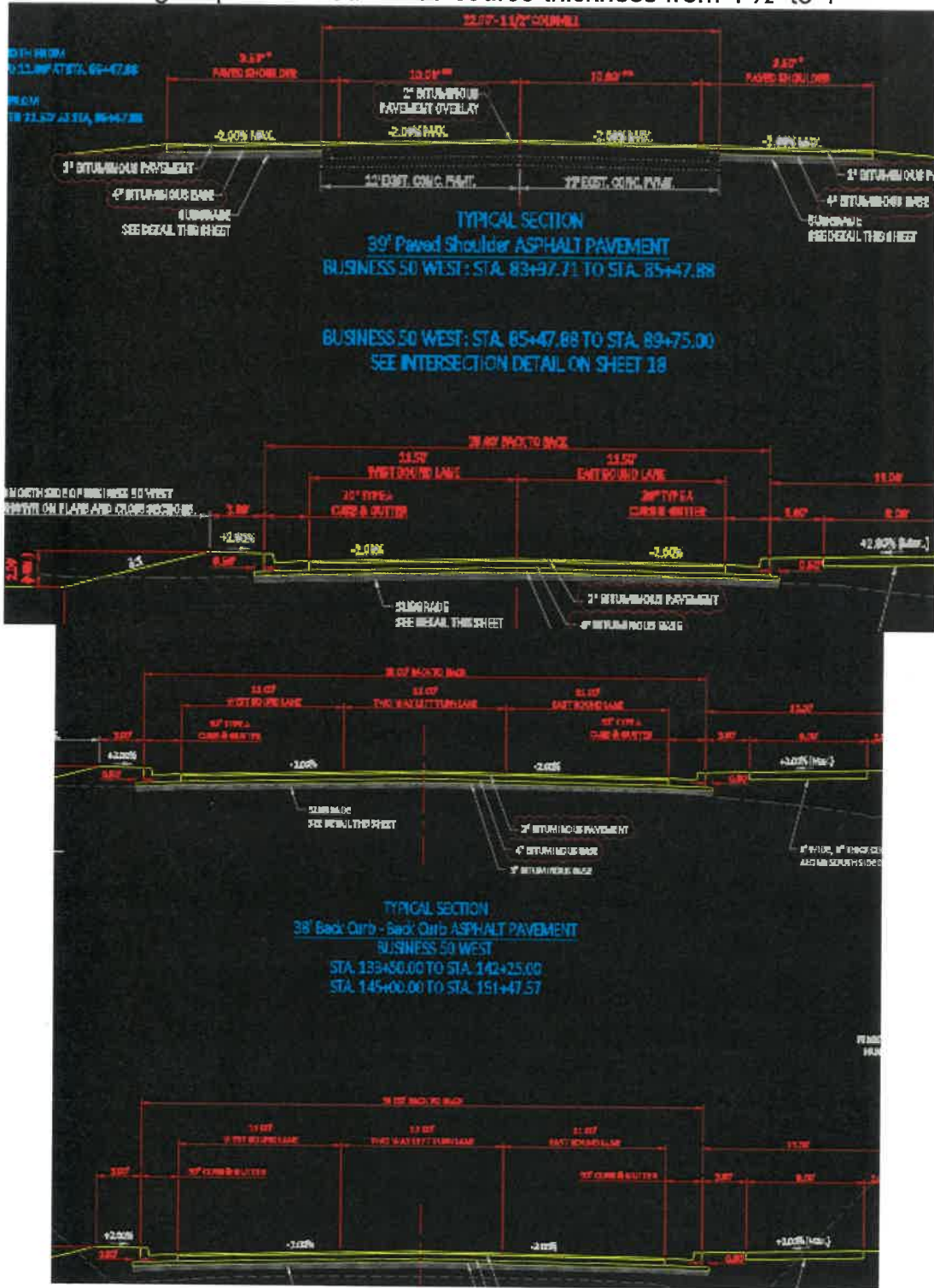
STORM DRAINAGE INLETS												
STRUCTURE	LOCATION			MoDOT TYPE T	TYPE A / AD INLETS			AREA INLETS		JUNCTION BOXES		REMARKS
				INLET 2.5' X 3' (EA)	4' X 3' (EA)	6' X 3' (EA)	3' X 3' (EA)	4' X 4' (EA)	3' X 3' (EA)	4' X 4' (EA)		
I-1a	85+64.62	- 16.00'	LT. BUS. 50 W.	1								
I-1b	85+33.78	- 52.64'	LT. BUS. 50 W.						1			NEENAH R34
I-2a	85+64.62	- 16.00'	RT. BUS. 50 W.	1								
J-2b	85+33.46	- 62.02'	RT. BUS. 50 W.								1	
I-3	95+74.78	- 16.50'	RT. BUS. 50 W.		1							
I-4	95+41.67	- 32.76'	RT. BUS. 50 W.					1				REMOVE TOP
I-5	95+74.78	- 16.50'	LT. BUS. 50 W.			1						CONSTRUCT
I-7	106+30.19	- 31.34'	LT. BUS. 50 W.		1							
J-8	106+46.74	- 24.47'	LT. BUS. 50 W.							1		
I-9	113+00.00	- 16.50'	LT. BUS. 50 W.		1							
I-10	114+37.71	- 16.50'	LT. BUS. 50 W.		1							
I-12	112+99.90	- 16.50'	RT. BUS. 50 W.		1							
I-13	114+37.71	- 16.50'	RT. BUS. 50 W.		1							
J-14	113+54.90	- 33.94'	RT. BUS. 50 W.								1	
I-15	121+02.64	- 16.50'	LT. BUS. 50 W.		1							
I-17	121+02.64	- 16.50'	RT. BUS. 50 W.		1							
J-18	120+61.75	- 32.97'	RT. BUS. 50 W.								1	
I-19	129+70.00	- 16.50'	LT. BUS. 50 W.		1							
J-22	128+28.16	- 23.18'	LT. BUS. 50 W.								1	
I-20	128+50.00	- 16.50'	RT. BUS. 50 W.		1							
J-23	128+28.16	- 40.84'	RT. BUS. 50 W.								1	
J-2	128+28.16	- 23.18'	LT. BUS. 50 W.								1	

- Lump Sum Items
 - Delete Construction Staking

LUMP SUM ITEMS	
ITEM	QUANTITY (LS)
MOBILIZATION	1
CONSTRUCTION PHASING & TRAFFIC MANAGEMENT	1
TEMPORARY EROSION CONTROL	1
PRE-ENGINEERED PEDESTRIAN BRIDGE	1
TEMPORARY PAVEMENT MARKING	1

SHEET 8

- Change Bituminous Pavement thickness from 1 ½" to 2"
- Change top Bituminous Base course thickness from 4 ½" to 4"



SHEET 20

➤ Change C-7 pipe type from HPPE to CMP

C-6	8.00	0.46	30.00	783.90	782.30	CMP	5.33%	15	0.013
C-7	13.00	20.41	316.00	777.43	751.21	CMP	8.30%	24	0.024

END OF PLAN SHEET CHANGES

JOB SPECIAL PROVISIONS CHANGES

The Bidder shall make following changes to the Job Special Provisions:

JSP C. WORK ZONE CONSTRUCTION PHASING AND TRAFFIC MANAGEMENT

REVISE the following to read:

2.7 Construct the intersection of Business 50 West and Route T between May 24, 2021 and August 20, 2021 (See Job Special Provision W, Liquidated Damages Specified.)

JSP M. CONTRACTOR FURNISHED CONSTRUCTION STAKING

DELETE in its entirety.

JSP O. CURB AND GUTTER; AND SIDEWALKS

ADD the following:

2.3 The curb and gutter shall be placed by sliding form method (curb machine) with the exception of tying in areas at driveways approaches and drop inlets.

JSP P. BITUMINOUS PAVEMENT AND BITUMINOUS BASE

ADD the following:

9.2 An asphalt paver attachment commonly referred to as a "ski" shall be used to help ensure a smooth ride when paving the 2" bituminous pavement layer.

- 9.3 A self-propelled Material Transfer Vehicle (MTV) shall be required when paving the 2" bituminous pavement layer.
- 9.4 Transverse joints or headers, except at coldmilled butt joints and at the Route T intersection, shall not be allowed in the 2" bituminous pavement layer. This requires paving at least one lane per day from the Route T intersection to the end of the project
- 9.5 When paving a road or location requiring more than one lane pass of the paver, the centerline joint between the two lanes shall be reasonably straight as determined by the engineer. Joints will be checked using a straight edge or string line. Any major deviations as determined by the engineer shall be immediately corrected prior to the first pass of the breakdown roller.
- 9.6 The minimum requirements for the asphalt paver are as follows:
1. The paver shall be capable of expanding to pave a lane at least 16.5 feet in width.
 2. The contractor shall provide at a minimum one operator and two laborers with the paver. The laborers shall run the screed on both sides of the paver and the operator shall operate the paver.

The engineer may allow deviations to this requirement but only after a minimum of 2 days review.

JSP R. PRE-ENGINEERED PEDESTRIAN BRIDGE

Section 5.1 DELETE the following: "...with Sophisticated Paint Endorsement..."

Approved "Or Equal" Manufacturers:

Specified Product

Contech Express Connector Pre-Engineered Pedestrian Bridge

Approved "Or Equal"

True North Steel Pedestrian Bridge

Bridge Brothers

Pioneer Bridges

Wheeler Steel Recreation Bridge

JSP FF. ALTERNATE BID

1.0 Description. The County is considering an option to change the 2" inch bituminous pavement surface mix to require a 100% virgin asphalt mix design that will not allow recycled asphalt pavement (RAP) or reclaimed asphalt shingles (RAS). The Alternate as shown in the bid proposal shall include the additional cost for the contractor to provide a 100% virgin mix for the surface layer.

2.0 Basis of Payment. All costs associated with the above work shall be included in the bid items shown in “Add Alternate.”

BID PROPOSAL FORM

The following changes have been made to the Bid Proposal Form:

- Item 401-12.01 Bituminous Base - Change 4 ½” to 4”
- Item 401-12.02 Bituminous Pavement - Change 1 ½” to 2”

401-12.01	4" BITUMINOUS BASE, PG64-22	SY	19,015.4	
401-12.02	2" BITUMINOUS PAVEMENT PG64-22 (BP-1MX)	SY	22,913.6	
	• Item 608-60.04 Concrete Sidewalk - Change 4” to 6”			
608-60.04	6" THICK CONCRETE SIDEWALK	SY	4,921.4	
	• Item 627-40.00 Contractor Furnished Construction Staking – DELETE			
627-40.00	CONTRACTOR FURNISHED CONSTRUCTION STAKING	LS	4	_____
	• Item 731-30.20 4'X4' Junction Box – Change quantity from 6 ea to 5 ea.			
731-30.20	4'X4' JUNCTION BOX	EA	5	

- Added Alternate Bid Item for 100% Virgin Binder Bituminous Pavement

A new Bid Proposal has been provided.

DOCUMENTS ATTACHED FOR REFERENCE

Minutes from Pre-Bid Meeting held March 4, 2021.

Geotechnical Report prepared by Terracon dated February 17, 2012.

END OF ADDENDUM NO. 2

REVISED BID PROPOSAL FORM

PLAN HOLDER CONTACT INFORMATION**COUNTY OF COLE, MISSOURI****BUSINESS 50 WEST IMPROVEMENTS – PHASE II
PROJECT NO. 2018-301-1**

All potential bidders **SHALL** complete this form and submit it to the Cole County Public Works email address listed below in order to provide contact information required. All other plan holders may submit this form at their own option. Addenda will be posted on the county website. In the event of disruption of website services, all such information will be communicated to all registered plan holders.

Any bids received from individuals/companies that do not submit this form in advance will not be opened.

Project Name: Business 50 West Improvements – Phase II
Project No. 2018-301-1
Bid Opening Date/Time: March 12, 2021
Plans and Specifications: Free Download Below

<https://colecouny.org/Bids.aspx?CatID=29&txtSort=Category&showAllBids=on&Status>

Contact Information: (All Information is Required)

Company Name (If Applicable): _____

Plan Holder Name / Contact: _____

Address: _____

City, State, Zip Code: _____

Phone: _____

Email: _____

Email this completed form to: ccpwprojects@colecouny.org

PROPOSAL FORM**COUNTY OF COLE, MISSOURI****BUSINESS 50 WEST IMPROVEMENTS – PHASE II
PROJECT NO. 2018-301-1**

Name of Bidder: _____

Address of Bidder: _____

To: Cole County Department of Public Works
5055 Monticello Road
Jefferson City, MO 65109

THE UNDERSIGNED BIDDER, having examined the Plans, Specifications, Regulations of the Contract, Special Conditions and other proposed Contract Documents, and all addenda thereto; and being acquainted with and fully understanding (a) the extent and character of the work covered by this Proposal; (b) the location, arrangement, and specified requirements for the proposed work; (c) the location, character, and condition of existing streets, roads, highways, railroads, pavement, surfacing, walks, driveways, curbs, gutters, trees, sewers, utilities, drainage courses and structures, and other installation, both surface and underground which may affect or be affected by the proposed work; (d) the nature and extent of the excavations to be made, and the type, character, and general condition of materials to be excavated; (e) the necessary handling and re-handling of excavated materials; (f) the location and extent of necessary or probable dewatering requirements; (g) storm and flood water; (h) local conditions relative to labor, transportation, hauling, and rail delivery facilities; and (i) all other factors and conditions affecting or which may be affected by the work.

HEREBY PROPOSED to furnish all required materials, supplies, equipment, tools, and plant; to perform all necessary labor and supervision; and to construct, install, erect, and complete all work stipulated in, required by, and in accordance with the proposed Contract Documents and the drawings, Specifications, and other documents referred to therein (as altered, amended, or modified by addenda), in the manner and time prescribed and that he will accept in full payment sums determined by applying to the quantities of the following items, the following unit prices and/or any lump sum payments provided, plus or minus any special payments and adjustments provided in the Specifications and he understands that the estimated quantities herein given are not guaranteed to be the exact or total quantities required for the completion of the work shown on the drawings and described in the Specifications, and that increases or decreases may be made over or under the Contract estimated quantities to provide for needs that are determined during progress of the work and that prices bid shall apply to such increased or decreased quantities as follows:

**BUSINESS 50 WEST IMPROVEMENTS – PHASE II
PROJECT NO. 2018-301-1**

BID PROPOSAL FORM					
ITEM	DESCRIPTION	UNITS	NO. OF UNITS	UNIT PRICE	AMOUNT
104-10.00	TEMPORARY AGGREGATE SURFACE	SY	3,000		
202-20.10	REMOVAL OF IMPROVEMENTS	LS	1		
202-20.15	REMOVAL OF EXISTING PAVEMENT	SY	16,458		
203-99.01	EARTHWORK	LS	1		
206-31.00	CLASS 3 EXCAVATION IN ROCK	CY	50.0		
210-10.06	SUBGRADE COMPACTION	STA.	47.2		
303-06.00	FURNISH & PLACE 18" ROCK BASE	SY	6,741.7		
304-05.04	4" TYPE 5 AGGREGATE BASE	SY	16,876.4		
310-07.03	6" AGGREGATE DRIVE	SY	1,983.3		
310-07.04	ADDITIONAL 6" AGGREGATE DRIVE	SY	175.0		
401-12.00	3" BITUMINOUS BASE, PG64-22	SY	22,493.8		
401-12.01	4" BITUMINOUS BASE, PG64-22	SY	19,015.4		
401-12.02	2" BITUMINOUS PAVEMENT PG64-22 (BP-1MIX)	SY	22,913.6		
401-30.10	VARIABLE DEPTH BITUMINOUS BASE, PG64-22	TON	112.9		
604-40.10	CONCRETE PIPE ANCHOR	EA	6		
604-40.13	TYPE C PIPE COLLAR	EA	4		
606-10.10	TYPE A GUARDRAIL	LF	215.0		
606-10-20	REPLACE EXISTING TYPE A GUARDRAIL	LF	806.5		
607-20.10	FENCING	LF	575		
607-99.01	PEDISTRIAN HANDRAIL, 4" RAIL SPACING	LF	631		
608-10.10	6" THICK CONCRETE SIDEWALK RAMP	SY	538.1		
608-10.12	TRUNCATED DOME PANELS	SF	461.8		
608-30.08	CONCRETE MEDIAN STRIP (8")	SY	315.2		
608-50.08	8" CONCRETE APPROACH	SY	2,619.1		
608-50.09	ADDITIONAL 8" CONCRETE COMMERCIAL APPROACH	SY	250.0		
608-60.04	6" THICK CONCRETE SIDEWALK	SY	4,921.4		
609-10.52	MoDOT TYPE B CURB AND GUTTER	LF	755.7		
609-10.55	TYPE A CURB AND GUTTER	LF	10,585.9		
609-70.00	ROCK LINING	CY	445.4		
616-10.00	CONSTRUCTION PHASING AND TRAFFIC MANAGEMENT	LS	1		
618-10.00	MOBILIZATION	LS	1		
620-00.01	PREFORMED MARKING TAPE, TYPE 2 - 6" WHITE	LF	286		

