Department of Public Works
Engineering Division
602 S Main Street
Joplin, Missouri 64801
417-624-0820

May 1, 2025

CITY OF JOPLIN
Zora Phase 2 Street Improvements

Addendum No. 1

Contract Bidders:

Enclosed is Addendum No. 1 for the above referenced project. Please execute, attach, and submit this Addendum No. 1 with your bid.

City of Joplin

Rob Beachner,
Project Manager

The undersigned hereby acknowledges receipt of this addendum, which by this reference is hereby incorporated in and becomes a part of the Contract Documents for the above referenced project.

_____
Company Name

_____
Signature

_____
Printed Name, Title

May 1, 2025

ADDENDUM NO. 1

PROJECT: Zora Phase 2 Street Improvements
Joplin, Missouri

BID OPENING: 2:00 p.m., May 15, 2025
602 S Main St.
4th Floor
Joplin, Missouri

This addendum forms a part of the Bid Documents for the project described above. The original Bid Documents and any prior addenda remain in full force and effect except as modified by the following, which shall take precedence over any contrary provision in the prior documents. The following clarifications are made:

Clarifications

1. Project bid opening shall hereby be delayed until May 15, 2025. Questions may be received by May 8, 2025, by 5pm.
2. **Project Start Date:** Early this summer.
3. **Utility Status update:** All utilities anticipate being out of the way by June 1, with the possible exception of AT&T.
4. **Will there be any additional day for bad weather?** 270 Calendar days have been included with an anticipated end date Spring 2026.
5. **Who provides the materials testing?** The City of Joplin will provide material testing.
6. **Are there Bore Logs for the project?** Geotechnical report and supplement is included as part of this addendum.
7. **Earthwork Clarification:** There is a revised breakout table in the plans and an additional pay item for Embankment (Contractor Furnished). Helping to explain the earthwork in more detail to provide a consistent bid. Broken down per traffic control phase.
8. **Type A2 Shoulder thickness:** Removed Type A2 Shoulder Pay Item. Quantity added to full depth pavement items 17-18.
9. **HMA MoDOT BP-1:** This pay item was included for temporary access to driveways and the event center. Quantity Table updated to include.
10. **Bid Bond:** A sample bid bond has been provided, however, contractor may utilize there own bond form.
11. **Detour Plan:** Additional details have been provided to the traffic control plan providing clarity for detour routes and additional CMS boards. Contractor shall submit CMS verbiage to city prior to installation for approval.
12. **Pre-**Bid: Agenda and Sign-in Sheet attached to this addendum
13. **Bid Form:** A revised bid form has been updated and included as part of this addendum.

Plan Sheets

The following plan sheets have been updated and included with this addendum.

1. Sheet 11 – Summary of Quantities (RECAP)
2. Sheet 12 – Summary of Quantities
3. Sheet 13 – Summary of Quantities
4. Sheet 15 – Summary of Quantities
5. Sheet 37 – Roadway Plan and Profile
6. Sheet 91 – Traffic Control Plan Detour
7. Sheet 92 – Traffic Control Plan Detour

Job Special Provisions

The following job special provisions have been updated and included with this addendum.

1. JSP-5100-01 Special Seed Mix
2. JSP-0400-02 Encroachment Agreement – Southern Start
    a. Southern Star Encroachment Agreement has been included in this addendum and shall be included as part of JSP-0400-02

Geotechnical Reports

Geotechnical Investigation Report (Boring)
Geotechnical Investigation Concept Report (Mining)

In order to have a valid bid proposal, this addendum must be acknowledged and returned with your bid proposal.

If you have any questions concerning this addendum, please feel free to contact Jonathan Peitz at (417) 885-1763.



Jonathan Peitz, P.E.
Project Engineer
Olsson

	ZORA STREET IMPROVEMENTS - PHASE 2				
	INVITATION FOR BID #				
	BASE BID				
ITEM NO.	**DESCRIPTION**	**UNIT**	**ESTIMATED QUANTITY**	**Unit Cost**	**Total**
1	Mobilization	LS	1	$	$
2	Contractor Furnished Construction Staking and Surveying	LS	1	$	$
3	Miscellaneous Demolition & Removal	LS	1	$	$
4	Clearing & Grubbing / Tree & Brush Removal	LS	1	$	$
5	Existing Road Pavement Removal (Full Depth)	SY	15043	$	$
6	Existing Storm Removal	LF	312	$	$
7	Unclassified Excavation	CY	12831	$	$
8	Embankment	CY	6297	$	$
9	Embankment (Contractor Furnished)	CY	252	$	$
10	Backfill of Unsuitable Material*	CY	2962	$	$
11	Removal of Unsuitable Material*	CY	2962	$	$
12	Driveway Approach Concrete (8" Concrete) (Incl. 4" MoDOT Type 5 Aggr. Base)	SY	410	$	$
13	Driveway Asphalt Surface (6" MoDOT Bituminous Base)	SY	355	$	$
14	Driveway Gravel Surface (6" MoDOT Type 1 Aggr. Base)	SY	142	$	$
15	Asphalt Tack Coat	GAL	3876	$	$
16	Aggregate Base (8" MoDOT Type 5)	SY	33677	$	$
17	Asphaltic Concrete Surface (2") (MoDOT BP-1)	TONS	2725	$	$
18	Asphaltic Concrete Base (8")	TONS	10955	$	$
19	Temporary Surfacing Material (HMA MoDOT BP-1)	TONS	52	$	$
20	Temporary Surfacing Material (Aggregate)(MoDOT Type 1)	TONS	158	$	$
21	Rock Blanket	SY	133	$	$
22	MoDOT Paved Ditch	SY	40	$	$
23	Joplin Standard Upright Curb & Gutter	LF	2088	$	$
24	15" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	245	$	$
25	18" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	76	$	$
26	18" Class V RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	20	$	$

ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	Unit Cost	Total
27	24" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	343	$	$
28	30" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	142	$	$
29	30" Class V RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	20	$	$
30	36" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	82	$	$
31	60"X36" Class III RCBC (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	132	$	$
32	34"X22" Class III HERCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	64	$	$
33	38"X24" Class III HERCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	59	$	$
34	15" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	9	$	$
35	18" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	2	$	$
36	30" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	2	$	$
37	36" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	2	$	$
38	Cast-in-Place Headwalls and Wingwalls (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	4	$	$
39	Area Inlet 3'x3' I.D.	EA	2	$	$
40	Area Inlet 4'x4' I.D.	EA	1	$	$
41	Area Inlet 4.5'x4.5' I.D.	EA	2	$	$
42	Area Inlet 10.5'x7' I.D.	EA	1	$	$
43	Type C Curb Inlet 5'x3' I.D.	EA	7	$	$
44	Combination Grated Inlet 7'x 4' I.D.	EA	2	$	$
45	Junction Box 10.5'x3.5' I.D.	EA	1	$	$
46	Seeding, Fertilizing and Mulch	SY	7873	$	$
47	Special Seeding	SY	10461	$	$
48	Erosion Control Culvert Inlet Protection	LF	700	$	$
49	Erosion Control Curb Inlet Protection	EA	14	$	$
50	Erosion Control Biodegradable Ditch Check	LF	1983	$	$
51	Erosion Control Silt Sock	LF	2904	$	$
52	Removal & Resetting Existing Signs	LS	1	$	$
53	Permanent Signage W2-6	SF	6	$	$
54	Permanent Signage W13-1P	SF	14	$	$

ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	Unit Cost	Total
55	Permanent Signage R1-1	SF	5	$	$
56	Permanent Signage D3-1	SF	12	$	$
57	Construction Signs	SF	588	$	$
58	Traffic Control Signage Changeable Message Board	EA	8	$	$
59	Traffic Control Signage Type III Barricade	EA	12	$	$
60	Pavement Marking Removal	LF	1158	$	$
61	4" Solid Yellow Thermoplastic Lane Line	LF	12462	$	$
62	4" Broken Yellow Thermoplastic Lane Line	LF	500	$	$
63	4" Solid White Thermoplastic Edge Line	LF	7554	$	$
64	12' Solid Yellow Preformed Diagonal Cross Hatch Marking	LF	106	$	$
65	Solid White Preformed Left Turn Arrow	EA	10	$	$
66	24" Solid White Preformed Stop Bar	LF	19	$	$
67	Barb Wire Fence (4 Strand with Steel T-Posts)	LF	4474	$	$
68	Temporary Barb Wire Fence (Cattle Rated)	LF	4474	$	$
69	48"x24" Class III RCBC (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	136	$	$
		BASE BID TOTAL =		**$**	

MEETING AGENDA

Pre-Bid Meeting

Project Name:	Zora Phase 2 Street Improvements
Project Location:	Joplin, MO
Client:	City of Joplin
Project Manager:	Jonathan Peitz
Project #:	R17-06420
Date:	4/23/2025

1) Introductions and Sign In

2) General Overview of the Project

a) Purpose

i) Project Description: Widen Zora Street, from Duquesne to 249, to the south to obtain two 12 foot driving lanes and two 10 foot full depth paved shoulders. The profile grade of Zora is being corrected to meet current design standards for 45 mph.

b) Right of way and easements

i) All necessary Right-of-Way and Easements have been acquired for this project

3) Bonding & Insurance

a) Must submit a Bid Bond or Certified Check (5% of total bid) with sealed bid

b) Performance and Payment Bonds are required

c) Insurance is required – see specifications

4) Key Dates

a) Deadline for Questions: May 1, 2025, 5:00 PM

b) Bid Opening

i) May 8, 2025, 2:00 PM

ii) 4th Floor Conference Room

c) Substantial Completion Date: 270 Calendar days

d) Liquidated Damages: $3,800 per day

5) Bidding and Contract Requirements

a) The Contractor shall seal their bid in an envelope and clearly mark the outside with the name of the Project and company name/letterhead.

b) Required with each bid:

i) Bid Form

ii) Bid Bond (5%)

iii) Subcontractors List & Disclosure Forms

iv) Anti-Collusion Statement

v) Statement of Bidders Qualifications, and/or identification of LLC participants.

vi) Acknowledgement of Addendums

vii) Subcontractors Certification Regarding Affirmative Action

viii) DBE Submittal Form (5% DBE Goal)

ix) E-Verify Affidavit & MOU

c) Project is exempt from Sales Tax

i) Tax exemption certificate will be furnished to the General Contractor.

ii) It is the General Contractor's responsibility to ensure that copies of the certificate are provided to other necessary parties, as outlined in RSMo 144.062.3

d) Prevailing Wages and/or Davis Bacon

i) Prevailing Wage – Wage Order 31

e) Weather Delays.

i) In general, there will be no extension of Contract time due to weather.

f) Review what is needed at the time contracts is signed, such as Payment Bond (100% of base bid) and a Labor & Materials Bond (100% of base bid), Insurance with endorsements, OSHA 10-hr.

6) General Overview of the Project

a) JSP – Utility Coordination

i) Gas – Southern Star – no relocation anticipated

ii) Water – Missouri American Water - relocation in progress south side

iii) Electric – Liberty Overhead Distribution - two locations on south side by June 2025.

iv) Phone - AT&T Distribution – no conflicts; AT&T Transmission – relocation on north side by June 2025.

v) Cable/Fiber – Sparklight – various locations by June 2025

vi) Fiber – Liberty Connect – no conflicts

b) JSP – Special Seeding Mix

i) Specific to Acme Land CO (Newt Sharp); Final Seed Mix to be included with Addendum #1

c) Traffic Control

i) Phasing plan provided. Maintain access to residence and businesses at all times.

7) Addendums/Questions Received

a) May be issued to clarify questions / comments from this meeting

b) Testing Requirements?

c) Geotech Reports

d) Earthwork discussion

e) New Pay Item 48”x24” RCBC

8) Questions & Answers

9) Notes

olsson

MEETING ATTENDANCE RECORD

Project Name:	Zora Phase 2 Street Improvements
Client:	City of Joplin
Project Manager:	Jonathan Peitz
Project #:	R17-0642
Date:	April 23, 2025

Name of Attendee (Please print)	Company / Role	Phone #	Cell #	Email
DAVID ANDREWS	APAC	417.849.0821		david.andrews@apac.com
Bryson Trogdon	APAC	417-207-9229		bryson.trogdon@apac.com
SHAEL PUCKETT	ELEMENTS CONSTRUCTION CONCEPTS	417-359-8831		elementsconstructionconcepts@gmail.com
JEREMY KELLER	Crossland	620-429-1414		bids@crossland.com
Gavin Lux	Emery Sapp + Sons	417-546-0802		gavin.lux@emerysapp.com
Brad Rogers	Joplin Stone / Relix	417-439-7951		brogers@joplinstone.com
Mark Snowbarger	O&E Plumbing	417-725-5300		[redacted]eplbg01@yahoo.com
Sid DAVIS	SWMJTM	417 437-0285		Sdavis@Joplin.com
Blake Sprouls	SCI	417-682-9577		Blake@SCI96.com
Rusty Snyder	Asbell Ex	417-437-1195		rsnyder@jeffasbell.com
ANDY TANNECK	Scarlock Ind.	417-862-5088		andyt@s-ind.com
Rob Beachner	City of Joplin	417-624-0870		rbeachner@joplinmo.org
Jeremy Hagerman	CoJ	417-624-0820		jhagerman@joplinmo.org
Steve Kendall	Olsson / Design	620-670-5104		SKendall@olsson.com
Jonathan Peitz	Olsson	417-885-1763		JPeitz@olsson.com

RECAPITULATION OF QUANTITIES - BASE BID

ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	GOVERNING TECHNICAL SPECIFICATION
1	Mobilization	LS	1	JSP-0400-03
2	Contractor Furnished Construction Staking and Surveying	LS	1	JSP-0400-04
3	Miscellaneous Demolition & Removal	LS	1	JSP-1100-02
4	Clearing & Grubbing / Tree & Brush Removal	LS	1	JSP-1100-01
5	Existing Road Pavement Removal (Full Depth)	SY	15043	City 1100
6	Existing Storm Removal	LF	312	City 1100
7	Unclassified Excavation	CY	12831	City 1200
8	Embankment	CY	6297	City 1200
1 9	Embankment (Contractor Furnished)	CY	252	City 1200
10	Backfill of Unsuitable Material*	CY	2962	City 1200
11	Removal of Unsuitable Material*	CY	2962	City 1200
12	Driveway Approach Concrete (8" Concrete) (Incl. 4" MoDOT Type 5 Aggr. Base)	SY	410	City 3400
13	Driveway Asphalt Surface (6" MoDOT Bituminous Base)	SY	355	City 2200
14	Driveway Gravel Surface (6" MoDOT Type 1 Aggr. Base)	SY	142	JSP-1400-02
15	Asphalt Tack Coat	GAL	3876 1	City 2100
16	Aggregate Base (8" MoDOT Type 5)	SY	33677 1	JSP-1400-01
17	Asphaltic Concrete Surface (2") (MoDOT BP-1)	TONS	2725 1	City 2200
1 18	Asphaltic Concrete Base (8")	TONS	10955 1	City 2200
19	Temporary Surfacing Material (HMA MoDOT BP-1)	TONS	52	City 2200
20	Temporary Surfacing Material (Aggregate)(MoDOT Type 1)	TONS	158	JSP-1400-02
21	Rock Blanket	SY	133	JSP-4200-01
22	MoDOT Paved Ditch	SY	40	MoDOT 609
23	Joplin Standard Upright Curb & Gutter	LF	2088	City 3200
24	15" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	245	City 4200
25	18" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	76	City 4200
26	18" Class V RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	20	City 4200
27	24" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	343	City 4200
28	30" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	142	City 4200
29	30" Class V RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	20	City 4200
30	36" Class III RCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	82	City 4200
31	60"X36" Class III RCBC (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	132	City 4200
32	34"X22" Class III HERCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	64	City 4200
33	38"X24" Class III HERCP (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	59	City 4200
34	15" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	9	City 4200
35	18" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	2	City 4200
36	30" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	2	City 4200
37	36" RCP FES (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	2	City 4200
38	Cast-in-Place Headwalls and Wingwalls (including trenching, bedding, backfill, gaskets, and concrete collars)	EA	4	City 4400
39	Area Inlet 3'x3' I.D.	EA	2	City 4400
40	Area Inlet 4'x4' I.D.	EA	1	City 4400
41	Area Inlet 4.5'x4.5' I.D.	EA	2	City 4400
42	Area Inlet 10.5'x7' I.D.	EA	1	City 4400
43	Type C Curb Inlet 5'x3' I.D.	EA	7	City 4400
44	Combination Grated Inlet 7'x 4' I.D.	EA	2	City 4400
45	Junction Box 10.5'x3.5' I.D.	EA	1	City 4400
46	Seeding, Fertilizing and Mulch	SY	7873	City 5100
47	Special Seeding	SY	10461	JSP-5100-01
48	Erosion Control Culvert Inlet Protection	LF	700	JSP-1000-01
49	Erosion Control Curb Inlet Protection	EA	14	JSP-1000-01
50	Erosion Control Biodegradable Ditch Check	LF	1983	JSP-1000-01
51	Erosion Control Silt Sock	LF	2904	JSP-1000-01
52	Removal & Resetting Existing Signs	LS	1	JSP-2300-01
53	Permanent Signage W2-6	SF	6	JSP-2300-01
54	Permanent Signage W13-1P	SF	14	JSP-2300-01
55	Permanent Signage R1-1	SF	5	JSP-2300-01
56	Permanent Signage D3-1	SF	12	JSP-2300-01
57	Construction Signs	SF	588 1	JSP-6700-01
58	Traffic Control Signage Changeable Message Board	EA	8 1	JSP-6700-01
59	Traffic Control Signage Type III Barricade	EA	12	JSP-6700-01
60	Pavement Marking Removal	LF	1158	City 2306
61	4" Solid Yellow Thermoplastic Lane Line	LF	12462	City 2306
62	4" Broken Yellow Thermoplastic Lane Line	LF	500	City 2306
63	4" Solid White Thermoplastic Edge Line	LF	7554	City 2306
64	12' Solid Yellow Preformed Diagonal Cross Hatch Marking	LF	106	City 2306
65	Solid White Preformed Left Turn Arrow	EA	10	City 2306
66	24" Solid White Preformed Stop Bar	LF	19	City 2306
67	Barb Wire Fence (4 Strand with Steel T-Posts)	LF	4474	City 2307
68	Temporary Barb Wire Fence (Cattle Rated)	LF	4474	City 2307
1 69	48"x24" Class III RCBC (including trenching, bedding, backfill, gaskets, and concrete collars)	LF	136	City 4200

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Olsson - Civil Engineering
Missouri Certificate of Authority # 001592
1027 S. Main Street, Suite 503
Joplin, MO 64801
TEL 417.781.0643
www.olsson.com

STATE OF MISSOURI
JONATHAN W. PEITZ
NUMBER PE-2017019023
PROFESSIONAL ENGINEER
06/30/2025
JONATHAN W. PEITZ-CIVIL ENGINEER
MO# PE-2017019023

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	4/22/25	ADDED ITEMS:9,69; REVISED ITEMS 15-18; REMOVED A2 SHLDR	SMK

REVISIONS

SUMMARY OF QUANTITIES

ZORA STREET IMPROVEMENTS - PHASE 2
CITY OF JOPLIN

JOPLIN, MISSOURI

2025

drawn by: SMK/CTK
checked by: CAD
approved by: JWP
QA/QC by: ENG
project no.: 017-0642-R
drawing no.: C_QTY01_R170642
date: 4/9/2025

SHEET
11 of 120

DWG: F:\2017\0501-100\017-0642-R\40-Design\AutoCAD\Final Plans\Sheets\GNCV\C_QTY01_R170642.dwg USER: skendall
DATE: May 01, 2025 3:56pm XREFS: C_PTBLK_R170642

ASPHALT SURFACING QUANTITIES

STATION TO STATION		LOCATION	SIDE	ASPHALTIC CONCRETE SURFACE (2") (TONS)*	ASPHALTIC CONCRETE BASE COURSE (8") (TONS)*	MODOT TYPE 5 AGGREGATE BASE (8") (SQ. YD.)	ASPHALT TACK COAT (GAL.)**	TEMP SURFACING (HMA MODOT BP-1) (TONS.)*	TEMP SURFACING (MODOT TYPE 1 AGGREGATE) (TONS)*	REMARKS
110+82.18	163+88.55	CL	LT&RT	2725.1	10955.0	25015.2	3876			
121+56.7	163+88.55	CL	LT&RT			8661.7				
147+12	147+46	CL	LT					52		CONNECT EVENT CENTER DRIVE DURING CONSTRUCTION
110+82.18	163+88.55	CL	LT&RT						158	CONNECT DRIVEWAYS DURING CONST.
			TOTALS	2725	10955	33677	3876	52	158	

CURB AND GUTTER

STATION	OFFSET	STATION	OFFSET	LOCATION	SIDE	City of Joplin Standard (LN. FT.)	REMARKS	
110+82	17.5	112+00	19.0	E. ZORA	LT	118	UPRIGHT CURB	
110+82	17.5	112+00	19.0	E. ZORA	RT	118	UPRIGHT CURB	
112+00	19.0	117+08	32.0	E. ZORA	LT	515	UPRIGHT CURB	
117+41	31.0	120+68	58.0	E. ZORA	LT	371	UPRIGHT CURB	
121+08	54.0	121+57	19.0	E. ZORA	LT	86	UPRIGHT CURB	
112+00	19.0	112+12	19.0	E. ZORA	RT	12	UPRIGHT CURB	
112+38	19.0	112+65	19.0	E. ZORA	RT	27	UPRIGHT CURB	
112+90	19.0	115+60	19.0	E. ZORA	RT	270	UPRIGHT CURB	
115+86	19.0	121+57	18.8	E. ZORA	RT	571	UPRIGHT CURB	
					TOTAL	2088		

DRIVEWAY SURFACING QUANTITIES

STATION TO STATION		LOCATION	SIDE	GRAVEL SURFACE (6" MoDOT Type 1 Aggr) (SQ. YD.)	ASPHALT SURFACE (6" MoDOT Bit. Base) (SQ. YD.)	APPROACH CONCRETE (8") (SQ. YD.)
112+12	112+38	DRIVE 112+24	RT	17.4	0.0	18.9
112+65	112+91	DRIVE 112+80	RT	0.0	47.9	18.9
113+67	114+32	DRIVE 114+00	LT	0.0	0.0	56.2
115+60	115+86	DRIVE 115+73	RT	26.9	0.0	18.9
116+95	117+53	DRIVE 117+25	LT	0.0	27.3	39.1
123+79	124+01	DRIVE 123+90	LT	38.8	0.0	12.6
125+49	125+83	DRIVE 125+65	LT	0.0	24.0	16.2
126+57	126+87	DRIVE 126+70	LT	0.0	23.7	16.0
127+19	127+62	DRIVE 127+41	LT	26.3	0.0	20.7
128+25	128+58	DRIVE 128+41	LT	22.3	0.0	16.8
132+95	133+21	DRIVE 133+10	LT	0.0	28.3	13.0
143+67	143+92	DRIVE 143+80	LT	0.0	15.0	12.2
143+67	144+12	DRIVE 143+88	RT	10.6	0.0	23.4
147+12	147+46	DRIVE 147+30	LT	0.0	35.2	18.7
149+01	149+35	DRIVE 149+20	LT	0.0	29.3	18.8
151+19	151+63	DRIVE 151+40	LT	0.0	6.6	24.9
162+25	162+79	DRIVE 162+55	RT	0.0	57.4	29.9
163+19	163+51	DRIVE 163+35	RT	0.0	15.9	17.4
163+20	163+52	DRIVE 163+35	LT	0.0	44.2	17.4
TOTALS				142.3	354.8	410.0

ROCK BLANKET

STATION	LOCATION	SIDE	SQ. YD.
121+08	ZORA STREET	RT	15.5
128+60	ZORA STREET	LT	11.1
131+33	ZORA STREET	LT	44.5
131+36	ZORA STREET	RT	22.2
136+95	ZORA STREET	LT	39.6
	TOTAL		132.9

FLUME INLET & SLOPE DRAIN

STATION	LOCATION	SIDE	FLUME INLET (EACH)	SLOPE DRAIN (Ft.)
10+31	CENTER LANE	RT	1	
10+31	CENTER LANE	LT	1	
	TOTAL		2	0

PAVED DITCH

STATION	LOCATION	SIDE	SQ. YD.
156+94	ZORA STREET	LT	39.6
	TOTAL		40

CONSTRUCTION SIGNS

SIGN	SIZE	AREA	QUANTITY	TOTAL AREA	NOTES
G20-2	48X24	8.00	3	24	END ROAD WORK
R11-2	48X30	10.00	3	30	ROAD CLOSED
W4-2	48X48	16.00	4	64	MERGE (SYMBOL FROM LEFT/RIGHT)
W20-1	48X48	16.00	7	112	ROAD/BRIDGE/RAMP WORK AHEAD
W20-3	48X48	16.00	4	64	ROAD CLOSED AHEAD
W20-5	48X48	16.00	2	32	RIGHT/LEFT LANE CLOSED AHEAD
M4-9	30X24	5.00	5	25	DETOUR
R11-4	60x30	12.50	6	75	ROAD CLOSED TO THRU TRAFFIC
M4-8	30x15	3.13	9	28.17	DETOUR PLAQUE
M4-8A	24x18	3.00	2	6	END DETOUR
SPECIAL SIGN	96x48	32.00	4	128	⚠ VARIOUS ZORA STREET CLOSED
CHANGEABLE MESSAGE BOARD			8		
TYPE III BARRICADE			12		
			TOTALS	588.2	

PERMANENT SIGNAGE

STATION	OFFSET	SIGN NUMBER	SIZE	QUANTITY	SIDE	SQUARE FEET
111+59.81	+21.13	W13-1P	18X18	1	RT	2.3
111+99.35	+20.89	W2-6	30X30	1	LT	6.3
111+99.35	+20.89	W13-1P	18X18	1	LT	2.3
120+15.14	+21.78	W13-1P	18X18	1	LT	2.3
120+68.80	+31.	R1-1	30X30	1	LT	5.2
120+68.80	+31.	D3-1	18X48	2	LT	12.0
121+81.72	+18.31	W13-1P	18X18	1	RT	2.3
153+24.50	+31.41	W13-1P	18X18	1	LT	2.3
160+14.78	+16.3	W13-1P	18X18	1	RT	2.3
					TOTALS	36.9

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STATE OF MISSOURI
JONATHAN W. PEITZ
NUMBER PE-2017019023
PROFESSIONAL ENGINEER
5/1/2025
JONATHAN W. PEITZ-CIVIL ENGINEER
MO# PE-2017019023

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
⚠	5/1/2025	REMOVED A2 SHLDR, MOVED ERTHWRK TO SH 15, REV ASPHALT	SMK

REVISIONS

SUMMARY OF QUANTITIES

ZORA STREET IMPROVEMENTS - PHASE 2
CITY OF JOPLIN

JOPLIN, MISSOURI

2025

drawn by: SMK/CTK
checked by: CAD
approved by: JWP
QA/QC by: ENG
project no.: 017-0642-R
drawing no.: C_QTY01_R170642
date: 4/9/2025

SHEET
12 of 120

DWG: F:\2017\0501-1000\017-0642-R\40-Design\AutoCAD\Final Plans\Sheets\GNCV\C_QTY01_R170642.dwg
DATE: May 01, 2025 3:56pm XREFS: C_PTBLK_R170642
USER: skendall

STORM SEWER STRUCTURES & PIPE

	STATION	FEET	STATION	FEET	LOCATION	SIDE	STRUCTURE NO.	INLET (AREA) (3'X3') (Each)	INLET (AREA) (4'x4') (Each)	INLET (AREA) (4.5'x4.5') (Each)	INLET (AREA) (10.5'x7') (Each)	INLET (CURB) (5'x3') TYPE C (Each)	INLET (COMBINATION GRADED INLET) (7'x 4') (Each)	JUNCTION BOX (10.5' x 3.5") (Each)	RCP 15" (Ft.)	RCP 18" (Ft.)	CLASS V RCP 18" (Ft.)	RCP 24" (Ft.)	RCP 30" (Ft.)	CLASS V RCP 30" (Ft.)	RCP 36" (Ft.)	RCBC 48"x24" (FT)	RCBC 60"x36" (FT)	HERCP 34"x22" (Ft.)	HERCP 38"x24" (Ft.)	END SECTION 15" RC (Each)	END SECTION 18" RC (Each)	END SECTION 30" RC (Each)	END SECTION 36" RC (Each)	HEADWALL AND WINGWALL (LS)
	113+80	33.91			ZORA STREET	LT	AI-110			1																				
	113+80	33.91	114+48	34.53	ZORA STREET	LT	P-110																	63.51						
	114+48	34.53			ZORA STREET	LT	AI-120			1																				
	114+48	34.53	114+48	19	ZORA STREET	LT	P-120																		10.28					
	114+48	19			ZORA STREET	LT	CI-130					1																		
	114+48	19	114+48	19	ZORA STREET	RT	P-130																		38					
	114+48	+19.			ZORA STREET	RT	CI-140					1																		
	114+48	+19.	114+48.28	+27.5	ZORA STREET	RT	P-140																		11.08					
	114+48.28	+27.5			ZORA STREET	RT	FES-150																							1
	112+47	+19.			ZORA STREET	LT	CI-210					1																		
	112+47	+19.	112+47	+19.	ZORA STREET	LT/RT	P-210									38														
	112+47	+19.			ZORA STREET	RT	CI-220					1																		
	112+47	+19.	114+48	+19.	ZORA STREET	RT	P-220											196												
	116+00	+19.			ZORA STREET	LT	CI-230					1																		
	119+00	+19.	116+00	+19.	ZORA STREET	LT/RT	P-230									37.96														
	116+00	+19.			ZORA STREET	RT	CI-240					1																		
	119+00	+19.	114+48	+19.	ZORA STREET	RT	P-240											147.13												
	120+19.20	+34.64			ZORA STREET	LT	AI-310		1																					
	120+18.20	+34.64	120+18.20	+19.	ZORA STREET	LT	P-310												10.64											
	120+18.20	+19.			ZORA STREET	LT	CI-320					1																		
	120+18.20	+19.	120+18.20	+19.	ZORA STREET	LT/RT	P-320												37.78											
	120+18.20	+19.			ZORA STREET	RT	GI-330						1																	
	120+18.20	+17.3	121+11.16	+17.3	ZORA STREET	RT	P-330												86.93											
	121+11.16	+17.3	121+24.52	+19.55	ZORA STREET	RT	P-340												6.36											
	121+24.52	+17.3			ZORA STREET	RT	GI-420						1																	
	121+20.15	+34.73			ZORA STREET	LT	AI-410				1																			
	121+20.15	+34.73	121+11.61	+17.3	ZORA STREET	LT/RT	P-410															95.46								
	121+11.61	+17.3			ZORA STREET	LT	JB-430							1																
	121+11.61	+17.3	121+09.18	+31.04	ZORA STREET	LT	P-415															40.18								
	121+09.18	+31.04			ZORA STREET	LT	FES-400																							1
	131+33.24	+32.03			ZORA STREET	LT	WING WALL-510																							1
	131+33.24	+32.03	131+35.74	+29.18	ZORA STREET	LT/RT	P-510																132.08							
	131+35.74	+29.18			ZORA STREET	RT	WING WALL-520																							1
	156+94.53	+32.05			ZORA STREET	LT	FES-710																						1	
	156+94.53	+32.05	156+93.83	+35.83	ZORA STREET	LT/RT	P-710														82.45									
	156+93.83	+35.83			ZORA STREET	RT	FES-720																						1	
	127+24.68	+25.9			ZORA STREET	LT	AI-810	1																						
	127+24.68	+25.9	128+25	+30.31	ZORA STREET	LT	P-810								100.42															
	128+25	+30.31			ZORA STREET	LT	AI-820	1																						
	128+25	+30.31	128+57.76	+31.75	ZORA STREET	LT	P-820								35.04															
	128+57.76	+31.75			ZORA STREET	LT	FES-830																			1				
	123+76.14	+34.83			DRIVEWAY STA 123-90 LT	LT	FES-123-1																				1			
	123+76.14	+34.83	124+01.14	+33.95	DRIVEWAY STA 123-90 LT	LT	P-123										20													
	124.01.14	+33.95			DRIVEWAY STA 123-90 LT	LT	FES-123-2																				1			
	132+96.76	+35.71			DRIVEWAY STA 133-10 LT	LT	FES-133-1																					1		
	132+96.76	+35.71	133+20.66	+33.53	DRIVEWAY STA 133-10 LT	LT	P-133													24										
	133+20.66	+33.53			DRIVEWAY STA 133-10 LT	LT	FES-133-2																					1		
	143+67.44	+39.65			DRIVEWAY STA 143-80 LT	LT	FES-143-1																			1				
	143+67.44	+39.65	143+91.44	+39.65	DRIVEWAY STA 143-80 LT	LT	P-143								18															
	143+91.44	+39.65			DRIVEWAY STA 143-80 LT	LT	FES-143-2																			1				
	143+65.65	+29.86			DRIVEWAY STA 143-90 RT	RT	FES-144-1																			1				
	143+65.65	+29.86	144+11.65	+29.47	DRIVEWAY STA 143-90 RT	RT	P-144								40															
	144+11.65	+29.47			DRIVEWAY STA 143-90 RT	RT	FES-144-2																			1				
	147+12.87	+40.53			DRIVEWAY STA 147-30 LT	LT	FES-147-1																			1				
	147+12.87	+40.53	147+44.86	+39.59	DRIVEWAY STA 147-30 LT	LT	P-147								26															
	147+44.86	+39.59			DRIVEWAY STA 147-30 LT	LT	FES-147-2																			1				
	149+02.01	+29.28			DRIVEWAY STA 149-20 LT	LT	FES-149-1																			1				
	149+02.01	+29.28	149+33.94	+31.31	DRIVEWAY STA 149-20 LT	LT	P-149								26															
	149+33.94	+31.31			DRIVEWAY STA 149-20 LT	LT	FES-149-2																			1				
							TOTAL	2	1	2	1	7	2	1	245	76	20	343	142	24	82	136	132	64	59	9	2	2	2	4

