PRELIMINARY ENGINEERING REPORT

Prepared for Collin County

E. Stone Road Improvements Study
(From W. A. Allen Boulevard to Bennett Road)

November 2021

Binkley & Barfield
consulting engineers

The seal appearing on this document was authorized by Richard A. Arvizu, P.E. Tx. No. 88432. Alteration of a sealed document without proper notification to the responsible engineer is an offense under the Texas Engineering Practice Act. 11/09/2021

STATE OF TEXAS
RICHARD A. ARVIZU
88432
LICENSED
PROFESSIONAL ENGINEER

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EXECUTIVE SUMMARY

E. Stone Road from W. A. Allen Boulevard to Bennett Road is a narrow two-lane asphalt roadway with parallel drainage ditches along both sides, including areas with steep to nearly vertical side slopes along the edges of the roadway. The narrow roadway, which is more than 3' narrower than what applicable standards recommend, combined with the steep side slopes create safety issues along the corridor. The corridor experiences a varied mix of traffic, and due to the proximity to the local high school, there is a high percentage of teenage drivers, pedestrian traffic, and school buses. The purpose of this report is to document existing conditions, recommend improvements, and present options to improve safety conditions along the roadway.

Existing (2021) traffic counts were collected and forecasted to future (2045) conditions. Crash data was collected and analyzed throughout the study area, and it was determined that a high number of crashes throughout the study area were single vehicle crashes, which often occur with a road that has an unforgiving cross section, where errant movements and inattention result in crashes into an adjacent ditch or tree. In addition, issues with traffic not properly yielding at the W. A. Allen Boulevard intersection and the Beaver Creek intersection were identified.

A capacity analysis for each of the existing cross drainage structures along the study limits was performed, and it was determined that five of the nine cross-drainage structures are undersized. A capacity analysis for the parallel drainage ditches was also performed, and it was determined that there are segments that convey only the 10-year or 25-year storm events rather than the 100-year storm event. In addition, several cross-drainage structures do not extend far from the edge of pavement. This results in steep, unforgiving roadway embankments and/or drop-offs near the structures and creates impact hazards, especially considering there is no guardrail to protect vehicles from driving off the existing roadway.

Three roadway improvement options were considered and are summarized below:

Option 1 - Reconstruct the road with no widening of the existing pavement, no improvements to the existing ditches, no improvements to the cross-drainage structures, and no acquisition of right-of-way. This would improve the pavement, but it would not address drainage and safety. The estimate of probable construction cost is $3.5 million.

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Option 2 - Reconstruct the road and widen to a 26' wide concrete roadway, which would include one 12' lane in each direction and an additional 2' of shoulder on each side. Drainage ditches will remain on both sides, but they will be re-graded as needed to increase drainage capacity. Cross-drainage structures will be replaced and resized to meet current drainage criteria, including a proposed 3-span concrete bridge to cross Rush Creek. This option will require a minimum ROW width of 70' to contain the proposed improved roadway ditches and additional space (minimum 5' along the backside of the ditch adjacent to the ROW line) for maintenance. The estimate of probable construction cost is $8.3 million.

Option 3 - Reconstruct the road to an urban, curb and gutter section with underground drainage. The roadway would be 38' wide and include one 12' lane in each direction and a 14' reversable turn lane to improve traffic flow. Drainage ditches will be eliminated and replaced with an underground storm sewer system. Cross-drainage structures will be replaced and resized to meet current drainage criteria, including a 3-span concrete bridge to cross over Rush Creek. This option will include a concrete sidewalk for pedestrian safety. This option will require a minimum ROW width of 70'. The estimate of probable construction cost is $13.7 million

For all options, existing ROW limits are based on plat information, and acquisition costs for additional ROW are based on estimated land values in the area, with additional costs added to cover potential appraisal fees, legal fees, and property value increases over the next few years.

We make the following recommendations based on this study and analysis:

- Reconstruct the road to a curb and gutter concrete roadway (Option 3)
- Include a continuous two-way left-turn lane (Option 3)
- Construct sidewalks to accommodate pedestrians (Option 3)
- Upgrade the cross-drainage structures (Option 2 and 3)
- Evaluate the phasing of the traffic signal at W. A. Allen Boulevard and consider using protected-only phasing for the northbound left turn
- Install a Stop sign for the northbound movement on Beaver Creek Road at the intersection of Stone Road/Beaver Creek Road
- Increase the visibility of the southbound stop sign on Stone Road at Beaver Creek Road by clearing vegetation and/or realigning/widening the cross section

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1.0 INTRODUCTION

1.1 Authorization

Binkley & Barfield, Inc. (BBI) has been contracted by Collin County to prepare an engineering study of East Stone Road. The scope of this project scope is focused on exploring options for improving safety conditions on this roadway. The Project was authorized and Notice to Proceed given by Collin County in June 2021.

1.2 Project Limits

The project site is located in Wylie, Texas and in unincorporate areas of Collin County. The roadway is a two-lane asphalt road that extends for approximately 2.5 miles on E. Stone Road from W. A. Allen Boulevard to Bennett Road.

The intersection of E. Stone Road and W.A. Allen Boulevard is a signalized intersection. W.A. Allen Boulevard is a four-lane concrete roadway with two lanes in each direction. E. Stone Road is also four-lane concrete roadway with two lanes in each direction at the intersection. E. Stone Road then transitions from a four-lane concrete roadway to a two-lane asphalt roadway approximately 150’ east of the signalized intersection.

The intersection of E. Stone Road and Brown Road is a four way, all stop intersection. Brown Road is a four-lane concrete roadway to the west of the intersection. To the east of this intersection, it is a two-lane concrete driveway for Wylie East High School. E. Stone Road is called Wylie East Drive to the north of the intersection and is also a four-lane concrete roadway with two lanes in each direction. E. Stone Road transitions from a four-lane concrete roadway to a two-lane asphalt roadway approximately 100’ south of the all stop intersection, including at the intersection with Bennett Road. Bennett Road is a two-lane asphalt roadway with a stop sign at its westbound approach at E. Stone Road.

1.3 Purpose and Scope

The project involves identifying and investigating alternative proposals to provide local officials with the necessary information to enhance safety along the roadway, including determining viable

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options, providing preliminary costs of the alternatives, and identifying the impacts on the community. The following three alternatives have been identified by the County for analysis:

Option 1

Reconstruct the road with no widening of the existing pavement. This would improve the pavement, but it would not address drainage and safety. Included in this option analysis is an estimate of the probable construction cost and an assessment of the resulting drainage and safety conditions. The expected serviceable life expectancy of the rebuilt pavement shall also be determined in order determine if bond funds are appropriate for the improvements.

Option 2

Reconstruct the pavement and acquire the applicable right-of-way (ROW) to improve the ditches and safety of the road where necessary, including identifying which improvements are required for adequate drainage and safety and determining the ROW necessary for those improvements. A cost estimate for improvements plus ROW acquisition shall be included in the option analysis.

Option 3

Reconstruct the road to an urban, curb and gutter section with underground drainage. According to the County, traffic projections indicate the volume will remain well under 10,000 vehicles per day, so a two-lane road with additional turn lanes at strategic locations is anticipated. This analysis option includes developing a concept plan, identifying the ROW required, and developing an estimate of probable construction cost. In addition, traffic counts and forecasting shall be included to confirm the recommended number of lanes and associated roadway improvements.

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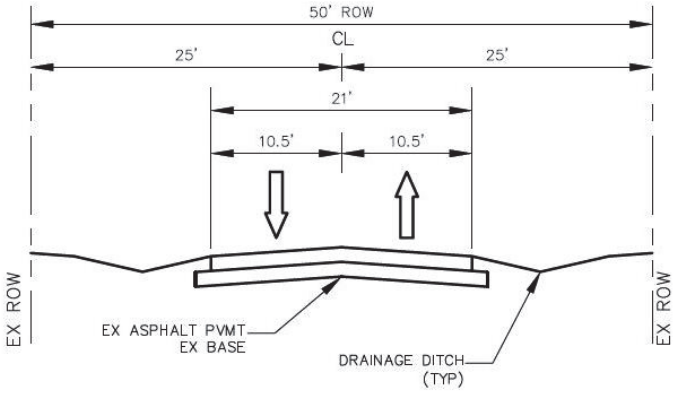
2.0 EXISTING CONDITIONS

2.1 Typical Sections

The road experiences a varied mix of traffic including passenger vehicles, construction trucks, and school buses. There is also a high percentage of teenage drivers and pedestrian traffic due to the proximity to the local high school.

The existing roadway cross section for E Stone Road is asphalt with drainage ditches along both sides. The road is on average 21’ wide (narrower in places) with one lane in each direction, there are no sidewalks, and the ROW varies in width from 50’ to 100’ based on records research of available plats along the corridor. Collin County Roadway Standards and City of Wylie Paving Standards specify a minimum of 12’ wide lanes for this type of roadway (24’ total width for two lanes), making this existing condition narrow by over 3’ in width. The depth of the existing asphalt pavement is unknown, the asphalt material type is unknow, and the subgrade is unknown. The ROW changes width in twelve different locations. Existing typical sections for the 50’, 70’ and 100’ ROWs are shown below:



EXISTING TYPICAL SECTION
(50' ROW)