BID PROPOSAL FORM (CONTINUED)					
ITEM	DESCRIPTION	UNITS	NO. OF UNITS	UNIT PRICE	AMOUNT
620-00.02	PREFORMED MARKING TAPE, TYPE 2 - 24" YELLOW	LF	59		
620-00.03	PREFORMED MARKING TAPE, TYPE 2 - 24" WHITE	LF	63		
620-00.04	PREFORMED MARKING TAPE, TYPE 2 - TURN ARROW WHITE	EA	8		
620-00.05	PREFORMED MARKING TAPE, TYPE 2 - BIKE/PED SYMBOL W	EA	4		
620-60.01	ACRYLIC WATERBORNE PAINT, 4" SOLID WHITE	LF	886		
620-60.02	ACRYLIC WATERBORNE PAINT, 4" SOLID YELLOW	LF	14,658		
620-60.03	ACRYLIC WATERBORNE PAINT, 4" INTERMITENT YELLOW	LF	913		
620-60.04	ACRYLIC WATERBORNE PAINT, 6" SOLID WHITE	LF	500		
620-80.63	TEMPORARY PAVEMENT MARKING	LS	1		
621-46.00	FLOWABLE BACKFILL	CY	52.9		
622-10.01	VARIABLE DEPTH COLDMILLING (1.5" MAX.)	SY	1,964.5		
703-10.00	PRE-ENGINEERED PEDISTRIAN BRIDGE	LS	1		
720-10.00	SEGMENTAL BLOCK RETAINING WALL	SF	3,674		
725-03.15	15" ALUMINIZED CORRUGATED METAL PIPE (16 GA)	LF	218.0		
725-03.18	18" ALUMINIZED CORRUGATED METAL PIPE (16 GA)	LF	90.0		
725-03.24	24" ALUMINIZED CORRUGATED METAL PIPE (16 GA)	LF	316.0		
726-10.15	15" CLASS III REINFORCED CONCRETE PIPE	LF	620.3		
726-10.24	24" CLASS III REINFORCED CONCRETE PIPE	LF	295.1		
726-10.36	36" CLASS III REINFORCED CONCRETE PIPE	LF	77.7		
731-00.10	MoDOT 2.5'X3' TYPE T INLET	EA	2		
731-10.10	4'X3' TYPE A/AD INLET	EA	13		
731-10.20	6'X3' TYPE A/AD INLET	EA	1		
731-20.10	3'X3' AREA INLET	EA	1		
731-20.20	4'X4' AREA INLET	EA	1		
731-30.10	3'X3' JUNCTION BOX	EA	2		
731-30.20	4'X4' JUNCTION BOX	EA	5		
732-00.15	15" CORRUGATED METAL PIPE FLARED END SECTION	EA	14		
732-00.18	18" CORRUGATED METAL PIPE FLARED END SECTION	EA	4		
732-00.24	24" CORRUGATED METAL PIPE FLARED END SECTION	EA	2		
732-06.15	15" REINFORCED CONCRETE PIPE FLARED END SECTION	EA	7		
732-06.24	24" REINFORCED CONCRETE PIPE FLARED END SECTION	EA	9		
732-06.36	36" REINFORCED CONCRETE PIPE FLARED END SECTION	EA	5		
805-10.00	SEEDING AND MULCH	LS	1		
806-10.00	TEMPORARY SEED AND MULCH	AC	2.0		
806-20.00	TEMPORARY EROSION CONTROL	LS	1		

BID PROPOSAL FORM (CONTINUED)					
ITEM	DESCRIPTION	UNITS	NO. OF UNITS	UNIT PRICE	AMOUNT
806-41.10	C125 EROSION CONTROL BLANKET	SY	1,028.9		
806-41.20	SC250 TURF REINFORCEMENT MAT	SY	44.2		
806-41.21	P550 TURF REINFORCEMENT MAT	SY	64.0		
806-99.01	SCOUR PROTECTION MAT	SF	944		
903-50.04	FLAT SHEET SIGNS	SF	92.25		
903-12.70	2" PERFORATED SQUARE STEEL TUBE POST	LF	97.2		
903-12.71	2.5" PERFORATED SQUARE STEEL TUBE ANCHOR	EA	9		
903-60.10	36" SURFACE MOUNT DELINEATOR POST (WHITE)	EA	9		
TOTAL ROADWAY BASE BID (LINE A)					
PWSD #3 WATER MAIN ADJUSTMENTS BID PROPOSAL FORM					
ITEM	DESCRIPTION	UNITS	NO. OF UNITS	UNIT PRICE	AMOUNT
	Abandonments, Removals, and Locating Existing Water Lines	LS	1		
	Line Flushing, Pigging, Pressure Testing, and Disinfection	LS	1.0		
	14" Steel Encasement with 8" PR200 Restrained Joint PVC (Open Cut)	LF	60.0		
	8" PR200 Restrained Joint PVC (Open Cut)	LF	60.0		
	8" C900 PR235 Restrained Joint PVC (Open Cut)	LF	400.0		
	6" C900 PR235 Restrained Joint PVC (Open Cut)	LF	100.0		
	8" Gate Valve & Box	EA	6.0		
	8" Solid Sleeve	EA	3.0		
	6" Solid Sleeve	EA	1.0		
	8" Bend (all angles)	EA	8.0		
	6" Bend (all angles)	EA	7.0		
	8" Anchor Coupling	EA	4.0		
	8" X 8" X 8" Anchor Tee	EA	2.0		
	8" X 8" X 6" Anchor Tee	EA	1.0		
	2" End Cleanout	EA	1.0		
	Furnish and Install Fire Hydrant Assembly, Complete	EA	1.0		
TOTAL WATER MAIN BID (LINE B)					
TOTAL BID (LINE A + LINE B)				\$	
ADD ALTERNATE					
ITEM	DESCRIPTION	UNITS	NO. OF UNITS	UNIT PRICE	AMOUNT
401-12.02A	2" BIT. PAVEMENT (BP-1) VIRGIN ASPHALT ADDED COST	SY	22,913.6		

BIDDER recognizes and acknowledges the receipt of the following Addenda:

<u>DATE</u>	<u>Addendum Number</u>	<u>DATE</u>	<u>Addendum Number</u>
-------------	------------------------	-------------	------------------------

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

If the Bidder intends to use any subcontractor in the course of the construction, he shall list them. (If necessary, attach additional pages to list all subcontractors.)

<u>Company Name</u>	<u>Address</u>	<u>City, State, Zip</u>	<u>Work To Be Performed</u>	<u>% of Bid</u>
---------------------	----------------	-------------------------	-----------------------------	-----------------

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

TIME OF COMPLETION:

The undersigned hereby agrees to complete the project by no later than **December 17, 2021**, subject to the stipulations of the regulations of the Contract and the Special Conditions.

It is understood that the specifications governing the construction of the work contemplated are those known and designated as the "Missouri Highway & Transportation Commission Standard Specifications for Highway Construction" approved by the Missouri Highways & Transportation Commission, together with the special provisions, job and general, if any attached to this proposal.

It is understood and agreed that if this Proposal is accepted, the prices quoted above include all applicable state taxes and that said taxes shall be paid by the Contractor.

The undersigned, as Bidder, hereby declares that the only persons or firms interested in the Proposal as principal or principals is or are named herein and that no other persons or firms than herein mentioned have any interest in this Proposal or in the Contract to be entered into; and this Proposal is made without connection with any other person, company, or parties making a bid or proposal; and that it is in all respects fair and in good faith, without collusion or fraud.

The undersigned agrees that the accompanying bid deposit shall become the property of the County should he fail or refuse to execute the Contract or furnish Bond as called for in the specifications within the time provided.

If written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the undersigned within ninety (90) days after the date of opening of bids, or any time thereafter before this bid is withdrawn, the undersigned will, within ten (10) days after the date of such mailing, telegraphing, or delivering of such notice, execute and deliver a Contract in the form of Contract attached.

The undersigned hereby designates as his office to which such notice of acceptance may be mailed, telegraphed, or delivered:

Contact Person	Company Name	Mailing Address	City, State & Zip Code
----------------	--------------	-----------------	------------------------

It is understood and agreed that this bid may be withdrawn at any time prior to the scheduled time for the opening of bids or any authorized postponement thereof.

Attached hereto is a Bid Bond for the sum of _____

_____ (\$ _____)
 Dollars (cashier's check), made payable to the County of COLE.

SIGNATURE AND IDENTITY OF BIDDER

The undersigned states that the correct LEGAL NAME and ADDRESS of (1) the individual bidder, (2) each partner or joint venturer (whether individuals or corporation, and whether doing business under a fictitious name), or (3) the corporation (with the state in which it is incorporated) are shown below; and that (if not signing with the intention of binding himself to become the responsible and sole contractor) he is the agent of, and duly authorized in writing to sign for the Bidder or Bidders; and that he is signing and executing this (as indicated in the proper spaces below) as the proposal of

AN INDIVIDUAL:

Name of Individual

Residence Street Address

Social Security Number

City, State & Zip Code

Firm Name, If Any

Business Address

Business Telephone Number

City, State & Zip Code

Signature

Date

A PARTNERSHIP:

Name of Partnership

(State Names & Addresses of All Partners)

Partner

Residence Address

Partner

Residence Address

Business Address

City, State & Zip Code

Business Telephone Number

Signature of At Least One Partner

Date

A CORPORATION:

Name of Corporation

Incorporated under the laws of the State
of _____

Name and Title of Officer

Corporate License No. _____
(If a corporation organized in state other
than Missouri, attach Certificate of _____
Authority to do business in the State of
Missouri.)

Business Telephone Number

Business Address

City, State & Zip Code

Signature of Officer

Date

ATTEST:

Signature of Secretary (SEAL)

Date

ANTI-COLLUSION STATEMENT

STATE OF _____)

)

COUNTY OF _____)

)

being first duly sworn, deposes and says that he is

_____ of _____
Title of Person Signing Name of Bidder

Address of Bidder

that all statements made and facts set out in the proposal for the above project are true and correct; and that the bidder (The person, firm, association, or corporation making said bid) has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such bid of any contract which result from its acceptance.

Affiant further certifies that bidder is not financially interested in, or financially affiliated with, any other bidder for the above project.

(BY) _____

(BY) _____

Sworn to before me this _____ day of _____, 20_____

Notary Public

My commission expires: _____

CONTRACTOR'S AFFIDAVIT

STATE OF _____)

COUNTY OF _____)

This affidavit is hereby made a part of the Proposal, and an executed copy thereof shall accompany each Proposal submitted.

The undersigned, _____, of
lawful age, being first duly sworn states upon oath that he is _____

the Contractor submitting the attached proposal, that he knows of his own knowledge and states it to be a fact that neither said proposal nor the computation upon which it is based include any amount of monies, estimate or allowance representing wages, moneys or expenses, however designated, proposed to be paid to persons who are not required to furnish material or actually perform services upon or as a part of the proposed project.

AFFIANT

Subscribed and sworn to before me, a Notary Public, in and for the County and State aforesaid, this _____ day of _____, 20_____.

Notary Public

My commission expires _____

**Minutes from Pre-Bid Meeting held
March 4, 2021.**

**BUSINESS 50 WEST IMPROVEMENTS – PHASE II
PROJECT NO. 2018-301-1**

**PRE-BID MEETING NOTES
March 5, 2021**

The meeting was held at the Cole County Fire Protection District Training and Administration Building beginning at 9am. Those attending the meeting are listed below:

<u>Name</u>	<u>Representing</u>	<u>Phone</u>
Eric Landwehr	Cole County	573-636-3614
Matt Prenger	Cole County	573-636-3614
Spencer Coonce	Cole County	573-636-3614
Brad Wyss	Cole County	573-636-3614
Kyle Landwehr	Bartlett & West	573-659-6727
Brian Richmond	CTL	913-481-5119
Quintin Matheis	Jefferson Asphalt	573-418-9997
Kevin Schwartz	Jefferson Asphalt	573-801-6328
Kris Mantle	Jefferson Asphalt	573-659-7663
Luke Hake	Stockman	573-635-1316
Mike Bax	Three Rivers Electric	573-644-9000
Ted Neuner	Three Rivers Electric	573-644-9000
Don Rhea	Don Schnieders Excavating	573-893-2251
Paul Samson	CMPS	573-634-3455
Bryant Gaines	Sam Gaines Construction	573-257-6123

GENERAL BIDDING INFORMATION

1. Sealed proposals on the forms prepared by the Cole County Department of Public Works will be received by the County Commission, Cole County, Missouri, at the Courthouse Annex, Jefferson City, Missouri, until **9:00 a.m., on March 12, 2021**, for the **Business 50 West Improvements – Phase II**. The proposals will be publicly opened and read aloud thereafter. Bids received after the specified time for opening will be returned unopened.
2. Prior to the time and date designated for the receipt of bids, bids may be modified or withdrawn only by notice to the County Commission at the place and prior to the time designated for receipt of bids. No bids shall be withdrawn for a period of 90 calendar days after the scheduled closing time for receipt of bids.
3. Plans and specifications may be viewed and downloaded online in the bids section at www.colecounty.org. A hard copy of the plans and specifications will not be provided unless requested in advance.
4. **All contractors wishing to bid on this project shall submit the plan holder contact information form found in the specifications to ccpwprojects@colecounty.org prior**

Business 50 West Improvements – Phase II

Pre-Bid Minutes

Page 2

to the bid opening. A bid received from a contractor that has not submitted this form will not be opened and therefore not read. It will be returned to the contractor.

5. A bid bond will be required in the amount of 5% of the bid. No personal checks will be accepted.
6. A one-year Performance and Guarantee Bond is required.
7. Questions regarding the plans and specifications will be taken up to 24 hours prior to the date and time of the bid opening. This will allow the County to get the information out to all of the bidders. General questions regarding the bidding process will be answered up to the time of the opening.
8. Addenda may be issued on this project at any time up to 24 hours prior to the bid date and time. It shall be the responsibility of the contractor to verify if any addenda have been issued prior to submitting their bid. The County assumes no liability if a contractor fails to incorporate addenda into their bid. **Addenda will be posted on the website.**
9. Prevailing wage rates are required on this project. The wage rates for Cole County are included in the specifications.
10. The right is reserved by Cole County to reject any and all bids and to waive informalities therein.
11. Bids shall be submitted on the Proposal Form furnished by the County. All blank spaces shall be filled in on the forms by typewriter or by handwriting in ink. The bidder shall make no other stipulations in the bid form or qualify his bid in any manner. The bids shall be submitted in an opaque sealed envelope marked "**Business 50 West Improvements – Phase II, Project No. 2018-301-1, Construction Bid**" and shall be clearly marked with the bid date, bid time and bidder's name and address.
12. The County will accept computer generated spread sheets for the unit price items to help alleviate problems with computation mistakes. If a spread sheet is used, it shall be in the same format as the one included in the proposal. The sheet shall be inserted in front of the one included in the proposal form.
13. If awarded the contract, the Contractor agrees to complete the work by no later than **December 17, 2021.**
14. **Liquidated damages** shall be **\$2,000.00** per calendar day for every day that the Contractor fails to complete the work as provided in the contract documents.
15. Liquidated damages will also be assessed at **\$1,000** per calendar day that the intersection of Route T and Business 50 West is not completed by August 20, 2021. Work cannot begin until May 24, 2021.