⚠

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STATE OF MISSOURI
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PROFESSIONAL ENGINEER
06/30/2025

JONATHAN W. PEITZ-CIVIL ENGINEER
MO# PE-2017019023

REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	4/22/2025	ADDED 48"X24" RCBC TOTAL LF	SMK

SUMMARY OF QUANTITIES

ZORA STREET IMPROVEMENTS - PHASE 2
CITY OF JOPLIN

JOPLIN, MISSOURI

2025

drawn by: SMK/CTK
checked by: CAD
approved by: JWP
QA/QC by: ENG
project no.: 017-0642-R
drawing no.: C_QTY01_R170642
date: 4/9/2025

SHEET
13 of 120

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DATE: May 01, 2025 2:44pm XREFS: C_PTBLK_R170642
USER: skendall

⚠

EARTHWORK											
			UNCLASSIFIED EXCAVATION EXCAVATION		EMBANKMENT					EARTHWORK BALANCE	
STATION TO STATION		LOCATION	TOTAL CUT (Cu. Yd.)	EXISTING PAVEMENT (Cu. Yd.)	ON SITE (Cu. Yd.)	EXCESS MATERIAL (Cu. Yd.)	VMF (+15%)	HAUL IN (Cu. Yd.)	REMARKS	INDIVIDUAL PHASE TOTAL	CUMULATIVE BALANCE (Cu. Yd.)
110+82.18	116+95	TTC PHASE 1A	816	359	335	481	553		BOTH SIDES	553.15	553.15
116+95	117+53	TTC PHASE 1B	150	49	10	140	161	0	DRIVEWAY	161	714.15
117+53	121+56	TTC PHASE 1B	331	235	707	-376	0	0	BOTH SIDES	-376	338.15
121+56	128+65	TTC PHASE 2.1	855	53	702	153	176	0	SOUTH SIDE	175.95	514.1
128+65	140+00	TTC PHASE 2.2	1384	51	2150	-766	0	252	SOUTH SIDE	-766	-251.9
140+00	159+30	TTC PHASE 2.3	2745	93	885	1860	2139	0	SOUTH SIDE	2139	1887.1
121+56	128+65	TTC PHASE 3.1	1183	337	252	931	1071	0	NORTH SIDE	1070.65	2957.75
128+65	140+00	TTC PHASE 3.2	1039	542	503	536	616	0	NORTH SIDE	616.4	3574.15
140+00	159+30	TTC PHASE 3.3	2194	929	752	1442	1658	0	NORTH SIDE	1658.3	5232.45
159+30	163+88.88	TAPER TO EXISTING	2134	254	1	2133	2453	0	BOTH SIDES	2452.95	7685.4
		TOTAL	12831	2904	6297		8827	252		7685.4 *	

* EXCESS MATERIAL

REMOVAL OF EXISTING STRUCTURES (For Information Only)							
STATION	STATION	LOCATION	SIDE	ITEM	QUANTITY	UNITS	NOTES
110+82.18	163+88.88	ZORA		PAVEMENT REMOVAL	130479	SF	
112+15.89	112+32.60	DRIVEWAY STA 112+25 RT	RT	GRAVEL DRIVEWAY	430	SF	
112+51.56	112+76.63	DRIVEWAY STA 112+80 RT	RT	PAVEMENT DRIVEWAY	417	SF	
113+72.08	114+26.26	DRIVEWAY STA 114+00 LT	LT	PAVEMENT DRIVEWAY	669	SF	
115+59.11	115+74.30	DIRVEWAY STA 115-75 RT	RT	GRAVEL DRIVEWAY	374	SF	
117+03.13	117+46.30	DRIVEWAY STA 117+25 LT	LT	PAVEMENT DRIVEWAY	710	SF	
120+57.26	121+14.08	CENTER LANE	RT	PAVEMENT REMOVAL	1129	SF	
123+78.50	123+99.73	DRIVEWAY STA 123+90 LT	LT	GRAVEL DRIVEWAY	469	SF	
125+49.62	125+78.69	DRIVEWAY STA 125+65 LT	LT	PAVEMENT DRIVEWAY	333	SF	
126+56.06	126+80.02	DRIVEWAY STA 126+70 LT	LT	PAVEMENT DRIVEWAY	340	SF	
127+19.66	127+53.68	DRIVEWAY STA 127+40 LT	LT	GRAVEL DRIVEWAY	377	SF	
128+18.81	128+60.30	DRIVEWAY STA 128+40 LT	LT	GRAVEL DRIVEWAY	428	SF	
132+93.21	133+18.90	DRIVEWAY STA 133+10 LT	LT	GRAVEL DRIVEWAY	215	SF	
132+93.21	133+18.90	DRIVEWAY STA 133+10 LT	LT	CONCRETE DRIVEWAY	198	SF	
143+73.74	143+86.19	DRIVEWAY STA 143+80 LT	LT	GRAVEL DRIVEWAY	257	SF	
143+67.39	144+09.77	DRIVEWAY STA 143+90 RT	RT	GRAVEL DRIVEWAY	788	SF	
147+11.11	147+47.30	DRIVEWAY STA 147+30 LT	LT	GRAVEL DRIVEWAY	422	SF	
149+07.02	149+29.52	DRIVEWAY STA 149+20 LT	LT	PAVEMENT DRIVEWAY	400	SF	
151+17.16	151+61.91	DRIVEWAY STA 151+40 LT	LT	GRAVEL DRIVEWAY	246	SF	
162+19.95	162+83.43	DRIVEWAY STA 162+55 RT	RT	GRAVEL DRIVEWAY	820	SF	
163+25.75	163+45.73	DRIVEWAY STA 163+35 LT	LT	CONCRETE DRIVEWAY	363	SF	
163+24.97	163.45.18	DRIVESAY STA 163+35 RT	RT	CONCRETE DRIVEWAY	352	SF	
110+82.18	160+55.33	ZORA	RT	TELEPHONE LINE REMOVAL AND REPLACE	4973	LF	BY OTHERS ⚠
110+98.81		ZORA	RT	WATER METER RELOCATE	1	EA	BY OTHERS
111+39.95		ZORA	RT	TELEPHONE PEDISTAL RELOCATE	2	EA	BY OTHERS
111+48.92		ZORA	RT	MAILBOX RELOCATE	1	EA	
112+13.79		ZORA	RT	WATER METER RELOCATE	1	EA	BY OTHERS
114+12.49		ZORA	RT	TELEPHONE PEDISTAL RELOCATE	1	EA	BY OTHERS
114+32.90		ZORA	RT	TELEPHONE PEDISTAL RELOCATE	1	EA	BY OTHERS
114+46.85	114+45.16	ZORA	LT/RT	REMOVE 15" RCP	33	LF	
114+43.74	115+53.35	ZORA	RT	FENCE REMOVAL	110	LT	
115+51.53		ZORA	RT	RELOCATE FIRE HYDRANT	1	EA	BY OTHERS
115+53.44		ZORA	RT	RELOCATE MAIL BOX	1	EA	
116+73		ZORA	RT	WATER METER RELOCATE	1	EA	BY OTHERS
117+22.53		ZORA	RT	TELEPHONE PEDISTAL RELOCATE	1	EA	BY OTHERS
117+23.61	162+36.23	ZORA	RT	RELOCATE EXISTING FENCE	4513	LF	
118+84.73		ZORA	LT	TELEPHONE PEDISTAL RELOCATE	1	EA	BY OTHERS
120+29.53		ZORA	LT	SIGN RELOCATION	1	EA	
120+38.49	120+73.55	ZORA	LT/RT	REMOVE 18" CMP	50	LF	
121+05.37		ZORA	LT	WATER METER RELOCATE	1	EA	BY OTHERS
121+08.22	121+10.27	ZORA	LT/RT	REMOVE 24" RCP	38	LF	
123+76.94		ZORA	LT	TELEPHONE PEDISTAL RELOCATE	1	EA	BY OTHERS
126+86.47		ZORA	LT	RELOCATE MAIL BOX	1	EA	
127+96.88		ZORA	LT	RELOCATE MAIL BOX	1	EA	
128+63.01		ZORA	LT	TELEPHONE PEDISTAL RELOCATE	1	EA	BY OTHERS
129+06.55		ZORA	RT	TELEPHONE PEDISTAL RELOCATE	1	EA	BY OTHERS
128+50		ZORA	LT	CONCRETE BLOCKS	17	LF	
128+63.01	129+06.55	ZORA	LT/RT	TELEPHONE LINE REMOVAL AND REPLACE	1	EA	BY OTHERS
131+29.10	131+30.26	ZORA	LT/RT	REMOVE 42" RCP & INLET	36	LF	
113+34.96	131+36.42	ZORA	LT/RT	REMOVE 42" RCP & INLET	37	LF	
133+01.60	133+17.20	ZORA	LT	REMOVE 22" CMP	16	LF	
133+19.13		ZORA	LT	MAILBOX RELOCATE	1	LF	
134+33.15		ZORA	RT	SIGN RELOCATION	1	EA	
136+76		ZORA	LT	CONCRETE BLOCKS	2	EA	
138+84.72		ZORA	RT	RELOCATE EXISTING GUY WIRE	1	EA	BY OTHERS
142.32.06		ZORA	RT	TELEPHONE PEDISTAL RELOCATE	1	EA	BY OTHERS
143+70.17	143+90.23	ZORA	LT	REMOVE 12" RCP	20	FT	
143+68.57	144+08.35	ZORA	RT	REMOVE 14" RCP	40	FT	
147+12.22	147+46.05	ZORA	LT	REMOVE CULVERT	34	FT	
147+52.97	160+38.91	ZORA	LT	RELOCATE EXISTING FENCE	1285	FT	
148+94.50		ZORA	LT	MAILBOX RELOCATE	1	EA	
149+03.25	149+30.46	ZORA	LT	REMOVE 9" STEEL CULVERT	27	FT	
151+19.45		ZORA	LT	MAILBOX RELOCATE	1	EA	
153+23.37		ZORA	LT	REMOVE SIGN	1	EA	
156+94.41	156+94.12	ZORA	LT/RT	REMOVE 36" CMP	31	LF	
160+18.36		ZORA	RT	REMOVE SIGN	1	EA	
160+55.33		ZORA	RT	TELEPHONE PEDISTAL RELOCATE	1	EA	BY OTHERS
160+40		ZORA	LT	REMOVE SIGN	1	EA	
160+41		ZORA	LT	REMOVE SIGN	1	EA	

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STATE OF MISSOURI
JONATHAN W. PEITZ
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PROFESSIONAL ENGINEER
12/31/2025

JONATHAN W. PEITZ-CIVIL ENGINEER
MO# PE-2017019023

REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	4/22/2025	ADDED "BY OTHERS" TO ITEM NOTE; ADDED EARTHWORK TABLE	SMK

SUMMARY OF QUANTITIES

ZORA STREET IMPROVEMENTS - PHASE 2
CITY OF JOPLIN

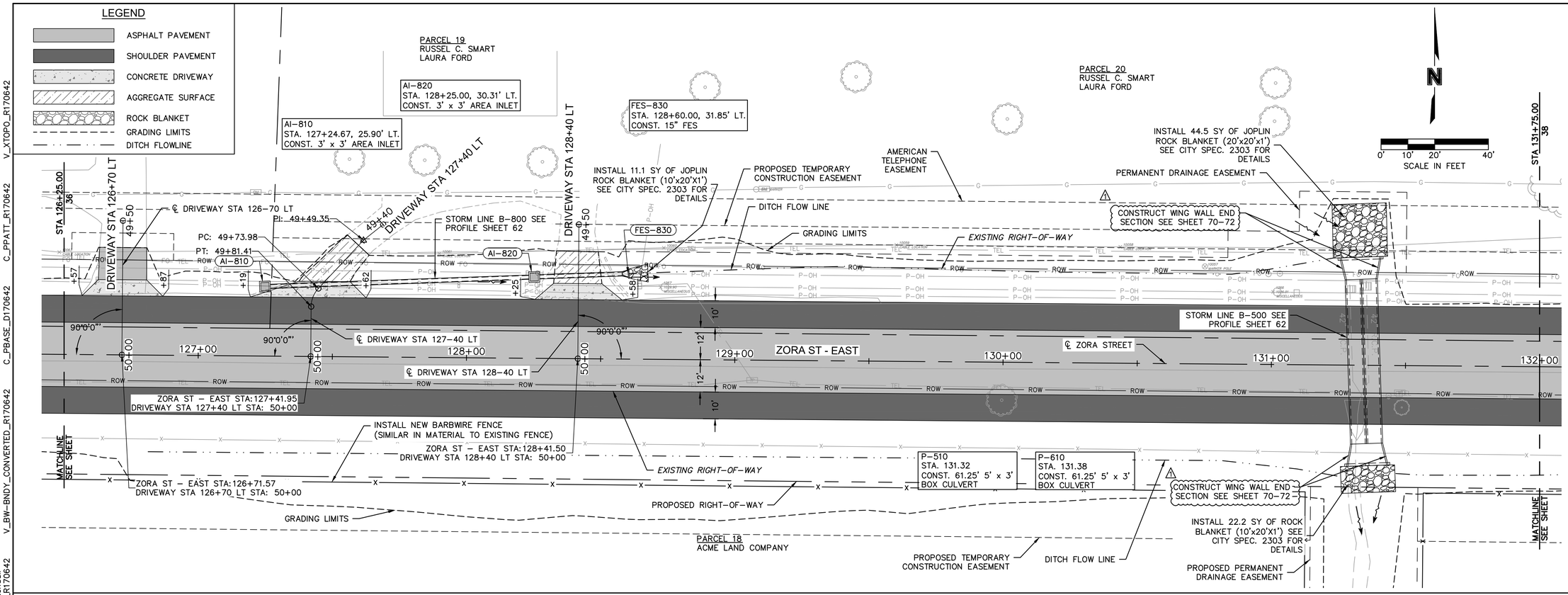
2025

JOPLIN, MISSOURI

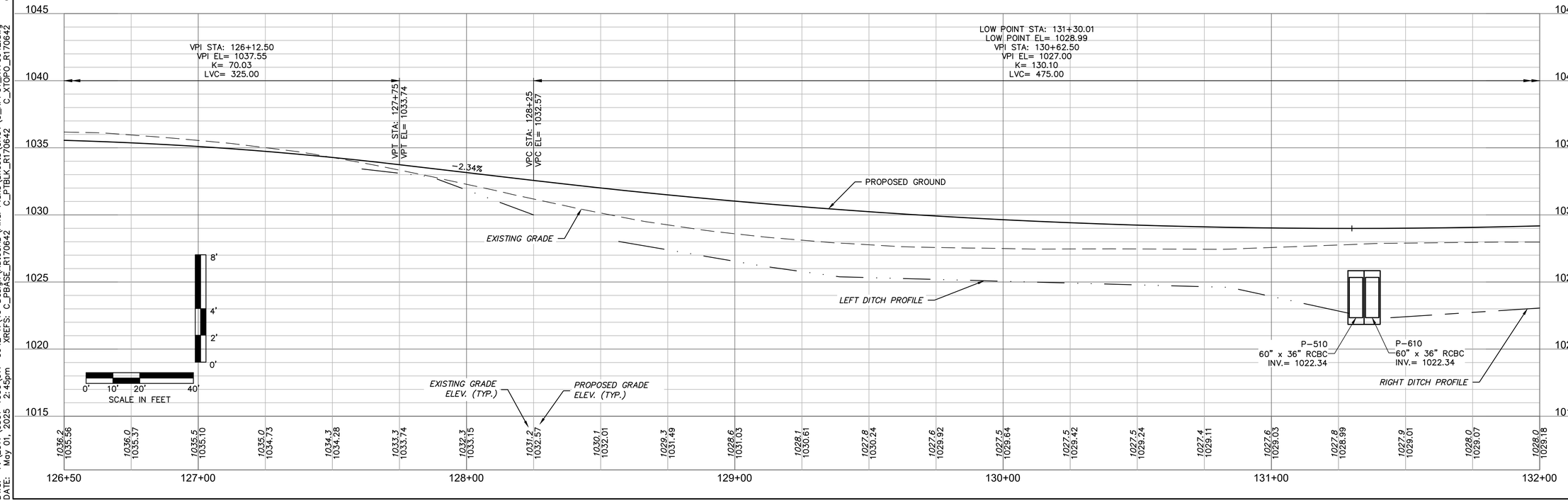
drawn by: SMK/CTK
checked by: CAD
approved by: JWP
QA/QC by: ENG
project no.: 017-0642-R
drawing no.: C_QTY01_R170642
date: 4/9/2025

SHEET
15 of 120

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DATE: May 01, 2025 2:44pm XREFS: C_PTBLK_R170642
USER: skendall



ZORA ST - EAST (126+50 - 132+00)



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STATE OF MISSOURI
JONATHAN W. PEITZ
NUMBER PE-2017019023
PROFESSIONAL ENGINEER
My commission expires 6/30/2025
JONATHAN W. PEITZ-CIVIL ENGINEER
MO# PE-2017019023

REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION	BY
1	4/22/2025	REVISED SEE SHEET NOTE	SMK

ROADWAY PLAN & PROFILE

ZORA STREET IMPROVEMENTS - PHASE 2
CITY OF JOPLIN

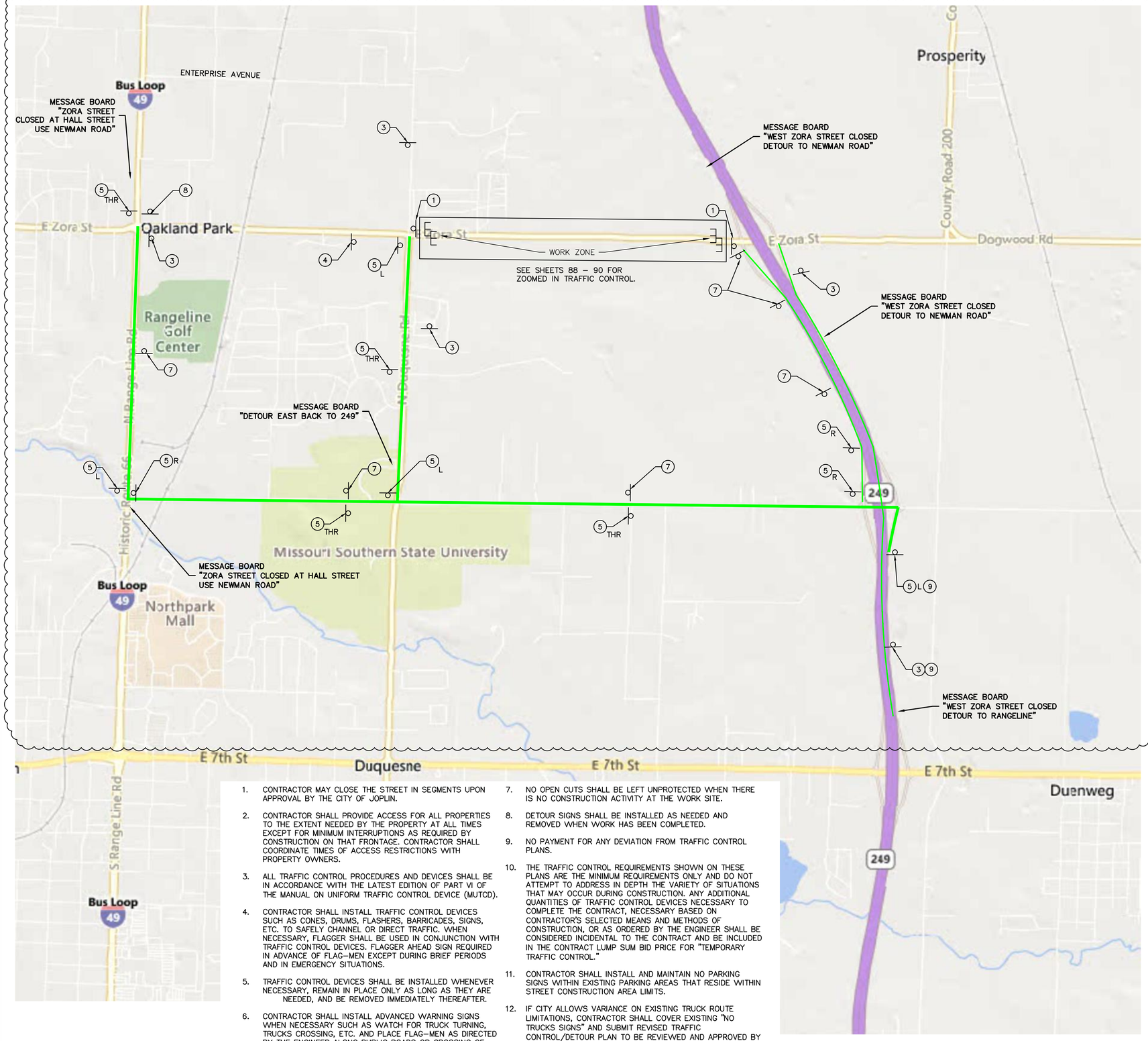
2025

JOPLIN, MISSOURI

drawn by:	SMK/CTK
checked by:	CAD
approved by:	JWP
QA/QC by:	ENG
project no.:	017-0642-R
drawing no.:	C_RPP01_R170642
date:	4/9/2025

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USER: skendall
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1. CONTRACTOR MAY CLOSE THE STREET IN SEGMENTS UPON APPROVAL BY THE CITY OF JOPLIN.
2. CONTRACTOR SHALL PROVIDE ACCESS FOR ALL PROPERTIES TO THE EXTENT NEEDED BY THE PROPERTY AT ALL TIMES EXCEPT FOR MINIMUM INTERRUPTIONS AS REQUIRED BY CONSTRUCTION ON THAT FRONTAGE. CONTRACTOR SHALL COORDINATE TIMES OF ACCESS RESTRICTIONS WITH PROPERTY OWNERS.
3. ALL TRAFFIC CONTROL PROCEDURES AND DEVICES SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF PART VI OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICE (MUTCD).
4. CONTRACTOR SHALL INSTALL TRAFFIC CONTROL DEVICES SUCH AS CONES, DRUMS, FLASHERS, BARRICADES, SIGNS, ETC. TO SAFELY CHANNEL OR DIRECT TRAFFIC. WHEN NECESSARY, FLAGGER SHALL BE USED IN CONJUNCTION WITH TRAFFIC CONTROL DEVICES. FLAGGER AHEAD SIGN REQUIRED IN ADVANCE OF FLAG–MEN EXCEPT DURING BRIEF PERIODS AND IN EMERGENCY SITUATIONS.
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7. NO OPEN CUTS SHALL BE LEFT UNPROTECTED WHEN THERE IS NO CONSTRUCTION ACTIVITY AT THE WORK SITE.
8. DETOUR SIGNS SHALL BE INSTALLED AS NEEDED AND REMOVED WHEN WORK HAS BEEN COMPLETED.
9. NO PAYMENT FOR ANY DEVIATION FROM TRAFFIC CONTROL PLANS.
10. THE TRAFFIC CONTROL REQUIREMENTS SHOWN ON THESE PLANS ARE THE MINIMUM REQUIREMENTS ONLY AND DO NOT ATTEMPT TO ADDRESS IN DEPTH THE VARIETY OF SITUATIONS THAT MAY OCCUR DURING CONSTRUCTION. ANY ADDITIONAL QUANTITIES OF TRAFFIC CONTROL DEVICES NECESSARY TO COMPLETE THE CONTRACT, NECESSARY BASED ON CONTRACTOR'S SELECTED MEANS AND METHODS OF CONSTRUCTION, OR AS ORDERED BY THE ENGINEER SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT AND BE INCLUDED IN THE CONTRACT LUMP SUM BID PRICE FOR "TEMPORARY TRAFFIC CONTROL."
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NOT TO SCALE

Legend

- TEMPORARY SIGN
- TYPE III BARRICADE
- PROPOSED DETOUR

END ROAD WORK
G20-2
1

ROAD CLOSED
R11-2
2

ROAD WORK AHEAD
W20-1
3

ROAD CLOSED AHEAD
W20-3
4

DETOUR
M4-9 L/R/THROUGH
5

ROAD CLOSED TO THRU TRAFFIC
R11-4
6

DETOUR
M4-8
7

END DETOUR
M4-8a
8

ZORA STREET
CLOSED WEST OF 249
FOLLOW DETOUR
9

olsson
Olsson - Civil Engineering
Missouri Certificate of Authority # 001592
1027 S. Main Street, Suite 503
Joplin, MO 64801
TEL 417.781.0643
www.olsson.com

STATE OF MISSOURI
JONATHAN W. PEITZ
NUMBER PE-2017019023
PROFESSIONAL ENGINEER
5/1/2025
JONATHAN W. PEITZ–CIVIL ENGINEER
MO# PE–2017019023

REVISIONS

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1	5/1/2025	REVISED DETOUR SIGNING, ADDED MESSAGE BOARDS	SMK

TRAFFIC CONTROL PLANS
SOUTH DETOUR ROUTE

ZORA STREET IMPROVEMENTS - PHASE 2
CITY OF JOPLIN

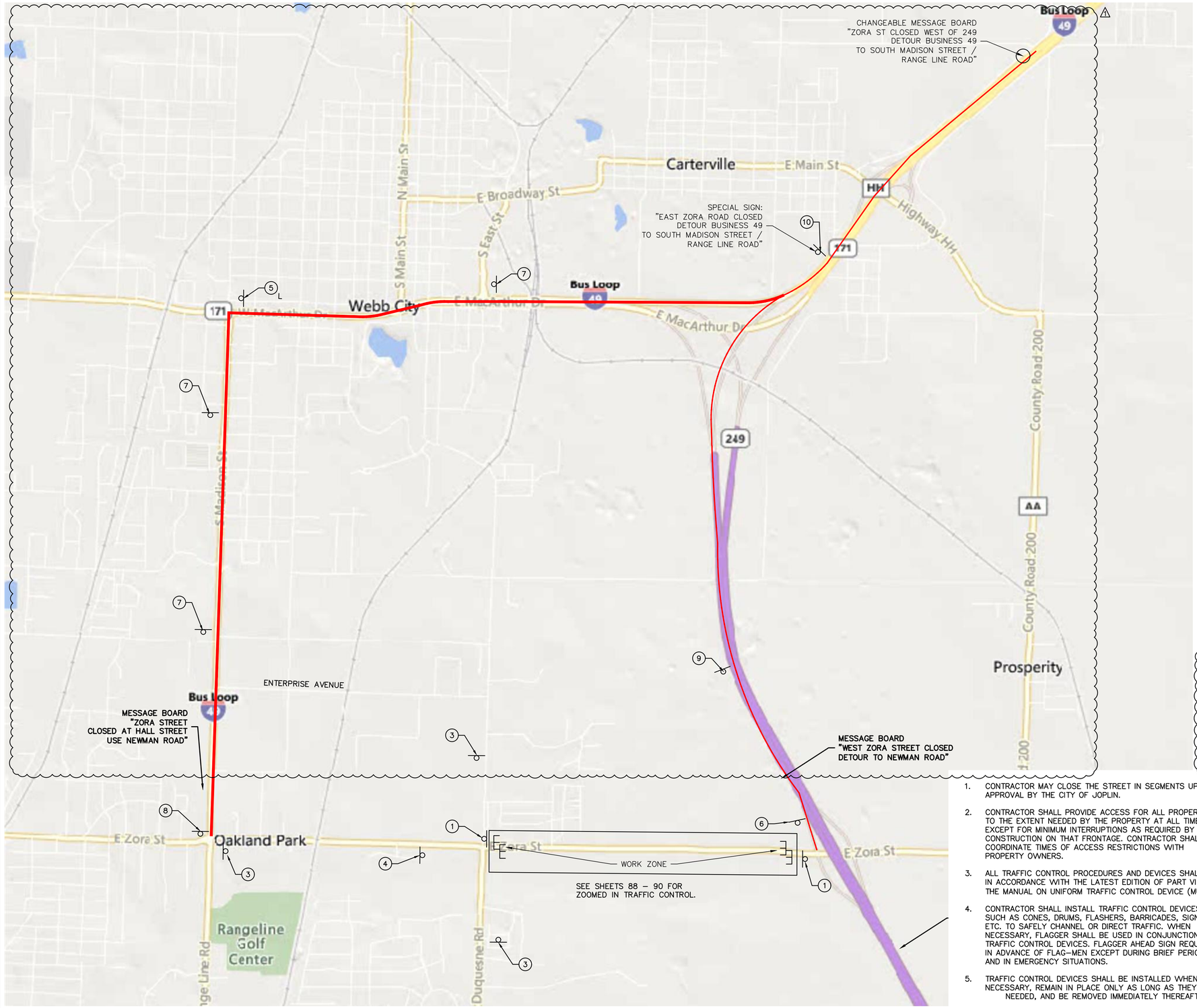
JOPLIN, MISSOURI

2025

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Legend

- TEMPORARY SIGN
- TYPE III BARRICADE
- PROPOSED DETOUR

N

NOT TO SCALE

(1) END ROAD WORK — G20-2

(2) ROAD CLOSED — R11-2

(3) ROAD WORK AHEAD — W20-1

(4) ROAD CLOSED AHEAD — W20-3

(5) DETOUR — M4-9 L/R/THROUGH

(6) ROAD CLOSED TO THRU TRAFFIC — R11-4

(7) DETOUR — M4-8

(8) END DETOUR — M4-8a

(9) ZORA STREET — CLOSED WEST OF 249 — FOLLOW DETOUR

(10) ZORA STREET — CLOSED WEST OF 249 USE BUS. 49 TO MADISON ST/ RANGELINE — FOLLOW DETOUR

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STATE OF MISSOURI
JONATHAN W. PEITZ
NUMBER PE-2017019023
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5/1/2025

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MO# PE–2017019023

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REVISIONS

TRAFFIC CONTROL PLANS
NORTH DETOUR ROUTE

ZORA STREET IMPROVEMENTS - PHASE 2
CITY OF JOPLIN

JOPLIN, MISSOURI

2025

drawn by: SMK/CTK
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USER: skendall

SAMPLE BID BOND

BID BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we _____
_____
as principal and _____
as surety, are held and firmly bound unto the (City of Joplin)_____ in the penal sum of_____
_____ Dollars ($) to be paid to the commission to be credited to the state road fund, the principal and surety binding themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____

THE CONDITION OF THIS OBLIGATION is such that

WHEREAS the principal is submitting herewith a bid to the commission on route(s) _____
_____
in _____ County(ies),
project (s) _____
_____
for construction or improvement of state highway as set out in said bid;

NOW THEREFORE, if the commission shall accept the bid of the principal and if the principal shall properly execute and deliver to the commission the contract, contract bond, and evidence of insurance coverage in compliance with the requirements of the bid, the specifications, and the provisions of section 227.100 RSMo, to the satisfaction of the commission, then this obligation shall be void and of no effect, otherwise to remain in full force and effect.

In the event the said principal shall, in the judgment of the commission, fail to comply with any requirement as set forth in the preceding paragraph, then the state of Missouri, acting by and through the commission, shall immediately and forthwith be entitled to recover the full penal sum above set out, together with court costs, attorney's fees, and any other expense of recovery.