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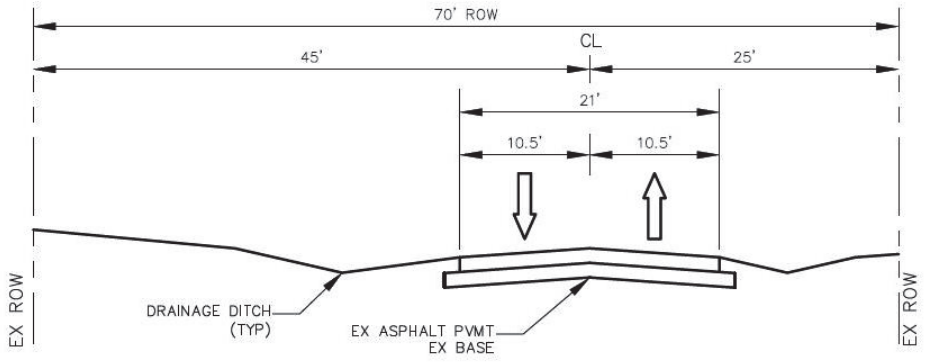
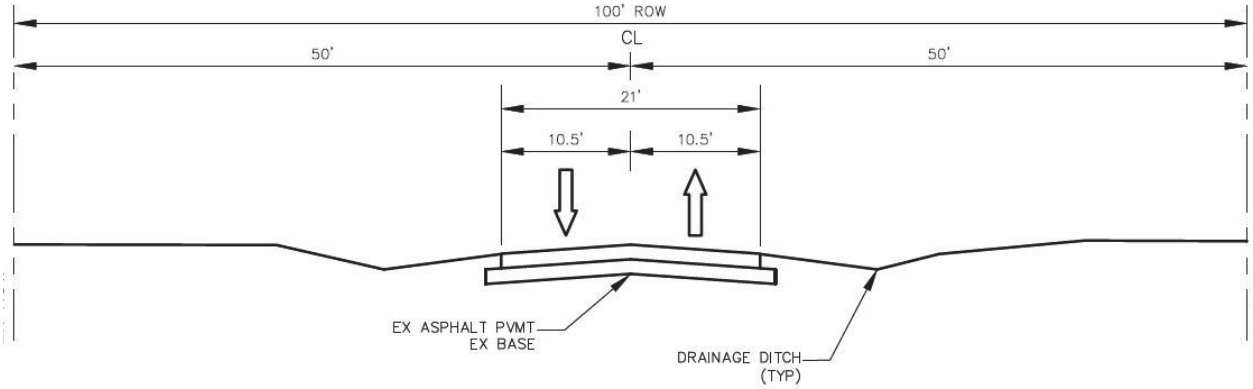


EXISTING TYPICAL SECTION
(70' ROW)



EXISTING TYPICAL SECTION
(100' ROW)

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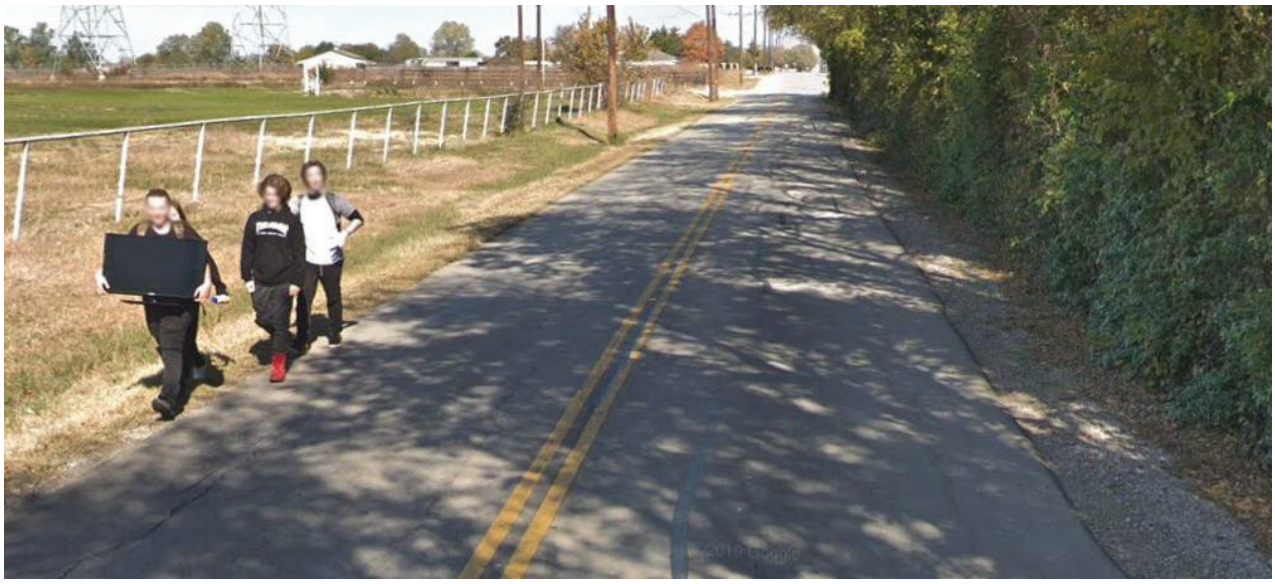
2.2 Pedestrian Traffic

A narrow roadway with drainage ditches on both sides and a lack of sidewalks forces all pedestrian traffic to walk along the narrow roadway and close to vehicular traffic.



Students Walking South Along E Stone Rd

2.3 Cross-Drainage Structures

The existing drainage system for E Stone Road consists of numerous cross drainage structures and drainage ditches. Multiple culverts are not functioning at capacity due to a buildup of dirt and debris inside the culverts.

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Several cross-drainage structures do not extend far from the edge of pavement. This results in steep, unforgiving roadway embankments and/or drop-offs near the structures and creates impact hazards, especially considering there is no guardrail to protect vehicles from driving off the existing roadway.

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Some culverts have makeshift headwalls that are deteriorating.

Several cross-drainage structures are damaged.

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One location has an existing rock check dam that was not removed after previous construction.

Erosion and scour have occurred along several drainage structure outfalls.

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In addition, there have been reported resident concerns of the culverts shown in the photo above (crossing E Stone Road at Rush Creek Tributary 1 between Wildflower and Hickory Woods Way) being undersized with insufficient capacity to handle the flow from upstream, including flow from the Grayhawk Park subdivision. The drainage structure is comprised of existing dual 72" metal pipe culverts with a steel plate headwall in poor condition.

2.3 Utilities

Prior to performing limited survey activities for this study, Texas811 was contacted and marked some (but not all) of the franchise utilities along the corridor as evidenced by the colored flags in the site photo below. A detailed analysis of any existing private utility easements or costs for any required relocations are not included in this study or in the estimates of probable construction costs. This also includes any wastewater or water lines or appurtenances.

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2.3 Right-of-Way Acquisition

Detailed abstracting and research are not part of the scope of this project, and property corners and/or ROW monumentation were not located as part of the limited survey performed. However, existing plat information available from the Collin County Central Appraisal District was downloaded for properties along the corridor and associated ROW lines added to the schematic for conceptual analysis. Acquisition costs for additional ROW are based on estimated land values in the area, with additional costs added to cover potential appraisal fees, legal fees, and property value increases over the next few years. It should also be noted that residential homes front the project corridor along E Stone Road, and improvements such as driveways would be impacted by construction within the proposed ROW limits. Furthermore, it should be anticipated that property owners may seek proximity damages to compensate for any perceived decrease in the value of their land that remains once the additional ROW is secured.

3.0 DRAINAGE ANALYSIS

Rational Method and Manning's Equation were used for this analysis for roadway ditches and as applicable for cross drainage structures, and a previous flood study performed for the crossing at Rush Creek was used as the basis for drainage structure recommendations at that location. The project limits cross over Rush Creek, Rush Creek Tributary 1, and through Zone "AE" & Zone "X" of FEMA FIRM Panel 48085C0420J dated June 2, 2009.

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- Zone “AE” is defined by FEMA as an area with 1% annual chance flood with Base Flood Elevations (BFE) or depths.
- Zone “X” is defined by FEMA as an area of 0.2% annual chance plain, areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual change flood.
- A Regulatory Floodway is defined by FEMA as the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flow can be carried without substantial increases in flood heights.

The overall drainage area for all cross-drainage structures in this project is shown on **Exhibit 1 – Existing Drainage Area Map, Cross Culverts.** This drainage area map shows the existing contours and the overall boundary area that drains into E. Stone Road. The boundary area is subdivided into smaller drainage areas with numbers that correlate to their associated cross culvert structure number.

A more detailed drainage area map for all drainage ditches on this project is shown on **Exhibit 2 – Existing Drainage Area Map, Drainage Ditches.** This drainage area map shows the existing contours at two-foot intervals. The boundary areas are subdivided into smaller drainage areas with numbers that correlate to a drainage point number. Each drainage point leads to a cross drainage structure.

A capacity analysis for each of the existing cross drainage structures is shown in **Table 1 – Existing Cross-Drainage Structures**.

A capacity analysis for each of the existing drainage ditches is shown in **Table 2 – Existing Drainage Ditches**.

Recommended sizes for cross drainage structures are shown in **Table 3 – Proposed Cross Drainage Structures**.

Recommended sizes for existing drainage ditches are shown in **Table 4 – Proposed Drainage Ditches**.

The cross-drainage structure referenced in Section 2.3 Cross-Drainage Structures and described as being undersized and in poor condition by local residents is proposed to be replaced for fully

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developed upstream conditions as three (3) 9’ x 6’ reinforced concrete box culverts with concrete headwalls and metal beam guard fencing.