Business 50 West Improvements – Phase II

Pre-Bid Minutes

Page 3

15. Simultaneously with the delivery of the executed contract, the Contractor shall furnish a surety bond in the amount of 100% of the total contract sum, as security for both faithful performance of the contract and for the payment of all persons performing labor on the project under this contract as specified in the contract documents.
16. Do NOT include federal excise tax or sales and use taxes in the bid prices. This project will be a SALES TAX EXEPMT project. A copy of the federal tax exemption certificate will be furnished.

The following items were discussed by Eric Landwehr regarding the plans and specifications:

GENERAL PROJECT INFORMATION

1. The contractor is highly advised to visit the project location to observe existing site conditions.
2. The County will be providing QC for the project.
3. The County will be providing all construction staking for the project.
4. The earthwork bid item is lump sum. However, cross section volumes are shown in the tabulation quantities and are for information only.
5. The Contractor and utility companies will be required to use extreme care to not disturb any property corner pins. If any property corner pins are disturbed, the County will require them to be replaced at no expense to the County.
6. Utilities – There are multiple utilities on this project with some conflicts. Towards the end of the meeting, there will be a utility discussion.
7. PWSD#3 relocation work is included in this contract.
8. CHANGE ORDERS – If there is any item that the contractor thinks additional pay is warranted, a change order request will have to be submitted and approved by the Director or County Engineer prior to commencing any of the additional work. Any extra work done without approval is not guaranteed to be paid.
9. Notice to Proceed will be done as soon as possible in order to get the project started early however JSP C lists a provision that must be complete before the NTP is issued.
10. The typical section shows the first layer of bit base to be placed to a width of 6" outside the back of curb with the curb and gutter placed on top of that.
11. The Distler property would not sign the easement. The contractor needs to stay off of them.

APPROVAL OF EQUIVALENT PRODUCTS OR MATERIAL

Some bid items call out a certain product either in the job special provisions or as a note on the plans. In some cases an approved equivalent will be allowed. The contractor shall not assume an equivalent will be allowed, especially if it does not have equivalent or similar properties or characteristics. It is recommended that the product be pre-approved prior to bidding. Submittals on this shall be no later than Tuesday, March 9th at 9:00am.

GENERAL SPECIFICATIONS

The general special provisions are the 2004 version of the MoDOT spec book except as revised in Section 7

TECHNICAL SPECIFICATIONS

The technical specs for this project will be the latest effective version of the MoDOT spec book.

STANDARD PLANS

City of Jefferson Standard Drawings will apply in most situations. Other items not covered by the the city's standards will fall under the MoDOT standard plans.

JOB SPECIAL PROVISIONS

The job special provisions were reviewed. Special attention was given to the following:

1. **B. Project Management.** This project will affect several businesses, property owners and the travelling public including a fire station and school. Effective project management is essential to the successful completion of the project. Specific requirements are listed here. One requirement is the contractor shall designate a Project Manager and Work Zone Manager for the job and they can't be the same person.
2. **C. Work Zone Construction Phasing and Traffic Management.** Specifics on what will be required and/or expected from the contractor for traffic control and phasing is listed here. The plans show detours that will be allowed and some basic traffic control requirements. The contractor shall be required to submit their traffic management plan for approval prior to receiving notice to proceed and this plan shall be signed and sealed by a registered engineer.
3. **H. Clearing and Grubbing.** There will be no direct pay. Contractors shall include their costs for these items in the removal of improvements price.
4. **L. Storm Drainage.** Pre-cast inlets will be allowed. All lids and gutter transition pans shall be cast in place. There is an estimated class 3 excavation in rock quantity in the bid proposal and it is approximate. The actual amount of class 3 excavation in rock will be paid.
5. **M. Contractor Furnished Construction Staking.** This item will be removed from the project. Staking will be done by county staff or CMPS as needed.
6. **P. Bituminous Pavement and Bituminous Base.** Quantities are calculated in square yards and measured from the top of the layer. There is a profilograph provision. Other county specific asphalt provisions are included. Shingles will not be allowed in the top mix.
7. **R. Pre-engineered Pedestrian Bridge.** Specifics are listed in this provision. Bid item is lump sum and the contractor shall design and furnish.
8. **S. Segmental Block Retaining Walls.** There are two retaining walls at the Cardwell property. They shall be designed and constructed in accordance with Sec. 720 of the MoDOT specs. The wall system shall be on the MoDOT pre-qualified products list.
9. **U. Remove and Replace Fencing.** There is some barbed wire and woven wire fencing that is to be replaced near some pipe extensions. Quantities are included in the project and in areas where cattle are currently at the fencing shall be done prior to removal of the

existing fence.

10. V. Liquidated Damages for for Completion Date. Completion date is December 17, 2021 and damages are \$2,000 per day.
11. W. Liquidated Damages Specified. Construction on the Route T intersection shall not start until May 24, 2021 and there is a \$1,000 per day penalty if the contractor does not complete it by August 20, 2021.
12. X. Removal of Improvements. The removals noted in the plans may not include everything necessary to complete the project. There will be no extra pay for any extra removals. We don't expect any additional but this is not a guarantee. Signing removed from the project shall remain the property of either MoDOT or the County.
13. Y. Additional Quantity for Specific Bid Items. This is for some of the items that we expect could overrun on quantity. An estimated quantity is included in the proposal for each. Payment on these items shall include any additional removals, excavation, grading, seeding and mulch necessary.
14. Z. Temporary Pavement Patch. This addresses areas where it is necessary to remove a section of pavement for stormwater work but the rest of the pavement will be left in place for some extended time after. A temporary patch will be required with no direct pay.
15. AA. Permits. There are two permits associated with this project. DNR land disturbance, and MoDOT work on ROW. The DNR permit held by the county and the contractor will have to follow some basic requirements related to erosion and sediment control. The MoDOT permit will be signed by the contractor after award and applies to the Route T intersection work.
16. BB. Erosion Control. There are several items of work related to minimizing the amount of silt runoff from the project. The contractor shall install these items as directed by the engineer and shall adhere to all provisions of the SWPPP.

KNOWN ITEMS TO BE ADDRESSED ON ADDENDUM

1. Change asphalt thickness of the Bit Pavement and Bit Base to 2" and 7".
2. Remove contractor furnished staking.
3. Curb and gutter shall be placed with a curb machine except for tie in areas.
4. Add alternates for a virgin mix and fiber reinforced mix for the asphalt surface layer.

PLAN REVIEW

Paul Samson discussed items on the plans:

- Sheets 5-7 Right of Way Plans-status of easements
- Yellow – Construction Easement
 - Blue – Permanent Storm Drainage Easement
 - Pink – New ROW
 - The Distler property did not sign an easement, so we need to stay off this property.
- Sheet 8 Typical Sections

Business 50 West Improvements – Phase II

Pre-Bid Minutes

Page 6

- From start of job to just east of Rte T – mill and overlay/wedging through the intersection with raised concrete islands.

Sheets 9-11 Removals

- All existing pavement will be removed. Approximately 7” to 8” of concrete with 8” of asphalt.

Sheet 12-17 Plan & Profiles

- From Rte T to Cheyenne Rd is 2 lane section, 28’ back to back curb & gutter with 8’ sidewalk on the south side.
- From Cheyenne Rd east to Phase I is 3 lane section, 38’ back to back curb & gutter with 8’ sidewalk on the south side.
- Two retaining walls are located at the Cardwell Property. Details are on Sheet 36.
- There is a pedestrian bridge located around Sta. 149+00. Details are on Sheet 37.
- Guardrail installed with Phase I will need to be removed and then replaced after the grading is completed in this area.
- Existing 5’ sidewalk in front of Mertens Bait Shop will need to be removed and replaced with 8’ sidewalk.

Sheet 18 Bus 50/Route T Intersection

- Anything done on MoDOT ROW will require the MoDOT Permit.
- Existing light poles will need minor elevation adjustments.

Sheet 19-20 Storm Sewer Profiles

- All the pipes are noted as RCP, but HDPP may be substituted for any pipe not under the mainline.

Sheet 21-22 Entrance Profiles

Sheet 23-26 Signing & Striping Plans

- Striping by contractor, Signing by County

Sheets 27-29 Traffic Control Plans

- There is a fire station towards the beginning of the job. They will need access at all times of the project.

Sheets 30-34 Erosion Control Plans

Contractor responsible for documenting any changes

Sheets 35-37 Construction Details

UTILITIES

Design One-Calls

Notes on plans-locations of utilities shown on plans are correct horizontally **but not vertically**. Where utilities were found with hydro-excavation the elevations are noted on the plans but are not graphically shown.

Utility contacts are listed in the JSP's.

Discussion on specific utilities:

PWSD#3

- There are no bores to cross the road.
- Service disruptions need to be kept to a minimum.

QUESTIONS AND ANSWERS

Received at pre-bid meeting, by telephone, e-mail etc. prior to issuing Addendum No. 1

- Q1. It appears that the curb quantity does not include the curb section running thru the inlets. The stationing seems to stop and start in the area at the boxes. Is the gutter transition pan to the inlet figured in the curb and gutter quantity?
- A1. NO. We did not figure the curb and gutter through the inlets it is included in the unit price of the drop inlets. We did this because of the additional reinforcing in the gutter.
- Q2. The bid form shows 4" thick sidewalk and the plan sheets show 6" thick. Which is correct?
- A2. The correct thickness is 6". The bid form will be corrected to show this.
- Q3. C-7 on Sheet 20 shows HDPP. The bid form shows CMP. Which is correct?
- A3. The correct pipe type is CMP and sheet 20 has been changed.
- Q4. Quantities show 6 junction boxes, but we only count 5.
- A4. J22 is shown twice. This will be corrected with this addendum.
- Q5. There is no line item for silt fence, but there is a lot shown on the plans.
- A5. All temporary erosion control items will be paid for as Lump Sum as the project progresses.
- Q6. Do we need a pipe color to connect the gray plastic pipe to concrete?
- A6. There are quantities set up in the job. We will have to see in the field if we need them or not.
- Q7. Do the area inlet tops have to be cast-in-place or can they be precast?
- A7. Inlets in the streets will need to be cast-in-place. Anything else can be precast if field conditions allow it.

Business 50 West Improvements – Phase II

Pre-Bid Minutes

Page 8

- Q8. What concrete items will require to be joint sealed and what material will need to be used?
- A8. Please reference City of Jefferson Standard Details. In short, all saw joints are sawed at 1/8" and are not sealed. Expansion joints are required as shown on the Standard Drawings. Sealer on curb and gutter can be hot applied (MoDOT Spec 1057.5). Sealer on sidewalks needs to be cold applied silicon (MoDOT Spec 1057.10)

ESL:el

CC: File
Attendees
Planholders

Geotechnical Report prepared by
Terracon dated February 17, 2012.

Geotechnical Engineering Report

Business Highway 50 Pavement Rehabilitation

Apache Flats, Missouri

February 17, 2012

Terracon Project No. 09126604

Prepared for:

Central Missouri Professional Services, Inc.

Jefferson City, Missouri

Prepared by:

Terracon Consultants, Inc.

Columbia, Missouri

Offices Nationwide
Employee-Owned

Established in 1965
terracon.com

Terracon

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

February 17, 2012



Central Missouri Professional Services, Inc.
2500 East McCarty Street
Jefferson City, MO 65101

Attn: Mr. Paul Samson, P.E.
P: [573] 634 3455
F: [573] 634 8898


Re: Geotechnical Engineering Report
Business Highway 50 Pavement Rehabilitation
Apache Flats, Missouri
Terracon Project Number: 09126604

Dear Mr. Sampson:


Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal number P0911100.2 dated March 9, 2011. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of pavement sections for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.


Eric M. Hollabaugh, P.E.
Geotechnical Engineer
Missouri PE-2010019556




Eric H. Lidholm, P.E.
Senior Principal
Office Manager

Enclosures
cc: 5 – Client (4 bound, 1 unbound)
1 – Client (electronic-PDF)
1 – File

Terracon Consultants, Inc. 3601 Mojave Court, Ste. A Columbia, Missouri 65202
P [573] 214 2677 F [573] 214 2714 terracon.com

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	i
1.0 INTRODUCTION.....	1
2.0 PROJECT INFORMATION	1
2.1 Project Description.....	1
2.2 Site Location and Description	2
3.0 SUBSURFACE CONDITIONS	2
3.1 Geology	2
3.2 Typical Profile	2
3.3 Groundwater	3
4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION	4
4.1 Geotechnical Considerations	4
4.1.1 Existing Uncontrolled Fill	4
4.1.2 Soft Subgrade Potential.....	5
4.1.3 Existing Pavement.....	5
4.1.4 General	5
4.2 Earthwork	6
4.2.1 Stripping and Demolition	6
4.2.2 Subgrade Preparation and Soil Stabilization.....	6
4.2.3 Material Requirements	8
4.2.4 Compaction Requirements	8
4.2.5 Earthwork Construction Considerations.....	9
4.3 Pavements.....	9
4.3.1 Pavement Subgrade Preparation	9
4.3.2 Pavement Design Considerations.....	10
4.3.3 Asphalt Concrete Thickness Design Recommendations.....	11
4.3.4 Asphalt Concrete Overlay Thickness Design Recommendations	12
4.3.5 Portland Cement Concrete Thickness Design Recommendations	12
4.3.6 Pavement Drainage.....	13
4.3.7 Pavement Maintenance.....	13
5.0 GENERAL COMMENTS	14

APPENDIX A – FIELD EXPLORATION

Exhibit A-1	Site Location Map
Exhibit A-2	Geologic Map
Exhibit A-3 to A-7	Boring Location Diagrams
Exhibit A-7 to A-16	Boring Logs
Exhibit A-17	Field Exploration Description

APPENDIX B – SUPPORTING INFORMATION

Exhibit B-1	Laboratory Testing
Exhibit B-2	Standard Proctor Moisture and Density Test Results
Exhibit B-3	California Bearing Ratio (CBR) Test Results

APPENDIX C – SUPPORTING DOCUMENTS

Exhibit C-1	General Notes
Exhibit C-2	Unified Soil Classification System

EXECUTIVE SUMMARY

A geotechnical investigation has been performed for the proposed pavement rehabilitation to be performed on the existing section of Business Highway 50 between Rainbow Drive and Country Club Drive in Apache Flats, Missouri. Ten (10) borings, designated B-1 through B-10, were performed to a depth of approximately 5 feet below the existing pavement surface.