The principal and surety hereby certify that the document is the original or a verbatim copy of the bid bond form furnished by the Commission, in accordance with Sec 102.9 of the Missouri Standard Specifications for Highway Construction.

_____
Principal

SEAL By_____
Signature

_____
Surety

SEAL By_____
Signature of Attorney in Fact

NOTE: This bond must be executed by the principal, and by a corporate surety authorized to conduct surety business in the state of Missouri.

PALMERTON & PARRISH, INC.

GEOTECHNICAL & MATERIALS ENGINEERS
MATERIALS TESTING LABORATORIES
ENVIRONMENTAL SERVICES

4168 W. KEARNEY ST.
SPRINGFIELD, MO 65803
Ph: (417) 864-6000
www.ppimo.com

July 1, 2016

Mr. Herb Bailey, P.E.
Bartlett & West, Inc.
544 Columbia
Lawrence, KS 66049

RE: Zora Street Widening - Geotechnical Investigation: Conceptual Phase
Joplin, Missouri
PPI Job Number: 229492

Dear Mr. Bailey:

This letter provides an initial evaluation of the geotechnical and geological conditions of the widening proposed along East Zora Street between Range Line Road and Missouri Highway 249. This study was performed under a Master Agreement for Professional Services between Bartlett & West, Inc. and Palmerton & Parrish. Inc. (PPI) and authorized by Mr. Herb Bailey, P.E., representing Bartlett & West, Inc. via an email dated April 21, 2016 and performed in accordance with revised proposal dated March 1, 2016 to Mr. Herb Bailey, P.E.

EXECUTIVE SUMMARY

This executive summary was prepared for the convenience of the reader. However, users of this report should read the entire document for better comprehension and explanation.

One (1) historically mapped mine feature was identified along/adjacent to the planned widening of East Zora Street during document review. Four (4) roadway repairs suspected of being karst features have been brought to our attention by the City of Joplin. Additionally, a small pond suspected of being a sinkhole has been brought to our attention by the City of Joplin.

Upon site reconnaissance, the historically mapped mine feature and four (4) suspected karst features were considered worthy of further review and evaluation. Additionally, there are several small areas east of Missouri Highway 249 on East Zora Street that have been repaired and/or appear to have signs of failure. These features are discussed below and recommendations for additional investigations in the Preliminary Plan Phase are discussed in the Conclusions and Recommendations section below. These features are presented on Figures 2 and 3.

The exact size and location of the historically mapped mine feature is unknown. MDNR documents indicate that the center of this feature is approximately 50 ft. south of the eastbound lane. Historical aerial photos indicate that the northern extent of this feature is potentially 15 ft. south of the east bound lane. Additional investigation is recommended to discern if any portion of this feature lies within the planned roadway widening.

The four (4) roadway repairs suspected of being karst features do not exhibit observable evidence at the surface of being karst related. However, these features are in close proximity and it is our opinion that an additional investigation would be useful in this area to discern if subsurface conditions indicate potential karst activity.

The pond suspected of being a sinkhole is likely manmade, but the possibility exists that is karst in nature. However, additional investigation is deemed unnecessary because the roadway

widening is anticipated to be located beyond the required 25 ft. sinkhole setback as stated in the City of Joplin Stormwater Management Criteria.

The small areas of pavement repairs east of Hwy 249 do not exhibit specific evidence of being related to karst or mining features. However, the Missouri Hwy 249 corridor is heavily impacted by historic mining activities and the potential exists for mine features to exist in the planned roadway widening in this area.

REVIEW OF AVAILABLE RECORDS, MAPPING & SURVEYS

The following records, maps and surveys were reviewed which document or indicate the possible presence of mines in the area of the project:

- *Joplin East 7.5 Minute Topographic Quadrangle*, 1978, United States Geological Survey;
- Google Earth, Historical Aerial Photos;
- USGS Earth Explorer, Historical Aerial Photos;
- CalTopo, Shaded Relief Map, http://caltopo.com/map.html;
- United States Department of Agriculture, Web Soil Survey, http://websoilsurvey.sc.egov.usda.gov/;
- University of Missouri, Digital Library, Tri-State Mining Map Collection, http://digital.library.umsystem.edu/cgi/i/image/image-idx?page=index;c=mssuic; and
- Missouri Department of Natural Resources, GeoStrat, http://dnr.no.gov/geostrat/

Of all of the above records reviewed, only the Missouri Department of Natural Resources (MDNR) identified a single mine within approximately 50 ft. of the proposed East Zora Street centerline. MDNR Inventory of Mines Map is overlain on Figures 1 and 2. No sinkholes were identified in the records reviewed above.

Historical aerial photos indicate that the majority of the surrounding area is heavily impacted by historical mining activity. However, only one (1) area within the proposed roadway widening appears to be potentially mining impacted. This potential feature is the same area identified in MDNR records.

USDA soils map of the project site indicates the majority of soils types anticipated to be encountered are primarily silty/gravelly loams. The possibility for some clays with shrink/swell potential exists, but are not anticipated to be the primary subgrade material exposed.

In 2008, PPI performed a geotechnical investigation and pavement analysis for the widening and resurfacing of Hall Street from East Zora Street north approximately 7,500 feet to the railroad tracks. Site conditions for the widening and resurfacing of Hall Street were favorable with an average California Bearing Ratio (CBR) value of 5 assumed for pavement analysis with the assumption that areas of very poor pavement were removed and replaced.

SITE RECONNAISSANCE

Prior to a site visit, it was brought to our attention that there have been sinkhole repairs at four (4) locations on East Zora Street 150 ft. east of Wellington Street. These locations were marked in the field by Allgeier, Martin and Associates Inc. (AMA) and gps coordinates were provided to PPI by Mr. Herb Bailey, P.E. Additionally, coordinates were provided for a pond that is suspected of being a sinkhole on the north side of East Zora Street east of North Center Lane approximately 0.3 miles. These locations are presented on Figure 2.

On May 19, 2016, Joshua Elson, G.R.I.T., of PPI visited the above referenced site to observe the one (1) mapped mine feature, observe the four (4) repaired areas and to observe if any sinkholes, mines and other geological features may be apparent on the surface within 100 ft. of the proposed centerline of the East Zora Street widening.

At the time of the site visit, close observation of the ground surface within 100 ft. of the centerline was not possible in all areas due to thick vegetation, residential structures and privacy fences.

The center of the mapped mine feature is located approximately 0.5 mi. west on East Zora Street from the entrance ramp onto Missouri Highway 249 and south approximately 50 ft. of the edge of pavement. At the time of the site visit no depression was observed at the ground surface. However, mine tailings were observed on the ground surface at the fence row and in the general vicinity of the suspect feature. An additional investigation would be required to confirm whether this is a mining feature and if the location is in conflict with widening the roadway. The location of this feature is presented on Figure 2.

There are several areas of repaired pavement and potential subsidence on East Zora Street within a section of roadway 1000 ft. west of Hwy 249. While these areas are relatively small, the area surrounding Hwy 249 is heavily impacted by historical mining activities and the potential exists that this area of proposed roadway widening could be impacted by historical mining activity. These areas are presented on Figure 2.

There are four (4) roadway repairs approximately 150 ft. east of Wellington Street that have been reported by City of Joplin personnel as sinkhole repairs. No observable evidence on the ground surface would suggest that the roadway repairs are karst related. However, all of these features are relatively close in proximity and the potential exists that they are karst related. Additional investigation would be required to confirm whether these features are karst related and if they conflict with planned roadway widening. These features are presented on Figure 3.

The pond surveyed by AMA, is understood to be a potential sinkhole. Historical aerial photos indicate that the pond has been holding water since prior to 1996 and was not existent prior to 1961. It is most likely a manmade feature, and additional investigation would be required to confirm if this feature is a sinkhole. However, the southern edge of the pond is approximately 80 ft. from the northern edge of current pavement on East Zora Street. If this feature is a sinkhole, the roadway widening would most likely be beyond the 25 ft. minimum setback of a sinkhole as stated in the City of Joplin Stormwater Management Criteria. The pond is presented on Figure 2.

CONCLUSIONS & RECOMMENDATIONS

Mine Features and Potential Mine Features:

Mine Feature 1 is estimated by MDNR records to be centrally located approximately 50 ft. south of the edge of pavement, as presented on Figure 2. However, the size and exact location of this feature is unknown and historical aerial photos indicate this the feature could potentially impact the planned roadway widening. Further study of this feature is recommended to provide geotechnical recommendations should this feature be within the planned roadway widening. This can be accomplished by drilling soil sample borings between the current pavement and south towards the center of the suspected area.

Missouri Highway 249 Corridor is heavily impacted by historical mining activities. Several locations on East Zora Street within 1000 ft. of Hwy 249 show signs of pavement failure and/or have been repaired. Soil conditions in this area will be investigated with soil sample borings planned during the Geotechnical Investigation. No mining features were observed in this area. However, the possibility exists for a mining feature to lie within the planned roadway widening. Should a feature be encountered during construction, a Geotechnical Engineer from PPI should be contacted to observe the feature and prepare repair recommendations or further investigation procedures.

Potential Karst Features:

Repairs 1 – 4 do not exhibit evidence on the ground surface of being karst related. However, the close proximity of these features and the nature of the geology of the region renders the possibility that these features could potentially be karst. Further study of this area is recommended to discern if subsurface conditions exhibit characteristics of karst activity. This can be accomplished by drilling soil sample borings to bedrock depth in and around the repaired areas.

While it is not anticipated, should any karst or mining features not observed in this preliminary investigation be encountered during construction, a Geotechnical Engineer from PPI should be contacted to provide additional investigation or repair recommendations.

CLOSURE

We hope this information will assist you in evaluation of this site. Obviously, the information presented above is based upon very preliminary concepts. Our office will be happy to refine this evaluation as more information becomes available. We understand that a Geotechincal investigation will be performed once preliminary widening plans are prepared. Incorporating investigation of any mining/karst features along the alignment would be an efficient use of geotechnical borings, if performed in conjunction with the drilling performed for the roadway.

Should you have any questions or need additional information, please do not hesitate to contact our office.

PALMERTON & PARRISH, INC.
By:

STATE OF MISSOURI
BRANDON ROSS PARRISH
NUMBER PE-2010000852
PROFESSIONAL ENGINEER

Brandon R. Parrish, P.E.
Vice-President

Joshua D. Elson, G.R.I.T.
Geologist

JDE:BRP:jde

Attachments: Figure 1 – Site Location Plan
Figure 2 – Mine/Karst Feature Location Plan 1
Figure 3 – Mine/Karst Feature Location Plan 2

FIGURES

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SCALE
1" = 1100'

LEGEND

- Site Location
- MDNR Mine Location

Project: East Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Site Location Plan

DATE: June 30, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
GEOTECHNICAL AND MATERIALS ENGINEERS/
MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 1



LEGEND

- Roadway Area with Pavment Damage
- Pond
- MDNR Mine Location

SCALE
1" = 1100'

Project: East Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Mine/Karst Feature Location Plan 1

DATE: June 30, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
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FIGURE 2

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg



LEGEND

Roadway Repair Location

SCALE
1" = 70'

Project: East Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Mine/Karst Feature Location Plan 2

DATE: June 30, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
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MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 3

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg

GEOTECHNICAL ENGINEERING REPORT

ZORA STREET WIDENING

RANGE LINE ROAD TO MO ROUTE 249

JOPLIN, MISSOURI

Prepared for:

BARTLETT & WEST
1719 Southridge Drive
Jefferson City, Missouri

Prepared by:



Springfield, MO
4168 W. Kearney Springfield, MO 65803
Call 417.864.6000 Fax 417.864.6004
www.ppimo.com

PPI PROJECT NUMBER: 229492

September 6, 2016

PALMERTON & PARRISH, INC.

GEOTECHNICAL & MATERIALS ENGINEERS
MATERIALS TESTING LABORATORIES
ENVIRONMENTAL SERVICES

4168 W. Kearney Street.
Springfield, MO 65803
Ph: (417) 864-6000
www.ppimo.com

September 6, 2016

Bartlett & West
1719 Southridge Drive
Jefferson City, MO 65109

Attn: Mr. Herb Bailey, P.E.
Herb.bailey@bartwest.com

RE: Geotechnical Engineering Report
Zora Street Widening – Range Line Road to MO Route 249
City Project #TC0608
Joplin, Missouri
PPI Project Number: 229492

Dear Mr. Bailey:

Attached, please find the report summarizing the results of the geotechnical investigation conducted for the above referenced project. We appreciate this opportunity to be of service. If you have any questions, please don't hesitate to contact this office.

PALMERTON & PARRISH, INC.
By:

Brandon R. Parrish P.E.
Vice-President

PALMERTON & PARRISH, INC.
By:

Brad R. Parrish, P.E.
President

STATE OF MISSOURI
BRANDON ROSS PARRISH
NUMBER PE-2010000852
9/6/16
PROFESSIONAL ENGINEER

Submitted: One (1) Electronic .pdf Copy

BRP/BRP/cmc

PALMERTON & PARRISH, INC.

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FIGURES

FIGURES 1 THRU 5 – BORING LOCATION PLAN

APPENDICES

APPENDIX I – BORING LOGS & KEY TO SYMBOLS
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APPENDIX V – PAVEMENT ANALYSIS OUTPUT
APPENDIX VI – IMPORTANT INFORMATION REGARDING YOUR GEOTECHNICAL REPORT

EXECUTIVE SUMMARY

A Geotechnical Investigation was performed within the existing roadway along Zora Street from Range Line Road to Missouri Route 249 in Joplin, Missouri. Zora Street is currently a two-lane roadway along the proposed reconstruction alignment. It is understood that the alignment between Range Line Road and Duquesne Road will primarily consist of a two-lane roadway with a bike lane in either direction with a center turn lane. Curb and gutter with a sidewalk is anticipated along this section. From Duquesne Road to Missouri Route 249, the new roadway section will consist of a two-lane roadway with a center turn lane and 4 ft. shoulders. This section of roadway will be ditched versus construction of curb and gutter. Existing pavements that will be utilized are anticipated to receive a 2-inch overlay while new full depth asphalt construction will occur in the widening areas and in areas of full depth replacement of the existing roadway. The new roadway will be constructed along the same approximate alignment as the existing Zora Street with a new roundabout constructed at the intersection of Duquesne Road. Cut and fill depths of less than 2 ft. are anticipated along the entire roadway alignment.

A total of seventeen (17) pavement cores and shallow borings were drilled within the pavement along the proposed new reconstruction alignment. The borings extended to depths ranging from 5.6 to 10 ft. below the existing pavement surface. Based upon the information obtained from the borings and subsequent laboratory testing, recommendations for roadway reconstruction/repair were developed. Important geotechnical considerations for the project are summarized below. However, users of the information contained in the report must review the entire report for specific details pertinent to geotechnical design considerations.

- A conceptual phase Geotechnical Investigation consisting of a site reconnaissance and research was prepared and submitted July 1, 2016 by PPI for this project. During this conceptual phase investigation, several mining and possible karst features were documented within the proposed Zora Street widening alignment. Several roadway borings were strategically located within the areas of these features during this investigation, but a full scale study for

each of these features was not performed and was outside the scope of this investigation. These features are further discussed in Section 10.0 of this report;

- The existing pavement along the proposed roadway alignment consists of asphalt ranging in thickness from 5 to 11 inches overlying aggregate baserock ranging in thickness from 2 to 12 inches;
- The soil subgrade underlying pavements typically consisted of a clayey gravel or a lean/fat clay with appreciable rock fragments extending to boring completion depth. Many borings contained existing fill material below the pavement section which transitions to natural overburden soil at a relatively shallow depth. However, existing fill was encountered to boring completion depth within Boring 49+25 WB following auger refusal encountered at 5.6 ft. below the existing pavement surface. This boring is in a previously patched area where pavement subsidence has been reported by the City of Joplin to have occurred;
- Average minimum California Bearing Ratio (CBR) values correlated from Dynamic Cone Penetrometer (DCP) test data for all borings ranged from 2 to greater than 10 (primarily 6 to greater than 10);
- In general, stiff soil subgrade materials were encountered below the existing pavement section with the exception of borings located at stations 80+00 and 123+00 (above 2 ft.). Additional subgrade preparation and/or subgrade stabilization procedures should be anticipated in these areas exhibiting a low CBR value; and
- Palmerton & Parrish, Inc. should be retained for construction observation and construction materials testing. Close monitoring of subgrade preparation work is considered critical to achieve adequate subgrade performance.

GEOTECHNICAL ENGINEERING REPORT

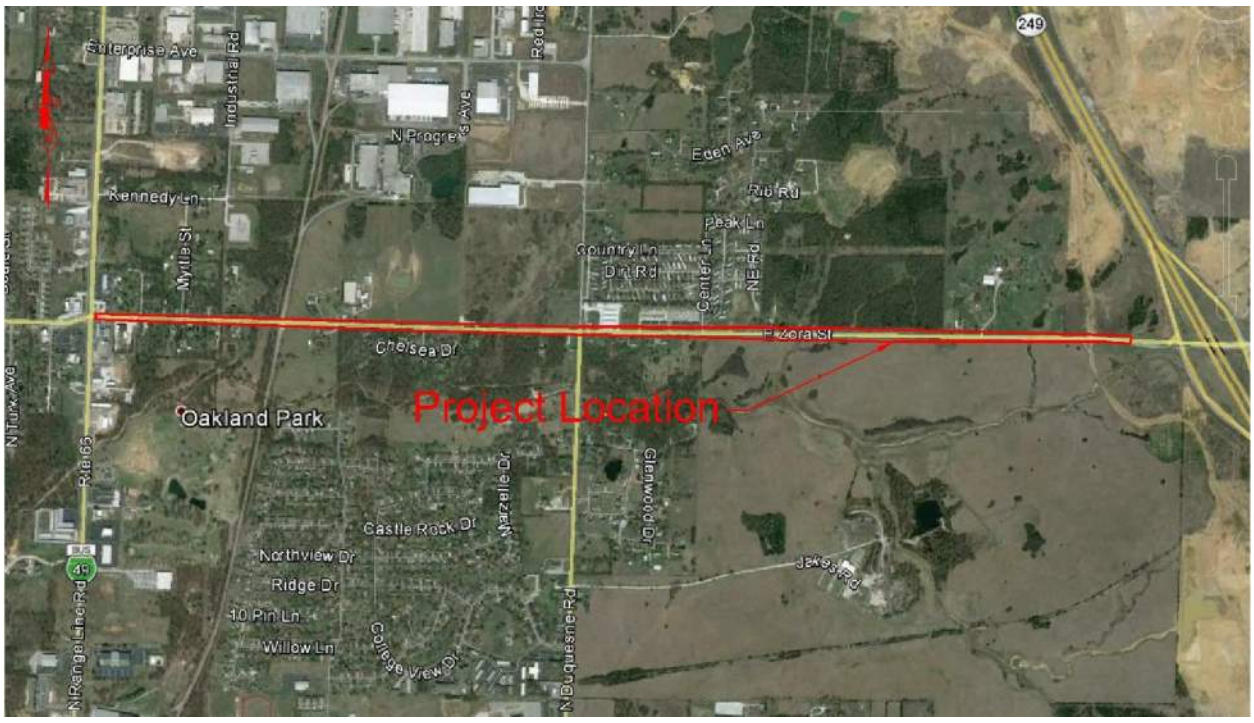
ZORA STREET WIDEINING

RANGE LINE ROAD TO MO ROUTE 249

JOPLIN, MISSOURI

1.0 INTRODUCTION

This is the report of the Geotechnical Investigation performed for the planned pavement improvement project along Zora Street between Range Line Road and Missouri Route 249 in Joplin, Missouri. This investigation was authorized by a letter proposal dated March 1st, 2016, performed under a Master Agreement for Professional Services between Bartlett & West and Palmerton & Parrish, Inc. (PPI). The approximate roadway improvement alignment is shown below.



The purpose of the Geotechnical Investigation was to provide information for design and construction planning, and to aid in site development. PPI's scope of services included field and laboratory investigation of the subsurface conditions in the vicinity of the proposed project site, engineering analysis of the collected data, development of recommendations for design and construction planning, and preparation of this engineering report.

2.0 PROJECT DESCRIPTION

Item	Description
Site Layout	See Figures 1 through 5: Boring Location Plan.
Grading	Cut and/or fill depths along the planned improvement alignment are anticipated to range from 1 to 2 ft. to achieve top of pavement elevation.
Planned Improvements	**Between Range Line Road and Duquesne Road:** Roadway Widening on both the north and south sides of the existing roadway to allow for construction of a two-lane runway with a center turn lane and 3 ft. bike lanes on both sides of the road with a 6 ft. sidewalk located on the south side of the roadway. Where full depth replacement is not performed, the existing pavement will be overlaid. **Between Duquesne Road and Missouri Route 249:** Widening to the south of the existing roadway, with the exception of a short segment of roadway that will be widened to the north just east of Duquesne, to allow for construction of a two-lane roadway with a center turn lane and 4 ft. shoulders in each direction. This section of roadway will include ditches on each side of the road. Where full depth replacement is not performed, the existing pavement will be overlaid.
Public Utilities	Both buried and aerial public utilities are present along this alignment of roadway, not only within the right-of-way, but also crossing Zora Street.

3.0 SITE DESCRIPTION

Item	Description
Physical Location	Zora Street between Range Line Road and Missouri Route 249 in Joplin, Missouri.
Current Ground Cover	Asphalt within the existing roadway and grass/brush/tree cover within widening areas.
Existing Topography	Gently rolling terrain.
Drainage Characteristics	Poor to Fair.

4.0 SUBSURFACE INVESTIGATION

Subsurface conditions were investigated through completion of pavement coring and subsurface borings, as well as subsequent laboratory testing.

4.1 Subsurface Borings

Subsurface conditions at this site were investigated by drilling and sampling a total of seventeen (17) pavement cores/sample borings located within the existing roadway along the planned improvement alignment. Boring locations were selected and staked in the field by PPI. Borings were identified as the station number in which they were located and were drilled at the approximate boring locations shown on Figures 1 through 5: Boring Location Plan.

Logs of the borings showing descriptions of soil and rock units encountered, as well as results of field and laboratory tests and a “Key to Symbols” are presented in Appendix I. A two-man flagging crew was mobilized during field drilling operations since the roadway alignment is currently two-lane only. Traffic control measures were in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). The traffic control plan was approved by the City of Joplin prior to mobilization. The Missouri One-Call System was also notified prior to the investigation to assist in locating buried public utilities.

The existing pavement section was removed at the boring locations using a 6-inch diameter diamond impregnated core barrel powered by a CME 75 truck-mounted drill rig. The pavement cores were obtained and sampling/coring procedures were implemented. After pavement removal, the aggregate baserock thickness was measured and then a subgrade sample was obtained using a split spoon sampler while performing the Standard Penetration Test (SPT) in general accordance with ASTM D1586. Drilling and sampling procedures extended to depths ranging from 5.6 to 10 ft. below the existing pavement surface. Please refer to Appendix II for general notes regarding boring logs and additional soil sampling information. In addition, please refer to Appendix III for pavement core photographs.

4.2 Dynamic Cone Penetrometer

Dynamic Cone Penetrometer (DCP) testing was performed within all boring locations, except Sta. 49+25 EB, at the ground surface after core removal, prior to drilling. The dual mass DCP is used to assess the in-situ strength of undisturbed soil and/or compacted materials. The operator drives the DCP tip into soil and/or compacted materials by lifting the sliding hammer to the handle then releasing it. The total penetration for a given number of blows is measured and recorded, which is then used to estimate the in-situ California Bearing Ratio (CBR) or shear strength from an appropriate correlation chart using equations recommended by the U.S. Army Corps of Engineers. Graphical results from DCP testing are presented in Appendix IV.

4.3 Laboratory Testing

Collected samples were sealed and transported to the laboratory for further evaluation and visual examination. Laboratory soil testing included the following:

- Moisture Content (ASTM D2216);
- Grain Size Analysis (ASTM D6913); and
- Atterberg Limits (ASTM D4318).

5.0 SITE GEOLOGY

The general site area is underlain at depth with Mississippian Age Limestone. The upper surface of this limestone is often irregular due to the effects of differential vertical weathering and solution activities. Limestone is often overlain by discontinuous beds of Pennsylvanian Shale. Overburden soils at the site are typically residual having developed through chemical and physical weathering of the underlying parent bedrock. The boundary between overburden soils and comparatively unweathered limestone is usually abrupt, while the boundary between overburden soils and shale is generally a more gradual transition.

5.1 Mining Activity

The project alignment is located with an area of previous intense lead and zinc mining activities, which occurred within the Joplin area, part of the Tri-State Lead Belt, from the mid-1800's to the 1950's. As previously stated, PPI performed a Conceptual Phase Geotechnical Investigation published July 1, 2016, which presents the published mining activity that may affect this project.

6.0 GENERAL SITE & SUBSURFACE CONDITIONS

Based upon subsurface conditions encountered within the borings drilled at the project site, generalized subsurface conditions are summarized in the table below. Soil stratification lines on the boring logs indicate approximate boundary lines between different types of soil and rock units based upon observations made during drilling. In-situ transitions between soil and some rock types are typically gradual.

Description	Borings	Approx. Depth to Bottom of Stratum	Material Encountered	Moisture	Consistency/ Density
Stratum 1A	All	5 to 11 inches	Asphalt	-	-
Stratum 1B	All	2 to 12 inches	Aggregate Baserock	Slightly Moist	Medium Dense
Stratum 2	15+00, 31+50, 46+00, 49+25 WB*, 58+00, 68+25, 80+00, 97+00 & 123+00	2 to 8 ft.	Fill – Chert Sand & Gravel, Lean or Fat Clay, Clayey Gravel or Mine Tailings	Slightly Moist to Moist	Medium Dense to Dense or Medium Stiff to Stiff
Stratum 3	46+00, 80+00, 88+00, 115+00 & 124+62	3.8 to 8 ft.	Lean Clay or Silty Lean Clay	Moist	Stiff to Hard
Stratum 4	All, Except 49+25 WB	Boring Completion or Top of Shale (Sta. 105+00)	Fat Clay with Gravel or Clayey Gravel	Moist	Stiff or Dense to Very Dense
Stratum 5	102+00	Boring Completion (9.5 ft.)	Limestone	-	Medium Hard
Stratum 6	105+00	Boring Completion (9.5 ft.)	Shale	-	Soft
*Sta. 49+25 was discontinued in fill following spoon refusal at a depth of 5.6 ft.					

6.1 Groundwater

Shallow groundwater was not observed within the borings on the date drilled. Groundwater levels should be expected to fluctuate with changes in site grading, precipitation, and regional groundwater levels. Groundwater may be encountered at shallower depths during wetter periods.

7.0 SUBGRADE PREPARATION & EARTHWORK

Minimal cut and fill depths ranging from 1 to 2 ft. are anticipated along the project alignment. The existing subgrade soils encountered below 5 to 11 inches of asphalt and 2 to 12 inches of aggregate baserock were primarily logged as medium stiff to stiff and medium dense to dense with primarily moderate to high average minimum CBR values correlated from field DCP testing. However, two (2) soft subgrade areas were identified at Sta. 88+00 and 123+00. These areas are understood to receive new pavement in the widening areas and overlay of the existing asphalt. If these subgrades

are exposed, stabilization will most likely be required to achieve a stable subgrade. Based upon preliminary plans, top of pavement elevations will be approximately 1 ft. higher than existing pavements within these areas. Subgrade preparation prior to pavement construction is considered essential to long term pavement performance. Please refer to the sections below for subgrade preparation alternates.

7.1 Subgrade Preparation – Widening Areas or Complete Reconstruction

In future widening areas where no pavements exist currently, or in areas where the existing pavement will be completely removed and reconstructed, the initial phase of subgrade preparation should include clearing/grubbing of all vegetative matter and topsoil stripping or removal of the existing pavement section. Although borings could not be drilled within the widening areas, topsoil stripping on the order of 6 to 8-inches should be anticipated. The second phase of subgrade preparation should include proof-rolling of the pavement subgrade, as well as other areas to receive controlled fill, if any, prior to fill placement and/or pavement construction in order to assure a stable subgrade. Proof rolling consists essentially of rolling the ground surface with a loaded tandem axle dump truck or similar heavy rubber tired construction equipment and noting any areas which rut or deflect during rolling. Proof rolling, undercutting and replacement should be monitored by a qualified representative of PPI. **The stability of the exposed subgrade will be greatly influenced by the time of year and related soil moisture conditions, as well as provisions for drainage provided during construction. Any unstable subgrades should be stabilized using the methods outlined below in Section 7.3.**

7.2 Subgrade Preparation – Filling on Existing Asphalt

In areas where the existing pavement is to be left in place and filled upon, but not overlaid, pavements may be broken up with a large diameter vibratory compactor, pneumatic breaker, or any other means necessary to allow for downward migration of water and provide a suitable base for baserock/fill placement. Prior to fill placement, all areas should be proof-rolled and approved, as described above.

7.3 Structural Fill & Subgrade Stabilization

Widespread subgrade improvement is not anticipated at the project site. However, subgrade improvements may be desired prior to pavement construction within isolated areas of lower CBR values that do not pass a proof-rolling. Options for subgrade stabilization or improvement are presented in the sections below.

7.3.1 Removal & Replacement w/ Select Earth Fill

Although it is not anticipated, areas where deeper fill is required to achieve finish subgrade elevations, or after undercut of soft subgrade conditions, earth fill should be placed in no greater than 8-inch loose lifts and compacted to at least 95% of maximum density at a moisture content within 2% of optimum moisture content for CL soil types with a liquid limit less than 45 and between 0 and 4% above optimum for CH and CL-CH soil types with a liquid limit greater than or equal to 45, if utilized, as determined by Standard Proctor Procedures (ASTM D-698). This method of stabilization is typically the more expedient and economical method in the general site area. Adequate field density and moisture content tests should be performed to insure compliance with project specifications. A testing frequency of at least one field density test for each 5000 sq. ft. of fill lift, but no less than 3 tests per lift is recommended within pavement areas unless project specifications require a more frequent interval.

7.3.2 Rock Fill

In areas of soft subgrade identified during proof-rolling, if any, removal of soft soils and replacement with select earth fill or rock fill is recommended. Rock fill is the recommended filling medium, if deeper soft soil conditions are present. Rock fill can be utilized to stabilize the subgrade so that proper compaction of overlying soil fill can be achieved. Rock fill used to stabilize undercut bottoms should consist of 4 to 6 inch top size stone. Rock material should be placed in horizontal layers having a maximum thickness of 12-inches and compacted with a minimum of three (3) passes with a heavy self-propelled vibratory roller. Rock fill should not be dumped into place, but should be distributed in horizontal lifts by blading and dozing in such a manner as to ensure proper placement into final

position. Finer material including rock fines and limited soil fines should be worked into the rock voids during this blading operation. Excessive soil and rock fine particles preventing aggregate interlock should be prohibited. The testing of rock fill quality should include the requirements that a representative of the Geotechnical Engineer be present daily, but not necessarily continuously during the placement of the fill to observe the placement of rock fill in order to determine fill quality and to observe that the contractor's work sequence is in compliance with this specification. Progress reports indicative of the quality of the fill should be made at regular intervals to the Owner. If improper placement procedures are observed during the placement of the fill, the Contractor should be informed, and no additional fill should be permitted on the affected area until the condition causing the low densities has been corrected and the fill has been reworked to obtain sufficient density.

7.3.3 Chemical Stabilization

If additional subgrade improvements are required even after scarifying and recompacting, another option for additional subgrade improvement in deeper, soft areas is chemical stabilization using fly ash, Portland cement, cement kiln dust, or lime. Additional recommendations regarding chemical stabilization can be provided, if desired.

7.3.4 Geogrid

In lieu of or in addition to the subgrade improvement methods discussed above, geogrid reinforcement may be used in areas with deeper soft subgrade to reduce the required baserock thickness. A geogrid reinforcement product typically specified on similar roadway projects is Tensar Triax TX-5, or equivalent. Geogrids are typically placed at the base of the baserock course, above the soil subgrade in pavement areas or at the bottom of undercuts is soft areas that have been removed. Additional computation is required to identify the cost savings associated with reduced baserock thickness using geogrid. However, once baserock thicknesses are computed in softer subgrade areas, PPI can help evaluate whether the use of geogrid on this project would be beneficial.

7.4 Subgrade Support Parameters

At the time of this investigation, the aggregate baserock and soil subgrade primarily exhibited moderate to high CBR values. Please refer to the table below for the average minimum CBR value at each boring location. Existing pavement thicknesses have also been presented within this table.