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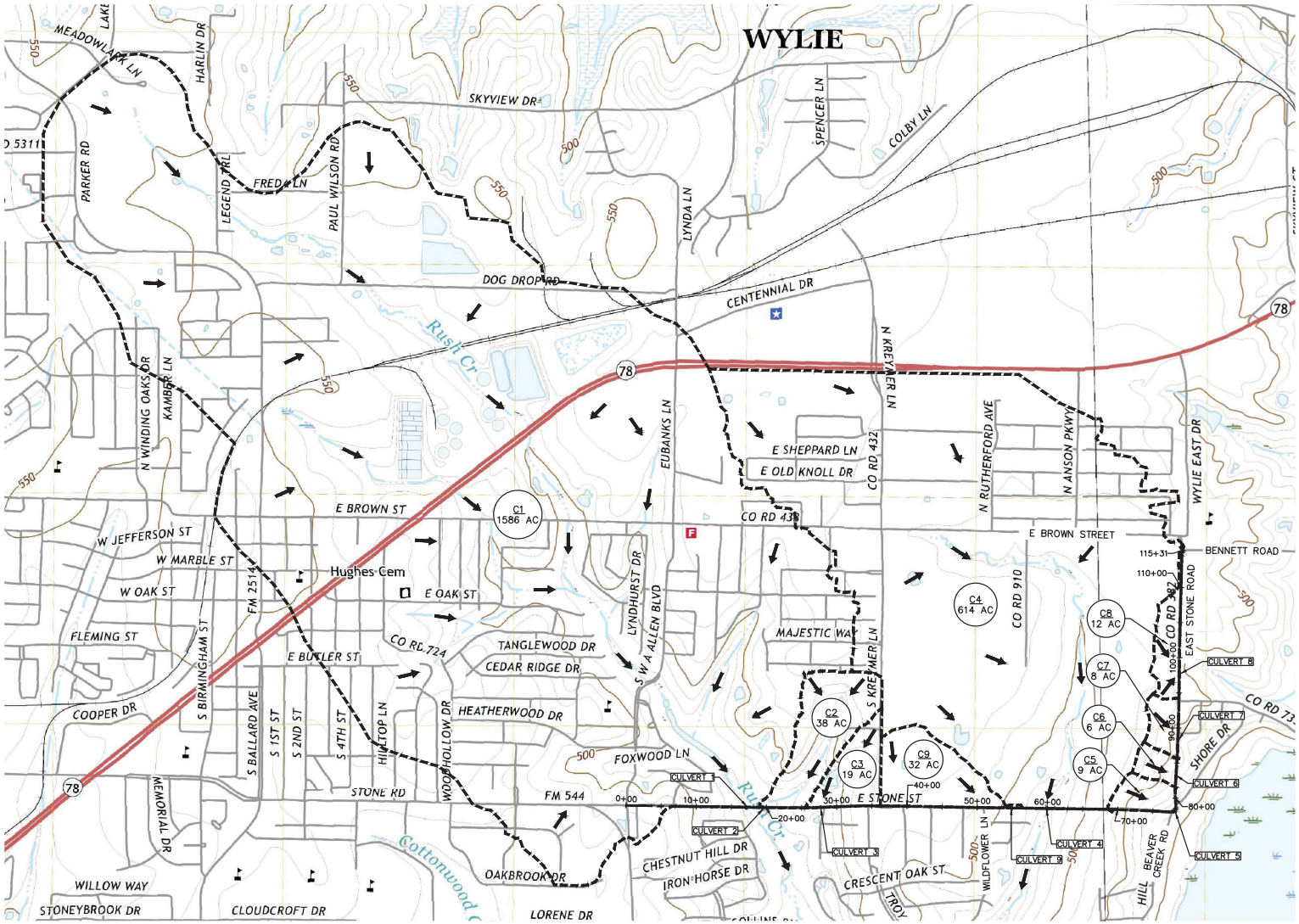

N
W E
S

750' 0' 750'
SCALE
1"=750'

LEGEND

XX
XX.XX AC — DRAINAGE AREA NUMBER
ACRES

CULVERT DRAINAGE DIVIDE

FLOW ARROW

CULVERT 1 — CULVERT

10' CONTOUR

J:\Collin\Co\2100000173.000\E Stone Road Improvements Study\X.00_CAD\X.03_Drawings\X.03.1_Sheet_Files\2DAM.dwg-CULVERT DAM Plotted: Oct 18, 2021 at 4:07pm by career | Last Saved by: career

Rev	Description	Date

CAUTION EXISTING UTILITIES !!!

Existing utilities and underground facilities indicated on these plans have been located from reference information. It shall be the responsibility of the contractor to verify both horizontally and vertically the location of all existing utilities and underground facilities prior to construction, to take the necessary precautions in order to protect all facilities encountered. The contractor shall preserve and protect all existing utilities from damage during construction.

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COLLIN COUNTY
ENGINEERING DEPARTMENT
MCKINNEY, TEXAS

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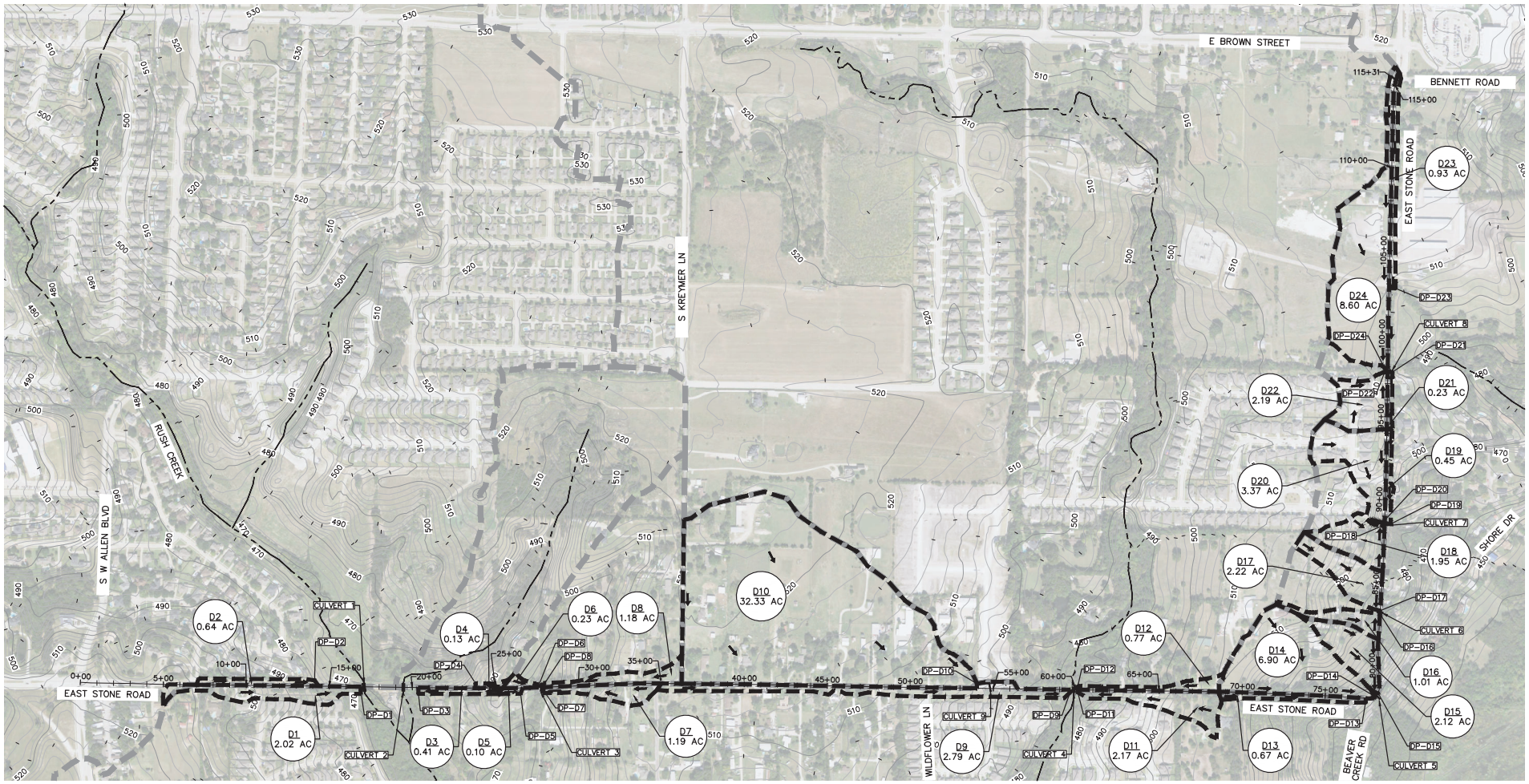
E. STONE RD IMPROVEMENTS STUDY
(FROM W. A. ALLEN BLVD TO BENNETT RD)
EXHIBIT 1
EXISTING DRAINAGE AREA MAP
CROSS DRAINAGE STRUCTURES

Scale:	Date:	Job No.:	
1"=750'	Oct 18, 2021	2100000173	----



LEGEND

- XX / XX.XX AC — DRAINAGE AREA NUMBER / ACRES
- DITCH DRAINAGE DIVIDE
- CULVERT DRAINAGE DIVIDE
- FLOW ARROW
- DP-D2 — DRAINAGE DESIGN POINT NUMBER
- CULVERT 1 — CULVERT
- 2' MINOR CONTOUR
- 2' MAJOR CONTOUR
- CREEK

300' 0' 300'
SCALE 1"=300'

N W E S

Rev	Description	Date

CAUTION EXISTING UTILITIES !!!

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COLLIN COUNTY
ENGINEERING DEPARTMENT
MCKINNEY, TEXAS

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E. STONE RD IMPROVEMENTS STUDY
(FROM W. A. ALLEN BLVD TO BENNETT RD)
EXHIBIT 2
EXISTING DRAINAGE AREA MAP
DRAINAGE DITCHES

Scale:	Date:	Job No.:	
1"=300'	Oct 18, 2021	2100000173	----

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TABLE 1 - EXISTING CROSS CULVERT CAPACITY								
CROSS CULVERT	PAVING STATION	#	SIZE	EQUIV SIZE	HW/D	CULVERT ENTRANCE CONDITION	Q CAPACITY AT TOP ROAD (CFS)	REQUIRED "Q100" (CFS)
CC-1	16+00	2	72" CMP		1.4	OPEN	630	3730.1
CC-2	19+50	2	84"x54" CMP	66" CMP	1.1	OPEN	360	176.0
CC-3	27+75	1	36" CMP	-	1.7	OPEN	65	94.8
CC-4	59+90	2	72" STEEL	-	1.4	OPEN	630	1442.8
CC-5	78+15	1	30" CMP	-	1.5	OPEN	36	40.6
CC-6	83+20	1	30" CMP	-	1.5	OPEN	36	27.1
CC-7	88+50	1	36" CMP	-	1.6	STRAIGHT	60	36.1
CC-8	97+80	1	30" CMP	-	1.5	OPEN	36	54.1
CC-9	54+80	1	4'x4' RCB	-	1.4	FLARED	140	130.6

For Proposed Q100 calculations see Table 3

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TABLE 2 - EXISTING DITCH CAPACITY