Based on the information obtained from our subsurface exploration, the following geotechnical considerations were identified:

- The existing pavement sections encountered in the borings consisted of varying combinations and amounts of asphaltic cement concrete (ACC), portland cement concrete (PCC) pavement, and crushed limestone base material. Complete replacement of the pavement section is anticipated.
- Existing uncontrolled fill was encountered in Borings B-1, B-2 and B-10 to depths of approximately 3½ to 5 feet. The proposed pavements should not bear directly on uncontrolled fill unless it is remediated as described in this report.
- Some of the upper soil encountered in the borings had relatively high moisture levels. In addition, portions of the upper soils may be susceptible to instability at existing moisture levels or with increased moisture. Accordingly, we recommend that the owner budget for the possibility that subgrade stabilization may be required and contractors should be prepared to handle potentially wet, soft conditions. Detailed recommendations regarding the potential for soft subgrade conditions are provided in section **4.1.2 Soft Subgrade Potential**.
- Due to the presence of uncontrolled fill, we recommend the proposed pavements be supported on at least 2 feet of new compacted structural fill. This will not completely eliminate the risk of unacceptable settlement, but will provide some thickness of controlled material below pavements.
- If the owner is not willing to assume the risk associated with construction on or above uncontrolled fill, we recommend that all uncontrolled fill beneath the proposed pavements be removed and replaced with compacted structural fill, or the subgrade soils could be remediated using soil stabilization methods.
- On-site soils appear suitable for use as compacted structural fill. Pulverized pavement materials may be considered for reuse as structural fill if they meet gradation requirements and are properly blended with other soils.

Geotechnical Engineering Report

Business Highway 50 Pavement Rehabilitation ■ Apache Flats, Missouri

February 17, 2012 ■ Terracon Project No. 09126604



Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

**GEOTECHNICAL ENGINEERING REPORT
BUSINESS HIGHWAY 50 PAVEMENT REHABILITATION
APACHE FLATS, MISSOURI**

Terracon Project No. 09126604

February 17, 2012

1.0 INTRODUCTION

A geotechnical engineering report has been completed for the pavement rehabilitation to be performed on the existing section of Business Highway 50 between Rainbow Drive and Country Club Drive in Apache Flats, Missouri. Ten (10) borings, designated B-1 through B-10, were performed to a depth of approximately 5 feet below the existing pavement surface. Logs of the borings along with a site location map, geologic map, and boring location diagrams are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- earthwork
- pavement subgrade preparation
- pavement thicknesses

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	See Appendix A, Exhibits A-3 to A-7: Boring Location Diagrams
Pavement	The project will include the partial and/or total reconstruction of the existing pavements.
Anticipated traffic loads	Based on projected Peak Hour Total Traffic Volumes for 2015 and 2030 provided by the client, total ESAL's for a 20-year design life were estimated as approximately 2,400,000 ESAL's.
Grading	Site grading plans were not available at the time this report was prepared; however, based upon conversations with the client, we understand that proposed grades are similar to existing grades.
Cut and fill slopes	No steeper than 3H:1V (Horizontal to Vertical) (assumed)

2.2 Site Location and Description

Item	Description
Location	This project includes Business Highway 50 in Apache Flats, Missouri between Rainbow Drive on the west end and Country Club Drive on the east end.
Existing improvements	Business Highway 50, various side streets, entrance drives, existing utilities, and associated infrastructure
Current ground cover	Varying combinations and thicknesses/widths of ACC, PCC, and base rock
Existing topography	Relatively level

3.0 SUBSURFACE CONDITIONS

3.1 Geology

Based on the 2003 Geologic Map of Missouri, Missouri Department of Natural Resources, bedrock at this site consists primarily of the Jefferson City (Ojc) formation. The Jefferson City formation is described as being comprised primarily of medium to finely crystalline dolomite and argillaceous dolomite with some chert. Lenses of shale and conglomerate are sometimes encountered in the Jefferson City formation.

Solution features, including caves and sinkholes, are commonly present in this formation. A sinkhole is published to exist approximately 1 mile north of this project site (see attached Site Geology Map).

It is difficult to predict future sinkhole activity. Sinkholes and caves in this area are in various stages of development and can appear at any time. Site grading and drainage may alter site conditions and could possibly cause sinkholes in areas that have no history of this activity.

3.2 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
Surface	0.9 to 2	Varying combinations and thicknesses/widths of ACC, PCC, and aggregate base material	N/A
1a	3½ to more than 5 ¹	Uncontrolled fill ² generally consisting of lean clay and fat clay containing varying amounts of sand and gravel	Stiff to hard
1b	Undetermined ²	Lean clay, silty clay, lean to fat clay, and fat clay containing varying amounts of sand and gravel	Very soft to very stiff

1. Borings B-2 and B-10 were terminated at their planned depth of 5 feet within this stratum.
2. Uncontrolled fill is material that was placed without moisture and density control. The encountered fill material was variable in composition, consistency, density, moisture, and thickness.
3. Borings B-1 and B-3 to B-9 were terminated at their planned depth of 5 feet within this stratum

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A of this report.

3.3 Groundwater

The boreholes were observed while drilling and after completion for the presence and level of groundwater. Groundwater was not observed in the borings during drilling or during the short period of time the boreholes were allowed to remain open following drilling completion. However, this does not mean that the borings were terminated above groundwater. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole in these materials. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. In addition, perched water can develop over low permeability soil or rock strata. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on the subsurface conditions encountered in the borings performed at this site, it is our opinion that the site is suitable for development of the proposed project.

Geotechnical considerations for this project include:

- Existing uncontrolled fill
- Soft subgrade potential
- Existing pavement

4.1.1 Existing Uncontrolled Fill

Uncontrolled fill was encountered in Borings B-1, B-2, and B-10 to depths of approximately 3½ to more than 5 feet. The uncontrolled fill encountered in the borings generally consisted of lean clay and fat clay containing varying amounts of sand and gravel. Uncontrolled fill thickness should be expected to vary across the site. The uncontrolled fill was variable in composition, density, moisture, and consistency, and appears to have been placed without moisture or density control.

If the owner's risk tolerance is low, relative to potential post construction pavement movement, we recommend that the existing uncontrolled fill be completely removed from beneath the proposed pavement areas. This overexcavation should be backfilled with compacted structural fill as described in section 4.2 **Earthwork**. Based on the results of the borings, it appears that the existing onsite uncontrolled fill would be suitable for re-use as compacted structural fill if properly moisture conditioned and compacted; however, we recommend that bid documents request add/deduct rates for haul-off and import of suitable fill in the event that unsuitable soil is encountered during construction.

As an alternate to removing and replacing the existing uncontrolled fill, consideration could be given to leaving some of the uncontrolled fill in place for support of pavements. In our opinion, support of pavements on or above uncontrolled fill involves risk. Risk associated with construction on uncontrolled fill must be assumed by the owner. Pavements supported on or above uncontrolled fill material that has not been uniformly placed and compacted with strict moisture and density control may not perform predictably. At a minimum we recommend that the uncontrolled fill be reworked to a depth of 24 inches beneath proposed pavement areas. Thicker depths of new compacted structural fill will result in less risk for adverse structural performance. Pavement should not bear directly on uncontrolled fill material. We recommend the uncontrolled fill material be evaluated further at the time of construction to determine its suitability for support of pavements.

4.1.2 Soft Subgrade Potential

Some of the soil encountered in the borings below the existing pavement had relatively high moisture levels. These soils may be susceptible to instability at existing moisture levels and/or with increased moisture.

During periods of dry weather these soils may be stable upon initial exposure; however, at the encountered moisture values, these soils should be expected to be relatively soft and unstable under construction traffic. Further, depending upon site conditions during construction, overexcavation or stabilization of the subgrade and/or base of over-excavations may be needed to achieve a suitable working surface. Accordingly, we recommend that the owner budget for the possibility that overexcavation and/or subgrade stabilization may be required and contractors be prepared to handle potentially wet, soft conditions. We recommend including a line item in the bid documents for stabilization of soft soils as outlined in **Section 4.2.2 Soil Stabilization**.

Further, moisture conditioning should be anticipated prior to placement of onsite materials as compacted structural fill in accordance with the recommendations outlined in section **4.2 Earthwork**. If time or weather constraints are prohibitive, importing suitable fill material or amending onsite soils with lime kiln dust, Code-L or class C fly ash may be required.

4.1.3 Existing Pavement

Existing ACC and PCC pavement is present on the site. We understand the existing pavement will be removed as part of site preparation. Thorough removal of the existing pavement will be an important aspect of site preparation.

If existing utilities are to remain in place, we recommend the backfill be tested at the time of construction. If these utilities are to be relocated, the resulting trenches should be overexcavated and backfilled properly and tested in accordance with the recommendations in this report in section **4.2 Earthwork** or be backfilled with lean concrete or flowable fill. Any abandoned underground pipes or conduits, left in place, should be fully grouted.

4.1.4 General

We recommend that the exposed subgrade be thoroughly evaluated after stripping of any topsoil and creation of all cut areas, but prior to the start of any fill operations. We recommend that the geotechnical engineer be retained to evaluate the subgrade soils. Subsurface conditions, as identified by the field and laboratory testing programs, have been reviewed and evaluated with respect to the proposed project plans known to us at this time.

4.2 Earthwork

4.2.1 Stripping and Demolition

In preparing the site for construction, all deleterious materials such as utilities to be abandoned (if any), associated backfill, pavements, organic soil, or loose, soft, frozen, or otherwise unsuitable materials should be removed from the proposed pavement areas. Based on the conditions encountered at the borings, a stripping depth of about 1 to 2 feet should be anticipated to remove pavements and aggregate base material. The actual stripping depths will vary for this project and should be evaluated during construction.

It is important that the recycled pavement be blended with another material, such as soil, sand, and/or gravel, to fill voids. A blend of these soils and crushed limestone can be used as engineered fill. This material should be well graded and have a maximum size, in any dimension, of 6-inches. This may necessitate the use of on-site screening of the excavated materials and processing the oversized portion through a crusher such that the maximum size of the well graded blend would be 6-inches. Recycled ACC pavement should be limited to a maximum of 50% of the fill material being placed in any lift.

The presence of lean clay, silty clay, and relatively high moisture levels in some the upper soils will likely result in areas of subgrade instability upon initial exposure. As a result, these soils may be prone to rutting, shoving, and pumping under existing moisture conditions. Unstable subgrade conditions could be exacerbated if the soils are wetted and/or subjected to repetitive construction traffic. Because of this we recommend the owner budget for the possibility for soil stabilization and the contractor should be prepared to handle potentially wet, soft subgrade conditions. We recommend including a line item in the bid documents for stabilization of soft soils as outlined in the following section.

4.2.2 Subgrade Preparation and Soil Stabilization

After the removal of the utilities (if any) and existing pavements, and prior to the placement of new fill, the subgrade should be moisture conditioned and compacted to the density and moisture content ranges recommended in section **4.2.4 Compaction Requirements**. The exposed subgrade soils should also be proofrolled with a loaded tandem-axle dump truck. This process will help to delineate soft or disturbed areas. If unsuitable areas are observed during this process, subgrade improvement will then be necessary to establish a suitable subgrade support condition; especially during wet periods of the year. Unstable materials located by proofrolling should be removed and replaced with suitable compacted structural fill or stabilized using methods as described below.

Methods of subgrade improvement could include scarification, moisture conditioning and recompaction, removal of unstable materials and replacement with granular fill (with or without geosynthetics) and chemical stabilization. The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size of area to be stabilized, and

the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs. Performing site grading operations during warm seasons and dry periods would help reduce the amount of subgrade stabilization required.

If the exposed subgrade is unstable during proofrolling operations, it could be stabilized using one of the methods outlined below.

- **Scarification and Recompaction** – It may be feasible to scarify, dry, and recompact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Stable subgrades likely would not be achievable if the thickness of the unstable soil is greater than about 12 inches, if the unstable soil is at or near groundwater levels, or if construction is performed during a period of wet or cool weather when drying is difficult.
- **Crushed Stone** – The use of crushed stone or crushed gravel is the most common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 6 to 30 inches below finished subgrade elevation. The use of high modulus geotextiles (i.e., engineering fabric or geogrid) could also be considered after underground work such as utility construction is completed. Prior to placing the fabric or geogrid, we recommend that all below grade construction, such as utility line installation, be completed to avoid damaging the fabric or geogrid. Equipment should not be operated above the fabric or geogrid until one full lift of crushed stone fill is placed above it. The maximum particle size of granular material placed over geotextile fabric or geogrid should meet the manufactures specifications, and generally does not exceed 1½ inches.
- **Chemical Stabilization** – Improvement of subgrades with Portland cement, lime kiln dust, Code L, or class C fly ash could be considered for improving unstable soils. Chemical modification should be performed by a pre-qualified contractor having experience with successfully stabilizing subgrades in the project area on similar sized projects with similar soil conditions. Results of chemical analysis of the additive materials should be provided to the geotechnical engineer prior to use. The hazards of chemicals blowing across the site or onto adjacent property should also be considered. Additional testing would be needed to develop specific recommendations to improve subgrade stability by blending chemicals with the site soils. Additional testing could include, but not be limited to, determining the most suitable stabilizing agent, the optimum amounts required, the presence of sulfates in the soil, and freeze-thaw durability of the subgrade.

Further evaluation of the need and recommendations for subgrade stabilization can be provided during construction as the geotechnical conditions are exposed.

4.2.3 Material Requirements

Compacted structural fill should meet the following material property requirements:

Fill Type ¹	USCS Classification	Acceptable Location for Placement
Lean clay	CL (LL<40)	All locations and elevations
Lean to fat clay	CL/CH (40<LL<50)	All locations and elevations
Fat clay ²	CH (LL≥50)	At least 12 inches below finished grades
Dense graded granular	GM ³	All locations and elevations
Low Volume Change Material	CL (LL<50 & PI<22) or GM ³	All locations and elevations
On-site soils	CH	All locations and elevations

1. Compacted structural fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade.
2. Delineation of moderate to highly plastic clays should be performed in the field by a qualified geotechnical engineer or their representative, and could require additional laboratory testing.
3. Similar to MoDOT Type 5 crushed limestone aggregate. If frost heave is not a concern, then MoDOT Type 1 crushed limestone aggregate, limestone screenings or granular material such as sand, gravel or crushed stone containing at least 18% low plasticity fines may also be used.

4.2.4 Compaction Requirements

Item	Description
Fill Lift Thickness	<ul style="list-style-type: none"> ■ 9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used ■ 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used
Compaction Requirements ¹	95% of the material's maximum standard Proctor dry density (ASTM D 698)
Moisture Content – Cohesive Soil	Within the range of optimum moisture content to 4% above optimum moisture content as determined by the standard Proctor test at the time of placement and compaction
Moisture Content – Granular Material ²	Workable moisture levels

1. We recommend that compacted structural fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.

4.2.5 Earthwork Construction Considerations

The presence of lean clay, silty clay, and relatively high moisture levels in some the upper soils will likely cause areas of subgrade instability upon initial exposure. Unstable subgrade conditions could worsen during general construction operations, particularly if the soils are wet or subjected to repetitive construction traffic. The use of light construction equipment would aid in reducing subgrade disturbance. The use of remotely operated equipment, such as a backhoe, would be beneficial to perform cuts and reduce subgrade disturbance. Should unstable subgrade conditions be encountered, stabilization measures will need to be employed. Further evaluation of the need and recommendations for subgrade stabilization can be provided during construction as the subgrade conditions are exposed on a broad scale.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to foundation construction. Final surrounding grades should be sloped away from the pavement on all sides to prevent ponding of water.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Safety and Health Administration (OSHA) regulations to provide stability and safe working conditions. Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; proof-rolling; placement and compaction of controlled compacted fills; backfilling of excavations into the completed subgrade, and just prior to construction of pavement.

4.3 Pavements

4.3.1 Pavement Subgrade Preparation

We anticipate that pavement construction will commence shortly after subgrade preparation and fill placement. As construction proceeds, if excavations are made into these areas, they become saturated, or heavy traffic from concrete trucks and other delivery vehicles disturbs the subgrade, then the initially prepared pavement subgrades should be carefully evaluated as the time for pavement construction approaches.

We recommend the moisture content and density of the upper 9 inches of the subgrade be evaluated and the pavement subgrades be proofrolled within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the material with compacted structural fill.