Boring Location	Asphalt (in.)	Aggregate Baserock (in.)	Average Minimum CBR Value
15+00	8	12	10
23+00	7	4	7
31+50	5	4	10
39+50	9	7	10
46+00	9	8	8
49+25EB	9	9	-
49+25WB	8.75	6	10 (Above 2.3 ft.) & 4 (Below 2.3 ft.)
58+00	8.5	5.5	>10
68+25	10.5	8	>10
80+00	11	2	7
88+00	8.25	9	2
97+00	10.5	2	>10
102+00	8.5	5.5	5
105+00	10	7	6
115+00	10	4	10
123+00	5	5	2 (Above 2 ft.) & 10 (Below 2 ft.)
124+62	6.25	5	10

For on-site gravelly soils scarified and adjusted to within the specified soil moisture range and recompacted to at least 95% of Maximum Standard Proctor density (ASTM D 698), a minimum CBR value of 5.0 should be appropriate. Based upon previous knowledge of the soils in the general site area, the design CBR value may be increased to 8.0 using chemical stabilization and 12.0 for at least 24 inches of rock fill below pavement sections. Benefits of chemical stabilization and rock fill are an increase in the design CBR value, as well as providing a working platform for pavement construction. Research has shown that chemically stabilized soils sometimes suffer strength loss

over time due to leaching. Alternate subgrade improvement methods are discussed below, with associated Design CBR values for all subgrade stabilization methods presented in the table below.

Subgrade Improvement Methods & Associated CBR Values	
Subgrade Improvement Method	**Design CBR Value**
Scarify & Recompact Existing Stiff Gravelly Clay Subgrade & Evaluate By Proof-Rolling	5.0
Remove & Replace (Select Earth Fill, i.e. containing at least 35% rock fragments retained on the No. 4 sieve)	6.0
Chemical Stabilization of Soil Subgrade using cement, flyash or hydrated lime	8.0
Remove & Replace (Rock Fill)	12.0

8.0 PAVEMENT MILLING & OVERLAY

Due to the medium stiff/dense to stiff/dense subgrade soils encountered below existing pavements and generally thick existing asphalt, milling and overlay is considered an option regarding pavement rehabilitation. This option is not considered equivalent to complete removal and replacement due to utilizing existing asphalt pavement with a reduced pavement life. In addition, the soil subgrade cannot be observed and repaired where needed when the existing asphalt is not completely removed. However, complete removal and replacement of existing pavement may not be economically feasible, and milling/overlay is a lower cost repair option with a lesser design life as compared to complete reconstruction in these areas. Based upon preliminary plans, a 2-inch overlay has been proposed for all existing pavements that will not be completely reconstructed. A pavement analysis was performed to evaluate whether or not a 2-inch overlay would be adequate for all the different pavement sections encountered. Results of this pavement analysis are summarized in in Section 9.2 below.

Based upon the information obtained during this study, as well as the understanding that the existing roadway was constructed many years ago, it is anticipated that isolated areas of deteriorated asphalt may be exposed. All highly deteriorated areas should be removed to stable subgrade soils and backfilled with asphalt pavement in accordance with the project asphalt specifications. A second alternative is to overlay all deteriorated areas with a petro-mat or equivalent, to resist reflective pavement cracking. It is

recommended that the pavement fabric extend a minimum of 5 feet beyond the highly deteriorated areas in all directions. In addition to deteriorated area, petro-mat or equivalent is recommended to be placed along the longitudinal interface between existing pavements and new pavements to reduce the potential for reflective cracking.

9.0 PAVEMENT

Refer to Section 7.0 regarding subgrade preparation for pavements. It is anticipated that any new pavements associated with this project will be constructed of an asphaltic concrete wearing surface placed over a base over a granular base course.

9.1 Asphalt Pavement

If asphaltic paving is selected, the aggregate base may be a granular compacted crushed limestone with a gradation and quality conforming to the requirements of the Missouri Department of Transportation, Standard Specification 1007 for either Type 1 or Type 5 aggregates. The maximum lift thickness for the granular base is 4 inches. Granular base thicknesses in excess of 4 inches should be placed in multiple lifts with each lift being of approximate equal thickness. The granular base should be compacted to at least 100% of Standard Proctor Compaction (ASTM D-698). The base may also be a bituminous base.

Asphaltic concrete, both base and surface, should conform to the applicable volumetric and gradational requirements of MoDOT Standard Specification 401 except that sampling for testing compliance during laydown should be from hot mix samples taken behind the paver. Asphaltic concrete should be compacted to 92 to 96% of Maximum Theoretical Specific Gravity (ASTM D-2041). 95% of 50-Blow Marshall compaction is also accepted as a minimum compaction if the void content (Va) is within the specification value range. Substitution of an appropriate Superpave Mix Design (MoDOT Section 403) is permitted. SP 190C or SP 250C can be used in place of the bituminous base. SP 190C or SP 125C may be used for the surface. All bituminous mix designs should have been prepared or verified within six (6) months of the date of placement on this project and should recognize the tendency of the mineral aggregate to “fine up” in the mixer.

9.2 Asphalt Thickness – New Construction

A site specific pavement analysis was performed for the above project site for the new pavements constructed in widening and reconstruction areas. The pavement analysis was performed using WINPAS, a pavement design software following AASHTO Guide for Pavement Structures, as well as traffic data provided by the City of Joplin. Assumptions used during this analysis included;

- 5,370 vehicles per day with 5% trucks (2015 values);
- 7,979 vehicles per day with 5% trucks (2035 values);
- Soil subgrade with a CBR of 5 corresponding to existing stiff gravelly clay subgrades passing proof-rolling;
- Design life of 20 years;
- Initial serviceability = 4.2;
- Terminal serviceability = 2.5 (minor arterial);
- Reliability = 90%; and
- Overall deviation = 0.45.

Please refer to Appendix V for a summary of the actual number and type of trucks assumed.

Based upon the above traffic loading and assumed subgrade conditions, a required structural number of approximately 4.69 was computed. Based upon this structural number, a pavement section consisting of 2-inches of asphalt concrete wearing surface, over 8-inches of asphaltic base, over 8-inches of aggregate baserock is required. This pavement section is equal to the City of Joplin minimum standard pavement section for roadways classifying as an arterial. As a result, the standard City of Joplin pavement section is applicable for use in all complete reconstruction and widening areas.

9.3 Asphalt Thickness – Overlays

An additional pavement analysis was performed for the sections of existing roadway where the asphalt will be overlaid. As presented in Section 7.3 above, existing pavement thicknesses vary considerably along the proposed project alignment. At the stations investigated, the required overlay thickness was computed using the pavement analysis assumptions presented above. It should be noted that the layer coefficient of the existing pavement was reduced, as compared to new asphalt, to account for the age and deterioration of the existing asphalt. Refer to the following table for the computed overlay thickness at each station investigated where future overlay is anticipated. The values shown are the required overlay thicknesses to bring the existing pavement section equivalent to a new standard pavement section. It should be noted that these values utilize the CBR obtained at each individual station.

Boring Location	Existing Asphalt (in.)	Existing Aggregate Baserock (in.)	Anticipated Construction	Computed Required Asphalt Overlay (inches)
15+00	8	12	Overlay	0.5
23+00	7	4	Full Depth Replacement	-
31+50	5	4	Overlay	5
39+50	9	7	Overlay	1
46+00	9	8	Full Depth Replacement	-
49+25EB	9	9	Overlay	0.5
49+25WB	8.75	6	Overlay	1.5
58+00	8.5	5.5	Overlay	2
68+25	10.5	8	Full Depth Replacement	-
80+00	11	2	Full Depth Replacement	-
88+00	8.25	9	Overlay	5.5
97+00	10.5	2	Overlay	1.5
102+00	8.5	5.5	Full Depth Replacement	-
105+00	10	7	Overlay	2
115+00	10	4	Full Depth Replacement	-
123+00	5	5	Overlay	4.5
124+62	6.25	5	Overlay	3.5

As shown in the table above, a 2-inch overlay, as is shown on the preliminary plans, is considered sufficient for some of the areas investigated, but not for others. Where a 2-inch overlay is not considered sufficient, the existing pavement section is relatively thin, a low subgrade CBR was obtained, or both. Although a 2-inch overlay will improve the life of the existing pavement, it will not be equivalent to the new pavement, constructed using the standard City of Joplin arterial pavement section. It is assumed that project budget will dictate overlay thickness in the deficient areas computed.

10.0 EXCAVATIONS

Based upon the subsurface conditions encountered during this investigation, the on-site soils typically classify as Type B in accordance with OSHA regulations. Temporary excavations in soils classifying as Type B with a total height of less than 20 ft. should be cut no steeper than 1H:1V in accordance with OSHA guidelines. Confirmation of soil classification during construction, as well as construction safety, including shoring, if required, is the responsibility of the contractor.

11.0 CUT & FILL SLOPES

Based upon the soil samples obtained during field drilling procedures, as well as previous knowledge of the general area overburden soil conditions, general cut and fill slopes may be designed with a grade of 2.5H:1V, or flatter. A steeper slope inclination of 2H:1V may be used if the residual soil contains at least 40-percent admixed chert or rock fragments retained on the No. 10 sieve, as recommended by MoDOT. However, it should be noted that this recommendation is for slopes 20 ft. in height, or less. A more detailed analysis should be performed by PPI for slopes greater than 20 ft. in height. Earth cut or fill slopes designed as a 2.5H:1V, shall be constructed with properly compacted earth fill or natural existing soils classifying as a GC, CL, CL-CH and/or CH. Slopes constructed completely out of rock fill (not just the slope surface) may be designed using a grade of 2H:1V. Rock fill should consist primarily of particles with a diameter of 4-inches, or greater.

Although design of 2H:1V earth slopes are permissible depending on material gradation, these steeper slopes typically require more maintenance and erosion protection immediately following construction, and through the life of the slope, as compared to a flatter slope. Although design and construction of 2H:1V slopes are considered permissible, and consistently used on similar transportation projects in the area, care should be taken to reduce the potential surface erosion of these slopes, which may lead to shallow surface failures if left unattended. Vegetation on slopes should be established as soon as reasonable possible, or some type of erosion control product used on the slope surface to minimize erosion potential.

11.1 Benching

Any fill material placed on top of existing slopes, should be benched into the existing hillside to reduce the potential of a failure plane forming between the two materials. Per MoDOT Section 203.4.11 "Embankment on Hillsides or Against Existing Embankment," any fill placed on existing hillsides or embankments (steeper than 6H:1V measured at a right angle to the roadway) shall be continuously benched into less than 12 inch rises over those areas receiving fill, as the embankment is constructed in lifts. Benching shall be of sufficient width to permit placing and compacting operations. Each horizontal cut shall begin at the intersection of the ground line and the vertical side of the previous bench. Existing slopes shall also be stepped to prevent any wedging action of the embankment against existing structures.

12.0 ADDITIONAL INVESTIGATION

As stated in Section 5.1 above, the project site is located within an area of previous intense mining activity. In addition, the City of Joplin has noted four (4) roadway repair areas of previous subsidence that have been patched in the past located approximately 150 ft. east of Wellington Street. Two (2) borings drilled during this investigation were located within one of the patched areas (Sta. 49+25 EB & WB). Within the boring located at Sta. 49+25 WB, existing fill was logged to spoon refusal depth at 5.6 ft., while no fill material was logged within the adjacent boring drilled within the eastbound lane. Since this boring was located within a previous patch area, with deeper fill, as compared to an adjacent boring, this patch area is believed to be a result of subsidence, most likely due to previous mining activity. From the data we currently have, this feature, as well as the other 3 features previously patched by the City of Joplin seem to be relatively small diameter, and may be previous prospect holes or pits. Asphalt overlay is currently planned for these areas. Since these areas have a history of subsidence, we recommended additional investigation for these areas to determine if they are indeed mining related and the horizontal extent and provide repair recommendations, if applicable. Additional investigation is anticipated to include drilling of additional geotechnical borings, possibly supplemented by surface seismic geophysics. PPI can

perform this additional investigations, if desired, prior to construction of the widening project.

13.0 CONSTRUCTION OBSERVATION & TESTING

The construction process is an integral design component with respect to the geotechnical aspects of a project. Since geotechnical engineering is influenced by variable depositional and weathering processes and because we sample only a small portion of the soils affecting the performance of the proposed structures, unanticipated or changed conditions can be disclosed during grading. Proper geotechnical observation and testing during construction is imperative to allow the Geotechnical Engineer the opportunity to evaluate assumptions made during the design process. Therefore, we recommend that PPI be kept apprised of design modifications and construction schedule of the proposed project to observe compliance with the design concepts and geotechnical recommendations, and to allow design changes in the event that subsurface conditions or methods of construction differ from those assumed while completing this study. We recommend that during construction all earthwork be monitored by a representative of PPI, including site preparation, placement of all engineered fill and trench backfill, and all foundation excavations as outlined below.

- An experienced Geotechnical Engineer or Engineering Technician of PPI should observe the subgrade throughout the proposed project site immediately following stripping to evaluate the native clay, identify areas requiring additional undercutting, and evaluate the suitability of the exposed surface for fill placement;
- An experienced Engineering Technician of PPI should monitor and test all fill placed within the pavement areas to determine whether the type of material, moisture content, and degree of compaction are within recommended limits; and
- The condition of the subgrade should be evaluated immediately prior to construction of the building floor slabs to determine whether the moisture content and relative density of the subgrade soils are as recommended.

14.0 REPORT LIMITATIONS

This report has been prepared in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same geographical area. Palmerton & Parrish, Inc. observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. Palmerton & Parrish's findings and conclusions must be considered not as scientific certainties, but as opinions based on our professional judgment concerning the significance of the data gathered during the course of this investigation. Other than this, no warranty is implied or intended.

FIGURES

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg



SCALE
1" = 250'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

DATE: August 15, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
GEOTECHNICAL AND MATERIALS ENGINEERS/
MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 1



SCALE
1" = 200'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

DATE: August 15, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
GEOTECHNICAL AND MATERIALS ENGINEERS/
MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 2

S: _MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg



SCALE
1" = 200'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

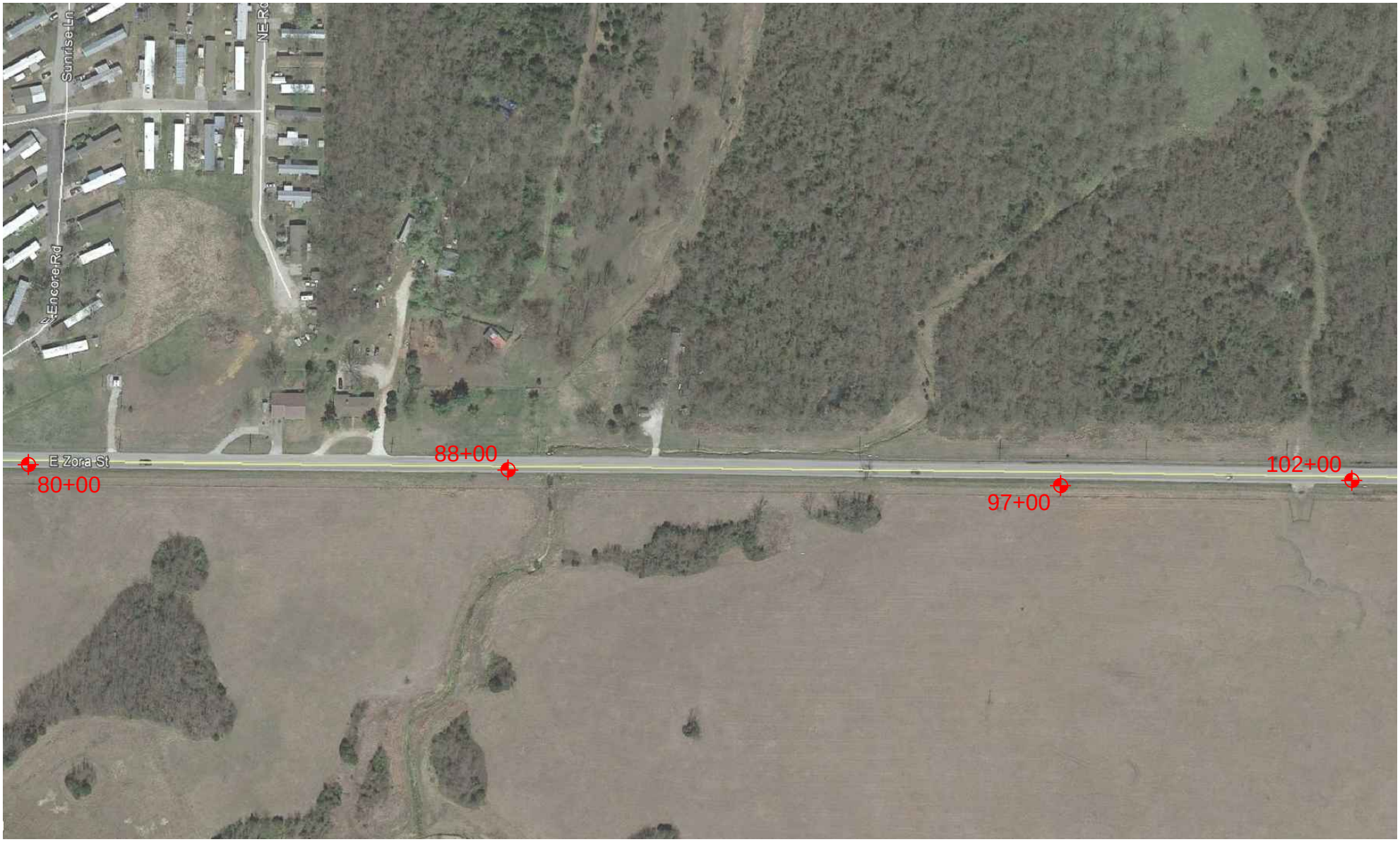
DATE: August 15, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
GEOTECHNICAL AND MATERIALS ENGINEERS/
MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 3

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg



SCALE
1" = 225'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

DATE: August 15, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
GEOTECHNICAL AND MATERIALS ENGINEERS/
MATERIALS TESTING LABORATORIES / ENVIRONMENTAL SERVICES

FIGURE 4

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg

S:_MASTER PROJECT FILE\2015\B\Bartlett & West-229492-Zora St Widening No T60608-Sub\Figures\Figures.dwg



SCALE
1" = 200'

LEGEND

Boring Location

Project: Zora Street Widening - Joplin, Missouri
Client: Bartlett & West, Inc.

Boring Location Plan

DATE: August 15, 2016

Project Number: 229492

PALMERTON & PARRISH, INC.
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FIGURE 5

APPENDIX I

BORING LOGS & KEY TO SYMBOLS

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 15+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 / N VALUE 20 40 60 80 / PL MC LL 20 40 60 80 / SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (8")						
			0.7 ft						
			AGGREGATE BASEROCK (12")						
			1.7 ft						
			FILL - Chert Sand & Gravel, w/ Fat Clay, Medium Dense, Moist (SC)	SPT 1		10-7-13 (20)			
2.5			3.0 ft						
			FAT CLAY, w/ Chert Gravel, Red, Moist, Stiff (CH)	SPT 2		7-9-9 (18)	2		
5.0			- Red to Red Brown below 5.5'	SPT 3		15-7-10 (17)	1		
7.5			- Dark Red and Very Stiff below 8'	SPT 4		10-13-13 (26)	3		
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 23+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 / N VALUE 20 40 60 80 / PL MC LL 20 40 60 80 / SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (7") 0.6 ft						
			AGGREGATE BASEROCK (4") 0.9 ft						
			FAT CLAY, w/ Chert Gravel, Dark Red, Stiff to Very Stiff, Moist (CH)	SPT 1		9-4-9 (13)	2.5		
2.5				ST 1	83		4		
5.0				SPT 2		9-16-10 (26)	3.5		
7.5			- Trace Chert below 8'	SPT 3		6-6-7 (13)			
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 31+50

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (5") 0.4 ft					
			AGGREGATE BASEROCK (4") 0.8 ft					
			FILL - LEAN to FAT CLAY, w/ Chert Gravel and Cobbles, Brown, Stiff, Moist (CL-CH)	SPT 1		6-7-10 (17)		
2.5				SPT 2		7-10-12 (22)		
5.0			- Very Stiff below 5.5'	SPT 3		4-12-15 (27)		
			7.0 ft					
7.5			CLAYEY GRAVEL, Tan, Very Dense, Moist (GC)	SPT 4		25-23-29 (52)		
			9.5 ft					

Bottom of borehole at 9.5 feet.

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 39+50

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (9")					
			0.8 ft					
			AGGREGATE BASEROCK (7")					
			1.3 ft					
			CLAYEY GRAVEL, Red to Red Brown, Dense, Moist (GC)	SPT 1		6-15-20 (35)		
2.5			- Moist and Very Dense below 3'	SPT 2		41-38-46 (84)		
5.0			- Dense Below 6'	SPT 3		13-13-13 (26)		
7.5				SPT 4		10-16-19 (35)		
			9.5 ft					

Bottom of borehole at 9.5 feet.

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 46+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (9")					
			0.8 ft AGGREGATE BASEROCK (8")					
			1.4 ft FILL - CLAYEY GRAVEL, Brown and Red, Medium Dense, Moist	SPT 1		12-13-10 (23)		
2.5				SPT 2		6-7-9 (16)		
5.0			5.5 ft SILTY LEAN CLAY, w/ Chert Gravel, Brown, Stiff to Very Stiff, Moist (CL-ML)	SPT 3		4-6-10 (16)		
7.5			8.0 ft CLAYEY GRAVEL, Reddish Brown, Dense, Moist (GC)	SPT 4		6-9-16 (25)		
			9.5 ft Bottom of borehole at 9.5 feet.					

DRY UNIT WT (pcf): 20 40 60 80 100
N VALUE: 20 40 60 80
PL MC LL: 20 40 60 80
SHEAR STRENGTH (ksf): 1 2 3 4

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 49+25 EB

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 N VALUE 20 40 60 80 PL MC LL 20 40 60 80 SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (9")						
			0.8 ft						
			AGGREGATE BASEROCK (9")						
			1.5 ft						
			FAT CLAY, w/ Chert Gravel, Dark Red Mottled Black and Tan, Stiff, Moist (CH)	SPT 1		10-4-6 (10)	2		
2.5				ST 1	100		3		
5.0			- Scattered Chert below 5'	SPT 2		4-7-10 (17)	3.5		
7.5				SPT 3		7-9-9 (18)			
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 49+25 WB

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/11/16 **COMPLETED** 8/11/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
0	CFA - 4.5" O.D.		ASPHALT (8.75")				
			0.7 ft				
			AGGREGATE BASEROCK (6")				
1			1.2 ft				
			FILL - FAT CLAY, w/ Chert Gravel, Stiff, Moist (CH)	SPT 1		7-7-4 (11)	1.25
2			2.5 ft				
			FILL - LEAN & FAT CLAY, Abundant Chert Sand & Gravel, Stiff, Moist (CL & CH)				
3							
4				ST 1	93		1
			4.7 ft				
			FILL - GRAVELLY FAT CLAY, w/ Chert Cobbles, Stiff, Moist (CH) --Drilling Discontinued on Probable Chert Boulder--	SPT 2		26-73/5"	
5			5.6 ft				

Bottom of borehole at 5.6 feet.

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

ELEVATION (ft)

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 58+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (8.5")					
			0.7 ft					
			AGGREGATE BASEROCK (5.5")					
			1.2 ft					
			FILL - CLAYEY GRAVEL, Brown, Medium Dense, Moist	SPT 1		7-9-9 (18)		
2.5			- Very Dense below 3.5'	SPT 2		32-17-28 (45)		
5.0			5.5 ft					
			FAT CLAY, Scattered Chert Gravel, Gray to Green Gray, Stiff, Moist (CH)	SPT 3		4-6-9 (15)	2	
7.5			7.5 ft					
			CLAYEY GRAVEL, Tan to Brown, Very Dense, Moist (GC)	SPT 4		35-41-46 (87)		
			9.5 ft					

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 68+25

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
0.0	CFA - 4.5" O.D.		ASPHALT (10.5")				
			0.9 ft AGGREGATE BASEROCK (8")				
			1.5 ft FILL - LEAN & FAT CLAY MIX, with Chert Gravel and Sand, Brown and Red, Stiff, Moist (CL & CH)	SPT 1		9-6-6 (12)	
2.5			3.5 ft FILL - POORLY GRADED SAND, w/ Chert Gravel (MINE TAILINGS),Gray to Brown, Medium Dense, Moist (SP)	ST 2	60		
5.0			-Very Dense Below 5.5'	SPT 3		12-25-33 (58)	
			7.5 ft CLAYEY GRAVEL, Brown, Very Dense, Moist (GC)				
7.5			- Red Brown to Brown and Dense below 8'	SPT 4		28-20-17 (37)	
			9.5 ft				

DRY UNIT WT (pcf) 20 40 60 80 100
N VALUE 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) 1 2 3 4

ELEVATION (ft)

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 80+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (11")					
			0.9 ft / 1.1 ft AGGREGATE BASEROCK (2")					
			FILL- Mine Tailing and Creek Gravel 1.4 ft					
			FILL - Lean Clay, with Chert Gravel, Brown, Stiff, Moist 2.0 ft					
2.5			SILTY LEAN CLAY, Scattered Chert and Sandstone Gravel, Dark Brown to Black, Hard, Moist (CL-ML)	SPT 1		4-26-33 (59)		
			4.0 ft					
5.0			CLAYEY GRAVEL, Tan to Brown, Medium Dense, Moist (GC)	SPT 2		26-13-7 (20)		
			5.5 ft					
7.5			FAT CLAY, w/ Chert Layers, Tan to Brown, Very Stiff to Hard, Moist (CH)	SPT 3		9-19-9 (28)	1	
			8.5 ft	SPT 4		29-73/0"		

DRY UNIT WT (pcf) ◆ 20 40 60 80 100
N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) □ 1 2 3 4

Bottom of borehole at 8.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

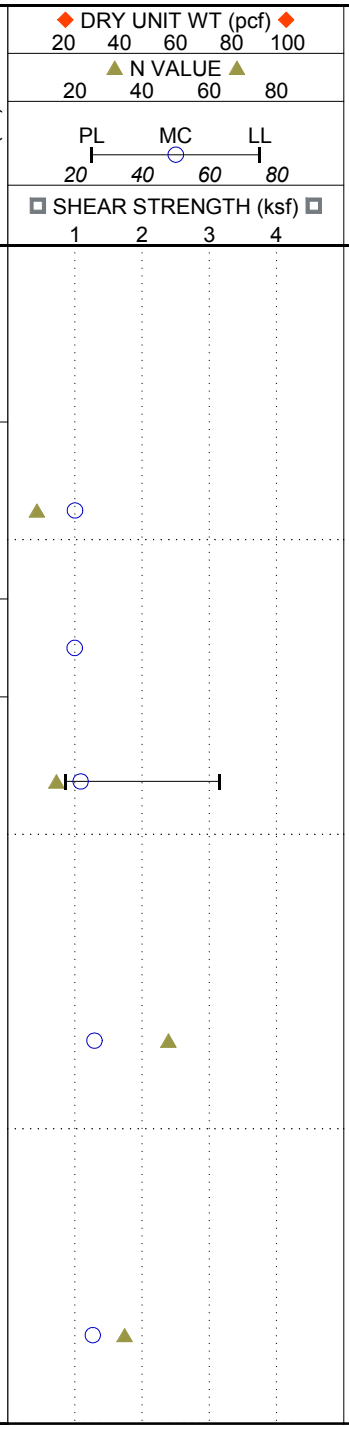
4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 88+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/9/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** AM
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
0.0	CFA - 4.5" O.D.		ASPHALT (8.25")				
			0.7 ft AGGREGATE BASEROCK (9")				
			1.4 ft SILTY LEAN CLAY, Scattered Chert Gravel, Brown to Gray, Medium Stiff, Moist (CL-ML)	SPT 1		6-4-4 (8)	1
2.5				ST 1	100		0
			3.8 ft FAT CLAY, w/ Chert Gravel and Sand, Gray Brown, Stiff, Moist (CH)	SPT 2		7-7-7 (14)	
5.0			6.0 ft CLAYEY GRAVEL, Tan to Gray, Dense, Moist (GC)	SPT 3		28-26-22 (48)	
7.5			- Wet and Medium Dense below 8.5'	SPT 4		23-20-15 (35)	
			10.0 ft				
10.0			Bottom of borehole at 10.0 feet.				



ELEVATION (ft)

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 97+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/9/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION Unified Soil Classification System	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 N VALUE 20 40 60 80 PL MC LL 20 40 60 80 SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (10.5")						
			0.9 ft 1.0 ft AGGREGATE BASEROCK (2")						
			FILL - Chert Cobbles 1.4 ft						
			FILL - POORLY SORTED GRAVEL, w/ Sand, Reddish Brown, Dense to Very Dense, Moist (GC)	SPT 1		46-41-39 (80)			
2.5				SPT 2		17-13-16 (29)			
5.0			- Scattered Clay Layers below 5.5'	SPT 3		10-41-73 (114)			
7.5			8.0 ft FAT CLAY, w/ Chert Gravel and Layers, Orange Tan to Red Brown, Very Stiff, Moist (CH)	SPT 4		15-17-13 (30)			
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
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GEOTECHNICAL BORING LOG

BORING NUMBER 102+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/9/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (8.5")					
			0.7 ft					
			AGGREGATE BASEROCK (5.5")					
			1.2 ft					
2.5			LEAN CLAY, Scattered Chert Gravel, Brown, Medium Stiff, Moist (CL)	ST 1	54		2	
			3.2 ft					
			FAT CLAY, Scattered Chert Sand, Gray Brown Mottled Red and Black, Stiff to Very Stiff, Moist (CH)	SPT 2		4-6-6 (12)	1.5	
5.0				SPT 3		4-6-6 (12)	3	
7.5								
			8.8 ft	SPT 4		16-61-33 (94)	2.5	
			LIMESTONE, Weathered, Medium Hard					
			9.5 ft					

Bottom of borehole at 9.5 feet.