DESIGN POINT	PAVING STATION	DITCH	LT/ RT	AREA	RUNOFF COEF "C"	AREA "A" (ACRES)	INTENSITY "I_{100}" (IN/HR)	RUNOFF "Q_{100}" (CFS)	DITCH SLOPE (FT/FT)	DITCH SIDE (H:V)	DITCH DEPTH (FT)	DITCH CAPACITY (CFS)	DITCH CAPACITY STM-YR
DP-D1	16+90	D1	RT	D1	0.60	2.02	7.52	9.1	0.037	3.0	1.5	51.7	100-YR
DP-D2	14+10	D2	LT	D2	0.60	0.64	7.52	2.9	0.037	3.0	1.5	51.5	100-YR
DP-D3	20+40	D3	RT	D3	0.60	0.41	7.52	1.8	0.051	3.0	1.5	60.5	100-YR
DP-D4	23+80	D4	LT	D4	0.60	0.13	7.52	0.6	0.046	3.0	1.5	57.6	100-YR
DP-D5	26+50	D5	RT	D5	0.60	0.10	7.52	0.5	0.013	3.0	1.5	30.5	100-YR
DP-D6	27+60	D6	LT	D6	0.60	0.23	7.52	1.0	0.025	3.0	1.5	42.1	100-YR
DP-D7	27+90	D7	RT	D7	0.60	1.19	7.52	5.4	0.044	3.0	1.5	55.7	100-YR
DP-D8	27+90	D8	LT	D8	0.60	1.18	7.52	5.3	0.041	3.0	1.5	53.8	100-YR
DP-D9	59+60	D9	RT	D9 & D10	0.60	2.79	6.80	143.3	0.014	3.0	2.6	137.1	25-YR
DP-D10	54+00	D10	LT	D10	0.60	32.33	6.80	131.9	0.013	3.0	2.6	130.0	25-YR
DP-D11	60+10	D11	RT	D11	0.60	2.17	7.52	9.8	0.037	3.0	1.5	51.0	100-YR
DP-D12	60+10	D12	LT	D12	0.60	0.77	7.52	3.5	0.037	3.0	1.5	51.3	100-YR
DP-D13	77+50	D13	RT	D13	0.60	0.67	7.52	3.0	0.056	3.0	1.5	63.3	100-YR
DP-D14	78+00	D14	LT	D14	0.60	6.90	7.52	31.1	0.057	3.0	1.5	63.9	100-YR
DP-D15	78+20	D15	LT	D15	0.60	2.12	7.52	9.6	0.060	3.0	1.5	65.4	100-YR
DP-D16	83+10	D16	LT	D16	0.60	1.01	7.52	4.6	0.010	3.0	1.5	26.3	100-YR
DP-D17	83+30	D17	LT	D17	0.60	2.22	7.52	10.0	0.034	3.0	1.5	48.9	100-YR
DP-D18	88+40	D18	LT	D18	0.60	1.95	7.52	8.8	0.003	3.0	1.5	14.6	100-YR
DP-D19	88+60	D19	RT	D19	0.60	0.45	7.52	2.0	0.042	3.0	1.5	54.8	100-YR
DP-D20	88+60	D20	LT	D20	0.60	3.37	7.52	15.2	0.032	3.0	1.5	47.9	100-YR
DP-D21	97+70	D21	RT	D21	0.60	0.23	7.52	1.0	0.014	3.0	1.5	31.7	100-YR
DP-D22	97+70	D22	LT	D22	0.60	2.19	7.52	9.9	0.016	3.0	1.5	33.6	100-YR
DP-D23	102+70	D23	RT	D23	0.60	0.93	7.52	4.2	0.009	3.0	1.5	25.5	100-YR
DP-D24	97+90	D24	LT	D24	0.60	8.60	7.52	38.8	0.010	3.0	1.6	32.4	10-YR

Note: Ditch Depth to top of road or top of outside bank, whichever is smaller

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TABLE 3 - PROPOSED CROSS CULVERTS									
CROSS CULVERT	PAVING STATION	#	SIZE	AREA	RUNOFF COEF "C"	AREA "A" (ACRES)	TIME (MIN)	INTENSITY "I_{100}" (IN/HR)	RUNOFF "Q_{100}" (CFS)
CC-1	16+00	-	BRIDGE	C1	0.60	1590	60	3.91	3730.1
CC-2	19+50	1	10'x8' RCB	C2	0.60	39	15	7.52	176.0
CC-3	27+75	-	PROP 36"RCP	C3	0.60	21	15	7.52	94.8
CC-4	59+90	3	9'x6' RCB	C4	0.60	615	60	3.91	1442.8
CC-5	78+15		PROP 36"RCP	C5	0.60	9.0	15	7.52	40.6
CC-6	83+20	-	USE EX 30"CMP	C6	0.60	6.0	15	7.52	27.1
CC-7	88+50	1	PROP 36"RCP	C7	0.60	8.0	15	7.52	36.1
CC-8	97+80	1	PROP 36"RCP	C8	0.60	12.0	15	7.52	54.1
CC-9	54+80	-	USE EX 4'x4' RCB	C9	0.60	32.0	20	6.80	130.6

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TABLE 4 - PROPOSED DITCHES													
DESIGN POINT	PAVING STATION	DITCH	LT/ RT	AREA	RUNOFF COEF "C"	AREA "A" (ACRES)	INTENSITY "I_{100}" (IN/HR)	RUNOFF "Q_{100}" (CFS)	DITCH SLOPE (FT/FT)	DITCH SIDE (H:V)	DITCH DEPTH (FT)	DITCH CAPACITY (CFS)	DITCH CAPACITY STM-YR
DP-D1	16+90	D1	RT	D1	0.60	2.02	7.52	9.1	0.037	4.0	1.0	23.7	100-YR
DP-D2	14+10	D2	LT	D2	0.60	0.64	7.52	2.9	0.037	4.0	1.0	23.6	100-YR
DP-D3	20+40	D3	RT	D3	0.60	0.41	7.52	1.8	0.051	4.0	0.5	4.4	100-YR
DP-D4	23+80	D4	LT	D4	0.60	0.13	7.52	0.6	0.046	4.0	0.5	4.2	100-YR
DP-D5	26+50	D5	RT	D5	0.60	0.10	7.52	0.5	0.013	4.0	0.5	2.2	100-YR
DP-D6	27+60	D6	LT	D6	0.60	0.23	7.52	1.0	0.025	4.0	0.5	3.0	100-YR
DP-D7	27+90	D7	RT	D7	0.60	1.19	7.52	5.4	0.044	4.0	0.8	14.1	100-YR
DP-D8	27+90	D8	LT	D8	0.60	1.18	7.52	5.3	0.041	4.0	1.0	24.7	100-YR
DP-D9	59+60	D9	RT	D9 & D10	0.60	2.79	6.80	143.3	0.014	4.0	2.4	149.8	100-YR
DP-D10	54+00	D10	LT	D10	0.60	32.33	6.80	131.9	0.013	4.0	2.4	142.1	100-YR
DP-D11	60+10	D11	RT	D11	0.60	2.17	7.52	9.8	0.037	4.0	0.8	12.9	100-YR
DP-D12	60+10	D12	LT	D12	0.60	0.77	7.52	3.5	0.037	4.0	0.5	3.7	100-YR
DP-D13	77+50	D13	RT	D13	0.60	0.67	7.52	3.0	0.056	4.0	0.5	4.6	100-YR
DP-D14	78+00	D14	LT	D14	0.60	6.90	7.52	31.1	0.057	4.0	1.1	37.8	100-YR
DP-D15	78+20	D15	LT	D15	0.60	2.12	7.52	9.6	0.060	4.0	0.8	16.6	100-YR
DP-D16	83+10	D16	LT	D16	0.60	1.01	7.52	4.6	0.010	4.0	0.8	6.7	100-YR
DP-D17	83+30	D17	LT	D17	0.60	2.22	7.52	10.0	0.034	4.0	0.8	12.4	100-YR
DP-D18	88+40	D18	LT	D18	0.60	1.95	7.52	8.8	0.003	4.0	1.2	10.9	100-YR
DP-D19	88+60	D19	RT	D19	0.60	0.45	7.52	2.0	0.042	4.0	0.6	6.4	100-YR
DP-D20	88+60	D20	LT	D20	0.60	3.37	7.52	15.2	0.032	4.0	0.9	16.6	100-YR
DP-D21	97+70	D21	RT	D21	0.60	0.23	7.52	1.0	0.014	4.0	0.6	3.7	100-YR
DP-D22	97+70	D22	LT	D22	0.60	2.19	7.52	9.9	0.016	4.0	0.9	11.6	100-YR
DP-D23	102+70	D23	RT	D23	0.60	0.93	7.52	4.2	0.009	4.0	0.8	6.5	100-YR
DP-D24	97+90	D24	LT	D24	0.60	8.60	7.52	38.8	0.010	4.0	1.8	60.0	100-YR

Note: Ditch Depth to top of road or top of outside bank, whichever is smaller

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Binkley & Barfield
consulting engineers

Date: September 14, 2021

To: Collin County Public Works and City of Wylie Public Works

From: Bradford Brimley, PhD, PE, PTOE, RSP

Re: Stone Road Traffic Study (Forecasts and Crash Analysis)

INTRODUCTION

Conditions on E Stone Road between WA Allen Boulevard and Bennett Road were evaluated to support an alternatives analysis for reconstruction of the 2.5-mile road. This study considers observed traffic volumes and the history of crashes on the road to recommend improvements for reconstruction of the road. The existing (2021) traffic counts are forecasted to future (2045) conditions. Patterns in the observed crashes are reviewed.

E Stone Road within the limits of this study is a two-lane undivided road with a 35 mph speed limit. The existing cross section includes open ditches. The road is listed in the Collin County Thoroughfare Plan as a Major Arterial. The road primarily serves residential neighborhoods and connects to Wylie East High School.