After proofrolling and repairing deep subgrade deficiencies, the entire subgrade should be scarified and developed as recommended in section **4.2 Earthwork** to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

4.3.2 Pavement Design Considerations

Traffic patterns and anticipated loading conditions were provided by the client in the form of morning and evening Peak Hour Total Traffic Volumes obtained in 2009, and projected evening Peak Hour Total Traffic Volumes for 2015 and 2030. Based on this information, we estimated twenty-year 18-kip equivalent single axle loads (ESAL's) of approximately 2,400,000.

The thickness of pavements subjected to truck traffic should be determined using expected traffic volumes, vehicle types, and vehicle loads and should be in accordance with local, city or county ordinances. Pavement thickness provided in this report were determined using AASHTO methods for the specific wheel loads, axle configurations, frequencies, and desired pavement life provided.

Pavement design methods are intended to provide structural sections with adequate thickness over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

This report provides recommendations to help mitigate the effects of soil shrinkage and expansion; however, even if these recommendations are followed some pavement distress could still occur. It is important to minimize moisture changes in the subgrade both during construction and during the life of the pavement to reduce shrink/swell movements.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to pavement should slope down from the edges at a minimum 2%;
- The subgrade and pavement surface should have a minimum 2% slope to promote proper surface drainage;
- Install below pavement drainage systems surrounding areas anticipated for frequent wetting;
- Install joint sealant and seal cracks immediately;
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils;
- Place compacted, low permeability backfill against the exterior side of curb and gutter; and,
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

Designs of new pavement sections for the project have been based on the procedures outlined in the 1993 Guideline for Design of Pavement Structures by the American Association of State Highway and Transportation Officials (AASHTO-1993). The provided design EAL's of about 295,000 for heavy duty pavements and 380 EAL's for light duty pavements was used in the 20-year analysis. Approximately half of these values were used for the 10-year design. The following pavement design parameters were estimated based upon our limited soils information, variation across the project area, and experience with similar projects and soil conditions.

Item	Flexible Pavement	Rigid Pavement
CBR	2.7	2.7
Subgrade modulus	4,800 psi	100 pci
Initial serviceability	4.2	4.5
Terminal serviceability	2.0	2.5
Reliability	85%	85%
Standard deviation	0.45	0.35
Layer coefficients	0.42 (surface and binder) 0.40 (AC base) 0.14 (aggregate base)	NA
Compressive strength	NA	4,000 psi at 28 days

4.3.3 Asphalt Concrete Thickness Design Recommendations

The results of the design analyses for new ACC pavements are presented in the following table:

Minimum Recommended ACC Pavement Section Thickness (inches)				
Design Life	Asphalt Surface	Asphalt Base	Aggregate Base ¹	Total Thickness
10 years	2.5	5.0	6.0	13.5
20 years	2.5	6.0	6.0	14.5

1. MoDOT Type 5 crushed limestone base material.

4.3.4 Asphalt Concrete Overlay Thickness Design Recommendations

If a 10-year pavement design is constructed and an asphalt overlay is constructed at a later date, the following conditions and pavement thicknesses could be considered for overlays. The first scenario considers performing an asphalt overlay within about two years after initial pavement reconstruction, when the pavement is still in relatively good condition (i.e. little to no alligator cracking and/or only low severity transverse cracking is present). The asphalt surface would require cleaning to remove soil, salts, and oils. Any cracks would require sealing and a tack coat should be applied. To extend the 10-year design to a 20-year design within the first 2 years of construction of the 10-year design, 2.0 inches of ACC should be overlain after surface preparations are performed.

The second scenario considers performing an ACC overlay at about 5 years after construction of the 10-year design. Some pavement degradation is anticipated at this time consistent with about 50 percent of the pavement life cycle similar to the following conditions:

- Greater than 10% low to medium severity alligator cracking and/or;
- Less than 10% medium to high severity alligator cracking and/or;
- Greater than 10% medium and high severity transverse cracking.
- No to slight evidence of pumping, degradation or base rock contamination by fines.

In this scenario 1 inch of the existing surface asphalt should be milled and 4.5 inches of new ACC should be overlain to achieve a 20-year design. Some isolated areas of full depth removal may be required to repair subgrade deficiencies, if present.

4.3.5 Portland Cement Concrete Thickness Design Recommendations

The results of the design analyses for new PCC pavements are presented in the following table:

Minimum Recommended PCC Pavement Section Thickness (inches)			
Traffic Area	Portland Cement Concrete ¹	Aggregate Base ²	Total Thickness
10 year	9.0	4.0	13.0
20 year	10.0	4.0	14.0

1. 4,000 psi at 28 days, 4-inch maximum slump and 5 to 7 percent air entrained, 6-sack minimum mix. PCC pavements are recommended for trash container pads and in any other areas subjected to

heavy wheel loads and/or turning traffic.

2. MoDOT Type 5 crushed limestone base material.
-

An adequate number of longitudinal and transverse control joints should be placed in the rigid pavement in accordance with ACI and/or AASHTO requirements. Control joints should be cut as soon as the slab can support the weight of a man and saw (usually 24 hours). Expansion (isolation) joints must be full depth and should only be used to isolate fixed objects abutting or within the paved area.

The following comments should be considered for the indicated concrete pavement design options.

- Contraction joints should have a maximum spacing of about 30 times the thickness of the concrete slab, as per ACI.
- At construction joints an adequately designed keyed construction joint or a butt end construction joint is recommended. For a butt end construction joint, an adequate number of deformed tie bars should be provided.
- Tie bars are also recommended along the first longitudinal joint from the pavement edge to keep the outside slab from separating from the pavement.
- Isolation joints are recommended for concrete pavement areas that abut fixed objects such as around light poles curb inlets, etc.

4.3.6 Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

4.3.7 Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

5.0 GENERAL COMMENTS

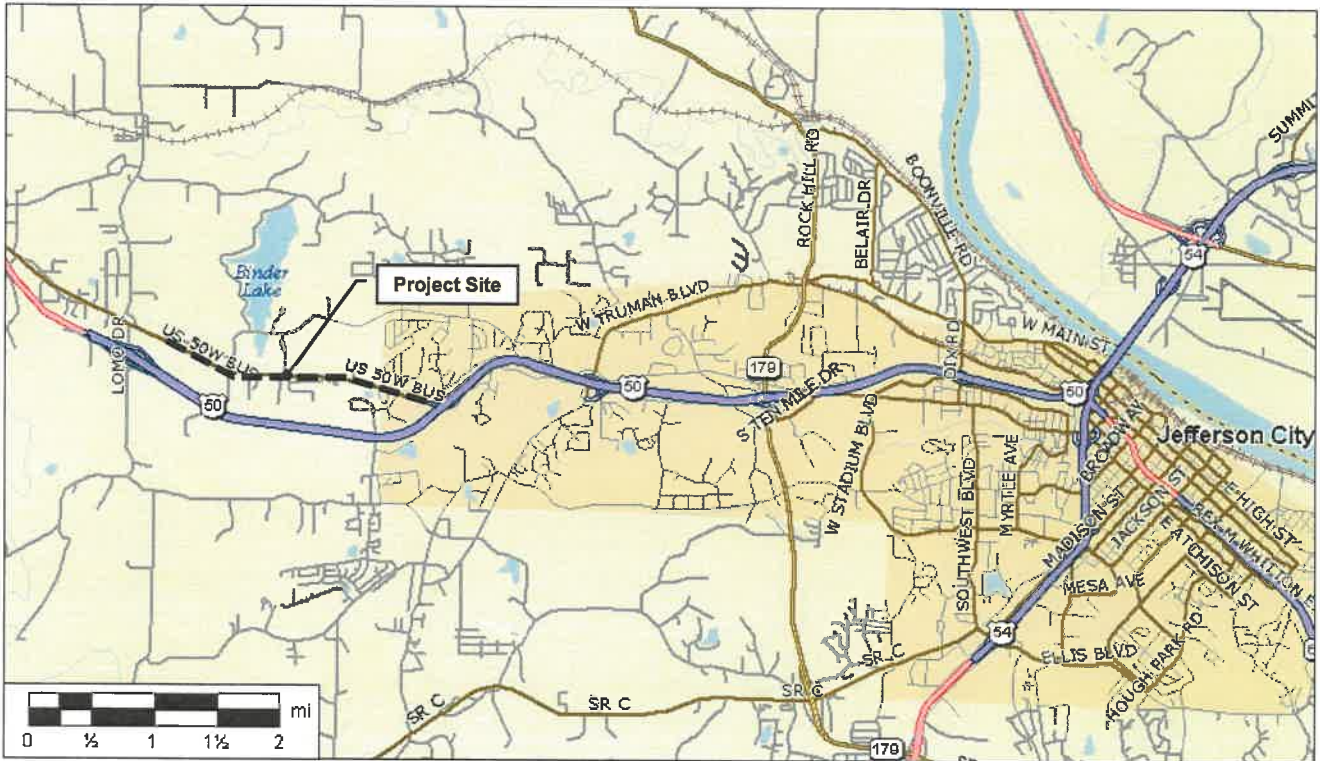
Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Observation and testing services should be performed during grading, excavation, and other earth-related construction phases of the project by qualified personnel.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

**APPENDIX A
FIELD EXPLORATION**



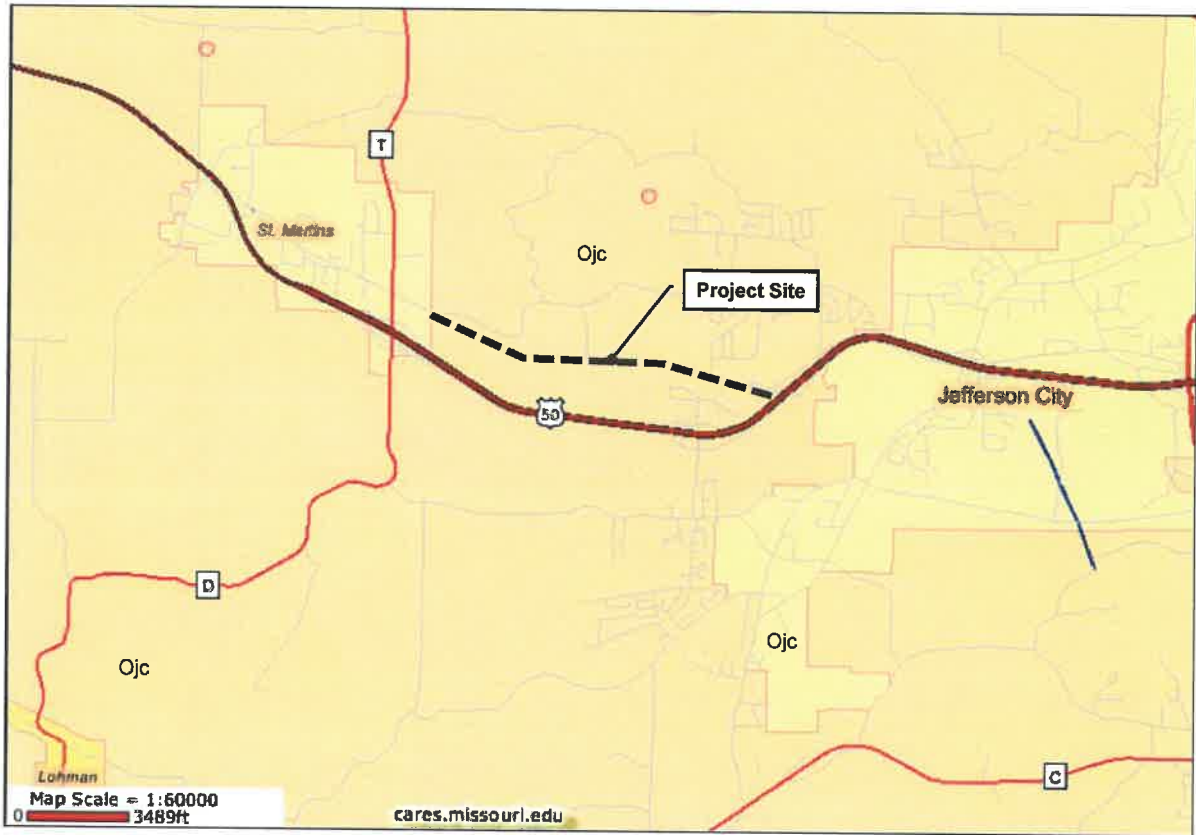
Project Manager:	EMH
Drawn by:	EMH
Checked by:	EHL
Approved by:	EHL

Project No.	09126604
Scale:	GRAPHIC
File Name:	09126604 SMAP
Date:	2/16/2012

Terracon
 Consulting Engineers & Scientists
 3801 Mojave Court, Suite A Columbia, Missouri 65202
 P (573) 214 2877 F (573) 214 2714

SITE LOCATION MAP
 BUSINESS HIGHWAY 50 PAVEMENT REHABILITATION
 RAINBOW DRIVE TO COUNTRY CLUB DRIVE
 APACHE FLATS, MISSOURI

Exhibit
A-1

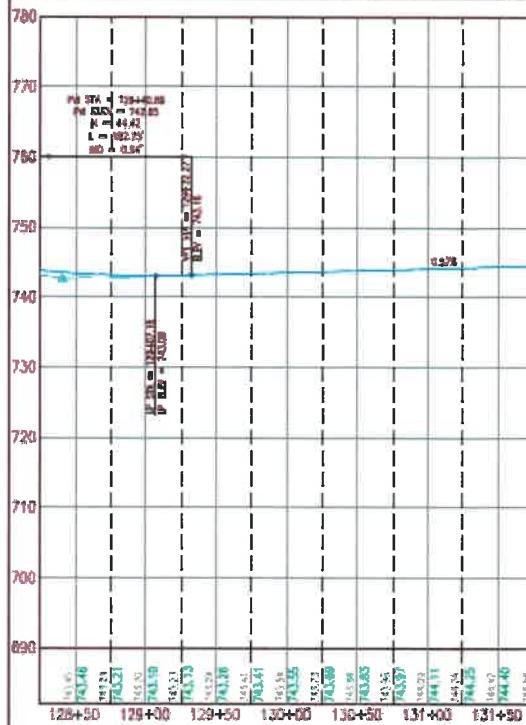
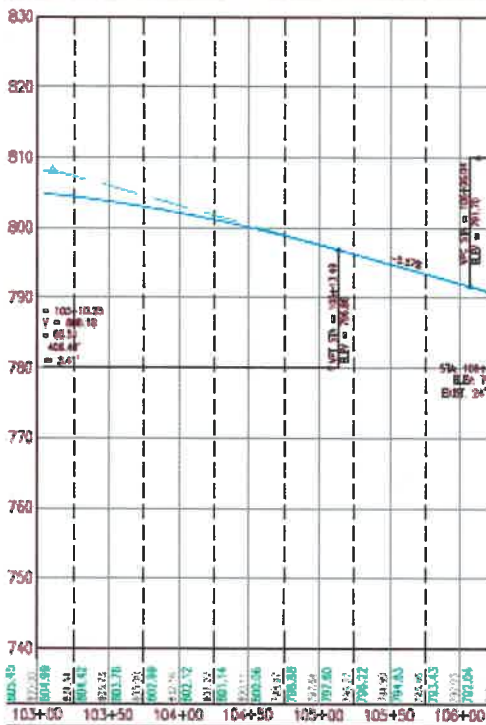
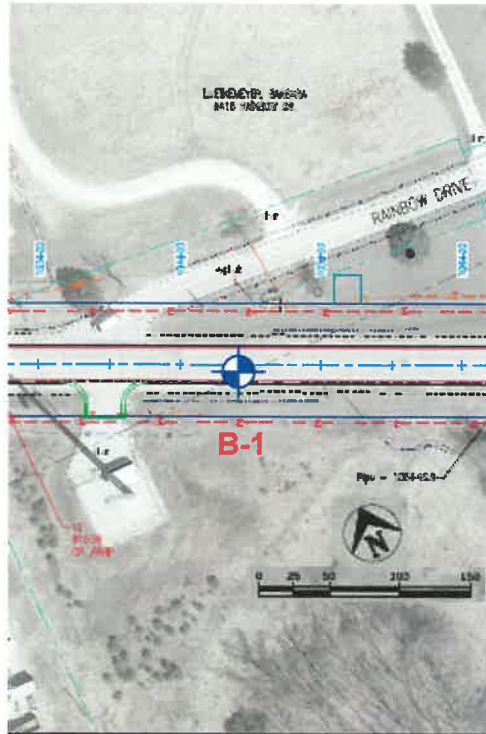