DRY UNIT WT (pcf) ◆ 20 40 60 80 100
N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
SHEAR STRENGTH (ksf) □ 1 2 3 4

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 105+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/9/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (10")					
			0.8 ft					
			AGGREGATE BASEROCK (7")					
			1.4 ft					
2.5			FAT CLAY, Scattered Chert Gravel, Brown, Medium Stiff, Moist (CH)	ST 1	54		4.5	
			3.3 ft					
			SHALEY FAT CLAY, Scattered Chert Gravel and Silt to Fine Sand Seams, Gray Mottled Red and Tan, Stiff, Moist (CH)	SPT 2		4-6-9 (15)	4	
			4.5 ft					
5.0			SHALE, Gray, Red Tan, Highly Weathered, Soft	SPT 3		7-13-13 (26)	2.75	
7.5				SPT 4		6-10-19 (29)	4.5	
			9.5 ft					

DRY UNIT WT (pcf) ◆ 20 40 60 80 100
▲ N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
□ SHEAR STRENGTH (ksf) □ 1 2 3 4

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 115+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/8/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 / N VALUE 20 40 60 80 / PL MC LL 20 40 60 80 / SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (10")						
			0.8 ft						
			AGGREGATE BASEROCK (4")						
			1.2 ft						
			SILTY LEAN CLAY, with Chert Gravel and Sand, Dark Brown, Hard, Moist (CL-ML)	SPT 1		25-22-17 (39)			
2.5			3.0 ft						
			LEAN CLAY, w/ Chert Gravel and Sand, Brown, Medium Stiff, Moist (CL)	ST 2	67		0.75		
			5.0 ft						
5.0			CLAYEY GRAVEL, Tan to Gray, Very Dense to Dense, Moist (GC)	SPT 3		22-26-33 (59)			
7.5									
				SPT 4		13-16-20 (36)			
			9.5 ft						

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

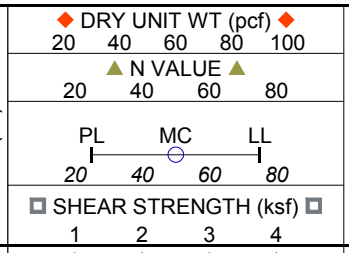
4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 123+00

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/10/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (5") 0.4 ft					
			AGGREGATE BASEROCK (5") 0.8 ft					
			FILL - LEAN TO FAT CLAY, Scattered Chert Gravel, Brown to Red Brown to Black, Medium Stiff, Moist (CL-CH)	SPT 1		3-4-6 (10)		
2.5			2.3 ft FILL - LEAN CLAY, Scattered Chert Sand, Dark Brown, Medium Stiff, Moist (CL)	ST 2	71		3.5	
			3.7 ft FILL - CHERT GRAVEL & SAND (MINE TAILINGS), Tan Brown, Very Dense, Slightly Moist (SP)	SPT 3		16-55-73/5"		
5.0			6.0 ft CLAYEY GRAVEL, Red Brown, Very Dense, Moist (GC)	SPT 4		52-73/5"		
7.5				SPT 5		29-25-16 (41)	2.25	
			9.5 ft					



Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

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Fax: (417) 864-6004

GEOTECHNICAL BORING LOG

BORING NUMBER 124+62

CLIENT Bartlett & West
PROJECT NAME Zora Street Widening - Range Line to MO Rte 249
PROJECT NO. 229492
PROJECT LOCATION Joplin, MO
DATE STARTED 8/8/16 **COMPLETED** 8/9/16
SURFACE ELEVATION _____ **BENCHMARK EL.** _____
DRILLER EP **DRILL RIG** CME 75
GROUND WATER LEVELS
HAMMER TYPE Auto
AT TIME OF DRILLING None
LOGGED BY CW **CHECKED BY** JE
AT END OF DRILLING _____
NOTES _____

DEPTH (ft)	DRILLING METHOD	STRATA SYMBOL	MATERIAL DESCRIPTION (Unified Soil Classification System)	SAMPLE TYPE NUMBER	RECOVERY % (RQD %)	CORRECTED BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT (pcf) 20 40 60 80 100 / N VALUE 20 40 60 80 / PL MC LL 20 40 60 80 / SHEAR STRENGTH (ksf) 1 2 3 4	ELEVATION (ft)
0.0	CFA - 4.5" O.D.		ASPHALT (6.25") 0.5 ft						
			AGGREGATE BASEROCK (5") 0.9 ft						
			SILTY LEAN CLAY, Scattered Chert Gravel, Brown to Dark Brown, Stiff, Moist (CL) 2.0 ft	SPT 1		10-7-6 (13)	3		
2.5			LEAN CLAY, Trace Chert Gravel, Brown, Medium Stiff, Moist (CL) 4.7 ft	ST 2	85		2.5		
5.0			CLAYEY GRAVLE, Brown, Very Dense, Moist (GC) 7.0 ft	SPT 3		7-51-36 (87)			
7.5			FAT CLAY, Trace Chert Gravel, Yellow, Stiff, Moist (CH) 9.5 ft	SPT 4		4-6-9 (15)			

Bottom of borehole at 9.5 feet.

BORING LOG - PPI - PPI STD TEMPLATE.GDT - 9/1/16 15:20 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

4168 W. Kearney St.
Springfield, MO 65803
Telephone: (417) 864-6000
Fax: (417) 864-6004

KEY TO SYMBOLS

CLIENT Bartlett & West

PROJECT NAME Zora Street Widening - Range Line to MO Rte 249

PROJECT NO. 229492

PROJECT LOCATION Joplin, MO

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

- ASPHALT: Asphalt
- CH: USCS High Plasticity Clay
- CL: USCS Low Plasticity Clay
- CL-ML: USCS Low Plasticity Silty Clay
- FILL: Fill (made ground)
- GC: USCS Clayey Gravel
- LIMESTONE
- SHALE: Shale

SAMPLER SYMBOLS

- Standard Penetration Test
- Shelby Tube

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION

- Water Level at Time Drilling, or as Shown
- Water Level at End of Drilling, or as Shown
- Water Level After 24 Hours, or as Shown

KEY TO SYMBOLS - PPI STD TEMPLATE.GDT - 8/24/16 15:08 - S:_MASTER PROJECT FILE\2015\B\BARTLETT & WEST-229492-ZORA ST WIDENING NO T60608-SUB\BORING LOGS\BORING LOGS.GPJ

APPENDIX II

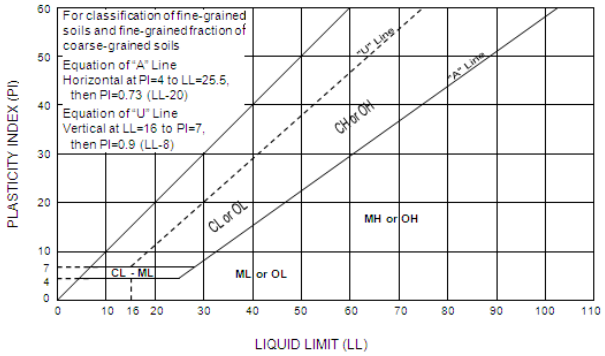
GENERAL NOTES

GENERAL NOTES

SOIL PROPERTIES & DESCRIPTIONS

COHESIVE SOILS

Consistency	Unconfined Compressive Strength (Qu)	Pocket Penetrometer Strength	N-Value
	(psf)	(tsf)	(blows/ft)
Very Soft	<500	<0.25	0-1
Soft	500-1000	0.25-0.50	2-4
Medium Stiff	1001-2000	0.50-1.00	5-8
Stiff	2001-4000	1.00-2.00	9-15
Very Stiff	4001-8000	2.00-4.00	16-30
Hard	>8000	>4.00	31-60
Very Hard			>60



Group Symbol	Group Name
CL –	Lean Clay
ML –	Silt
OL –	Organic Clay or Silt
CH –	Fat Clay
MH –	Elastic Silt
OH –	Organic Clay or Silt
PT –	Peat
CL-CH –	Lean to Fat Clay

Plasticity		Moisture	
Description	Liquid Limit (LL)	Descriptive Term	Guide
Lean	<45%	Dry	No indication of water
Lean to Fat	45-49%	Moist	Indication of water
Fat	≥50%	Wet	Visible water

Fine Grained Soil Subclassification	Percent (by weight) of Total Sample
Terms: SILT, LEAN CLAY, FAT CLAY, ELASTIC SILT	PRIMARY CONSTITUENT
Sandy,gravelly, abundant cobbles, abundant boulders	>30-50]
with sand, with gravel, with cobbles, with boulders	>15-30] – secondary coarse grained constituents
scattered sand, scattered gravel, scattered cobbles, scattered boulders	5-15]
a trace sand, a trace gravel, a few cobbles, a few boulders	<5]
The relationship of clay and silt constituents is based on plasticity and normally determined by performing index tests. Refined classifications are based on Atterberg Limits tests and the Plasticity Chart.	

NON-COHESIVE (GRANULAR) SOILS

RELATIVE DENSITY	N-VALUE
Very Loose	0-4
Loose	5-10
Medium Dense	11-24
Dense	25-50
Very Dense	≥51

MOISTURE CONDITION	
Descriptive Term	Guide
Dry	No indication of water
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table.

**GRAIN SIZE IDENTIFICATION		
Name	Size Limits	Familiar Example
Boulder	12 in. or more	Larger than basketball
Cobbles	3 in. to 12 in.	Grapefruit
Coarse Gravel	¾-in. to 3 in.	Orange or lemon
Fine Gravel	No. 4 sieve to ¾-in.	Grape or pea
Coarse Sand	No. 10 sieve to No. 4 sieve	Rock salt
Medium Sand	No. 40 sieve to No. 10 sieve	Sugar, table salt
Fine Sand*	No. 200 sieve to No. 40 sieve	Powdered sugar
Fines	Less than No. 200 sieve	
*Particles finer than fine sand cannot be discerned with the naked eye at a distance of 8 in.		

Coarse Grained Soil Subclassification	Percent (by weight) of Total Sample
Terms: GRAVEL, SAND, COBBLES, BOULDERS	PRIMARY CONSTITUENT
Sandy,gravelly, abundant cobbles, abundant boulders	>30-50]
with gravel, with sand, with cobbles, with boulders	>15-30] – secondary coarse grained constituents
scattered gravel, scattered sand, scattered cobbles, scattered boulders	5-15]
a trace gravel, a trace sand, a few cobbles, a few boulders	<5]
Silty (MH & ML)*, clayey (CL & CH)*	<15]
(with silt, with clay)*	5-15] – secondary fine grained constituents
(trace silt, trace clay)*	<5]
*Index tests and/or plasticity tests are performed to determine whether the term "silt" or "clay" is used.	

*Modified after Ref. ASTM D2487-93 & D2488-93
**Modified after Ref. Oregon DOT 1987 & FHWA 1997
***Modified after Ref. AASHTO 1988, DM 7.1 1982, and Oregon DOT 1987

GENERAL NOTES

BEDROCK PROPERTIES & DESCRIPTIONS

ROCK QUALITY DESIGNATION (RQD)	
Description of Rock Quality	*RQD (%)
Very Poor	< 25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	90-100

*RQD is defined as the total length of sound core pieces 4 in. or greater in length, expressed as a percentage of the total length cored. RQD provides an indication of the integrity of the rock mass and relative extent of seams and bedding planes.

SCALE OF RELATIVE ROCK HARDNESS		
Term	Field Identification	Approx. Unconfined Compressive Strength (tsf)
Extremely Soft	Can be indented by thumbnail	2.6-10
Very Soft	Can be peeled by pocket knife	10-50
Soft	Can be peeled with difficulty by pocket knife	50-260
Medium Hard	Can be grooved 2 mm deep by firm pressure of knife	260-520
Moderately Hard	Requires one hammer blow to fracture	520-1040
Hard	Can be scratched with knife or pick only with difficulty	1040-2610
Very Hard	Cannot be scratched by knife or sharp pick	>2610

DEGREE OF WEATHERING	
Slightly Weathered	Rock generally fresh, joints stained and discoloration extends into rock up to 25mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered	Rock mass is decomposed 50% or less, significant portions of rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

GRAIN SIZE (TYPICALLY FOR SEDIMENTARY ROCKS)		
Description	Diameter (mm)	Field Identification
Very Coarse Grained	>4.76	
Coarse Grained	2.0-4.76	Individual grains can easily be distinguished by eye.
Medium Grained	0.42-2.0	Individual grains can be distinguished by eye.
Fine Grained	0.074-0.42	Individual grains can be distinguished by eye with difficulty.
Very Fine Grained	<0.074	Individual grains cannot be distinguished by unaided eye.

VOIDS	
Pit	Voids barely seen with naked eye to 6mm (¼-in)
Vug	Voids 6 to 50mm (¼ to 2 in) in diameter
Cavity	50 to 6000mm (2 to 24 in) in diameter
Cave	>600mm

BEDDING THICKNESS	
Very Thick Bedded	> 3' thick
Thick Bedded	1' to 3' thick
Medium Bedded	4" to 1' thick
Thin Bedded	1¼" to 4" thick
Very Thin Bedded	½" to 1¼" thick
Thickly Laminated	⅛" to ½" thick
Thinly Laminated	⅛" or less (paper thin)

DRILLING NOTES

Drilling and Sampling Symbols

NQ – Rock Core (2-in. diameter)
HQ – Rock Core (3 in. diameter)
HSA – Hollow Stem Auger
CFA – Continuous Flight (Solid Stem) Auger
SS – Split Spoon Sampler
ST – Shelby Tube
WB – Wash Bore or Mud Rotary
TP – Test-Pit
HA – Hand Auger

Soil Sample Types

Shelby Tube Samples: Relatively undisturbed soil samples were obtained from the borings using thin wall (Shelby) tube samplers pushed hydraulically into the soil in advance of drilling. This sampling, which is considered to be undisturbed, was performed in accordance with the requirements of ASTM D 1587. This type of sample is considered best for the testing of "in-situ" soil properties such as natural density and strength characteristics. The use of this sampling method is basically restricted to soil containing little to no chert fragments and to softer shale deposits.

Split Spoon Samples: The Standard Penetration Test is conducted in conjunction with the split-barrel sampling procedure. The "N" value corresponds to the number of blows required to drive the last 1 foot of an 18-in. long, 2-in. O.D. split-barrel sampler with a 140 lb. hammer falling a distance of 30 in. The Standard Penetration Test is carried out according to ASTM D-1586.

Water Level Measurements

Water levels indicated on the boring logs are levels measured in the borings at the times indicated. In permeable materials, the indicated levels may reflect the location of groundwater. In low permeability soils, shallow groundwater may indicate a perched condition. Caution is merited when interpreting short-term water level readings from open bore holes. Accurate water levels are best determined from piezometers.

Automatic Hammer

Palmerton and Parrish's CME's are equipped with automatic hammers. The conventional method used to obtain disturbed soil samples used a safety hammer operated by company personnel with a cat head and rope. However, use of an automatic hammer allows a greater mechanical efficiency to be achieved in the field while performing a Standard Penetration resistance test based upon automatic hammer efficiencies calibrated using dynamic testing techniques.

*Modified after Ref. ASTM D2487-93 & D2488-93
**Modified after Ref. Oregon DOT 1987 & FHWA 1997
***Modified after Ref. AASHTO 1988, DM 7.1 1982, and Oregon DOT 1987

APPENDIX III

DCP TEST RESULTS

DCP TEST DATA

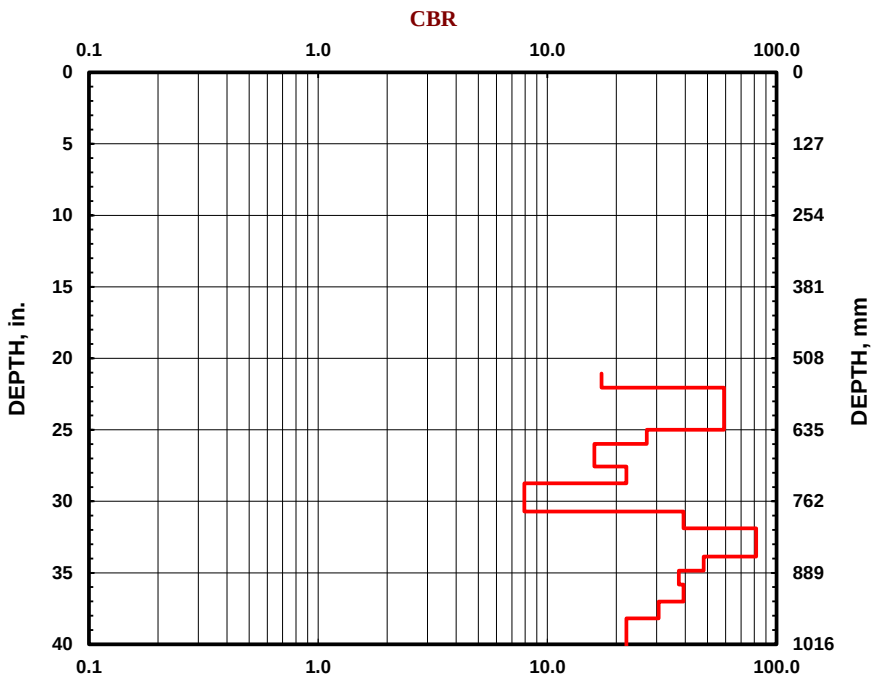
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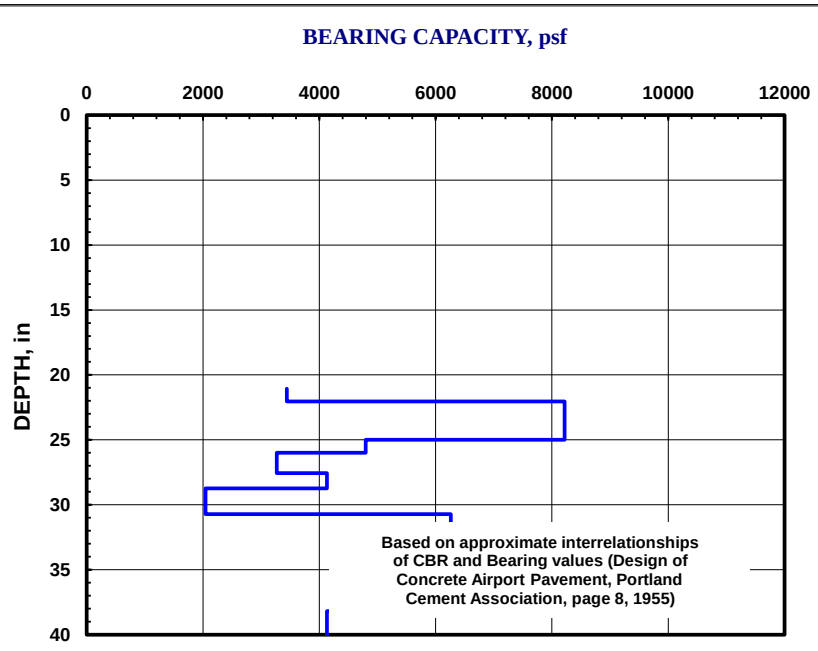
Project: *Zora St Widening*
Location: 15+00
Date: 8-Aug-16
Soil Type(s): Chert Sand & Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	535	1
2	560	1
6	585	1
6	610	1
6	635	1
3	660	1
3	700	1
3	730	1
2	780	1
5	810	1
8	835	1
8	860	1
5	885	1
4	910	1
5	940	1
4	970	1
3	1000	1
3	1030	1
3	1060	1
2	1095	1
2	1130	1
2	1155	1





DCP TEST DATA

File Name: 23+00

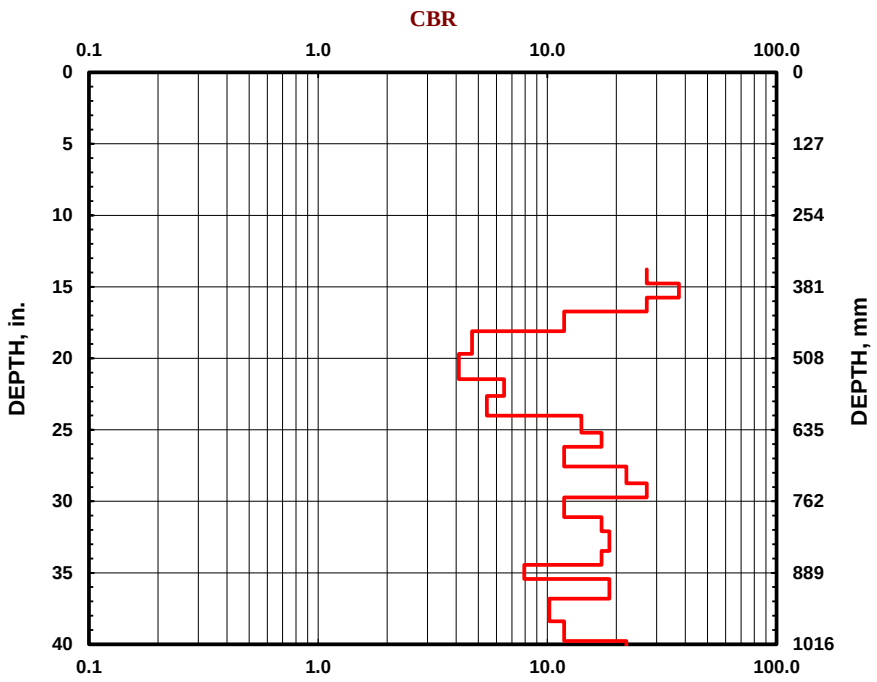
Project: *Zora St Widening* **Date:** 8-Aug-16

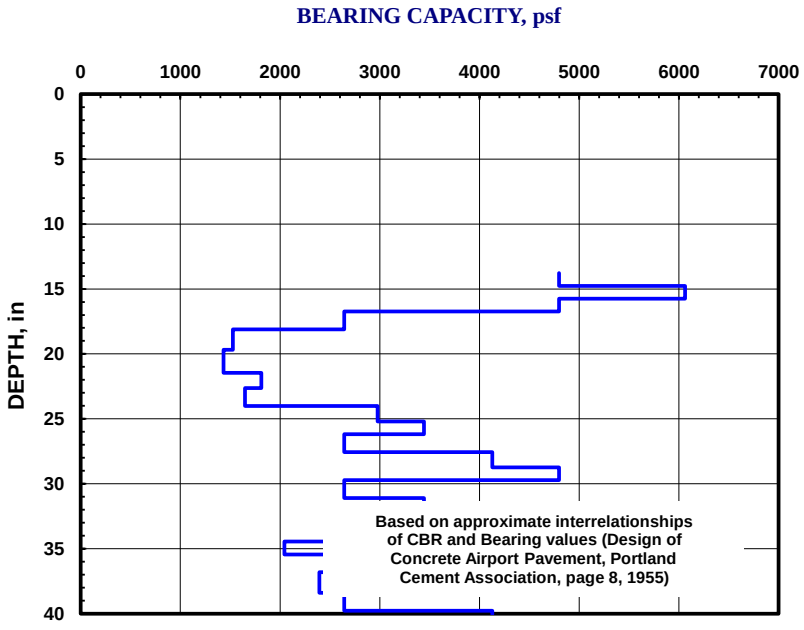
Location: 23+00 **Soil Type(s):** Fat Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	350	1
3	375	1
4	400	1
3	425	1
2	460	1
1	500	1
1	545	1
1	575	1
1	610	1
2	640	1
2	665	1
2	700	1
3	730	1
3	755	1
2	790	1
2	815	1
3	850	1
2	875	1
1	900	1
3	935	1
2	975	1
2	1010	1
3	1040	1
3	1100	1
4	1130	1





DCP TEST DATA

File Name: 31+50

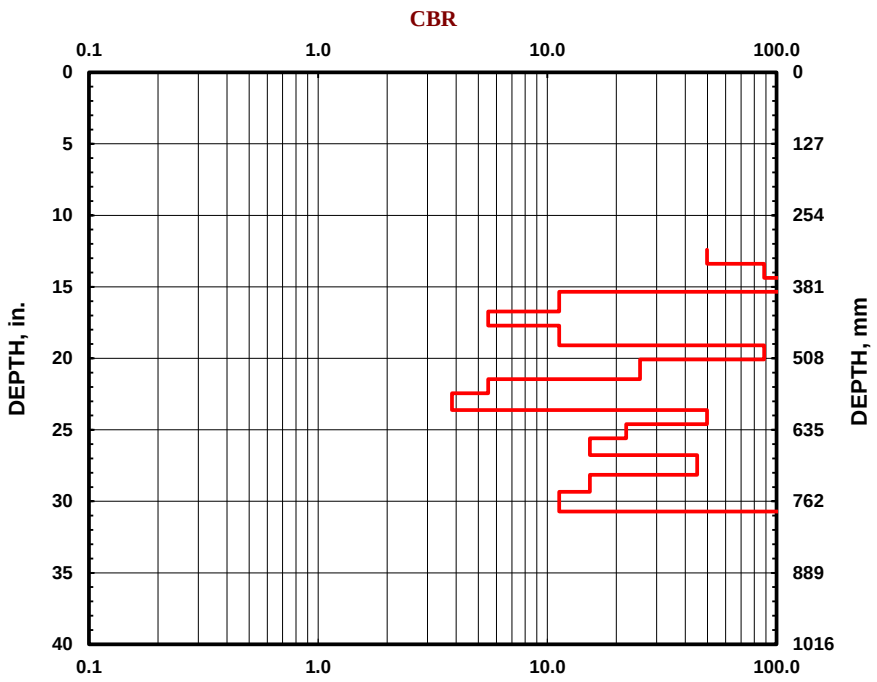
Project: *Zora St Widening* **Date:** 8-Aug-16

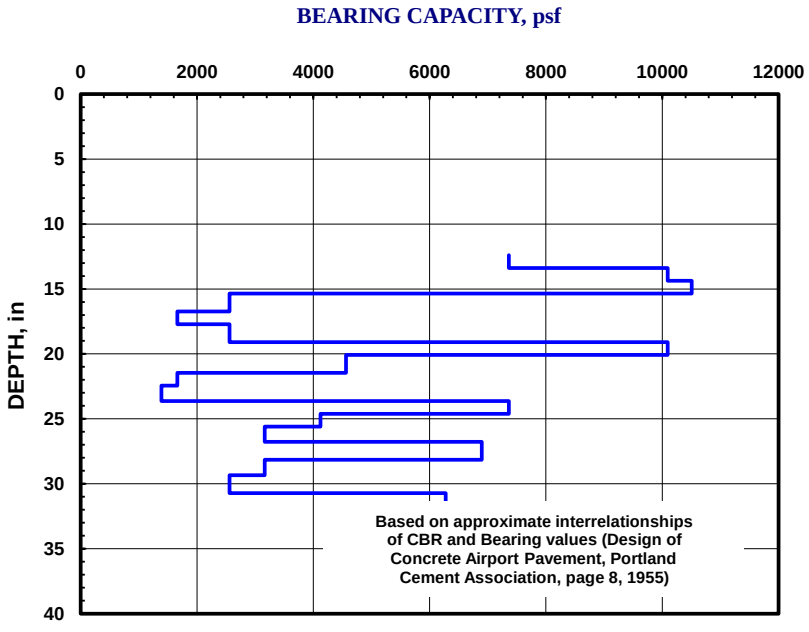
Location: 31+50 **Soil Type(s):** Lean Clay w/ Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	315	1
3	340	1
4	365	1
5	390	1
2	425	1
1	450	1
2	485	1
4	510	1
3	545	1
1	570	1
1	600	1
3	625	1
2	650	1
2	680	1
4	715	1
2	745	1
2	780	1
6	805	1
5	830	1
6	855	1
4	875	1





DCP TEST DATA

File Name: 39+50

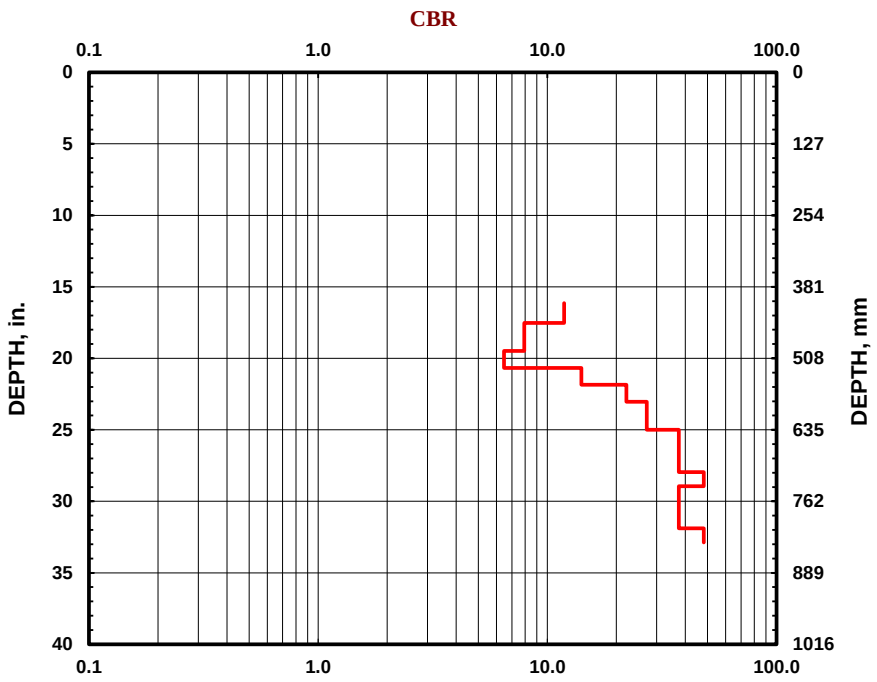
Project: *Zora St Widening* **Date:** 8-Aug-16

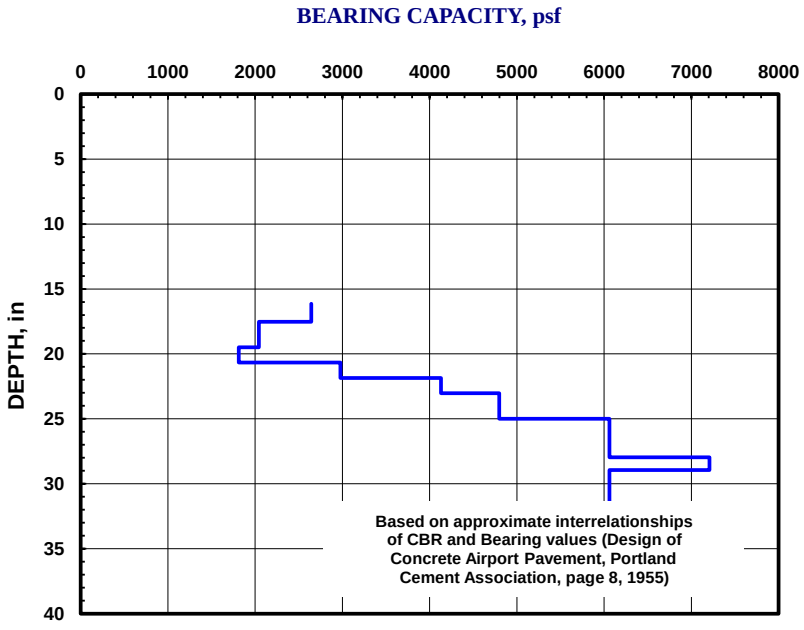
Location: 39+50 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	410	1
2	445	1
2	495	1
1	525	1
2	555	1
3	585	1
3	610	1
3	635	1
4	660	1
4	685	1
4	710	1
5	735	1
4	760	1
4	785	1
4	810	1
5	835	1





DCP TEST DATA

File Name: 46+00

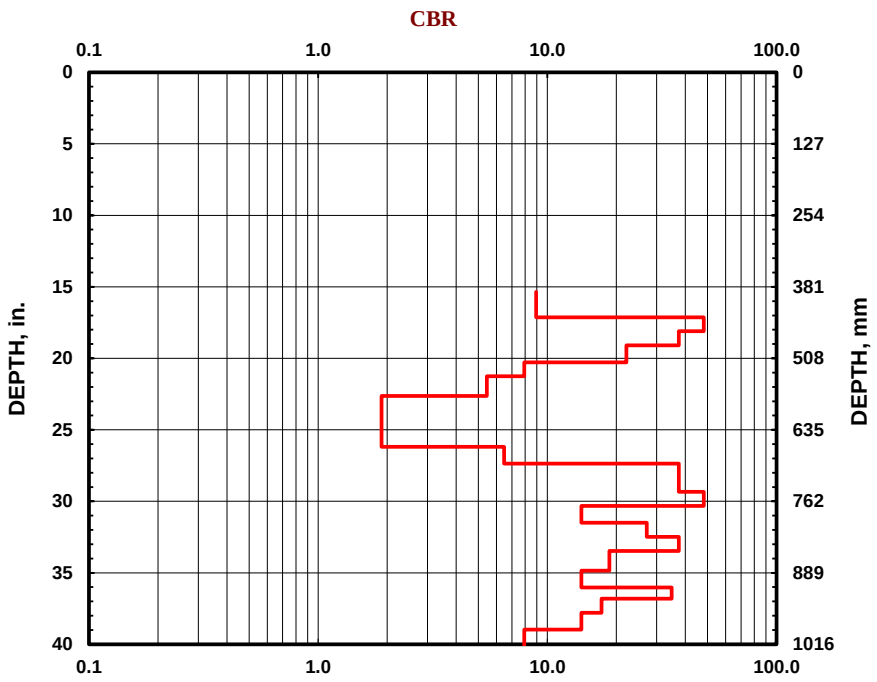
Project: *Zora St Widening* **Date:** 8-Aug-16

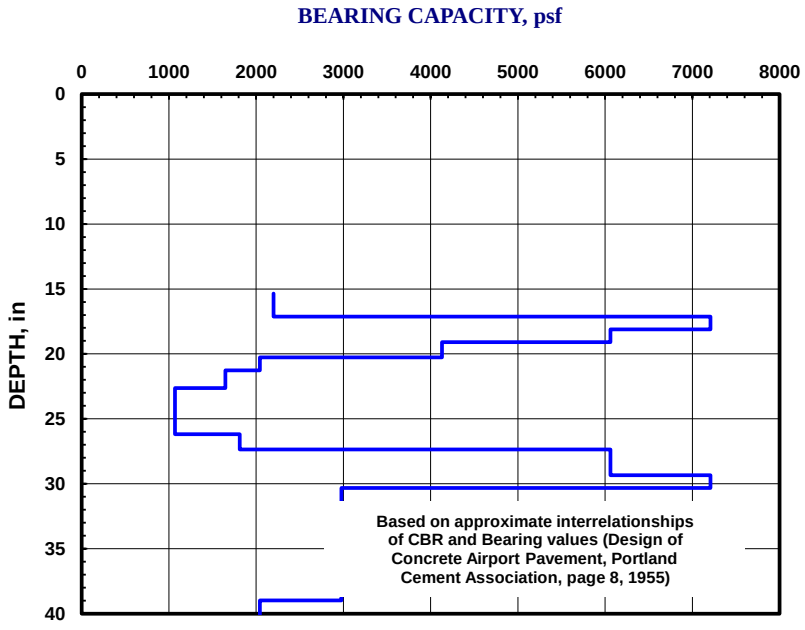
Location: 46+00 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	390	1
2	435	1
5	460	1
4	485	1
3	515	1
1	540	1
1	575	1
1	665	1
1	695	1
4	720	1
4	745	1
5	770	1
2	800	1
3	825	1
4	850	1
3	885	1
2	915	1
3	935	1
2	960	1
2	990	1
2	1040	1
2	1065	1
4	1095	1
3	1120	1