TRAFFIC VOLUMES

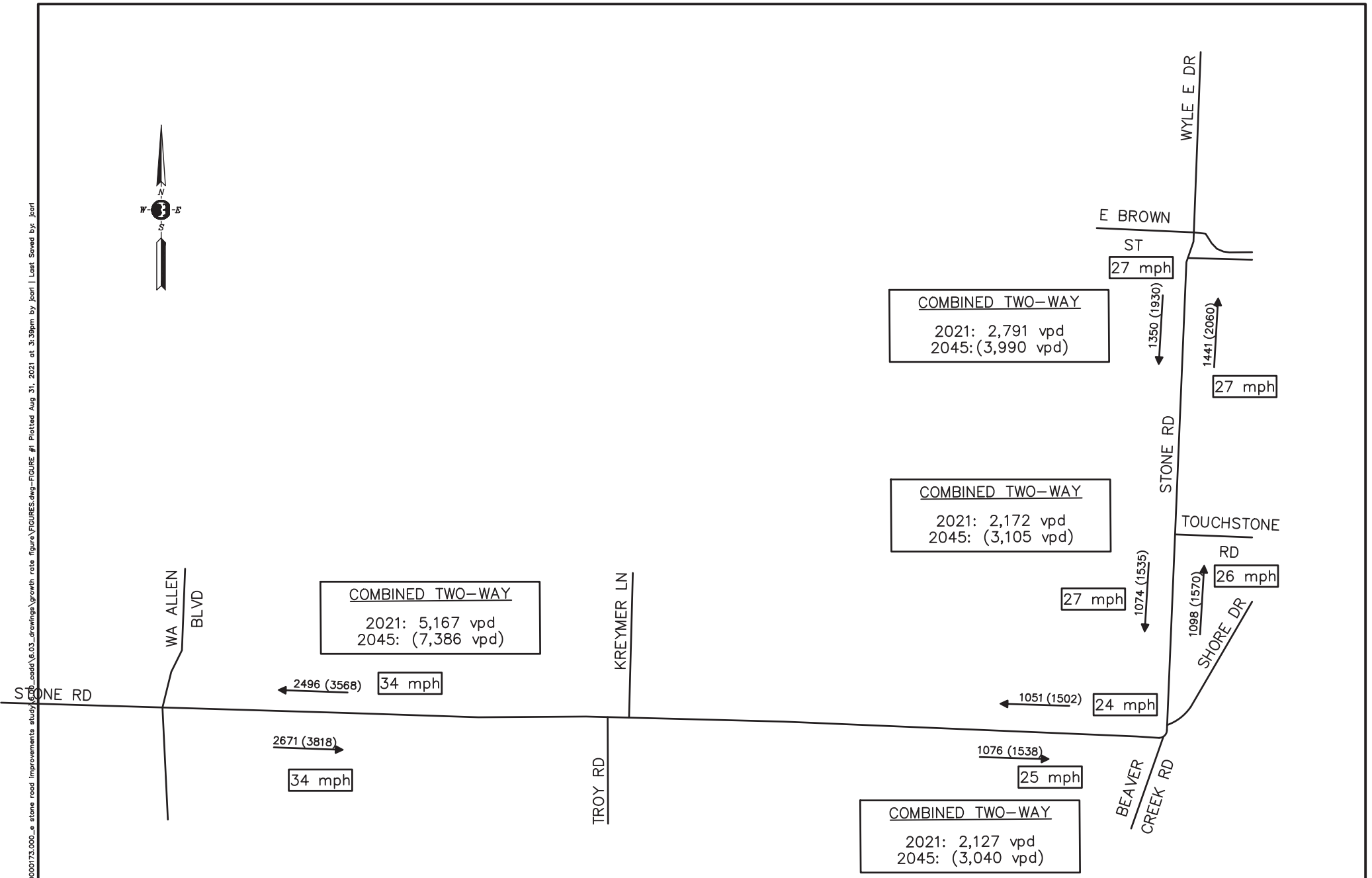
EXISTING TRAFFIC

Traffic volumes and speeds were observed at four locations for 48 hours along the corridor (Aug 24-26, 2021). On the east-west segment between WA Allen Boulevard and Beaver Creek Road, average daily traffic ranged from 3,040 to 5,167 vpd. On the north-south segment between Bennet Road and Shore Drive, average daily traffic ranged from 3,105 vpd to 3,990 vpd. Observed speeds on average were below the speed limit. Near WA Allen Boulevard, the average speed was 34 mph. The average speed at the other locations ranged between 24 and 27 mph. These observed speeds are reasonable for the existing speed limit.

FORECASTS

The E Stone Road corridor has seen significant residential development over the previous 20 years. There is potential for more development, although the existing streams/floodplains and existing low-density homesites will significantly limit this growth. After reviewing areas for potential development and the previous count data made available through the TxDOT Traffic Count Database System, we determined to apply a long-term growth factor of 1.5% annually for forecasting traffic to 2045. This represents a 43% increase in traffic from 2021 levels.

The existing traffic volumes and speeds and the forecasted 2045 traffic volumes are shown on **Figure 1**.



LEGEND
XXXX 2021 TRAFFIC
(XXXX) 2045 FORECASTED TRAFFIC

E Stone Road Improvements Study
AVERAGE 24-HOUR TRAFFIC VOLUMES

SCALE:	N/A	DATE:	SEPTEMBER 2021
JOB NO.:	2100000173.000	DWG. FILE:	FIGURE #1

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CRASH ANALYSIS

The purpose of the crash analysis is to evaluate the history of crashes along E Stone Road to identify patterns in the types of crashes and their causes. Appropriate countermeasures aimed at reducing or eliminating crashes can be identified from consistencies in the types and causes of crashes.

OBSERVED CRASHES

Crash records were obtained from Collin County and through the TxDOT Crash Record Information System (CRIS) for the five-year period between January 2016 and December 2020. A total of 45 relevant crashes were reported to occur on Stone Road between WA Allen Boulevard and Brown Street during the study period. Collision diagrams depicting the crashes and movements involved are shown in **Figure 2** and **Figure 3**. **Table 1** lists the crashes and some of the reported information.

ANALYSIS

A breakdown of the 45 crashes by type is as follows:

- 20 crashes (44.4%) were single vehicle,
- 9 crashes (20.0%) were turning (opposite direction),
- 8 crashes (17.8%) were right angle,
- 4 crashes (8.9%) were rear-end,
- 2 crashes (4.4%) involved animals, and
- 2 crashes (4.4%) were side swipe.

The three most common contributing factors were driver inattention (15 crashes, 33.3%), failure to yield ROW (12 crashes, 26.7%), and faulty evasive action (8 crashes, 17.8%). Regarding environmental factors, 12 crashes (26.7%) occurred when at dusk or when dark, and 5 crashes (11.1%) occurred during rainy or wet conditions.

The crashes in **Table 1** and **Figure 2** show a pattern of left-turning vehicles not properly yielding at the WA Allen Boulevard intersection. All turning collisions at the intersection involve northbound left-turning vehicles colliding with southbound vehicles continuing straight. All left-turning crashes involved the northbound vehicles and were a result of failing to yield ROW. With dual left-turn lanes northbound, but protected-permissive phasing, it is recommended that protected-only left-turn phasing be considered for that movement.

There is also a consistent pattern of crashes caused by vehicles not properly yielding at the Beaver Creek Road intersection. All four crashes involve southbound vehicles colliding with turning eastbound vehicles due to a failure to stop at the Stop sign. Given the horizontal curvature and the possibility for overgrown shrubbery when approaching the intersection from the north, it is possible that adequate sight distance is not provided for southbound vehicles to see and properly react to the stop sign at 35 miles per hour. An additional consideration is that the northbound movement is not controlled with a Stop sign. Although no crashes involved northbound vehicles, the lack of a Stop sign in the northbound direction results in inconsistent messaging for vehicles traveling on Beaver Creek Road/Stone Road. A Stop sign for the northbound direction would reinforce the need to stop at the intersection. It is recommended that a Stop sign be considered for the northbound direction and that modifications be made to the

alignment, cross section, and/or the vegetation in the southbound direction to make the existing Stop sign more conspicuous.

A high number of crashes throughout the study area were single vehicle crashes. These crashes often occur with a road that has an unforgiving cross section, where errant movements and inattention result in crashes into an adjacent ditch or tree. It is expected that a cross section with a curb and gutter will help motorists react and take corrective action, reducing the frequency of these type of crashes. An alternative way to help motorists is to add a shoulder and flatten the adjacent roadway ditch fore-slopes.

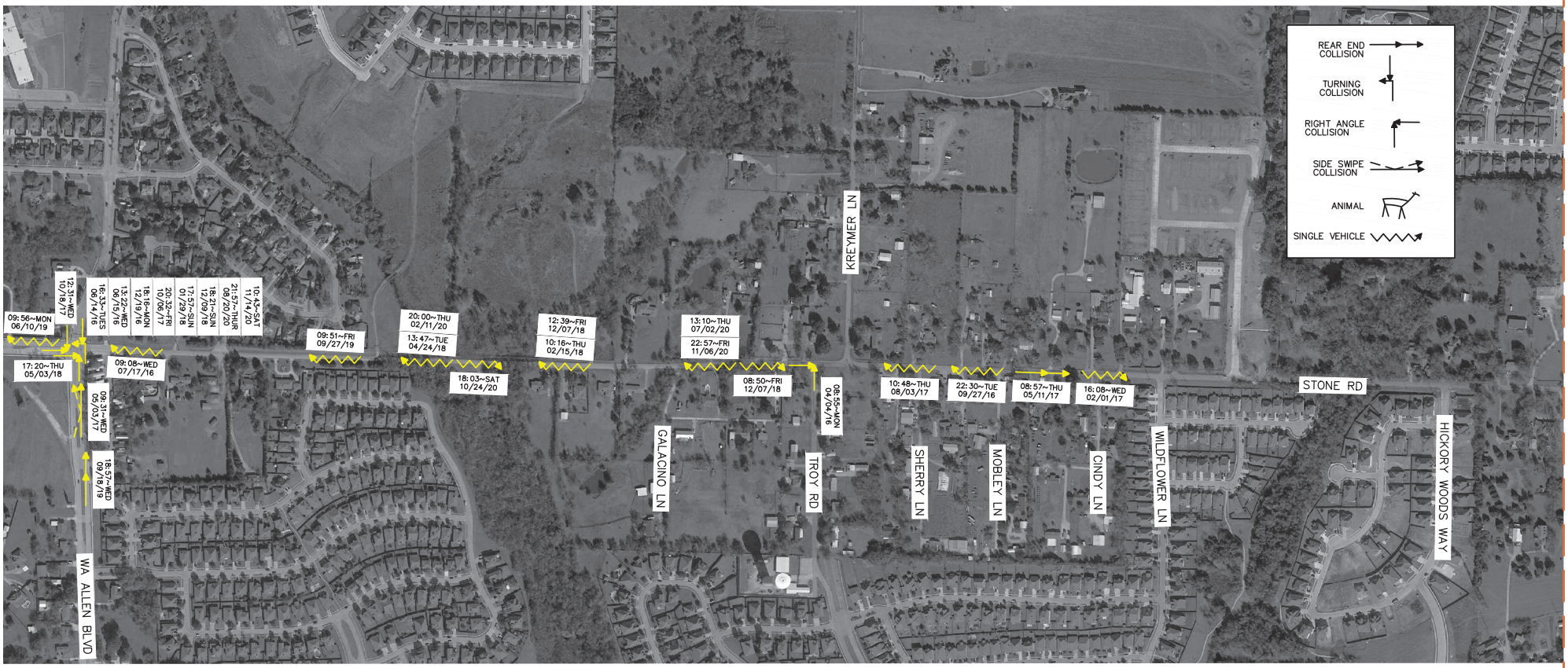
RECOMMENDATIONS

A general rule of thumb indicates that a two-lane road cross section can serve up to 10,000 vpd. Based on the traffic volume forecast, E Stone Road will operate adequately as a two-lane road. We make the following recommendations based on the traffic volume forecasts:

- Reconstruct the road to include a continuous two-way left-turn lane.
    - E Stone Road has a high density of driveways and intersecting side streets. A continuous two-way left-turn lane will accommodate vehicles turning to/from these accesses better than isolated left-turn lanes at specific streets. Each of these turn lanes would require tapers that extend into neighboring accesses.
- Construct sidewalks to accommodate pedestrians.