Project Manager:	EMH	Project No.	09126604
Drawn by:	EMH	Scale:	GRAPHIC
Checked by:	EHL	File Name:	09126604 GMAP
Approved by:	EHL	Date:	2/16/2012

Terracon
 Consulting Engineers & Scientists
 3601 Mojave Court, Suite A Columbia, Missouri 65202
 P (573) 214 2677 F (573) 214 2714

GEOLOGIC MAP
 BUSINESS HIGHWAY 50 PAVEMENT REHABILITATION
 RAINBOW DRIVE TO COUNTRY CLUB DRIVE
 APACHE FLATS, MISSOURI

Exhibit
A-2



NOTES

1. BASE DRAWING PROVIDED BY OTHERS
2. DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

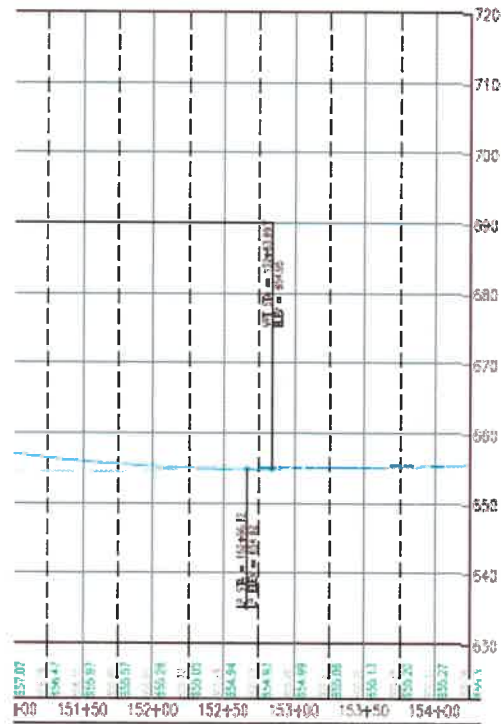
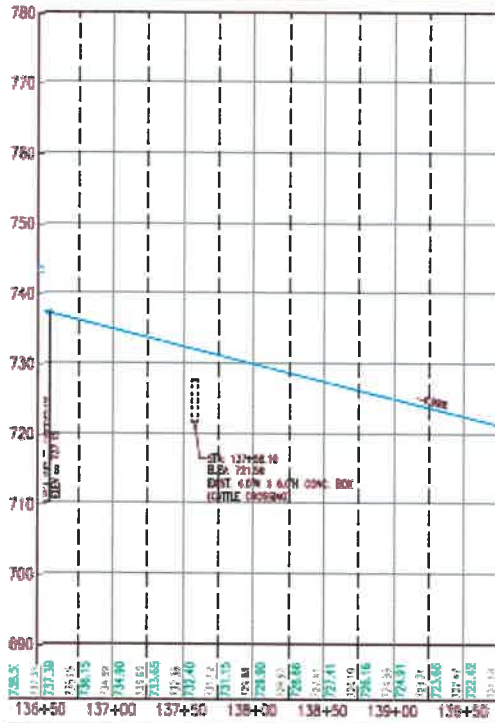
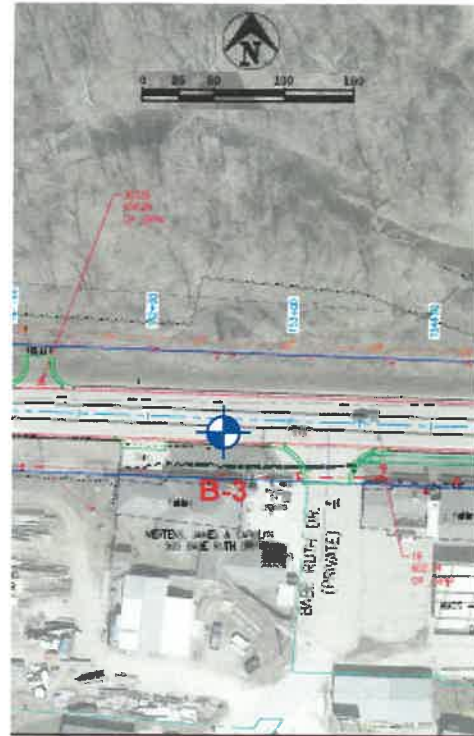
Project Manager:
EMH
Drawn by:
EMH
Checked by:
EHL
Approved by:
EHL

Proposal No.
09126604
Scale:
GRAPHIC
File Name:
09126604BPLAN1
Date:
2/16/2012

Terracon
Consulting Engineers & Scientists
3401 Mojave Court, Suite A Columbia, MO 65202
P (573) 214 2677 F (573) 214 2677

BORING LOCATION DIAGRAM
BUSINESS HIGHWAY 50 PAVEMENT REHABILITATION
RAINBOW DRIVE TO COUNTRY CLUB DRIVE
APACHE FLATS, MISSOURI

Exhibit
A-3



NOTES

1. BASE DRAWING PROVIDED BY OTHERS
2. DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

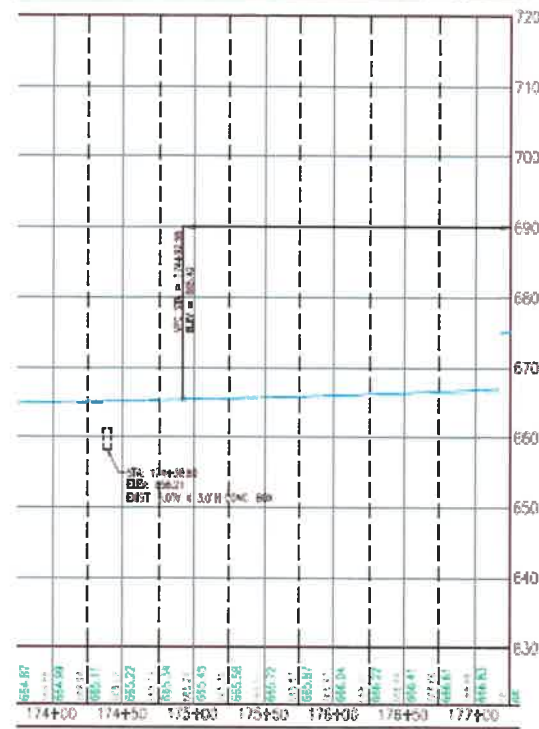
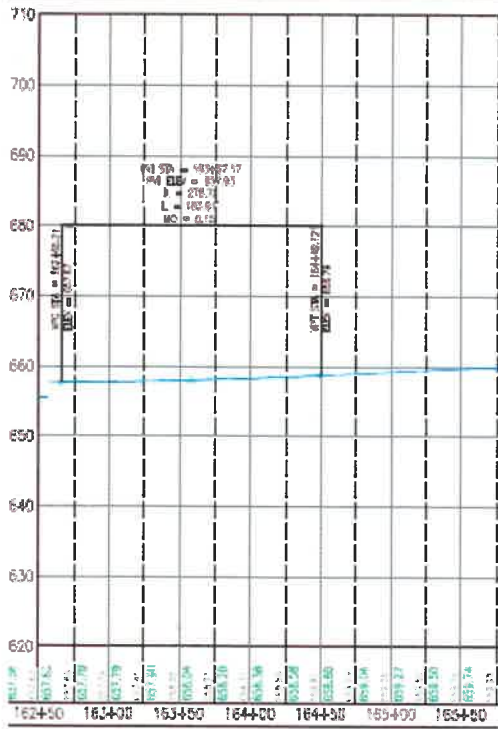
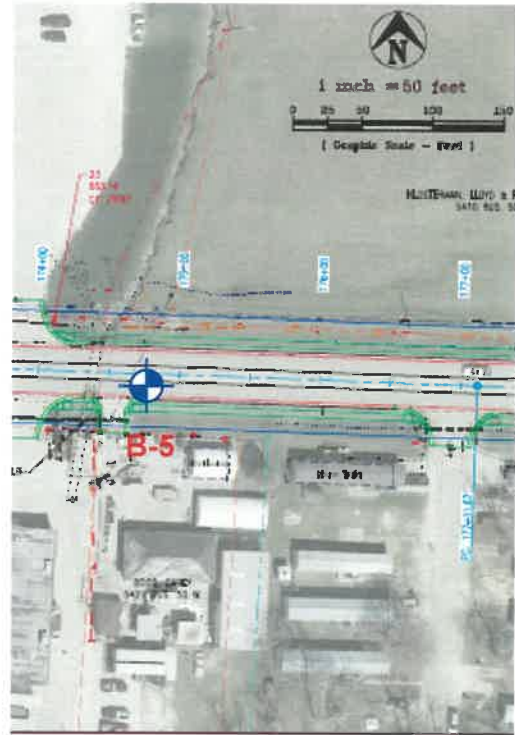
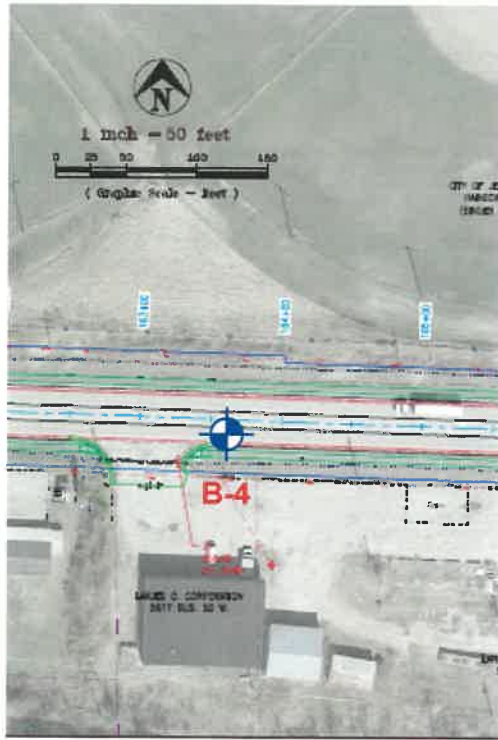
Project Manager:
EMH
Drawn by:
EMH
Checked by:
EHL
Approved by:
EHL

Proposal No.
09126604
Scale:
GRAPHIC
File Name:
09126604BPLAN2
Date:
2/16/2012

Terracon
Consulting Engineers & Scientists
3401 Mojave Court, Suite A Columbia, MO 65202
P (573) 214 2677 F (573) 214 2677

BORING LOCATION DIAGRAM
BUSINESS HIGHWAY 50 PAVEMENT REHABILITATION
RAINBOW DRIVE TO COUNTRY CLUB DRIVE
APACHE FLATS, MISSOURI

Exhibit
A-4



NOTES

1. BASE DRAWING PROVIDED BY OTHERS
2. DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

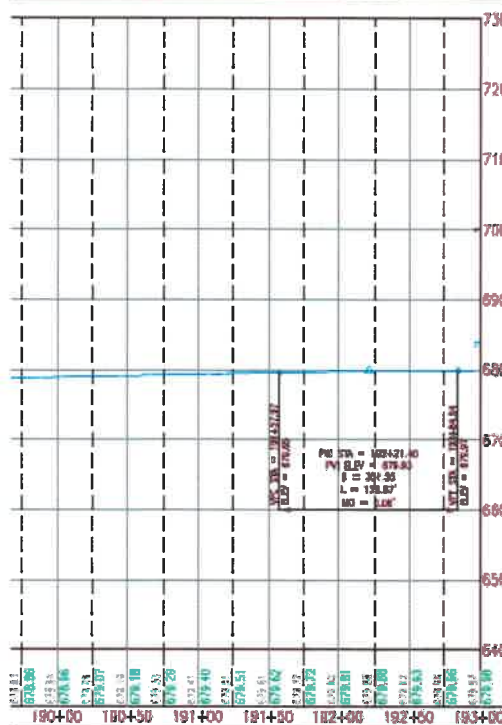
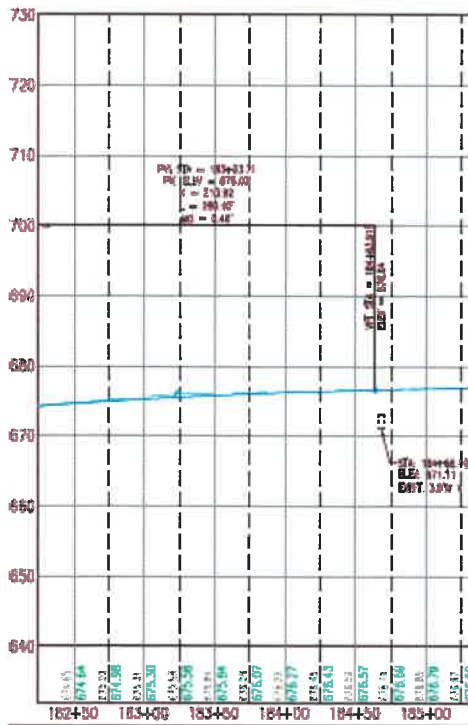
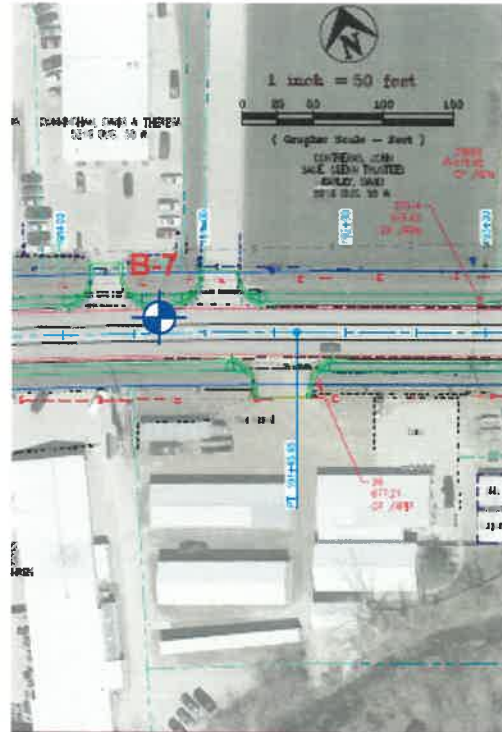
Project Manager:
EMH
Drawn by:
EMH
Checked by:
EHL
Approved by:
EHL

Proposal No.
09126604
Scale:
GRAPHIC
File Name:
09126604BPLAN3
Date:
2/16/2012

Terracon
Consulting Engineers & Scientists
3401 Mojave Court, Suite A Columbia, MO 65202
P (573) 214 2677 F (573) 214 2677

BORING LOCATION DIAGRAM
BUSINESS HIGHWAY 50 PAVEMENT REHABILITATION
RAINBOW DRIVE TO COUNTRY CLUB DRIVE
APACHE FLATS, MISSOURI