DCP TEST DATA

File Name: 49+25 WB

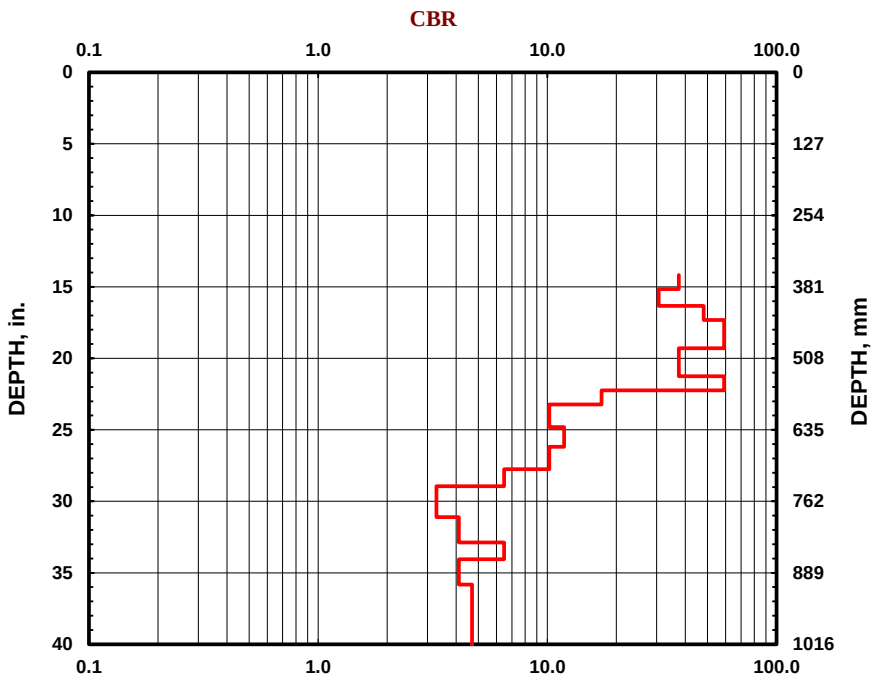
Project: *Zora St Widening* **Date:** 8-Aug-16

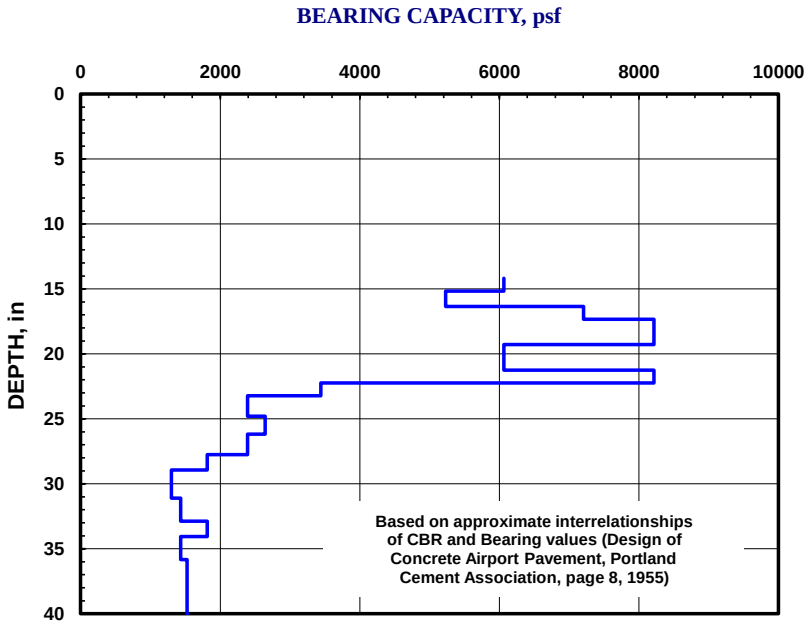
Location: 49+25 WB **Soil Type(s):** Fat Clay w/ Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	360	1
4	385	1
4	415	1
5	440	1
6	465	1
6	490	1
4	515	1
4	540	1
6	565	1
2	590	1
2	630	1
2	665	1
2	705	1
1	735	1
1	790	1
1	835	1
1	865	1
1	910	1
1	950	1
1	990	1
1	1030	1
1	1065	1
1	1095	1
2	1120	1





DCP TEST DATA

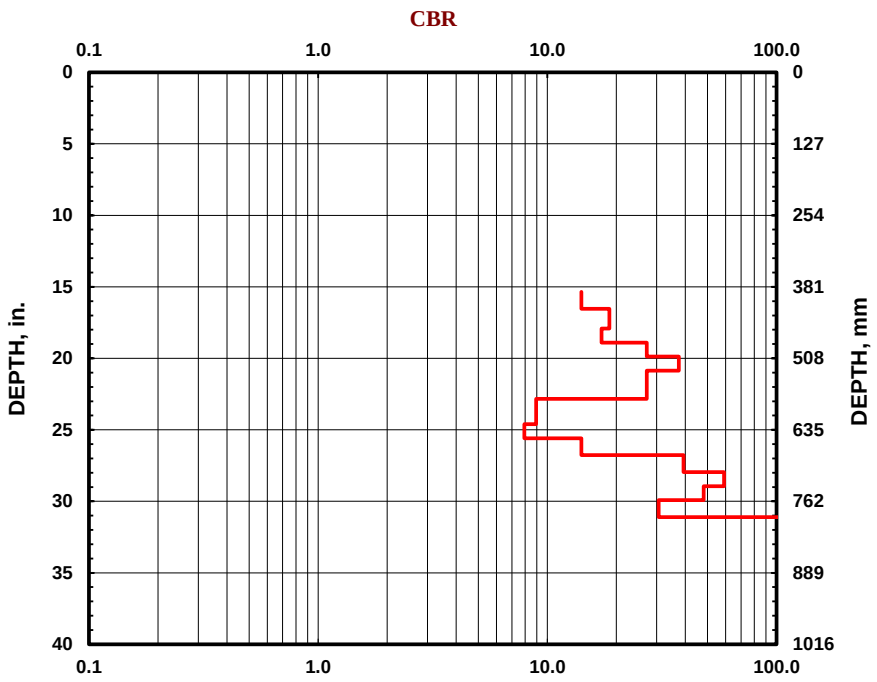
File Name: 58+00

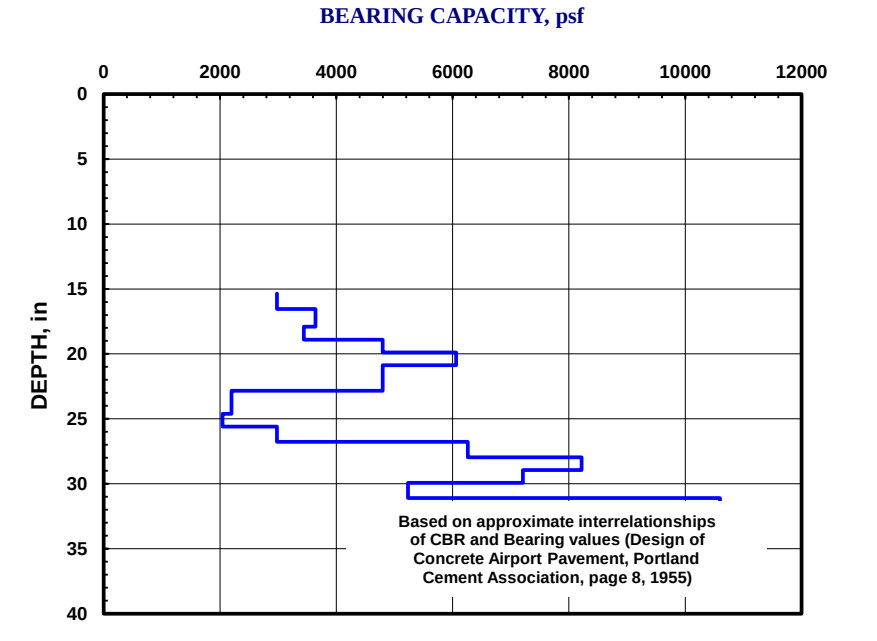
Project: *Zora St Widening*
Location: 58+00
Date: 8-Aug-16
Soil Type(s): Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	390	1
2	420	1
3	455	1
2	480	1
3	505	1
4	530	1
3	555	1
3	580	1
2	625	1
1	650	1
2	680	1
5	710	1
6	735	1
5	760	1
4	790	1
10	810	1





DCP TEST DATA

File Name: 68+25

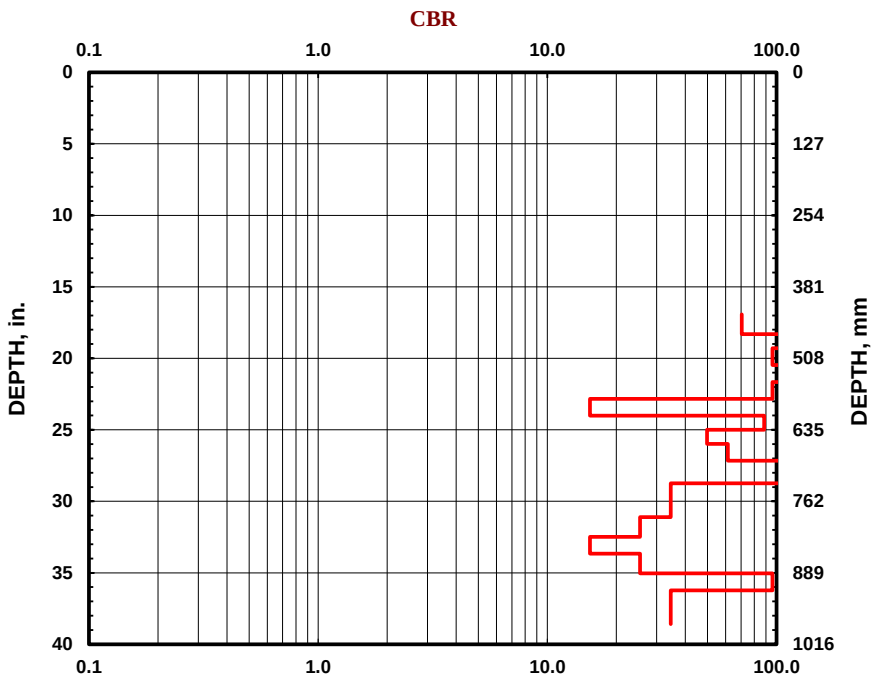
Project: *Zora St Widening* **Date:** 8-Aug-16

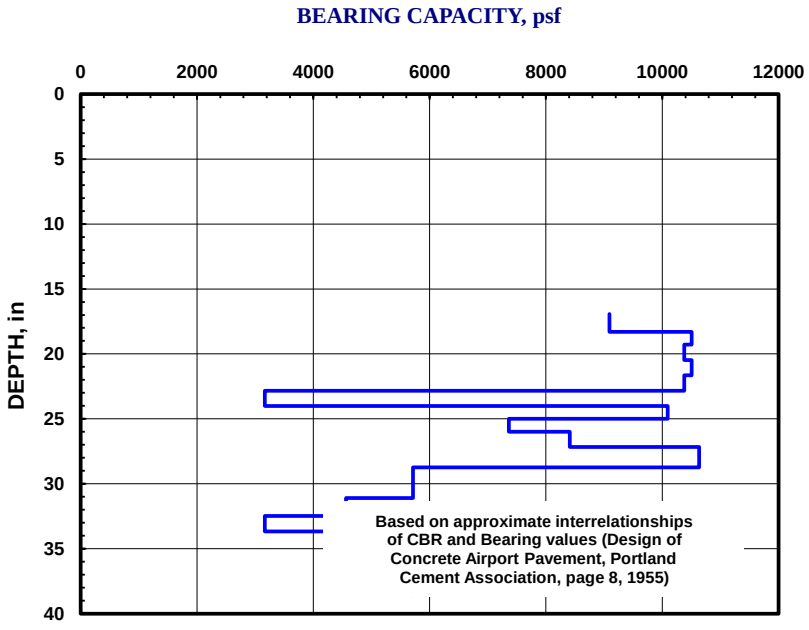
Location: 68+25 **Soil Type(s):** Lean & Fat Clay Mix

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	430	1
5	465	1
5	490	1
5	520	1
6	550	1
5	580	1
2	610	1
4	635	1
3	660	1
4	690	1
7	730	1
3	760	1
3	790	1
3	825	1
2	855	1
3	890	1
5	920	1
3	950	1
3	980	1





DCP TEST DATA

File Name: Zora Street Widening

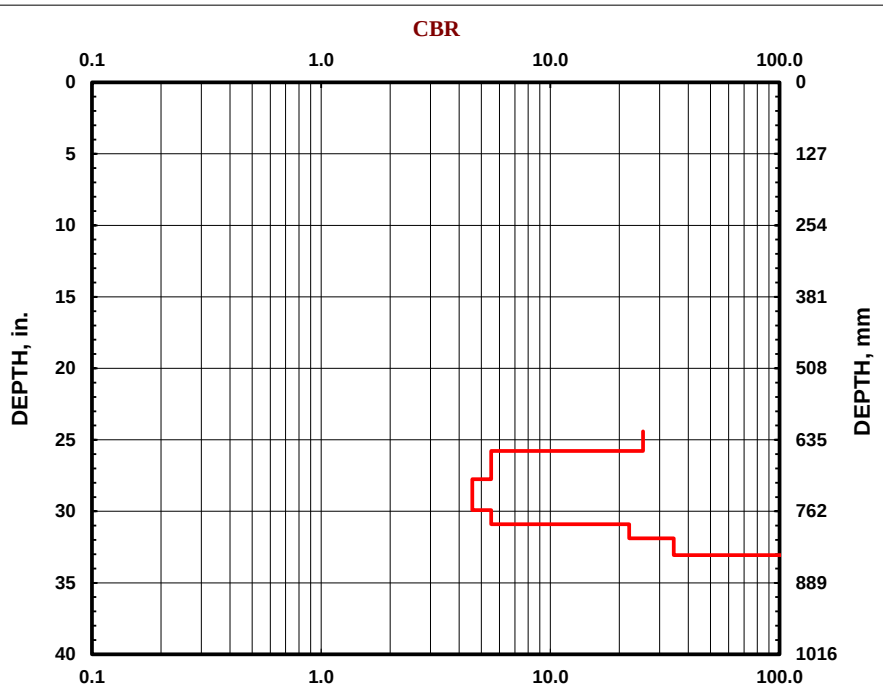
Project: *Zora St Widening* **Date:** 10-Aug-16

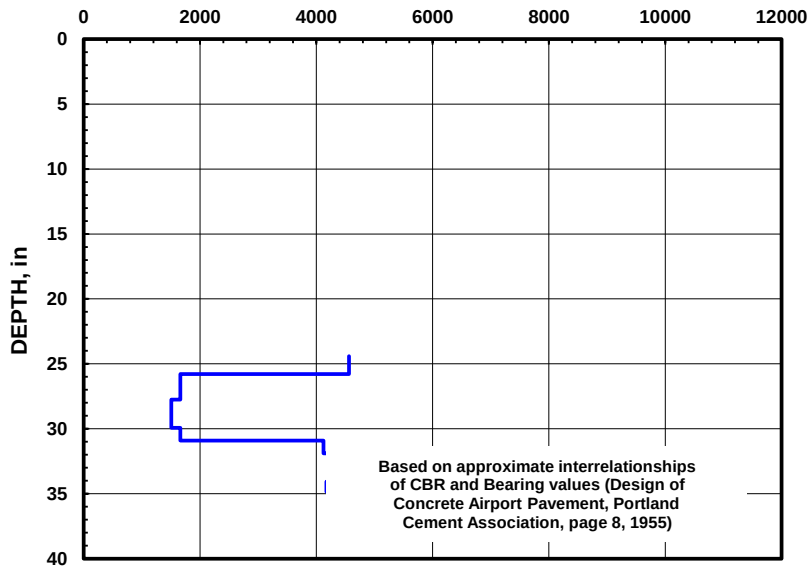
Location: 80+00 **Soil Type(s):** Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	620	1
3	655	1
2	705	1
2	760	1
1	785	1
2	810	1
3	840	1
5	865	1
5	885	1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
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		1





DCP TEST DATA

File Name: Zora Street Widening

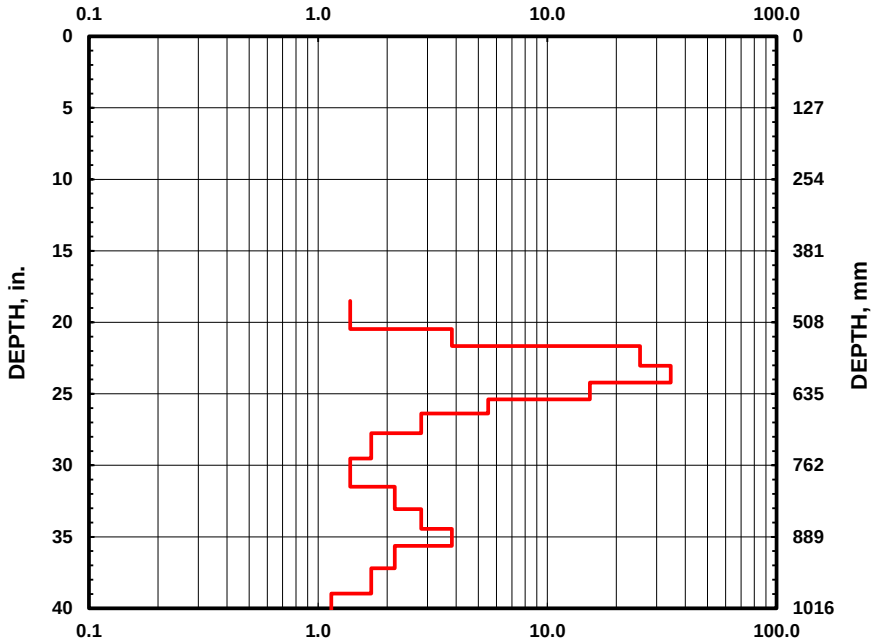
Project: *Zora St Widening* **Date:** 9-Aug-16

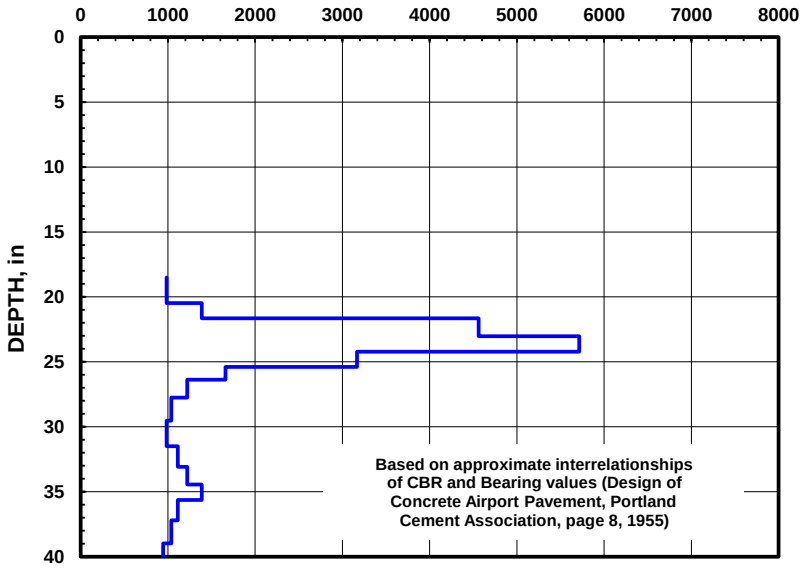
Location: 88+00 **Soil Type(s):** Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	470	1
1	520	1
1	550	1
3	585	1
3	615	1
2	645	1
1	670	1
1	705	1
1	750	1
1	800	1
1	840	1
1	875	1
1	905	1
1	945	1
1	990	1
1	1045	1
1	1085	1
2	1110	1
3	1135	1
	1135	1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
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		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1





DCP TEST DATA

File Name: 97+00

Project: *Zora St Widening* **Date:** 9-Aug-16

Location: 97+00 **Soil Type(s):** Poorly Sorted Sand

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	375	1
6	400	1
6	425	1
		1
		1

DCP TEST DATA

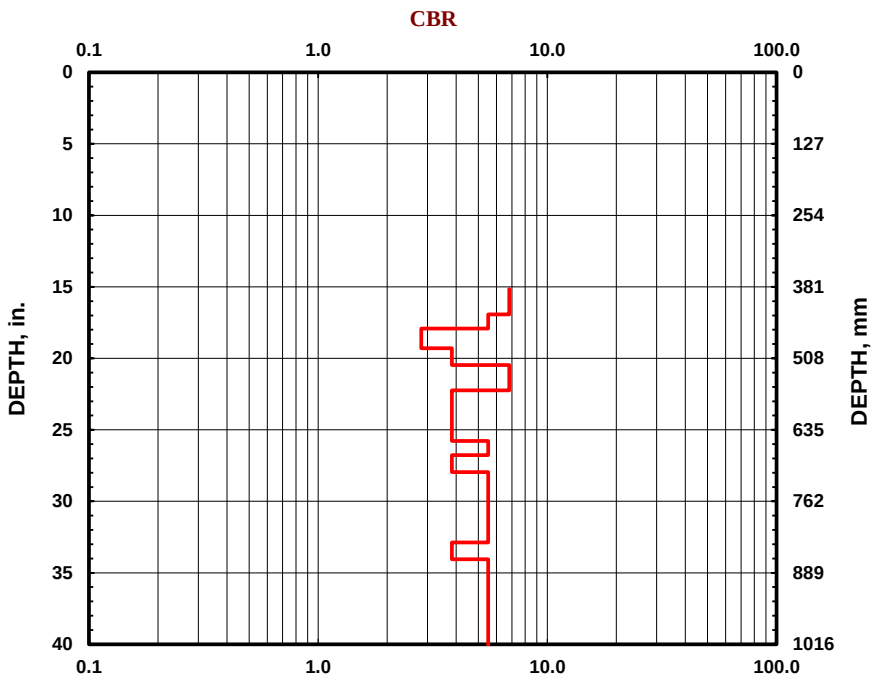
File Name: 102+00

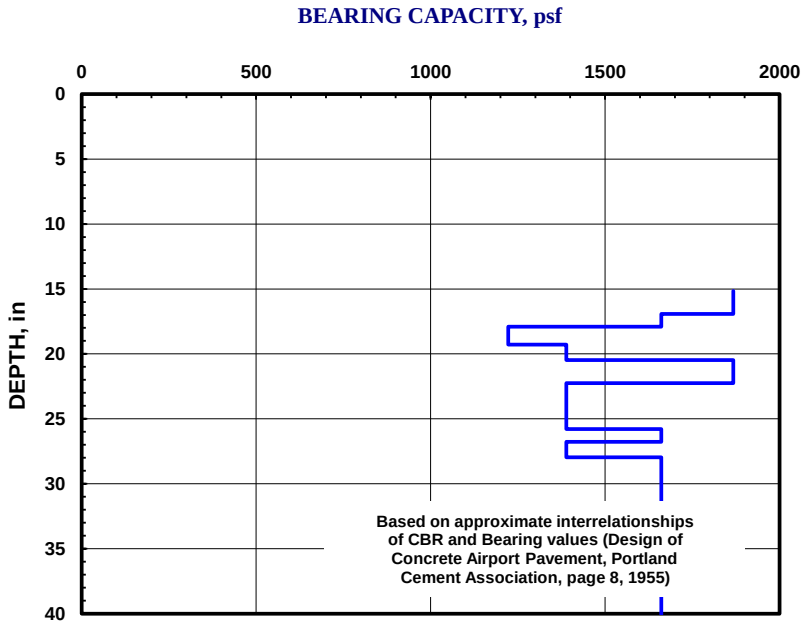
Project: *Zora St Widening*
Location: 102+00
Date: 9-Aug-16
Soil Type(s): Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	385	1
2	430	1
1	455	1
1	490	1
1	520	1
2	565	1
1	595	1
1	625	1
1	655	1
1	680	1
1	710	1
1	735	1
1	760	1
1	785	1
1	810	1
1	835	1
1	865	1
1	890	1
2	940	1
1	965	1
1	990	1
1	1015	1
1	1040	1
1	1070	1
1	1095	1
1	1120	1
1	1145	1
		1
		1
		1
		1
		1
		1
		1
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		1
		1
		1
		1
		1
		1
		1
		1





DCP TEST DATA

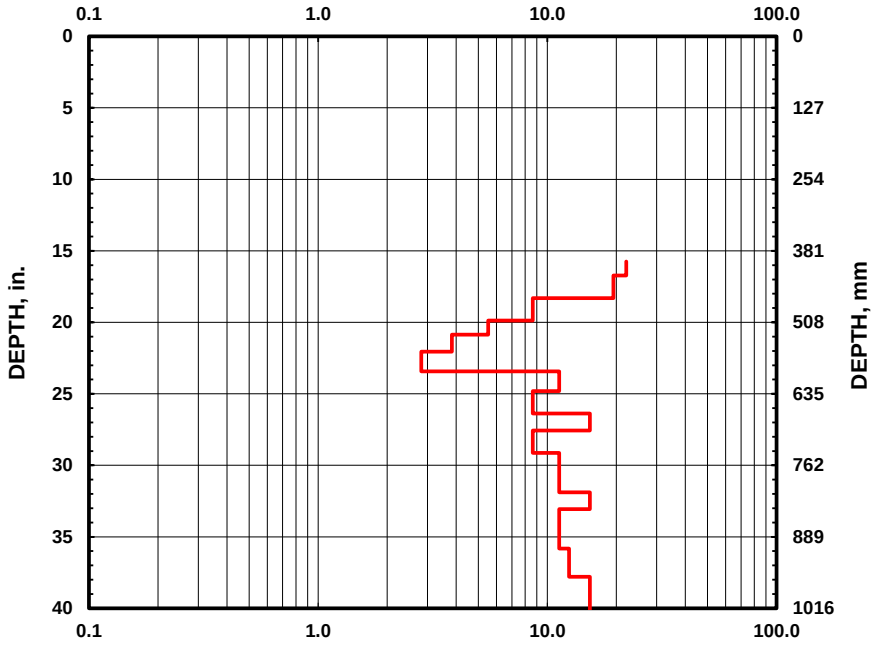
File Name: 105+00

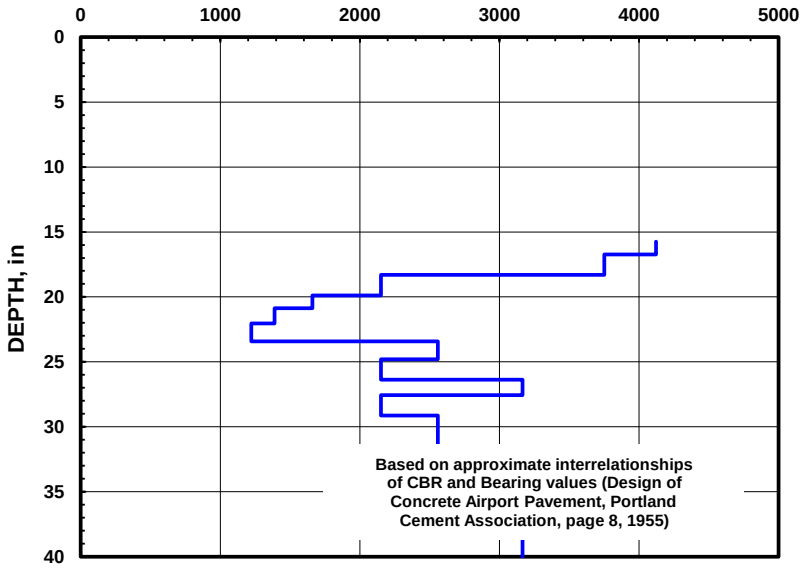
Project: *Zora St Widening*
Location: 105+00
Date: 9-Aug-16
Soil Type(s): Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	400	1
2	425	1
3	465	1
2	505	1
1	530	1
1	560	1
1	595	1
2	630	1
2	670	1
2	700	1
2	740	1
2	775	1
2	810	1
2	840	1
2	875	1
2	910	1
3	960	1
2	990	1
2	1020	1
2	1050	1
2	1085	1
2	1115	1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
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		1
		1





DCP TEST DATA

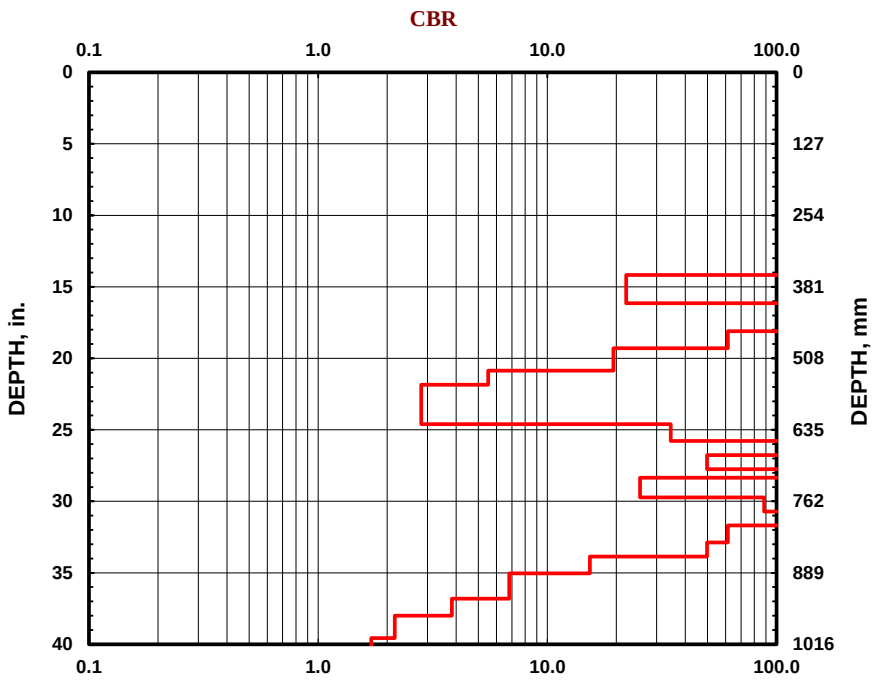
File Name: 115+00

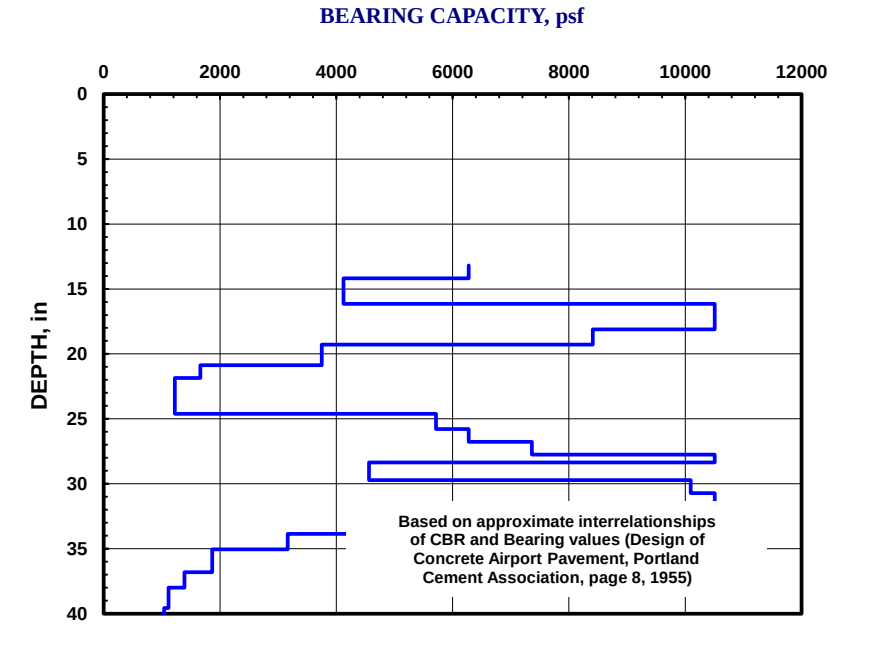
Project: *Zora St Widening*
Location: 115+00
Date: 9-Aug-16
Soil Type(s): Lean Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	335	1
6	360	1
2	385	1
2	410	1
5	435	1
5	460	1
4	490	1
3	530	1
1	555	1
1	590	1
1	625	1
3	655	1
6	680	1
3	705	1
3	720	1
3	755	1
4	780	1
5	805	1
4	835	1
3	860	1
2	890	1
2	935	1
1	965	1
1	1005	1
1	1050	1
1	1090	1
1	1125	1
		1
		1
		1
		1
		1
		1
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		1
		1