We make the following recommendations based on the crash analysis:

- Evaluate the phasing of the traffic signal at WA Allen Boulevard. Consider using protected-only phasing for the northbound left turn.
- Install a Stop sign for the northbound movement on Beaver Creek Road at the intersection of Stone Road/Beaver Creek Road.
- Increase the visibility of the southbound Stop sign on Stone Road at Beaver Creek Road by clearing vegetation and/or realigning/widening the cross section.
- Reconstruct Stone Road to have a curb and gutter cross section.
    - If a curb and gutter are not feasible, widen the shoulders and reduce the side slope to make the road more forgiving in single-vehicle crashes.



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north

500 ft

CRASH ANALYSIS - STONE ROAD SEGMENT 1			
SCALE:	N/A	DATE:	JULY 2021
JOB NO.:	2100000173.000	DWG. FILE:	FIGURE #2

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north

500 ft

CRASH ANALYSIS - STONE ROAD SEGMENT 2			
SCALE:	N/A	DATE:	JULY 2021
JOB NO.:	2100000173.000	DWG. FILE:	FIGURE #3

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Table 1: Reported Crashes 2016-2020

Date	Time	Condition	Contributing Factors	Type	Severity
4/4/2016	8:55 AM	Clear, Dry, Daylight	Failed to Yield ROW	Right Angle	Property Damage
4/7/2016	11:25 AM	Clear, Dry, Daylight	Illness	Single Vehicle	Possible Injury
5/9/2016	9:08 AM	Rain, Wet, Daylight	Disregarded Stop Sign, Driver Inattention	Right Angle	Property Damage
6/14/2016	4:33 PM	Clear, Dry, Daylight	Failed to Yield ROW	Turning Collision	Possible Injury
6/15/2016	1:22 PM	Clear, Dry, Daylight	Failed to Yield ROW, Turned When Unsafe	Turning Collision	Property Damage
7/17/2016	9:08 AM	Clear, Dry, Daylight	Faulty Evasive Action	Single Vehicle	Property Damage
9/14/2016	3:27 AM	Clear, Dry, Dark	Animal on Road, Failed to Control Speed	Animal	Possible Injury
9/27/2016	10:30 PM	Clear, Dry, Dark	Distraction in Vehicle, Failed to Drive in Single Lane	Single Vehicle	Property Damage
10/24/2016	12:49 PM	Clear, Dry, Daylight	Failed to Control Speed, Driver Inattention, Faulty Evasive Action	Single Vehicle	Possible Injury
12/19/2016	6:16 PM	Clear, Dry, Dark	Failed to Yield ROW	Turning Collision	Non-Incapacitating Injury
2/1/2017	4:08 PM	Clear, Dry, Daylight	Vehicle Malfunction	Single Vehicle	Possible Injury
4/20/2017	6:09 PM	Clear, Dry, Daylight	Driver Inattention, Unsafe Speed	Right Angle	Property Damage
5/3/2017	9:31 AM	Cloudy, Dry, Daylight	Turned Improperly	Side Swipe	Property Damage
5/11/2017	8:57 AM	Clear, Dry, Daylight	Followed Too Closely, Failed to Control Speed	Rear-end	Property Damage
5/23/2017	7:46 PM	Clear, Dry, Daylight	DWI, Distraction in Vehicle	Single Vehicle	Non-Incapacitating Injury
8/3/2017	10:48 AM	Clear, Dry, Daylight	Faulty Evasive Action	Single Vehicle	Property Damage
8/25/2017	9:45 PM	Clear, Dry, Dark	Animal on Road, Faulty Evasive Action	Animal	Property Damage
10/6/2017	8:32 PM	Clear, Dry, Dark	Failed to Yield ROW	Turning Collision	Property Damage

Table 1 (Continued): Reported Crashes 2016-2020

Date	Time	Condition	Contributing Factors	Type	Severity
10/18/2017	12:31 PM	Clear, Dry, Daylight	Disregarded Stop and Go Signal, Driver Inattention	Right Angle	Non-Incapacitating Injury
12/18/2017	12:39 PM	Cloudy, Dry, Daylight	Disregarded Stop Sign	Right Angle	Incapacitating Injury
1/29/2018	5:57 PM	Clear, Dry, Dusk	Failed to Yield ROW, Driver Inattention	Turning Collision	Property Damage
2/7/2018	1:12 PM	Cloudy, Wet, Daylight	Failed to Control Speed, Other	Single Vehicle	Non-Incapacitating Injury
2/9/2018	7:22 AM	Cloudy, Dry, Daylight	Driver Inattention	Rear-end	Property Damage
2/15/2018	10:16 AM	Cloudy, Dry, Daylight	Faulty Evasive Action, Other	Single Vehicle	Non-Incapacitating Injury
4/24/2018	1:47 PM	Clear, Dry, Daylight	Driver Inattention, Faulty Evasive Action, Other	Single Vehicle	Non-Incapacitating Injury
5/3/2018	5:20 PM	Clear, Dry, Daylight	Cell/Mobile Device Use, Driver Inattention	Right Angle	Property Damage
9/7/2018	3:41 PM	Clear, Dry, Daylight	Unsafe Speed, Driver Inattention	Single Vehicle	Non-Incapacitating Injury
12/7/2018	12:39 PM	Cloudy, Dry, Daylight	Driver Inattention, Failed to Control Speed	Single Vehicle	Property Damage
12/7/2018	8:50 AM	Clear, Dry, Daylight	Distraction in Vehicle	Single Vehicle	Non-Incapacitating Injury
12/9/2018	6:21 PM	Clear, Dry, Dark	Failed to Yield ROW	Turning Collision	Property Damage
12/17/2018	4:20 PM	Cloudy, Dry, Daylight	Parked in Traffic Lane	Rear-end	Possible Injury
1/18/2019	9:20 PM	Clear, Dry, Dark	Failed to Control Speed	Single Vehicle	Non-Incapacitating Injury
6/10/2019	9:56 AM	Clear, Dry, Daylight	Driver Inattention	Single Vehicle	Property Damage
9/18/2019	6:57 PM	Cloudy, Wet, Daylight	Driver Inattention, Had Been Drinking	Rear-end	Property Damage

Table 1 (Continued): Reported Crashes 2016-2020

Date	Time	Condition	Contributing Factors	Type	Severity
9/27/2019	9:51 AM	Clear, Dry, Daylight	Driver Inattention	Single Vehicle	Property Damage
10/18/2019	9:27 AM	Clear, Dry, Daylight	Failed to Yield ROW, Driver Inattention	Right Angle	Property Damage
12/16/2019	8:43 AM	Cloudy, Wet, Dawn	Failed to Yield ROW	Turning Collision	Property Damage
2/11/2020	8:00 PM	Rain, Wet, Dark	Faulty Evasive Action	Single Vehicle	Property Damage
7/2/2020	1:10 PM	Clear, Dry, Daylight	Driver Inattention	Single Vehicle	Property Damage
8/20/2020	9:57 PM	Clear, Dry, Dark	Failed to Yield ROW	Turning Collision	Property Damage
8/21/2020	1:57 PM	Clear, Dry, Daylight	Failed to Yield ROW, Driver Inattention	Right Angle	Property Damage
10/24/2020	6:03 PM	Cloudy, Dry, Dawn	Other	Single Vehicle	Property Damage
11/6/2020	10:57 PM	Clear, Dry, Dark	Had Been Drinking	Single Vehicle	Property Damage
11/13/2020	6:10 PM	Clear, Dry, Dark	Failed to Drive in Single Lane, Taking Medication	Side Swipe	Property Damage
11/14/2020	10:43 AM	Clear, Dry, Daylight	Failed to Yield ROW	Turning Collision	Possible Injury

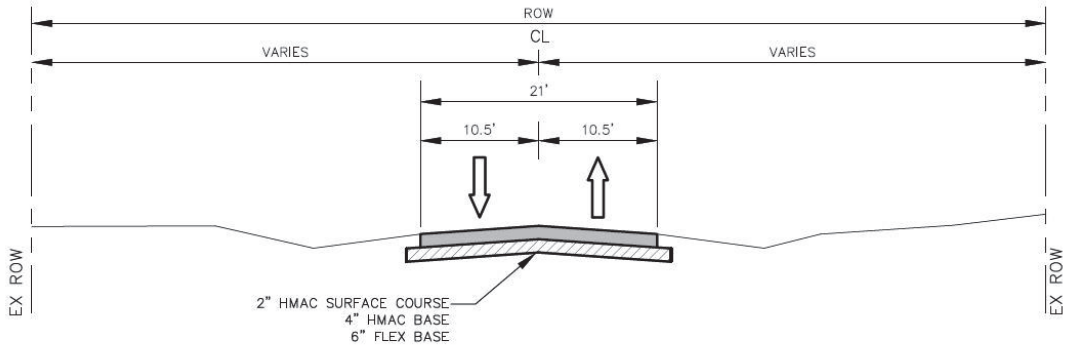
5.0 PROPOSED TYPICAL SECTIONS & PRELIMINARY SCHEMATICS

5.1 Option 1

The existing pavement is 21’ wide asphalt pavement with drainage ditches. Option 1 would replace the existing asphalt pavement at the same width. A geotechnical investigation should be performed for a pavement section and subgrade preparation recommendation. For the purposes of this study, we have assumed a section consisting of 2” HMAC surface course and 4” HMAC base over 6” flexible base.

This option does not improve the drainage capacity of any cross-drainage structures or drainage ditches.

This option does not include or require any ROW acquisition.



PROPOSED TYPICAL SECTION
(EX ROW VARIES)

Refer to **Exhibit 3 – Option 1, Proposed Typical Sections** and **Exhibit 4 – Option 1, Preliminary Schematic**.