Exhibit
A-5



NOTES

1. BASE DRAWING PROVIDED BY OTHERS
2. DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

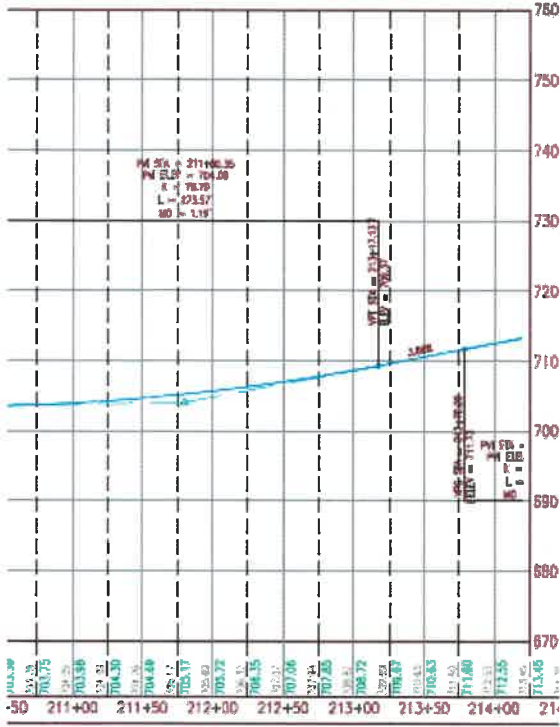
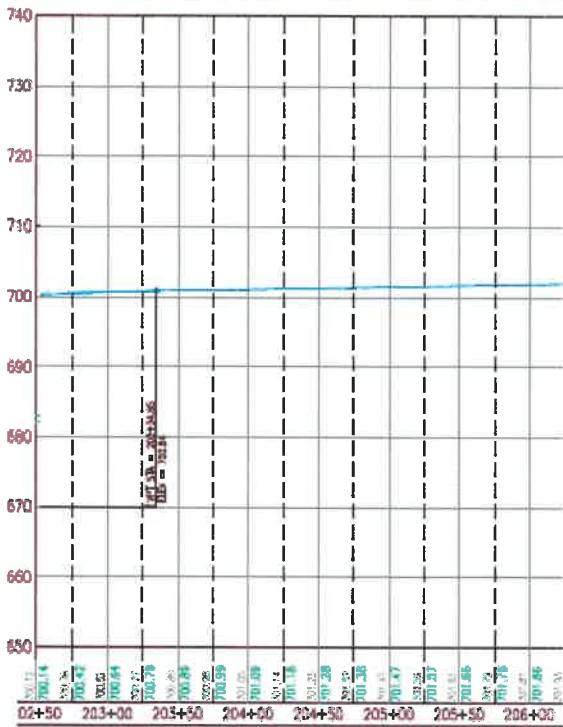
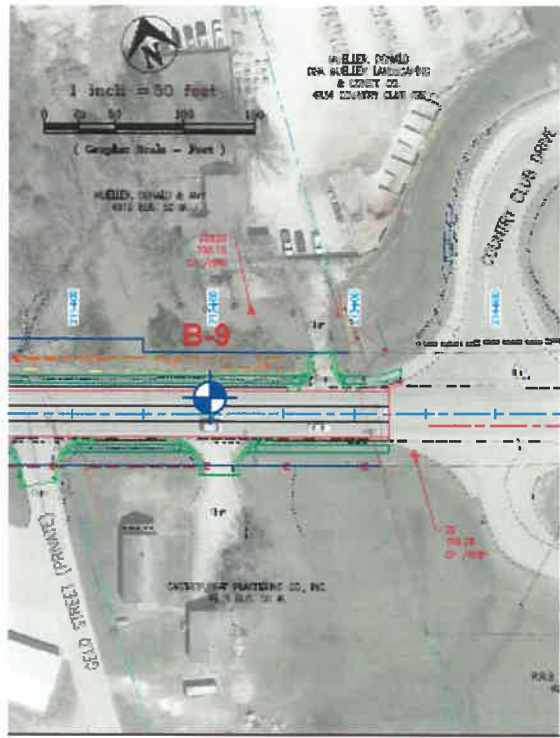
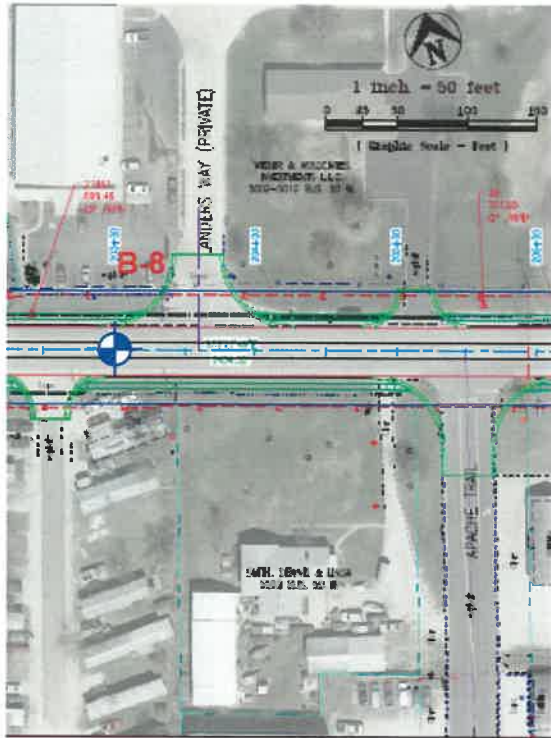
Project Manager:
EMH
Drawn by:
EMH
Checked by:
EHL
Approved by:
EHL

Proposal No.
09126604
Scale:
GRAPHIC
File Name:
09126604BPLAN4
Date:
2/16/2012

Terracon
Consulting Engineers & Scientists
3401 Mojave Court, Suite A Columbia, MO 65202
P (573) 214 2677 F (573) 214 2677

BORING LOCATION DIAGRAM
BUSINESS HIGHWAY 50 PAVEMENT REHABILITATION
RAINBOW DRIVE TO COUNTRY CLUB DRIVE
APACHE FLATS, MISSOURI

Exhibit
A-6



NOTES

1. BASE DRAWING PROVIDED BY OTHERS
2. DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: EMH Drawn by: EMH Checked by: EHL Approved by: EHL	Proposal No. 09126604 Scale: GRAPHIC File Name: 09126604BPLANS5 Date: 2/16/2012	 Consulting Engineers & Scientists 3401 Mojave Court, Suite A Columbia, MO 65202 P [573] 214 2677 F [573] 214 2677	BORING LOCATION DIAGRAM BUSINESS HIGHWAY 50 PAVEMENT REHABILITATION RAINBOW DRIVE TO COUNTRY CLUB DRIVE APACHE FLATS, MISSOURI	Exhibit A-7
--	--	--	--	-----------------------

BORING LOG NO. B-1

PROJECT: Business Highway 50 Pavement Rehabilitation

CLIENT: Central Missouri Professional Services, Inc.
Jefferson City, Missouri

SITE: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 104+45 Offset: 5' Rt. Approximate Surface Elev.: 800 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS
								LL-PL-PI
0.6	ASPHALT CONCRETE	799.5+/-						
1.4	PORTLAND CEMENT CONCRETE	798.5+/-						
2.0	AGGREGATE BASE COURSE	798+/-						
3.5	UNCONTROLLED FILL: gravelly lean clay, tan and reddish brown	796.5+/-			14	21-28-7 N=35	12	
5.0	FAT CLAY WITH SAND (CH): tan, with reddish brown, stiff to very stiff	795+/-			9	4-5-7 N=12 6500 (HP)	13	
Boring Terminated at 5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Continuous flight auger

Abandonment Method:
Backfilled with soil cuttings upon completion.

See Exhibit A for description of field procedures.
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 2/6/2012	Boring Completed: 2/6/2012
Drill Rig: CME-550X	Driller: S. Becker
Project No.: 09126604	Exhibit: A-8





TERRACON SMART LOG-HEADERS 09126604.GPJ TERRACON2012.GDT 2/17/12

BORING LOG NO. B-2

PROJECT: Business Highway 50 Pavement Rehabilitation

CLIENT: Central Missouri Professional Services, Inc.
Jefferson City, Missouri

SITE: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 128+60 Offset: 5' Rt. DEPTH	Approximate Surface Elev.: 744 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
									LL-PL-PI	
	ASPHALT CONCRETE									
	PORTLAND CEMENT CONCRETE		1							
	AGGREGATE BASE COURSE		2							
	UNCONTROLLED FILL: fat clay, trace sand, with gravel, reddish brown, brown, and tan		3			9	6-9-9 N=18 2000 (HP)	18		
			4			10	4-8-11 N=19 2000 (HP)	13		
	Boring Terminated at 5 Feet		5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Continuous flight auger

Abandonment Method:
Backfilled with soil cuttings upon completion.

See Exhibit A for description of field procedures.
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS
No free water observed



Boring Started: 2/6/2012

Boring Completed: 2/6/2012

Drill Rig: CME-550X

Driller: S. Becker

Project No.: 09126604

Exhibit: A-9

TERRACON SMART LOG-HEADERS 09126604.GPJ TERRACON2012.GDT 2/17/12

BORING LOG NO. B-3

PROJECT: Business Highway 50 Pavement Rehabilitation

CLIENT: Central Missouri Professional Services, Inc.
Jefferson City, Missouri

SITE: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 152+50 Offset: 12' Rt. DEPTH	Approximate Surface Elev.: 655 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
									LL-PL-PI	
	ASPHALT CONCRETE									
	0.7	654.5+/-								
	AGGREGATE BASE COURSE		1							
	1.5	653.5+/-								
	LEAN CLAY (CL): trace sand, dark brown, medium stiff to stiff		2			12	4-4-4 N=8 2000 (HP)	19	32-18-14	
	3.5	651.5+/-								
	GRAVELLY LEAN CLAY (CL): gray and tan		4			8	5-9-12 N=21	9		
	5.0	650+/-	5							
Boring Terminated at 5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Continuous flight auger

See Exhibit A for description of field procedures.
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from a topographic site plan.

Notes:

Abandonment Method:
Backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 2/6/2012

Boring Completed: 2/6/2012

Drill Rig: CME-550X

Driller: S. Becker

Project No.: 09126604

Exhibit: A-10

TERRACON SMART LOG-HEADERS 09126604.GPJ TERRACON2012.GDT 2/17/12

BORING LOG NO. B-4

PROJECT: Business Highway 50 Pavement Rehabilitation

CLIENT: Central Missouri Professional Services, Inc.
Jefferson City, Missouri

SITE: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 163+80 Offset: 10' Rt. Approximate Surface Elev.: 658 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	
	ASPHALT CONCRETE	0.6							
	PORTLAND CEMENT CONCRETE	1.4							
	AGGREGATE BASE COURSE	2.0							
	LEAN CLAY (CL): trace sand, dark gray, very soft to medium stiff								
		3			8	2-3-3 N=6 1000 (HP)	29	35-24-11	
		4			9	2-2-1 N=3 <500	32		
	Boring Terminated at 5 Feet	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Continuous flight auger

See Exhibit A for description of field procedures.
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from a topographic site plan.

Notes:

Abandonment Method:
Backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS
No free water observed



Boring Started: 2/6/2012
Drill Rig: CME-550X
Project No.: 09126604

Boring Completed: 2/6/2012
Driller: S. Becker
Exhibit: A-11

TERRACON SMART LOG-HEADERS 09126604.GPJ TERRACON\2012.GDT 2/17/12

BORING LOG NO. B-5

PROJECT: Business Highway 50 Pavement Rehabilitation

CLIENT: Central Missouri Professional Services, Inc.
Jefferson City, Missouri

SITE: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 174+65 Offset: 12' Rt. DEPTH	Approximate Surface Elev.: 665 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
									LL	PL-PI
	ASPHALT CONCRETE									
	0.7 AGGREGATE BASE COURSE	664.5+/-								
	0.9 LEAN CLAY (CL): trace sand, gray-brown, soft to medium stiff	664+/-	1							
	trace gravel		2			11	2-3-3 N=6 1000 (HP)	26		
			3							
			4			18	2-1-2 N=3 1000 (HP)	24		
	5.0 Boring Terminated at 5 Feet	660+/-	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Continuous flight auger

See Exhibit A for description of field procedures.
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from a topographic site plan.

Notes:

Abandonment Method:
Backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 2/6/2012

Boring Completed: 2/6/2012

Drill Rig: CME-550X

Driller: S. Becker

Project No.: 09126604

Exhibit: A-12

TERRACON SMART LOG-HEADERS: 09126604.GPJ TERRACON2012.GDT 2/17/12

BORING LOG NO. B-6

PROJECT: Business Highway 50 Pavement Rehabilitation

CLIENT: Central Missouri Professional Services, Inc.
Jefferson City, Missouri

SITE: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 183+60 Offset: 12' Lt. Approximate Surface Elev.: 676 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL	PL-PI
	ASPHALT CONCRETE	0.7							
	AGGREGATE BASE COURSE	1.2							
	FAT CLAY (CH); trace sand and gravel, dark gray, with brown, stiff	5.0							
	Boring Terminated at 5 Feet	5.0							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Continuous flight auger

Abandonment Method:
Backfilled with soil cuttings upon completion.

See Exhibit A for description of field procedures.
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS
No free water observed



Boring Started: 2/6/2012	Boring Completed: 2/6/2012
Drill Rig: CME-550X	Driller: S. Becker
Project No.: 09126604	Exhibit: A-13

TERRACON SMART LOG-HEADERS 09126604.GPJ TERRACON2012.GDT 2/17/12

BORING LOG NO. B-7

PROJECT: Business Highway 50 Pavement Rehabilitation	CLIENT: Central Missouri Professional Services, Inc. Jefferson City, Missouri
SITE: Rainbow Drive to Country Club Drive Apache Flats, Missouri	

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 190+75 Offset: 12' LL Approximate Surface Elev.: 679 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS
								LL-PL-PI
	ASPHALT CONCRETE	0.7						
	AGGREGATE BASE COURSE	1.5						
	SILTY CLAY (CL-ML): trace sand, light gray, trace brown, stiff	3.5			15	4-5-5 N=10 4000 (HP)	21	26-20-6
	LEAN TO FAT CLAY (CL-CH): trace sand, gray and dark gray, stiff	5.0			15	3-5-5 N=10 4000 (HP)	23	
	Boring Terminated at 5 Feet	5.0						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method: 6" Continuous flight auger	See Exhibit A for description of field procedures. See Appendix B for description of laboratory procedures and additional data, (if any). See Appendix C for explanation of symbols and abbreviations. Elevations were interpolated from a topographic site plan.	Notes:
Abandonment Method: Backfilled with soil cuttings upon completion.		
WATER LEVEL OBSERVATIONS No free water observed	 3601 Mojave Court, Suite A Columbia, Missouri	Boring Started: 2/6/2012
		Boring Completed: 2/6/2012
		Drill Rig: CME-550X
		Driller: S. Becker
		Project No.: 09126604
		Exhibit: A-14

TERRACON SMART LOG-HEADERS 09126604.GPJ TERRACON2012.GDT 2/17/12

BORING LOG NO. B-8

PROJECT: Business Highway 50 Pavement Rehabilitation

CLIENT: Central Missouri Professional Services, Inc.
Jefferson City, Missouri

SITE: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 203+15 Offset: Centerline DEPTH	Approximate Surface Elev.: 701 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
									LL	PL-PI
	ASPHALT CONCRETE									
	0.7	700.5+/-								
	PORTLAND CEMENT CONCRETE		1							
	1.5	699.5+/-								
	LEAN CLAY (CL): gray, stiff		2			11	8-8-5 N=13 3000 (HP)	21		
	3.5	697.5+/-								
	FAT CLAY (CH): trace sand, dark gray, stiff		4			9	3-3-4 N=7 4000 (HP)	28		
	5.0	696+/-	5							
Boring Terminated at 5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Continuous flight auger

See Exhibit A for description of field procedures.
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from a topographic site plan.

Notes:

Abandonment Method:
Backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

No free water observed



3601 Mojave Court, Suite A
Columbia, Missouri

Boring Started: 2/6/2012

Boring Completed: 2/6/2012

Drill Rig: CME-550X

Driller: S. Becker

Project No.: 09126604

Exhibit: A-15

TERRACON SMART LOG-HEADERS 09126604.GPJ TERRACON2012.GDT 2/17/12

BORING LOG NO. B-9

PROJECT: Business Highway 50 Pavement Rehabilitation

CLIENT: Central Missouri Professional Services, Inc.
Jefferson City, Missouri

SITE: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 211+95 Offset: 12 Lt. Approximate Surface Elev.: 706 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	
								LL-PL-PI	
	ASPHALT CONCRETE	0.7							
	AGGREGATE BASE COURSE	1.2							
	LEAN TO FAT CLAY (CL-CH): trace sand and gravel, brown, with gray, medium stiff	5.0							
	Boring Terminated at 5 Feet	5.0							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Continuous flight auger

See Exhibit A for description of field procedures.
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from a topographic site plan.