DCP TEST DATA

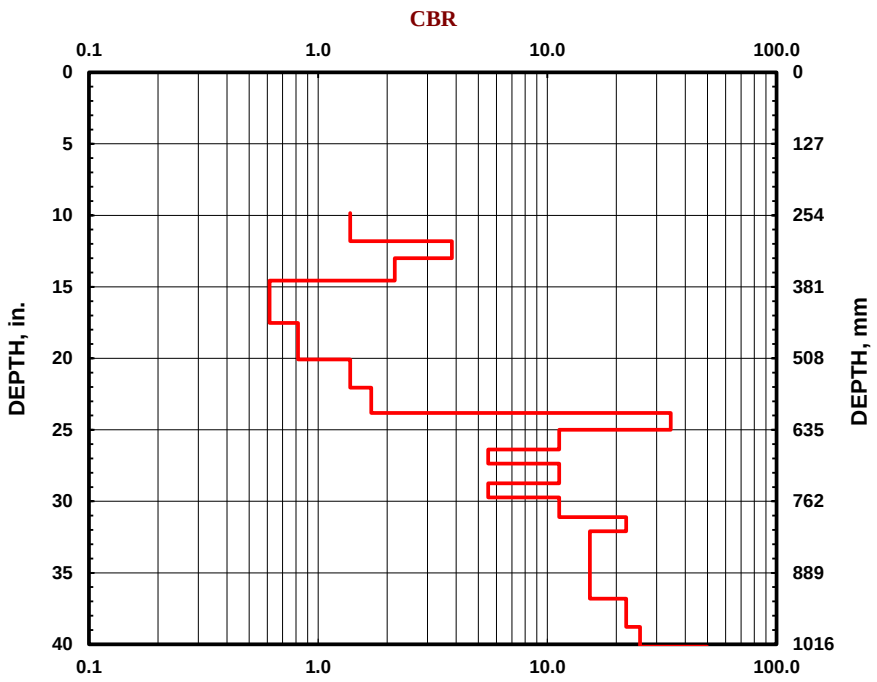
File Name: 123+00

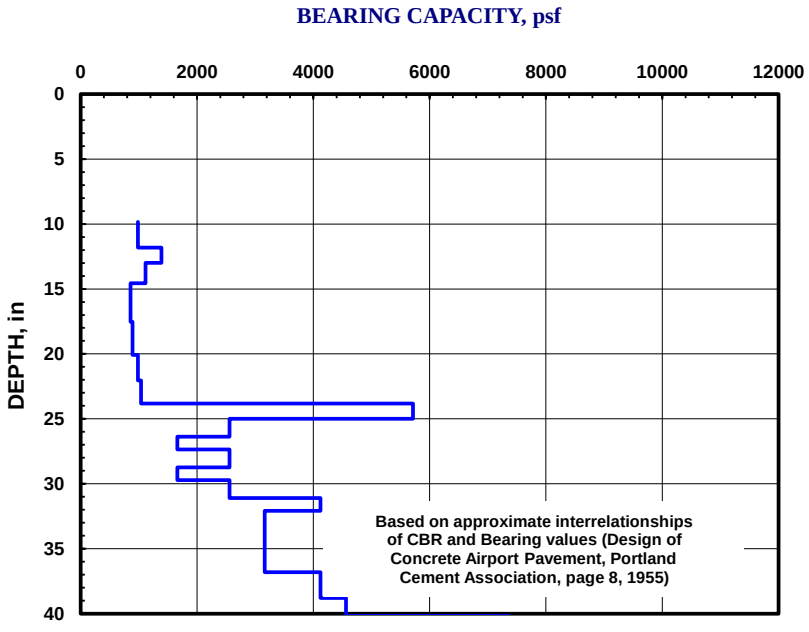
Project: *Zora St Widening*
Location: 123+00
Date: 10-Aug-16
Soil Type(s): Lean to Fat Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	250	1
1	300	1
1	330	1
1	370	1
1	445	1
1	510	1
1	560	1
1	605	1
3	635	1
2	670	1
1	695	1
2	730	1
1	755	1
2	790	1
2	815	1
2	845	1
2	875	1
2	905	1
2	935	1
2	960	1
2	985	1
3	1020	1
3	1045	1
4	1070	1
4	1095	1





DCP TEST DATA

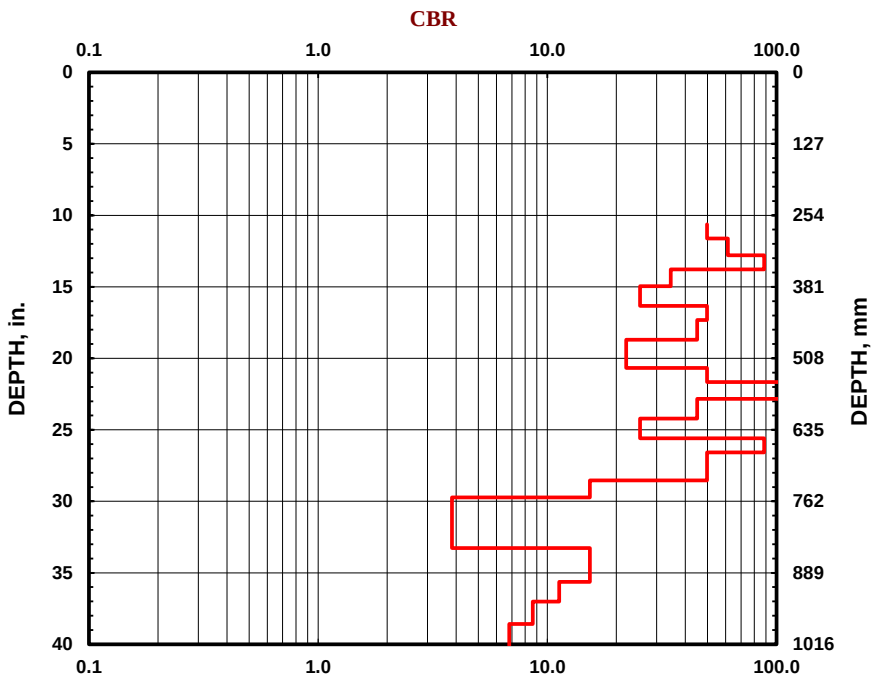
File Name: 124+62

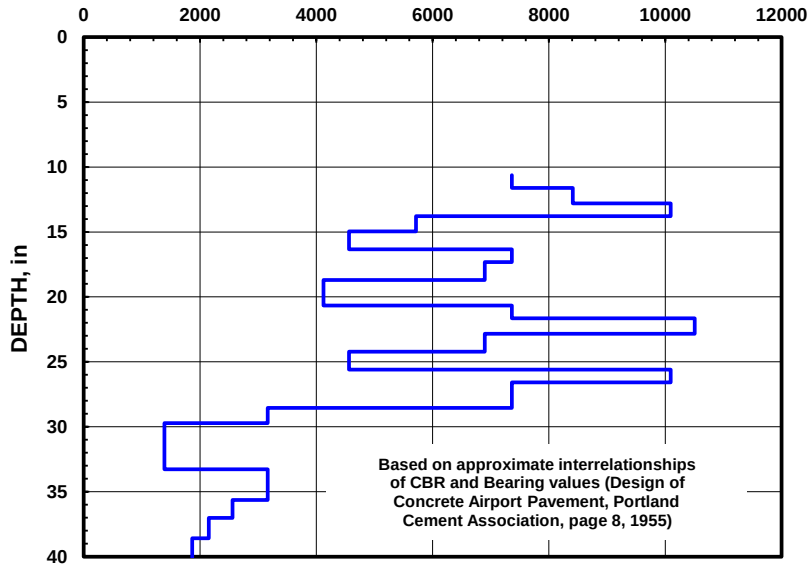
Project: *Zora St Widening*
Location: 124+62
Date: 8-Aug-16
Soil Type(s): Lean Clay w/ Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	270	1
3	295	1
4	325	1
4	350	1
3	380	1
3	415	1
3	440	1
4	475	1
4	525	1
3	550	1
6	580	1
4	615	1
3	650	1
4	675	1
3	700	1
3	725	1
2	755	1
1	785	1
1	815	1
1	845	1
2	875	1
2	905	1
2	940	1
2	980	1
2	1025	1
2	1060	1
2	1100	1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1
		1





APPENDIX IV

CORE PHOTOGRAPHS

Pavement Core Log

TOP



• Geotechnical Services
• Environmental Services
• Material Testing Services
PALMERTON & PARRISH, INC.
Springfield, MO
4168 W. Kearney Springfield, MO 65803
Call 417.864.6000 Fax 417.864.6004
www.ppimo.com

Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 15+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 15+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8
Aggregate Base	12
Total Core Thickness:	20

Pavement Core Log



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 23+00 Westbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 23+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	7
Aggregate Base	4
Total Core Thickness:	11

Pavement Core Log

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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 31+50 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 31+50

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	5
Aggregate Base	4
Total Core Thickness:	9”

Pavement Core Log

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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 39+50 Westbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 39+50

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	9
Aggregate Base	7
Total Core Thickness:	16

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 46+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 46+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	9
Aggregate Base	8
Total Core Thickness:	17

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 49+25 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 49+25 EB Lane

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	9
Aggregate Base	9
Total Core Thickness:	18

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 49+25 Patch Area in Westbound Lane
County:	Joplin, MO
Date:	8/17/2016
Boring Number:	Sta 49+25 WB Lane

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8.75
Aggregate Base	6
Total Core Thickness:	14.75

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 58+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 49+25

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8.5
Aggregate Base	5.5
Total Core Thickness:	14

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 68+25 Westbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 68+25

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	10.5
Aggregate Base	8

Total Core Thickness: 18.50”

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 80+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 80+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	11
Aggregate Base	2
Total Core Thickness:	13

Pavement Core Log

TOP



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Core Log

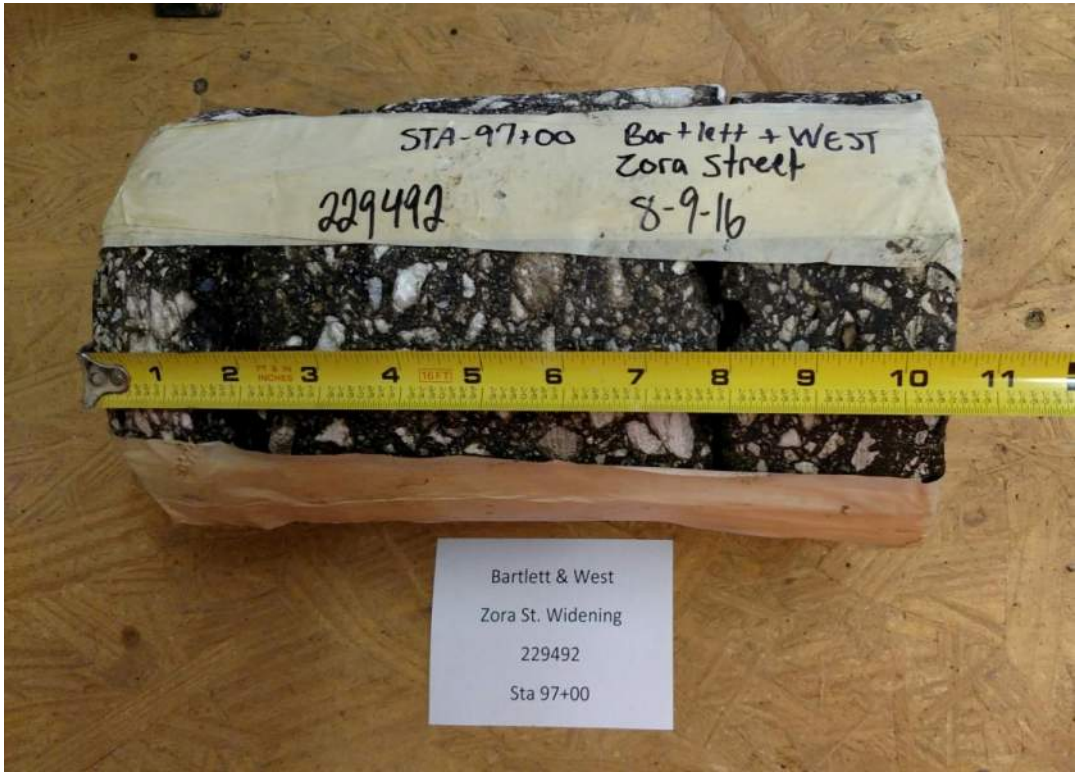
Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 88+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 88+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8.25
Aggregate Base	9
Total Core Thickness:	17.25”

Pavement Core Log

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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 97+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 97+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	10.5
Aggregate Base	2
Total Core Thickness:	12.5”

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 102+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 102+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	8.5
Aggregate Base	5.5
Total Core Thickness:	14

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 105+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 105+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	10
Aggregate Base	7
Total Core Thickness:	17

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 115+00 Westbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 115+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	10
Aggregate Base	4
Total Core Thickness:	14

Pavement Core Log

TOP



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Core Log

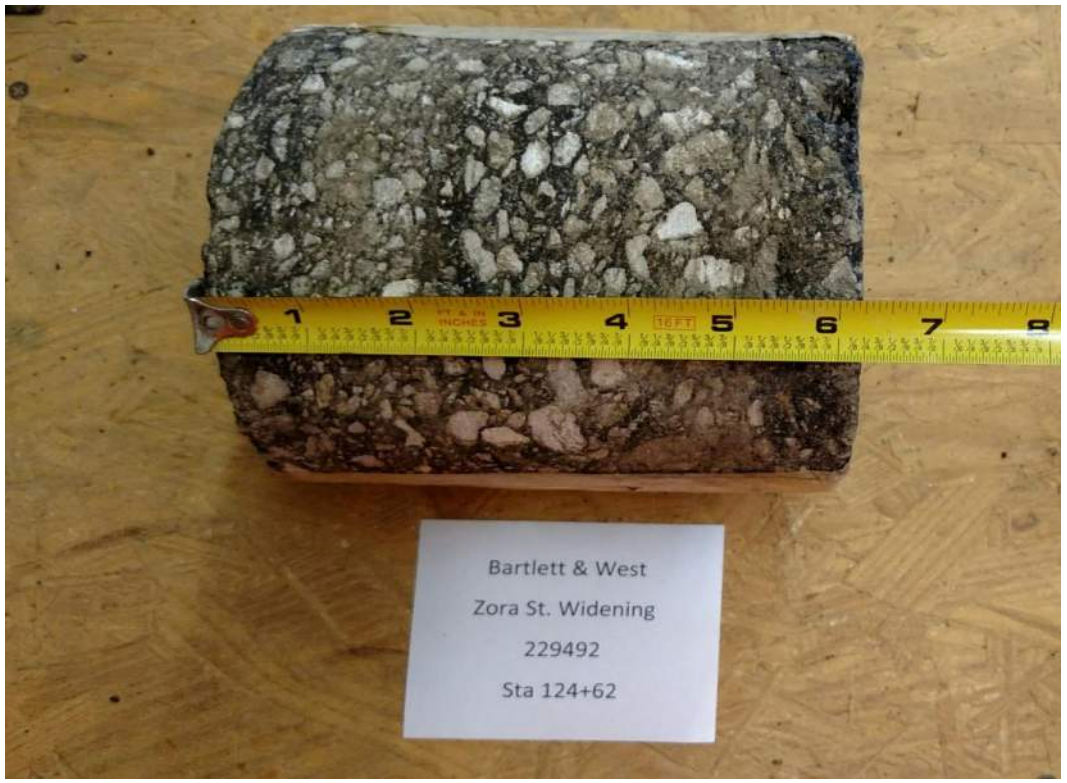
Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 123+00 Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 123+00

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	5
Aggregate Base	5
Total Core Thickness:	10

Pavement Core Log

TOP



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Core Log

Project Number:	229492
Client:	Bartlett & West
Project:	Zora St. Widening
Location:	Sta 124+62 Patch Area in Eastbound Lane
County:	Jasper
Date:	8/17/2016
Boring Number:	Sta 124+62

Core Layer Data (From Top to Bottom)

LAYER TYPE	**LAYER THICKNESS (in.)**
Asphalt	6.25
Aggregate Base	5
Total Core Thickness:	11.25

APPENDIX V

PAVEMENT ANALYSIS RESULTS

WinPAS 12

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

ESAL Data by Vehicle Type

Project Name: Zora Street Widening - Pavement Analysis
Route: Range Line to MO Rte 249
Location: Joplin, Missouri
Owner/Agency: City of Joplin
Design Engineer: BP

Traffic Factor

Estimated Rigid Thickness	7.96	**inches**
Estimated Structural Number	4.7	
Terminal Serviceability	2.5	
Design Life	20	**years**
Annual Growth Rate	2.43	**percent**
Traffic Input by	Day	

Traffic Input by

Design Lane
Design Lane Distribution 0.00 percent
Directional Distribution 0.00 percent

Vehicle	Axle Load	Axle Type	Number
	2.00	Single	
	2.00	Single	
	0.00	Single	5,102
	10.00	Single	
	0.00	Single	
	18.00	Single	54
	10.00	Single	
	0.00	Single	
	30.00	Tandem	54

Vehicle	Axle Load	Axle Type	Number
	12.00	Single	
	16.00	Single	
	30.00	Tandem	54
	12.00	Single	
	32.00	Tandem	
	32.00	Tandem	53
	12.00	Single	
	34.00	Tandem	
	34.00	Tandem	
	0.00	Single	
	0.00	Single	53

Total Rigid ESALs **5,583,405**

Total Flexible ESALs **3,817,137**

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Flexible Design Inputs

Project Name: Zora Street Widening - Pavement Analysis
Route: Range Line to MO Rte 249
Location: Joplin, Missouri
Owner/Agency: City of Joplin
Design Engineer: BP

Flexible Pavement Design/Evaluation

Structural Number	4.78		**Subgrade Resilient Modulus**	5,842.00	**psi**
Total Flexible ESALs	3,838,276		**Initial Serviceability**	4.20	
Reliability	90.00	**percent**	**Terminal Serviceability**	2.50	
Overall Standard Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.43	1.00	2.00	0.86
Asphalt Treated Agg. Base	0.37	1.00	8.00	2.96
Crushed Stone Base	0.12	1.00	8.00	0.96
			Σ SN	4.78

APPENDIX VI

IMPORTANT INFORMATION REGARDING YOUR GEOTECHNICAL REPORT

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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IIGER06075.0MRP

JOB SPECIAL PROVISION JSP-5100-01
SPECIAL SEEDING MIX

1.0 SCOPE

Special Seeding Mix shall be in accordance with Section 5100 of the current approved City of Joplin, Standard Specifications, except as modified by this Job Special Provision.

2.0 SUBMITTALS

Contractor shall submit seed mix for review by engineer and owner. The submitted mixture shall be approved by the Engineer prior to placement and shall include all specific seed mixtures and weights as a percentage of the total mixture. Seed mixture shall be from a supplier as approved by the Engineer.

3.0 MATERIALS

Seed Mixture: Shall conform to the following seed mix and application rate.

50#/Ac

Orchard grass - 30%
Perennial grass - 30%
Timothy - 20%
Medium red clover - 10%
Alfalfa - 5%
Ladino clover - 5%

Annual rye - 50#/Ac

4.0 MEASUREMENT

Special Seeding Mix will be measured to the nearest square yard as specified in the plans.

5.0 PAYMENT

The cost of furnishing all labor, equipment, tools, and materials, and the performance of all work necessary to complete Special Seeding Mix shall be paid in the units as specified in the proposal.

STATE OF MISSOURI **Tracts 27191, 27192, 27193, 27248 & 29337**

COUNTY OF JOPLIN **Line: HA 16”**

ENCROACHMENT AGREEMENT

THIS AGREEMENT dated this ____ day of _____, 2025 entered into by and between **SOUTHERN STAR CENTRAL GAS PIPELINE, INC.,** (formerly Williams Gas Pipelines Central, Inc., Williams Natural Gas Company, Northwest Central Pipeline Corporation and Cities Service Gas Company), a Delaware corporation, whose mailing address is P.O. Box 20010, Owensboro, Kentucky 42304, hereinafter referred to as "Company", and **CITY OF JOPLIN, MISSOURI,** a municipal corporation, whose mailing address is 602 S. Main, Joplin, Missouri 64801, hereinafter referred to as "Owner".

WHEREAS, Company is the current owner/holder of a valid and subsisting right-of-way(s), easement(s), lease(s), agreement(s) and/or similar rights located in the South Half (S ½) of Sections 28 and 29**,** in Township 28 North**,** Range 32 West**,** Jasper County, Missouri pursuant to the instruments recorded with the Register of Deeds in Jasper County, Missouri and as more fully described on **Exhibit A** (the “Pipeline Easement(s)”) for the installation, modification and/or operation of Pipeline Facilities defined, without limitation, as being pipelines currently existing on or in the Pipeline Easement(s), together with all substitutions or replacements thereto and together with all appurtenances thereto, including but not limited to compressor stations, pump stations, valves, meters, tanks, fittings, connections, corrosion control and pressure detection devices, wires, cables, pig traps, and any other appurtenances associated with the pipelines.

WHEREAS, Owner is in possession of leases and/or easement rights and/or owns (the “Owner’s Tracts”) a portion of which cover the parcels listed on **Exhibit B** (the “Property”) for the development, construction, operation, maintenance, repair and replacement of East Zora Street Improvements, Phase 2, to be located in the city of Joplin, Jasper County, Missouri (the “Project”).

WHEREAS, Owner has or shall construct certain improvements upon, over or under the Pipeline Easements as part of its Project and as specifically described on **Exhibit C** attached hereto and made a part hereof (collectively referred to herein as the "Encroachments").

WHEREAS, under the terms of this Agreement, Company is willing to permit said encroachments and,

NOW THEREFORE, Company grants Owner a limited right to encroach upon the Pipeline Easements, subject to the terms and conditions set forth herein; and Owner, in consideration of this limited right of Encroachments, agrees to the following covenants and obligations set forth herein:

1. Owner specifically acknowledges Company's need for access to its facilities and recognizes its rights under the Pipeline Easements, which, are to remain in full force and effect notwithstanding this Agreement. As consideration for this Agreement, any cost to Owner or damage to the Encroachments resulting from Company's need to maintain, operate, repair or replace any portion of the Pipeline Facilities, including, but not limited to, costs for the maintenance, replacement or repair of any portion of the Encroachments, will be the sole responsibility of Owner and Company will not, under any circumstances, be responsible for loss or damage to the Encroachments.

2. Owner will cause to be furnished to Company contemporaneously with the execution of this Agreement, detailed plans, including a certified survey, for the construction of the Encroachments upon, over or under the Pipeline Easements. The plans shall be deemed incorporated herein by reference and made a part of this Agreement. Owner agrees that any review or approval by Company of any plans and/or specifications relating to the Encroachments or the identity of any contractors, subcontractors and materialmen is solely for Company's benefit, and without any representation or warranty whatsoever to Owner with respect to the adequacy, correctness or efficiency thereof or otherwise and it is understood that such Company's approval does not absolve Owner of any liability hereunder. Further, Owner, in connection with the construction, maintenance and/or removal of the Encroachments, agrees to observe and fully comply with all laws, rules and regulations of the United States, the State of Missouri, and all agencies and political subdivisions thereof. Owner agrees and acknowledges that all work on the easement shall be performed in a workman like manner.

3. This Agreement shall be terminable by Company in the event of Owner's material noncompliance with the requirements, conditions or specifications of this Agreement and the continuation thereof for a period of thirty (30) days following written notice to Owner or immediately after such written demand by Company if such non-compliance will result in Company's opinion to a substantial risk to health or safety. Should Company terminate this Agreement, Owner will relocate and/or remove the Encroachments at no expense or risk to Company.

4. No permanent structures, including without limitation landscaping, irrigations systems and signage not explicitly approved by this Agreement shall be allowed within Company's easement.

5. Owner agrees and understands that its work and encroachments are to strictly adhere to Company's Land Use and Developers Handbook located on-line at https://www.southernstar.com/safety/pipeline-safety/.

6. Owner will restrict all equipment traffic over the Company's pipeline until the pipeline has undergone a load study conducted and approved by Company. In order for that study to be conducted, Owner agrees to submit to Company (at sscencroachments@southernstar.com) a comprehensive list of equipment to be used on the pipeline easement. Owner understands that it shall be financially responsible for any and all outside engineering services required for Company to perform the Load Study and for complying with the requirements of said Load Study.

7. Indemnity/Hold Harmless/Insurance.

(A) To the fullest extent permitted by law, Owner shall indemnify, defend and hold harmless Company and Company's affiliated companies, partners, shareholders, employees and agents (collectively, "indemnitees") for, from and against any and all claims, liabilities, fines, penalties, costs, damages, losses, liens, causes of action, suits, demands, judgments and reasonably incurred out of pocket expenses (including, without limitation, court costs, reasonable attorneys' fees and costs of investigation) (collectively, "liabilities") of any nature, kind or description of any indemnitee directly or indirectly arising out of, resulting from or related to (in whole or in part): (i) Owner's occupation and use of the existing pipeline easement area; (ii) construction, use, state of repair or presence of the encroachments; or (iii) any act or omission of Owner or Owner's officers, agents, employees, or contractors, or anyone directly or indirectly employed by any of them, or anyone they control or exercise control over, even if such liabilities arise from or are attributed to, in whole or in part, to the negligence of any indemnitee. The only liabilities with respect to which Owner's obligation to indemnify the indemnitees does not apply are liabilities wholly caused by the sole negligence or willful misconduct of an indemnitee.

(B) Owner acknowledges that having the encroachments, whether permitted or not, on the existing Pipeline Easements provides some risk that the encroachments may be damaged in the course of Company's operations or activities. Therefore, notwithstanding any other provision in this agreement, to the fullest extent permitted

by law, Owner releases the indemnitees from any loss, damage and/or claim from loss or damage to their property, including the encroachments, that Owner may have against the indemnitees resulting from the activities of Company in the ordinary course of its operations, provided that such release shall not apply to any loss, damage or claim wholly caused by the gross negligence or willful misconduct of an indemnitee.

8. Owner shall notify or cause Company to be notified, at least forty-eight (48) hours prior to the performance of any construction or excavation work upon the Pipeline Easement. Owner covenants and agrees to notify or cause its representative to notify the appropriate state one-call center as required by law no less than forty-eight (48) hours prior to the commencement of excavation in or near the existing pipeline easement area. Company shall have the absolute right to perform any work upon, over or under the Pipeline Easements it reasonably deems necessary for the maintenance or operation of its facilities without prior notice to Owner.

9. During the exercise of its easement rights to construct, maintain and operate the pipeline and appurtenances, in the event Company or its contractors destroy or damage the encroachments herein permitted, including without limitation landscaping and/or irrigation systems, all such damages to said permitted items and all costs thereof shall be the sole responsibility of Owner, its successors and assigns, unless such loss, or cost or expense is directly and solely caused by the gross negligence or willful misconduct of Company, its agents, contractors and/or subcontractors.

10. During the exercise of its easement rights to construct, maintain and operate the pipeline and appurtenances, in the event Company or its contractors restrict or block access to the Encroachment or any of its facilities, Company will not be responsible for providing an alternate source of access, liable for the loss of any and all income and/or any and all damages caused by such activities.

11. Prior to commencement of construction of the above referenced work and Encroachment(s), Owner or Owner's contractor, shall provide Company certificates of insurance expressly naming Company as an additional insured and evidencing coverage in the amount of one million dollars ($1,000,000.00) general liability, one million dollars ($1,000,000.00) auto liability, and one million dollars ($1,000,000.00) workers compensation and employers' liability insurance for the construction area described herein, and containing thirty (30) days prior written notice of cancellation. Certificates of Insurance and this signed Agreement will be submitted to the following address:

Southern Star Central Gas Pipeline, Inc.
Attn: Land Department
4700 State Route 56
P.O. Box 20010
Owensboro, KY 42304

12. No failure or delay in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any single or partial exercise thereof preclude any other or further exercise of any right, power or privilege hereunder. In the event it shall become necessary for either party to commence litigation to enforce any provision of this Agreement, the prevailing party shall be entitled to recover its reasonable attorney's fees and attendant expenses in conjunction with such litigation.

13. Owner warrants that it is the current owner of the real property and/or the holder of the easement right(s) described herein and has the right, title and capacity to enter into this Agreement.

14. Under no circumstance shall Company be required to relocate a Pipeline Facility.

15. Owner agrees to abide by the Company's guidelines, procedures and requirements for working in and around Company's easement(s) and/or facilities and failure to do so will be considered a breach of this Agreement.

16. The terms of this Agreement shall constitute covenants running with the land and will be binding upon and inure to the benefit of the parties hereto, or their successors and assigns. The obligations of Owner herein shall survive the termination of this Agreement.

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IN WITNESS WHEREOF, we hereunto set our hands and seals on the day and year indicated below our signatures.

COMPANY:

SOUTHERN STAR CENTRAL GAS PIPELINE, INC.

_____
Charles Crews, Executive Vice-President and
Chief Operations Officer

Date: _____

Owner:

CITY OF JOPLIN, MISSOURI

_____
Dan Johnson, PE
Public Works Director

Date: _____

CORPORATE ACKNOWLEDGEMENT

COMMONWEALTH OF KENTUCKY

COUNTY OF DAVIESS

Before me, the undersigned, a Notary Public duly commissioned in and for the county and state aforesaid, on this _____ day of _____, 2025, personally appeared Charles Crews, who being by me duly sworn, did say that he is the Executive Vice President and Chief Operations Officer of Southern Star Central Gas Pipeline, Inc., a corporation, and that said instrument was signed on behalf of said corporation by authority of its Board of Directors, and said Charles Crews acknowledged said instrument to be the free act and deed of said corporation.

In testimony whereof, I have hereunto set my hand and affixed my official seal at my office in said county and state the day and year last above written.

_____
Printed Name: _____
Notary Public

My Commission Expires _____, 20___.

ACKNOWLEDGEMENT

STATE OF MISSOURI

COUNTY OF JASPER

Before me, the undersigned, a Notary Public duly commissioned in and for the county and state aforesaid, on this _____ day of _____, 2025, personally appeared, Dan Johnson, PE, Public Works Director for the City of Joplin, Missouri, known to me to be identical person who executed the within and foregoing instrument and acknowledged to me that he/she executed the same as his/her free act and deed of said City of Joplin, Missouri, for the use and purpose set forth.

_____
Printed Name: _____
Notary Public

My Commission Expires: _____, 20_____.

EXHIBIT A

T27191

Right of Way Agreement dated January 18, 1961, recorded January 27, 1961, in Miscellaneous Book 948, Page 396 covering the South Half of the South Half of the Southwest Quarter of the Southwest Quarter (S/2 S/2 SW/4 SW/4) of Section 29, Township 28 North, Range 32 West, Jasper County, Missouri.

T27192

Right of Way Agreement dated January 18, 1961, recorded January 27, 1961, in Miscellaneous Book 948, Page 398 covering the Southeast Quarter of the Southwest Quarter (SE/4 SW/4) of Section 29, Township 28 North, Range 32 West, Jasper County, Missouri.

T27193

Right of Way Agreement dated January 19, 1961, recorded January 27, 1961, in Miscellaneous Book 948, Page 400 covering the East Half of the Southeast Quarter (E/2 SE/4) of Section 29, Township 28 North, Range 32 West, Jasper County, Missouri;

AND

Right of Way Agreement dated January 19, 1961, recorded January 27, 1961, in Miscellaneous Book 948, Page 402 covering the East Half of the Southeast Quarter (E/2 SE/4), the Southwest Quarter of the Southeast Quarter (SW/4 SE/4) and the Southeast Quarter of the Southwest Quarter (SE/4 SW/4) of Section 28, Township 28 North, Range 32 West, Jasper County, Missouri, SUBJECT TO Easement for Highway Construction dated March 7, 2001, recorded May 15, 2001, in Book 1665, Page 47, Jasper County, Missouri.