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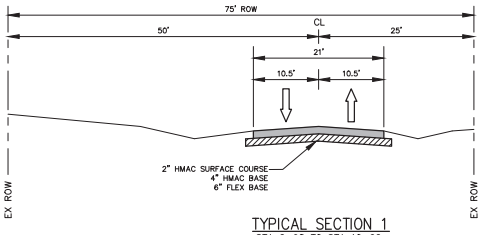
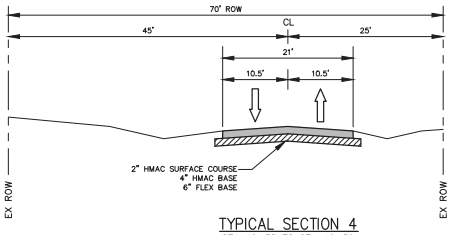
OPTION 1

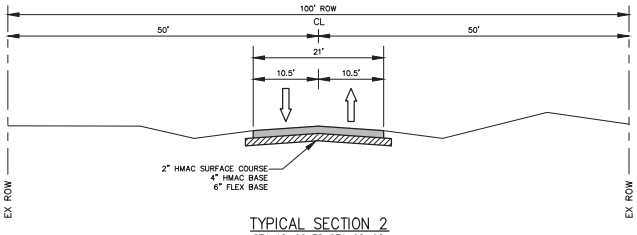
21' WIDE, 6" HMAC ROADWAY ON 6" FLEX BASE
REPLACE PAVEMENT AT EXISTING WIDTH
NO DRAINAGE OR SAFETY IMPROVEMENTS
NO ADDITIONAL RIGHT OF WAY OR EASEMENTS



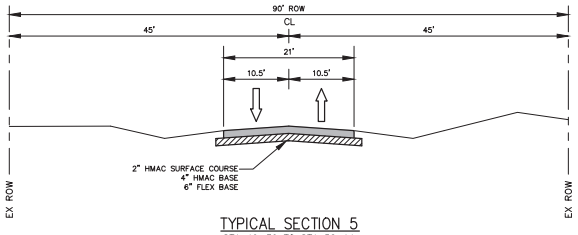
TYPICAL SECTION 1
STA 2+98 TO STA 10+62
STA 20+90 TO STA 25+34
STA 88+00 TO STA 97+98



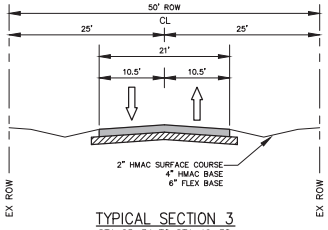
TYPICAL SECTION 4
STA 46+38 TO STA 49+39



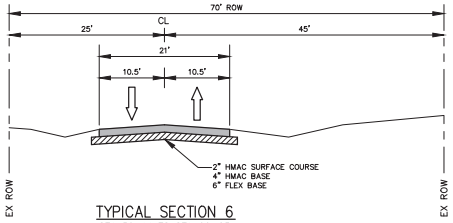
TYPICAL SECTION 2
STA 10+62 TO STA 20+90



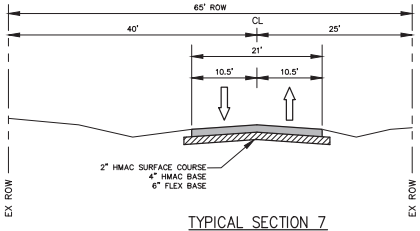
TYPICAL SECTION 5
STA 49+39 TO STA 56+14



TYPICAL SECTION 3
STA 25+34 TO STA 46+38
STA 66+03 TO STA 68+25
STA 82+07 TO STA 88+00
STA 97+98 TO STA 114+86



TYPICAL SECTION 6
STA 56+14 TO STA 66+03



TYPICAL SECTION 7
STA 68+25 TO STA 82+07

Rev	Description	Date
△		

This document is released for the purpose of interim review under the authority of: Richard A. Arvizu, P.E., Tx. No: 88432 Binkley & Barfield, Inc. #F-257. Not for regulatory approval, permitting, or construction.

COLLIN COUNTY
ENGINEERING DEPARTMENT
MCKINNEY, TEXAS

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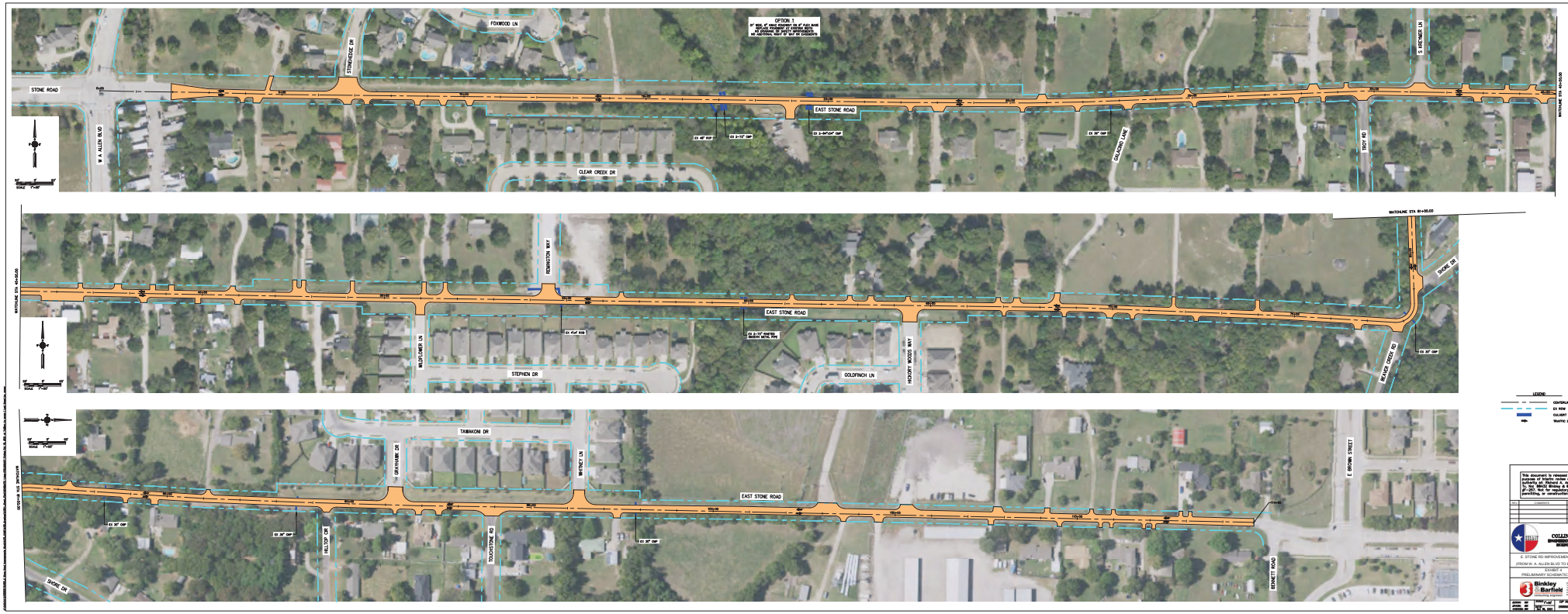
E. STONE RD IMPROVEMENTS STUDY
(FROM W. A. ALLEN BLVD TO BENNETT RD)
EXHIBIT 3
PROPOSED TYPICAL SECTIONS
OPTION 1

Scale:	Date:	Job No.:	
N.T.S.	Oct 18, 2021	2100000173	----



COLLIN COUNTY
ENGINEERING DEPARTMENT
MCKINNEY, TEXAS

E. STONE RD IMPROVEMENTS STUDY
(FROM W. A. ALLEN BLVD TO BENNETT RD)
EXHIBIT 6
PRELIMINARY SCHEMATIC OPTION 1

Binkley & Barfield
ENGINEERING PLANNING

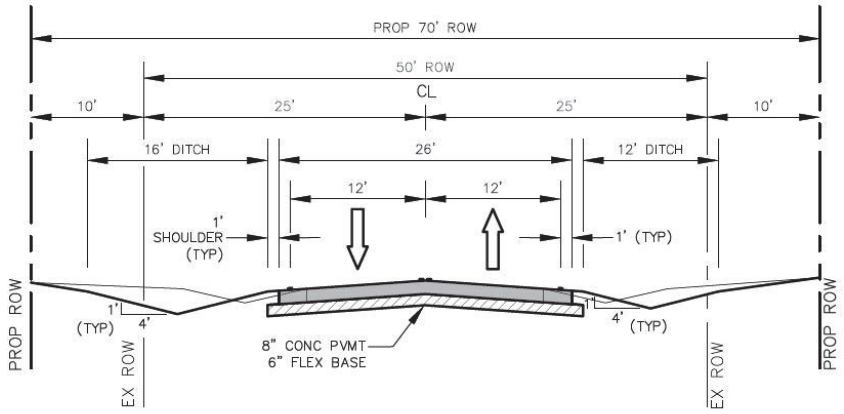
5.2 Option 2

The existing 21’ wide asphalt pavement would be replaced with a 26’ wide concrete roadway. The proposed roadway is proposed to be 8” concrete pavement over 6” flexible base. The roadway will include one 12’ lane in each direction. Each side will include an additional 1’ of concrete pavement width measured from the outside lane marking and 1’ of natural ground slopes at 2 percent.

Drainage ditches will remain on both sides; however, drainage ditches will be re-graded as needed to increase drainage capacity. Refer to **Table 4 – Proposed Drainage Ditches** and **Exhibit 5 – Option 2 Proposed Typical Sections**.

Cross-drainage structures will be replaced and resized to meet current drainage criteria. Refer to **Table 3 – Proposed Cross Drainage Structures**. This option includes a proposed 3-span concrete bridge to cross over Rush Creek.

This option will require a minimum ROW width of 70’ to contain the proposed improved roadway ditches and additional space (minimum 5 feet along the backside of the ditch adjacent to the ROW line) for maintenance.



PROPOSED TYPICAL SECTION
(70' ROW)

Refer to **Exhibit 5 – Option 2, Proposed Typical Sections** and **Exhibit 6 – Option 2, Preliminary Schematic**.