Notes:

Abandonment Method:
Backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 2/6/2012

Boring Completed: 2/6/2012

Drill Rig: CME-550X

Driller: S. Becker

Project No.: 09126604

Exhibit: A-16

TERRACON SMART LOG-HEADERS 09126604.GPJ TERRACON2012.GDT 2/17/12

BORING LOG NO. B-10

PROJECT: Business Highway 50 Pavement Rehabilitation

CLIENT: Central Missouri Professional Services, Inc.
Jefferson City, Missouri

SITE: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

GRAPHIC LOG	LOCATION: See Exhibit A-3 Station: 138+50 Offset: 5' Rt. Approximate Surface Elev.: 737 +/- ELEVATION	DEPTH (ft)	GROUNDWATER OBSERVATIONS	SAMPLE TYPE	RECOVERY (in)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS
								LL-PL-PI
0.6	736.5+/-							
1.5	735.5+/-	1						
2.0	735+/-	2						
3.0		3			9	3-4-4 N=8 4500 (HP)	22	
4.0		4			10	2-3-4 N=7 3000 (HP)	22	
5.0	732+/-	5						
Boring Terminated at 5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Continuous flight auger

See Exhibit A for description of field procedures.
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations were interpolated from a topographic site plan.

Notes:

Abandonment Method:
Backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 2/6/2012

Boring Completed: 2/6/2012

Drill Rig: CME-550X

Driller: S. Becker

Project No.: 09126604

Exhibit: A-17

Geotechnical Engineering Report

Business Highway 50 Pavement Rehabilitation ■ Apache Flats, Missouri
February 17, 2012 ■ Terracon Project No. 09126604



Field Exploration Description

The proposed boring locations were selected and laid out in the field by representatives from Terracon, Boone County Highway Department, and Central Missouri Professional Services. Boring locations referenced available site features. Stationing and ground surface elevations at the boring locations were interpolated from strip maps provided by the client. Offsets from roadway centerline were measured. The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled with an ATV-mounted rotary drill rig using continuous flight solid-stem augers to advance the boreholes. Samples of the soil were obtained using the split-barrel sampling procedures. Bulk samples of the auger cuttings obtained from below the aggregate base material were collected for standard Proctor moisture and density testing and CBR testing.

In the split-barrel sampling procedure, a standard 2-inch (outside diameter) split-barrel sampling spoon is driven into the ground with a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. These values, also referred to as SPT N-values, are an indication of soil strength and are provided on the boring logs at the depths of occurrence.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled with auger cuttings prior to the drill crew leaving the site.

A field log of each boring was prepared by a Terracon engineer. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

APPENDIX B
SUPPORTING INFORMATION

Geotechnical Engineering Report

Business Highway 50 Pavement Rehabilitation ■ Apache Flats, Missouri
February 17, 2012 ■ Terracon Project No. 09126604



Laboratory Testing

Soil samples were tested in the laboratory to measure their moisture content a pocket penetrometer was used to estimate the approximate unconfined compressive strength of some samples. The pocket penetrometer has been correlated with unconfined compression tests and provides a better estimate of soil consistency than visual examination alone. The test results are provided on the boring logs included in Appendix A.

A composite bulk sample was obtained from the borings to estimate the properties of the subgrade soils. A standard Proctor, CBR, and Atterberg limit tests were performed on this bulk sample and the test results are provided on the following sheets.

Descriptive classifications of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Also shown are estimated Unified Soil Classification Symbols. A brief description of this classification system is attached to this report. All classification was by visual manual procedures. Selected samples were further classified using the results of Atterberg limit testing. The Atterberg limit test results are also provided on the boring logs.

Laboratory Compaction Characteristics of Soil Standard Proctor - ASTM D698

Client Name: Central Missouri Professional Services
 Project Name: Bus. Hwy. 50 Pavement Rehabilitation
 Project Location: Rainbow Drive to Country Club Drive
Apache Flats, Missouri

Project No.: 09126604 Date: 02/09/12

Test Results

Maximum Dry Unit Weight: 110.2 pcf
 Optimum Water Content: 14.5 %

Source Material: Auger cuttings from B-4, 5, 7, 8 & 9
 Sample Description: LEAN CLAY: gray and brown, trace
sand and gravel

Natural Moisture Content: 25.9 %

Liquid Limit: 29

Plastic Limit: 20

Plasticity Index: 8 (NP = Non Plastic)

Sample Number: A Sample date: 02/06/12

Test Method: ASTM D698

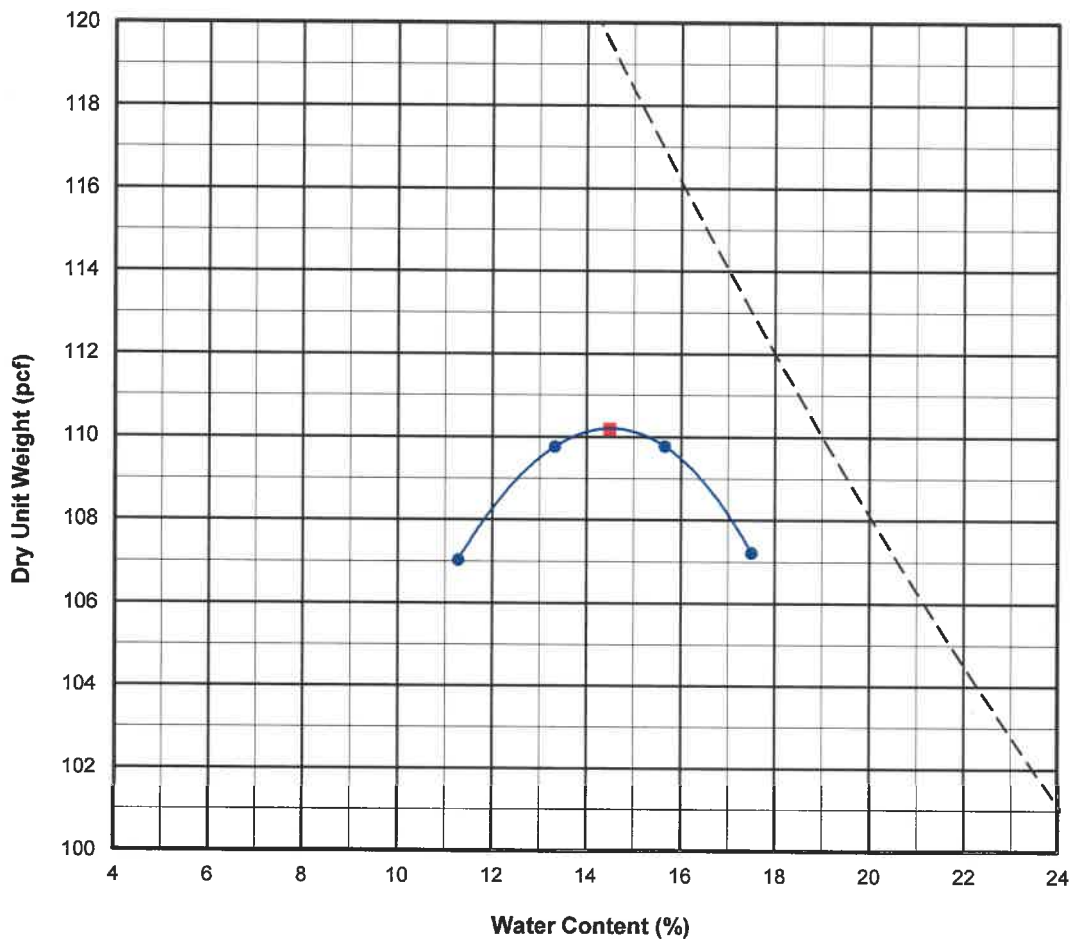
% passing # 200 sieve:

Test Procedure: Method A

Sample Preparation: Dry

Rammer: Mechanical X Manual

Reviewed by: Eric M. Hollabaugh, P.E.



• Data Points ■ Max. Dry Unit Wt. and Opt. Water Content - - - Zero Air Voids*

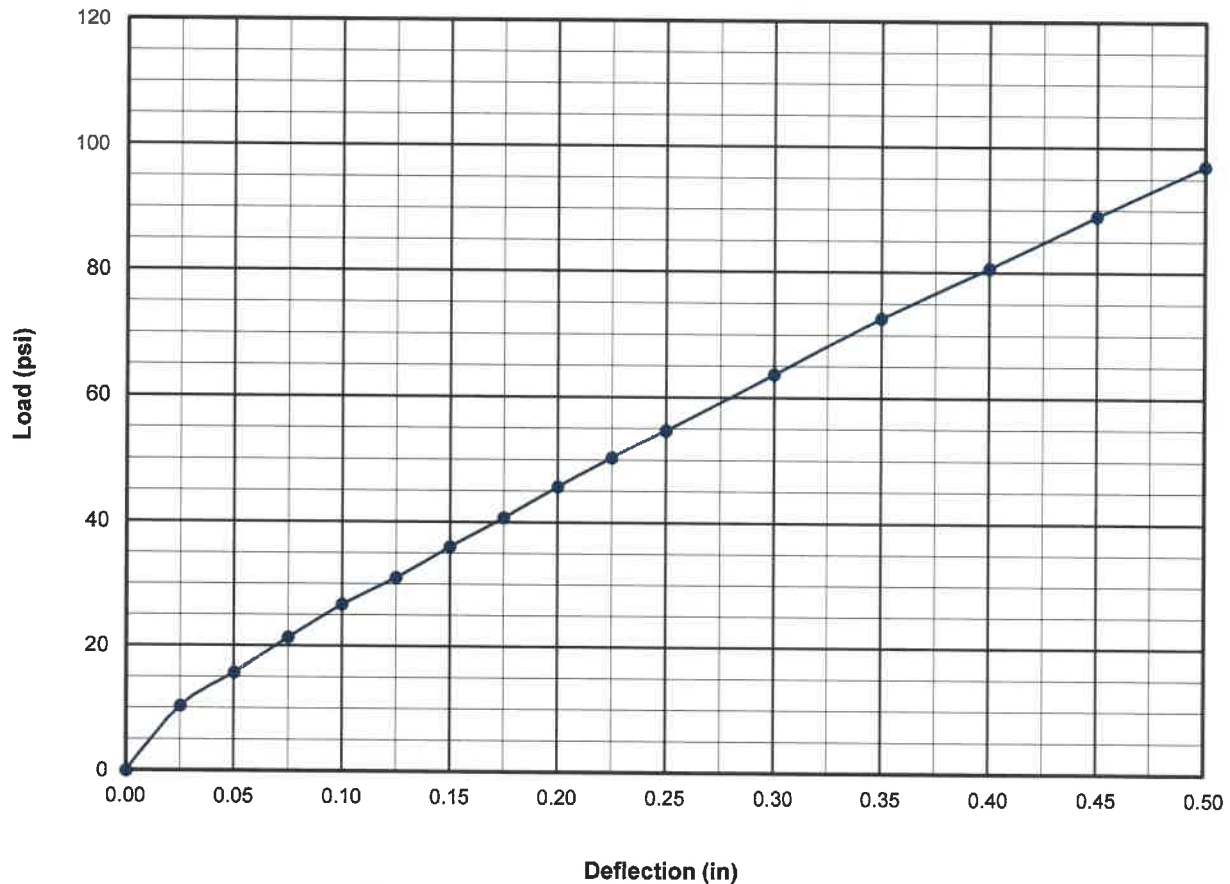
*Note: Zero air voids curve calculated for an assumed specific gravity of 2.65

Bearing Ratio of Laboratory-Compacted Soils California Bearing Ratio - ASTM D1883

Project Name: Business Highway 50 Pavement Rehabilitation
 Project Location: Rainbow Drive to Country Club Drive
Apache Flats, Missouri
 Sample Number: Proctor A
 Source Material: Auger cuttings from B-4, 5, 7, 8 & 9
 Sample Description: LEAN CLAY: gray and brown, trace sand and gravel
 Preparation Method: A ASTM D698
 Surcharge: 51 psf 10 pounds
 Length of Soaking: 96 hours
 Dry Density Before Soaking: 109.7 pcf
 Maximum Dry Density: 110.2 pcf
 Optimum Moisture Content: 14.5 %
 Percent Compaction: 99.5 % at + 3.8 % optimum moisture
Moisture Content:
 Before Soaking: 18.3 %
 Top 1 inch After Soaking: 19.6 %
 Average After Soaking: 19.5 %
 Swell (% of total height): -0.2 %

Project No.: 09116604
 Date: 2/14/2012

CBR:	
0.1 inch penetration:	<u>2.7</u>
0.2 inch penetration:	<u>3.0</u>



APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1- ³ / ₈ " I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., 3" O.D., unless otherwise noted	PA:	Power Auger (Solid Stem)
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	BCR:	Before Casing Removal
WCI:	Wet Cave in	WD:	While Drilling	ACR:	After Casing Removal
DCI:	Dry Cave in	AB:	After Boring	N/E:	Not Encountered

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

<u>Unconfined Compressive Strength, Qu, psf</u>	<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Consistency</u>
< 500	0 - 1	Very Soft
500 - 1,000	2 - 3	Soft
1,000 - 2,000	4 - 6	Medium Stiff
2,000 - 4,000	7 - 12	Stiff
4,000 - 8,000	13 - 26	Very Stiff
8,000+	> 26	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Relative Density</u>
0 - 3	Very Loose
4 - 9	Loose
10 - 29	Medium Dense
30 - 50	Dense
> 50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 - 29
Modifier	≥ 30

GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75 to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification			
				Group Symbol	Group Name ^B		
Coarse Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well-graded gravel ^F		
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	$Cu < 4$ and/or $1 > Cc > 3$ ^E	GP	Poorly graded gravel ^F	
			Fines classify as CL or CH		GM	Silty gravel ^{F,G,H}	
		Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E	SW	Well-graded sand ^I	
			Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	$Cu < 6$ and/or $1 > Cc > 3$ ^E	SP	Poorly graded sand ^I
	Fines Classify as CL or CH				SM	Silty sand ^{G,H,I}	
	Fine-Grained Soils: 50% or more passes the No. 200 sieve		Silts and Clays: Liquid limit less than 50	Inorganic:	$PI > 7$ and plots on or above "A" line ^J	CL	Lean clay ^{K,L,M}
					$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K,L,M}
		Organic:		Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K,L,M,N}
						OH	Organic silt ^{K,L,M,O}
Liquid limit - not dried					OH	Organic silt ^{K,L,M,O}	
Silts and Clays: Liquid limit 50 or more		Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}		
			PI plots below "A" line	MH	Elastic Silt ^{K,L,M}		
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K,L,M,P}	
					OH	Organic silt ^{K,L,M,O}	
			Liquid limit - not dried		OH	Organic silt ^{K,L,M,O}	
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat		

- ^A Based on the material passing the 3-in. (75-mm) sieve
- ^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
- ^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
- ^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay
- $$C_u = \frac{(D_{60})^2}{D_{10} \times D_{30}}$$
- ^E $C_u = D_{60}/D_{10}$ $C_c = \frac{D_{30} - D_{10}}{D_{60} - D_{10}}$
- ^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.
- ^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

- ^H If fines are organic, add "with organic fines" to group name.
- ^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
- ^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
- ^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
- ^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.
- ^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.
- ^N $PI \geq 4$ and plots on or above "A" line.
- ^O $PI < 4$ or plots below "A" line.
- ^P PI plots on or above "A" line.
- ^Q PI plots below "A" line.