T27248

Report of Commissioners dated March 6, 1961 of record in the Circuit Court of Jasper County, Missouri, Action Number 54347 covering the West Half of the Southeast Quarter (W/2 SE/4) and part of the East Half of the Southwest Quarter (E/2 SW/4) of Section 29, and the Southwest Quarter of the Southwest Quarter (SW/4 SW/4) of Section 28, Township 28 North, Range 32 West, Jasper County, Missouri, SUBJECT TO Easement for Highway Construction dated March 7, 2001, recorded May 15, 2001, in Book 1665, Page 47, Jasper County, Missouri.

T29337

Right of Way Agreement dated October 17, 1967, recorded November 3, 1967, in Miscellaneous Book 1097, Page 623 covering the Southwest Quarter of the Southwest Quarter (SW/4 SW/4) of Section 28, Township 28 North, Range 32 West, Jasper County, Missouri, SUBJECT TO Easement for Highway Construction dated March 7, 2001, recorded May 15, 2001, in Book 1665, Page 47, Jasper County, Missouri.

EXHIBIT B

Various permanent easements in favor of the City of Joplin, Missouri as shown below:

By virtue of that certain drainage easement granted by Laura J. Ford and Russell C. Smart to the City of Joplin, Missouri, dated February 14, 2024, recorded in Book 2713, Page 107 in the Recorder of Deed's Office of Jasper County, Missouri.

By virtue of that certain Drainage Easement granted by Laura J. Ford and Delbert W. Ford to the City of Joplin, Missouri, dated February 14, 2024, recorded in Book 2713, Page 105 in the Recorder of Deed's Office of Jasper County, Missouri.

By virtue of that certain Drainage Easement granted by William H Burden, Jr. and Mary Marcia Burden, Trustees of the Burden Family Revocable Trust U/A dated April 8, 1996 to the City of Joplin, Missouri, dated August 29, 2024, recorded in Book 2734, Page 390 in the Recorder of Deed's Office of Jasper County, Missouri.

By virtue of that certain Drainage Easement granted by Childress Royalty Company to the City of Joplin, MO, dated December 18, 2024, recorded in Book 2743, Page 436 in the Recorder of Deed's Office of Jasper County, Missouri.

By virtue of that certain Drainage Easement granted by Country Acres MHP, LLC to the City of Joplin, Missouri, dated September 11, 2024, recorded in Book 2734, Page 392 in the Recorder of Deed's Office of Jasper County, Missouri.

By virtue of that certain Drainage Easement granted by Donna Gage to the City of Joplin, Missouri, dated September 6, 2024, recorded in Book 2734, Page 389 in the Recorder of Deeds Office of Jasper County, Missouri.

By virtue of that certain Drainage Easement granted by Dustin W. Holt to the City of Joplin, Missouri, dated May 20, 2024, recorded in Book 2718, Page 223 in the Recorder of Deeds Office of Jasper County, Missouri.

By virtue of that certain Drainage Easement granted by Szklarski Farms, LLC to the City of Joplin, Missouri, dated May 15, 2024, recorded in Book 2718, Page 215 in the Recorder of Deed's Office of Jasper County, Missouri.

EXHIBIT B (CONTINUED)

By virtue of that certain Drainage Easement granted by Zora 4551 LLC to the City of Joplin, Missouri, dated August 23, 2024, recorded in Book 2731, Page 38 in the Recorder of Deed's Office of Jasper County, Missouri.

By virtue of that certain Right of Way Conveyance granted by Lawver Investments, L.L.C. to the City of Joplin, Missouri, dated May 12, 2023, recorded in Book 2685, Page 112 in the Recorder of Deed's Office of Jasper County, Missouri.

By virtue of that certain Drainage Easement granted by Lawver Investments, L.L.C. to the City of Joplin, Missouri, dated May 12, 2023, recorded in Book 2685, Page 112 in the Recorder of Deed's Office of Jasper County, Missouri.

By virtue of that Certain Drainage Easement granted by Schlegel Properties, LLC to the City of Joplin, Missouri, dated May 31, 2022, recorded in Book 2649, Page 243 in the Recorder of Deed's Office of Jasper County, Missouri.

By virtue of that Certain Drainage Easement granted by Schlegel Properties, LLC to the City of Joplin, Missouri, dated May 31, 2022, recorded in Book 2649, Page 242 in the Recorder of Deed's Office of Jasper County, Missouri.

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EXHIBIT C

LINE LETTER	HA 16"
NAME / DESCRIPTION	CITY OF JOPLIN ZORA STREET IMPROVEMENTS PHASE 2
LEGAL DESCRIPTION	S/2 OF S29 & S28 OF T28N-R32W JASPER COUNTY, MO
ENGINEER	ANDREW ZELLER
LAND REPRESENTATIVE	TRACY DAY
DATE	JANUARY 30, 2025

CITY OF JOPLIN will encroach on Southern Star's easement and Line HA 16" with street widening and storm drain improvements as described and shown in the exhibits below.

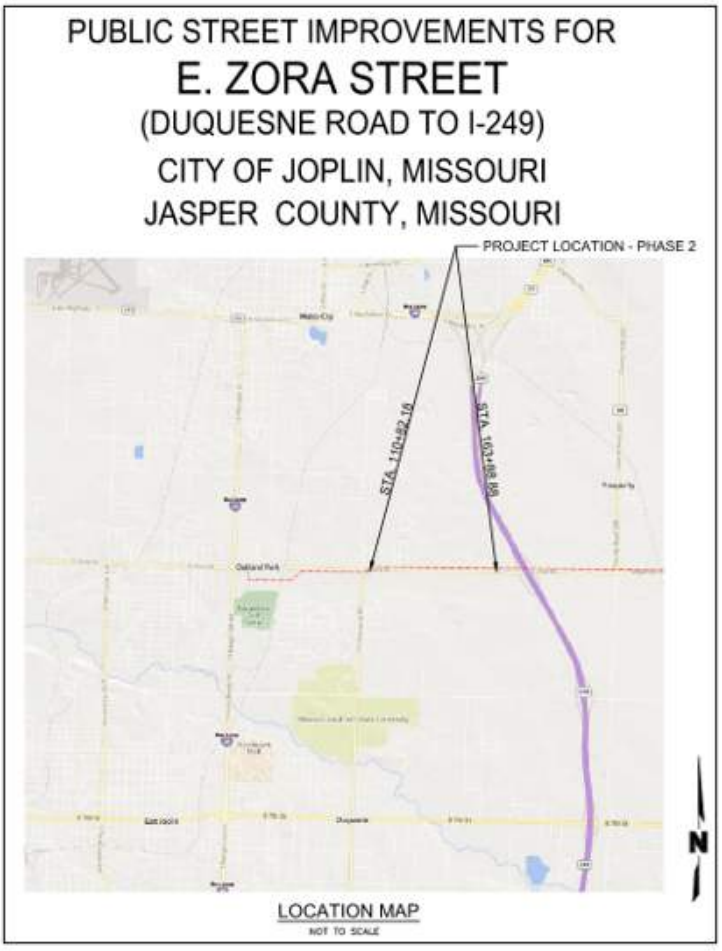


Figure 1. ZORA IMPROVEMENTS

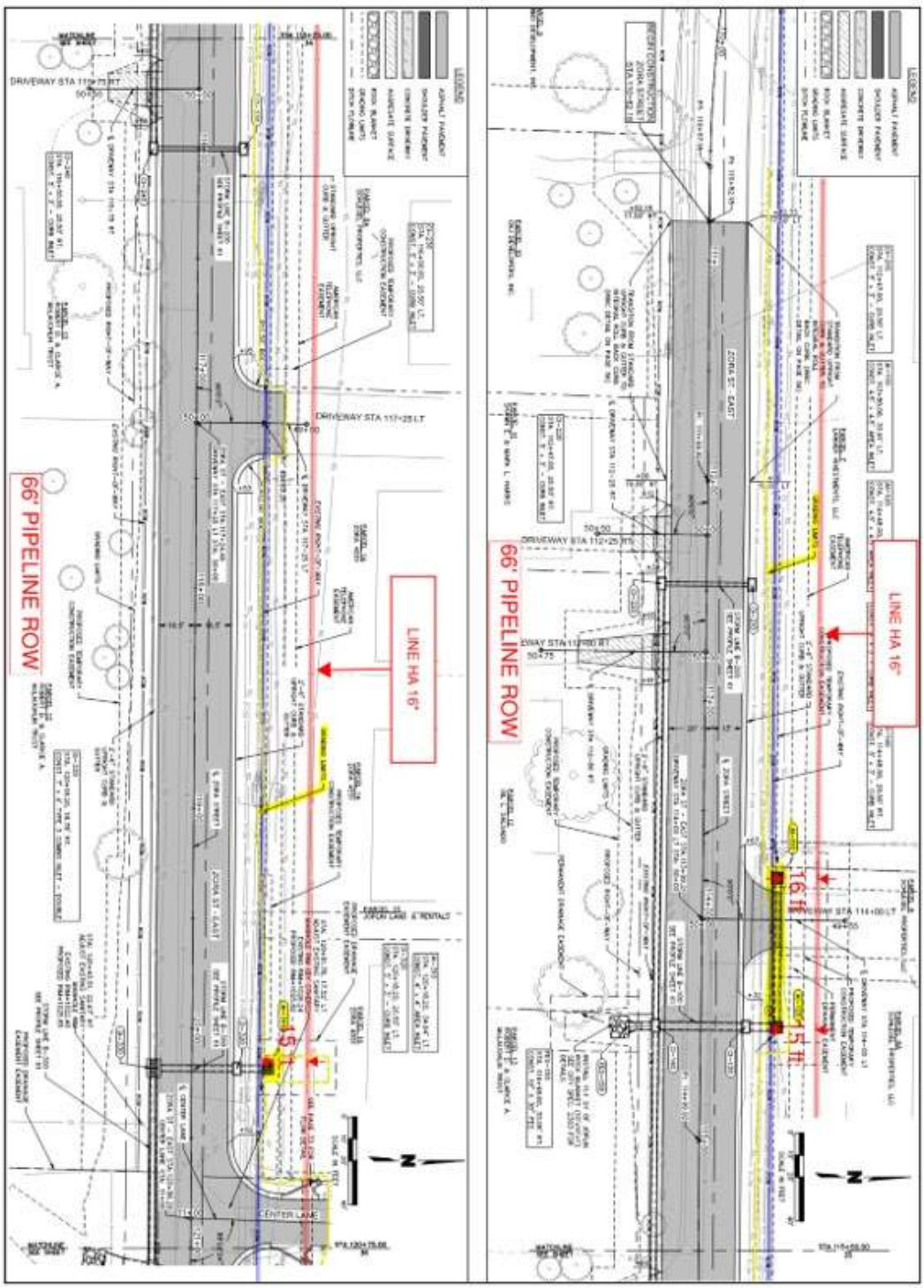


Figure 2. ZORA IMPROVEMENTS 111+00 TO 121+00

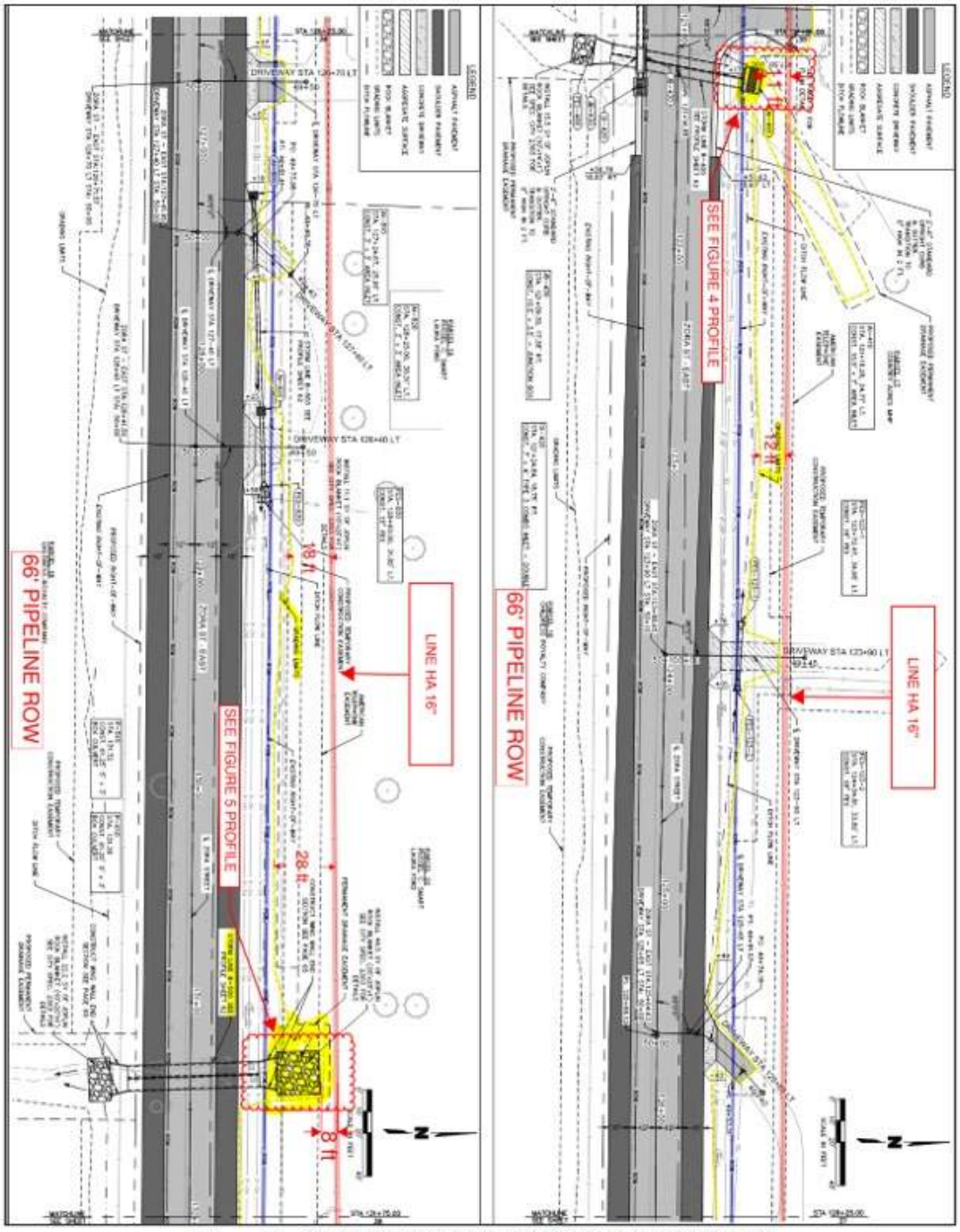


Figure 3. ZORA IMPROVEMENTS 121+00 TO 132+00

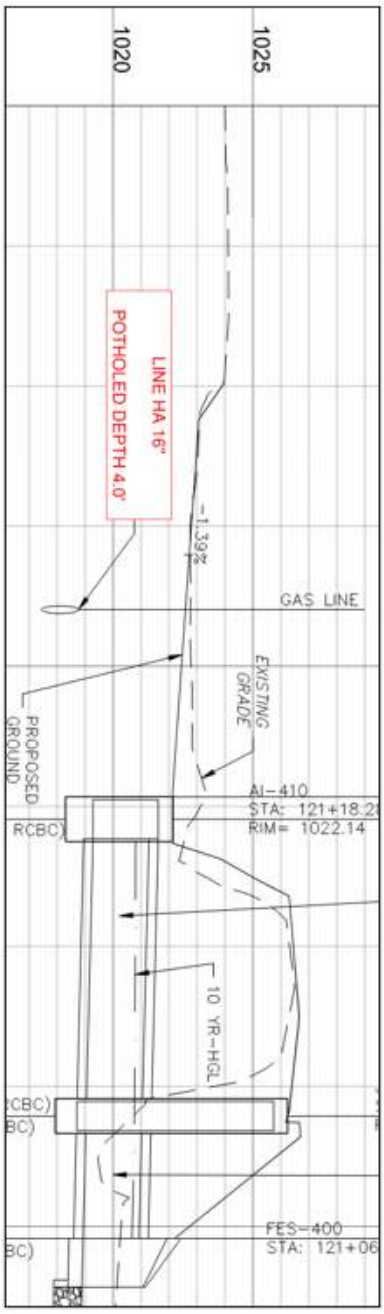


Figure 4. STORM LINE B-400 PROFILE

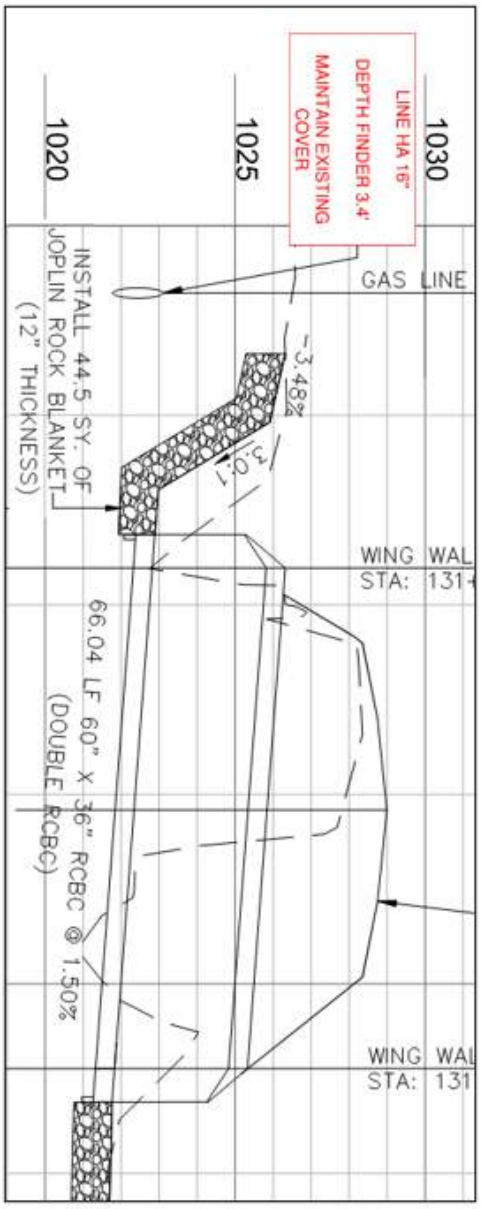


Figure 5. STORM LINE B-500 PROFILE

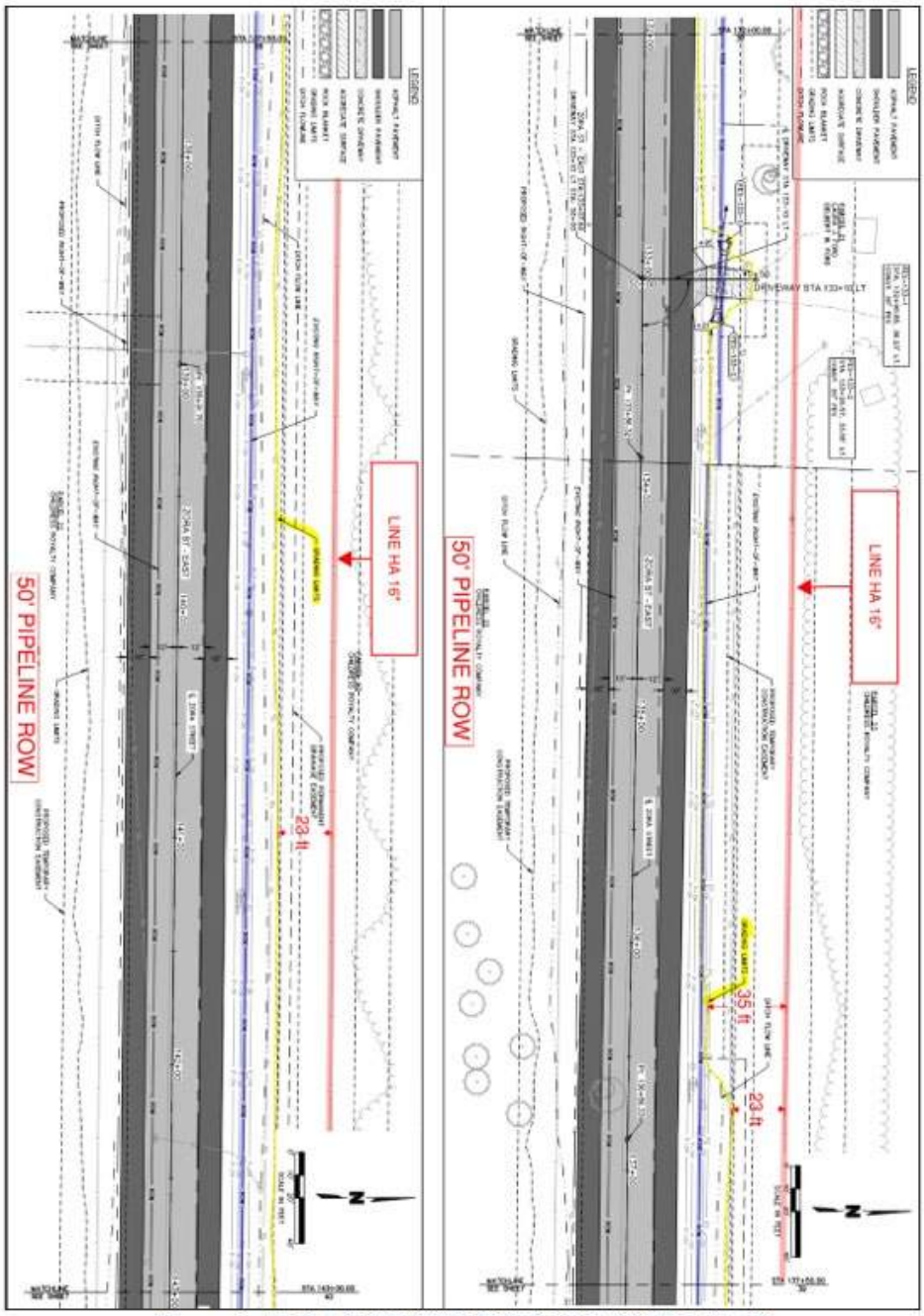


Figure 6. ZORA IMPROVEMENTS 132+00 TO 143+00

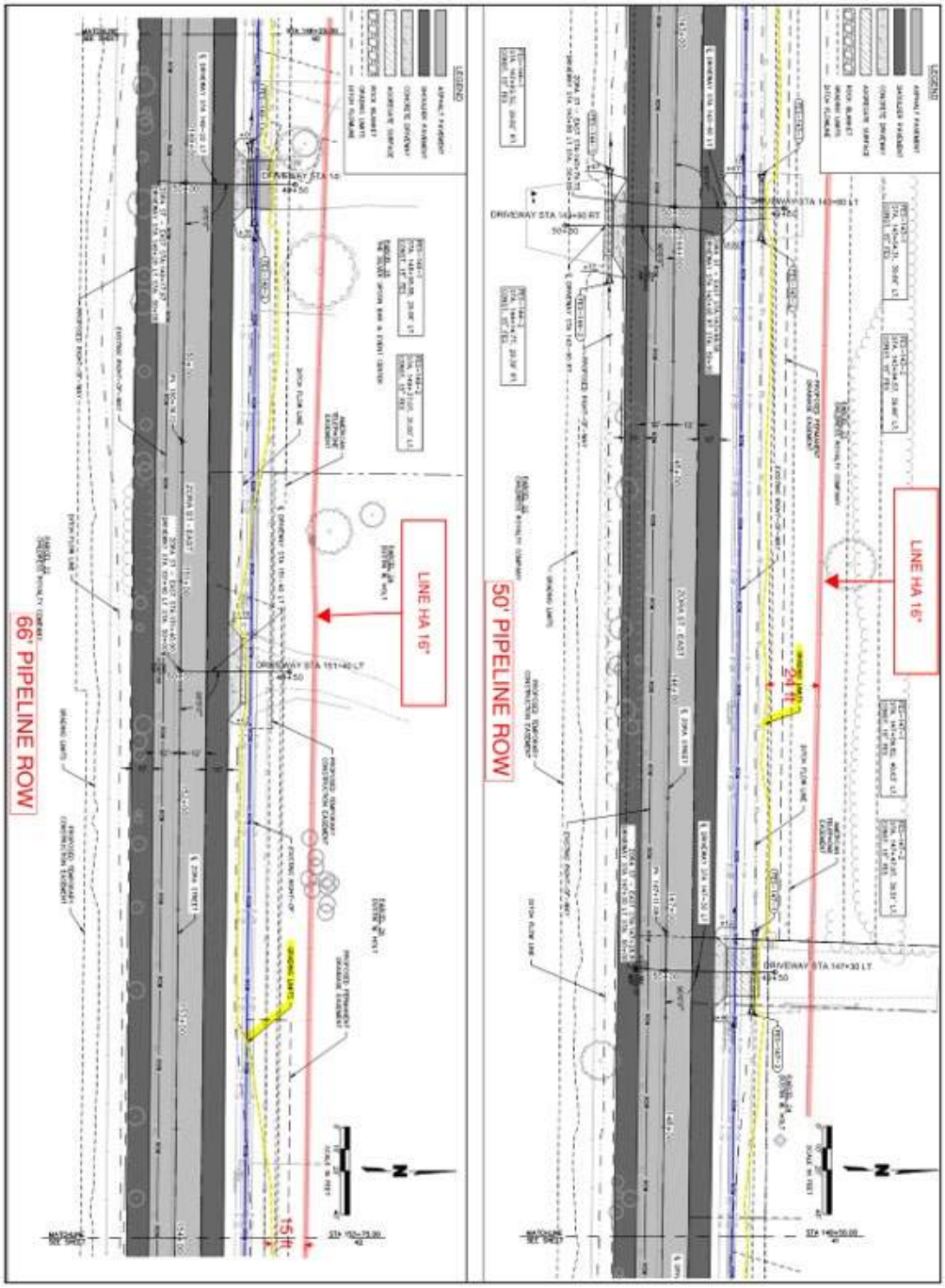


Figure 7. ZORA IMPROVEMENTS 143+00 TO 154+00

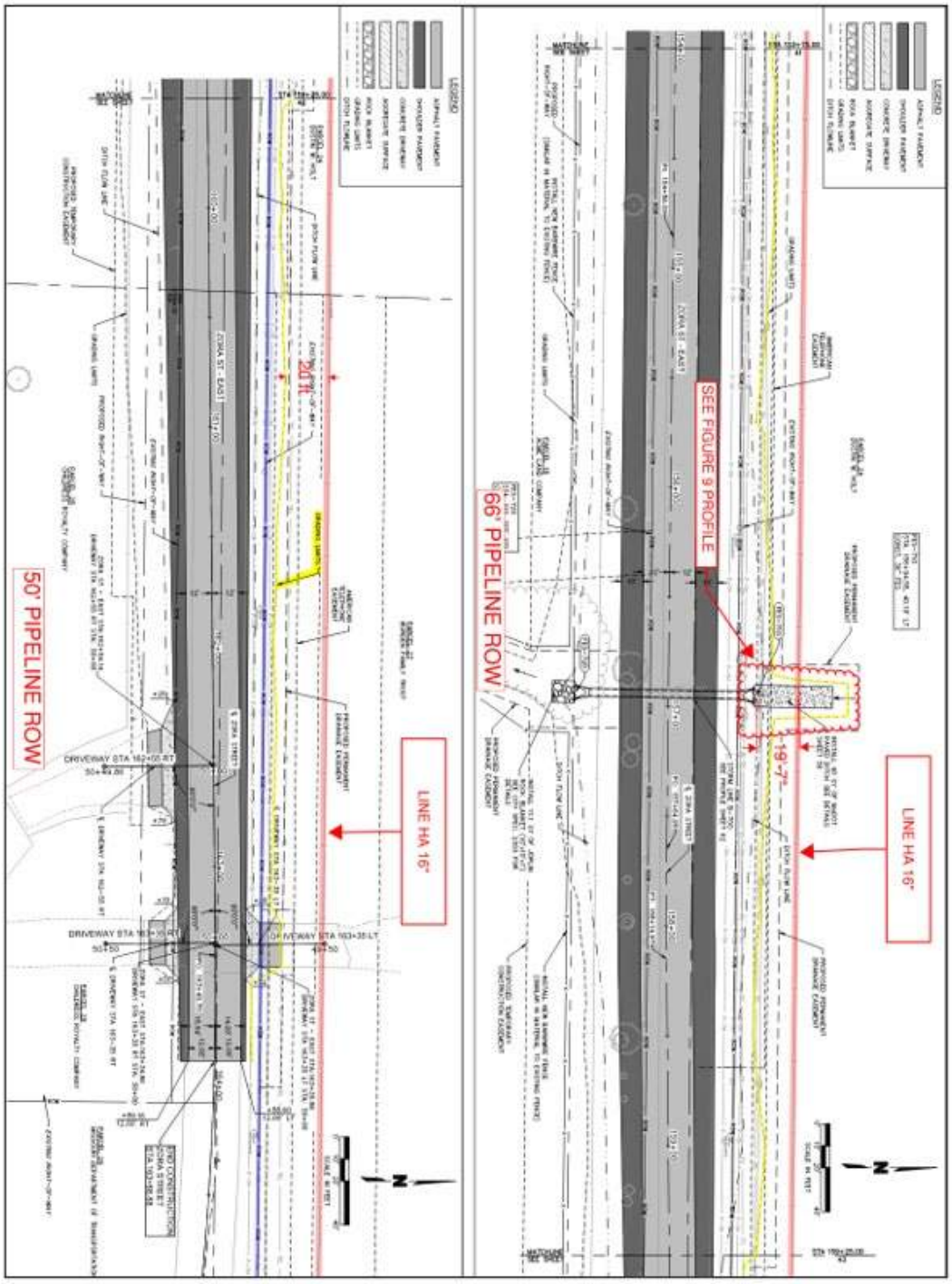


Figure 8. ZORA IMPROVEMENTS 154+00 TO 164+00

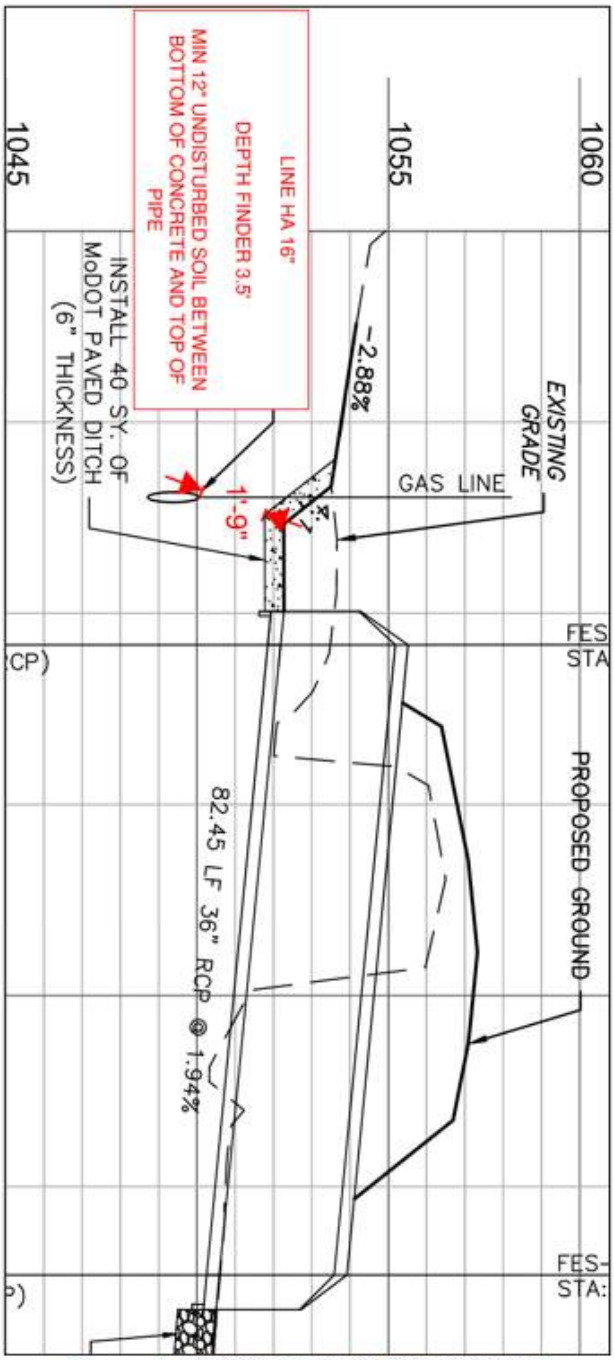


Figure 9. STORM LINE B-700 PROFILE