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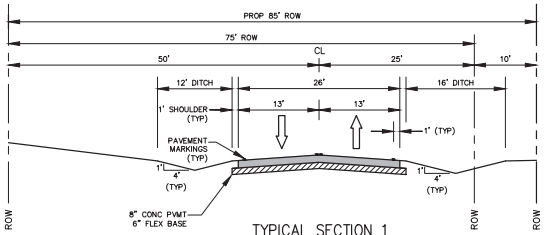
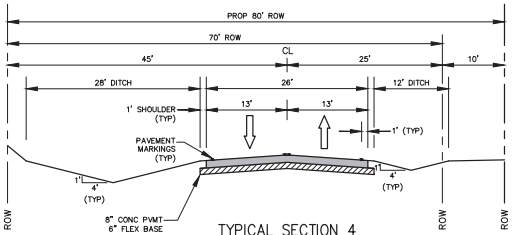
OPTION 2

26' WIDE, 8" CONCRETE ROADWAY ON 6" FLEX BASE
ROADWAY SAFETY IMPROVEMENTS
DRAINAGE IMPROVEMENTS
ADDITIONAL RIGHT OF WAY/EASEMENTS REQUIRED



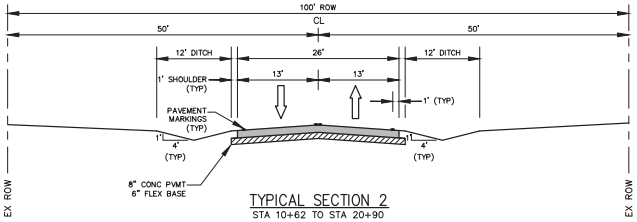
TYPICAL SECTION 1

STA 2+98 TO STA 10+62
STA 20+90 TO STA 25+34
STA 88+00 TO STA 97+98



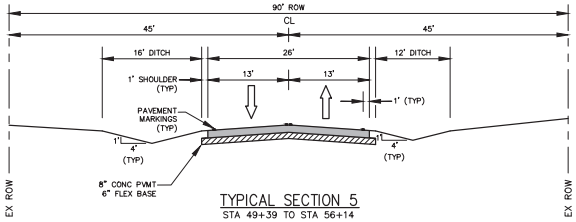
TYPICAL SECTION 4

STA 46+38 TO STA 49+39



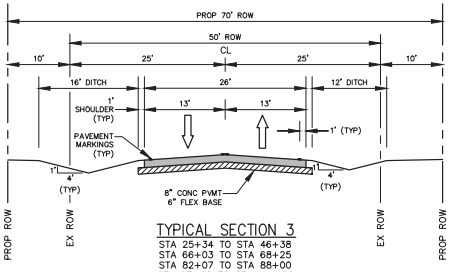
TYPICAL SECTION 2

STA 10+62 TO STA 20+90



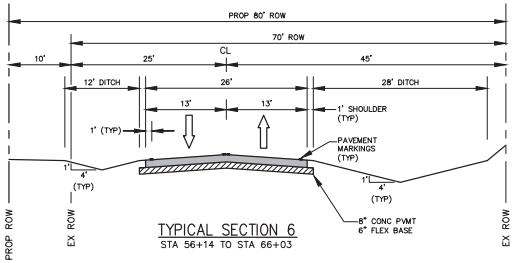
TYPICAL SECTION 5

STA 49+39 TO STA 56+14



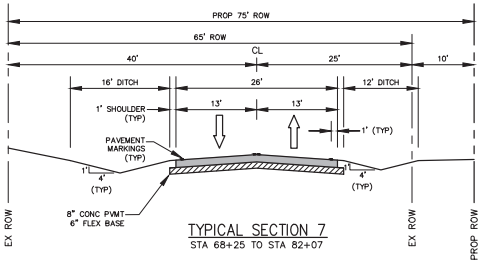
TYPICAL SECTION 3

STA 25+34 TO STA 46+38
STA 66+03 TO STA 68+25
STA 82+07 TO STA 88+00
STA 97+98 TO STA 114+86



TYPICAL SECTION 6

STA 56+14 TO STA 66+03



TYPICAL SECTION 7

STA 68+25 TO STA 82+07

Rev	Description	Date
△		

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COLLIN COUNTY
ENGINEERING DEPARTMENT
MCKINNEY, TEXAS

Binkley & Barfield consulting engineers
Binkley & Barfield, Inc. | TxEng F-257
1801 Gateway Blvd, Ste 101, Richardson, TX 75080
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E. STONE RD IMPROVEMENTS STUDY
(FROM W. A. ALLEN BLVD TO BENNETT RD)
EXHIBIT 5
PROPOSED TYPICAL SECTIONS
OPTION 2

Scale:	Date:	Job No.:	
N.T.S.	Oct 18, 2021	2100000173	----

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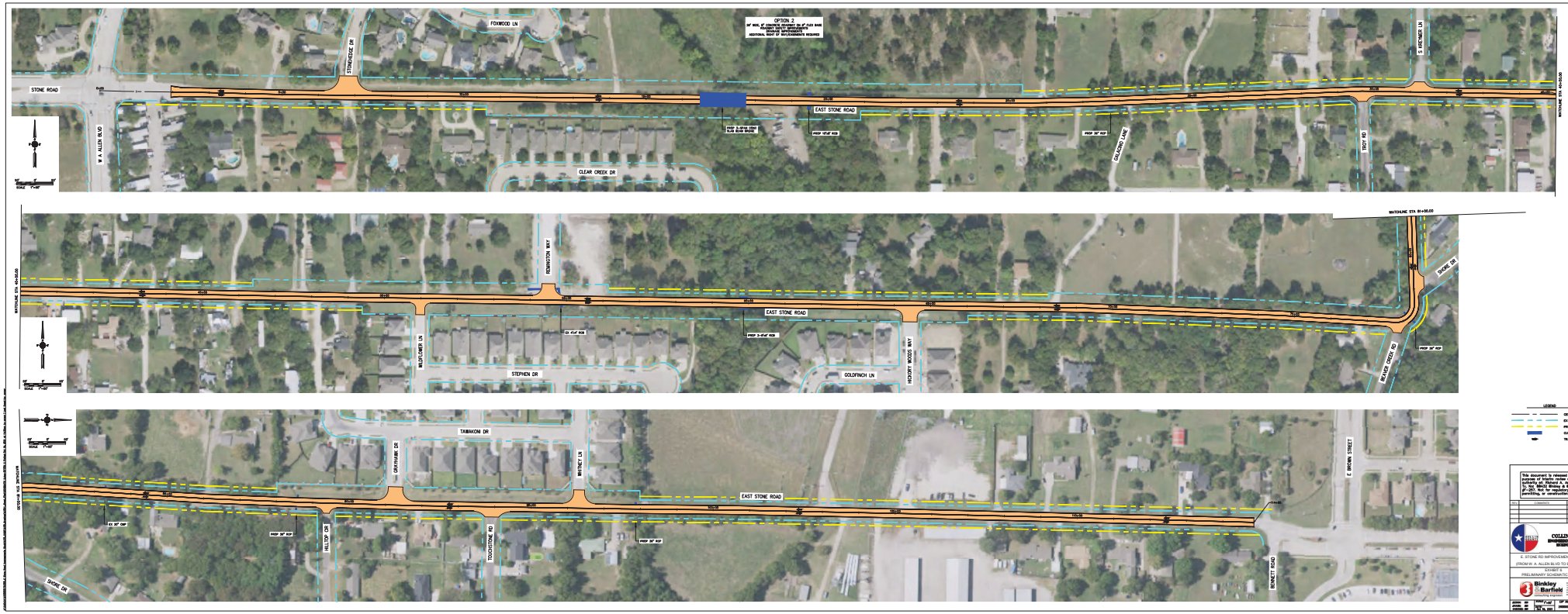


COLLIN COUNTY
ENGINEERING DEPARTMENT
MCKINNEY, TEXAS

E. STONE RD IMPROVEMENTS STUDY
(FROM W. A. ALLEN BLVD TO BENNETT RD)

EXHIBIT B
PRELIMINARY SCHEMATIC OPTION 2

Binkley & Barfield
ENGINEERING PLANNING

JOB NO.	SHEET

5.3 Option 3

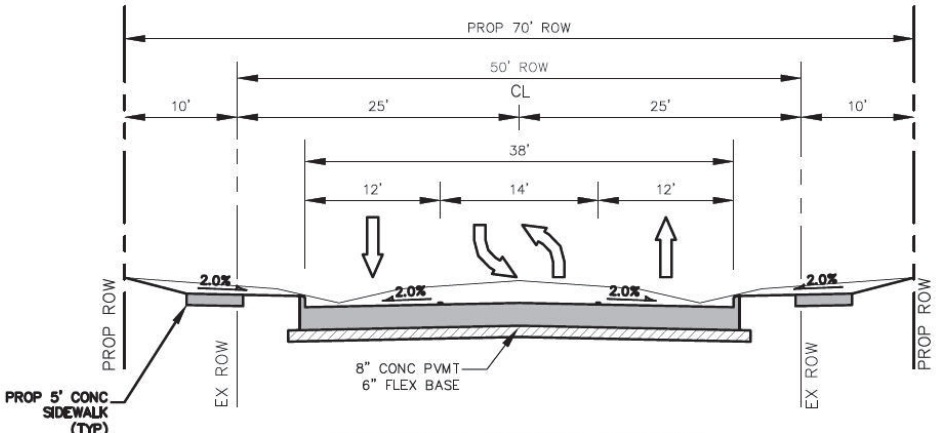
The existing 21’ wide asphalt pavement would be replaced with a 38’ wide concrete roadway and a 6” curb and gutter. The proposed roadway would be 8” concrete pavement over 6” flexible base. The roadway would include one 12’ lane in each direction and a 14’ reversable turn lane, in accordance with the Stone Road Traffic Study (Forecasts and Crash Analysis) recommendation. As presented in the above referenced study, the shared turn lane will improve traffic flow, and a raised pavement median is not recommended due to the numerous street and driveway entrances along the corridor.

Drainage ditches will be eliminated and replaced with an underground storm sewer system. All drainage in the parkway will be graded to drain towards the street curb and gutter.

Cross drainage structures will be replaced and resized in meet current drainage criteria. Refer to **Table 3 – Proposed Cross Drainage Structures**. This option will require a 3-span concrete bridge to cross over Rush Creek.

This option will include a concrete sidewalk for pedestrian safety.

This option will require a minimum right of way width of 70’.



PROPOSED TYPICAL SECTION
(70’ ROW)

Refer to **Exhibit 7 – Option 3, Proposed Typical Sections** and **Exhibit 8 – Option 3, Preliminary Schematic**.

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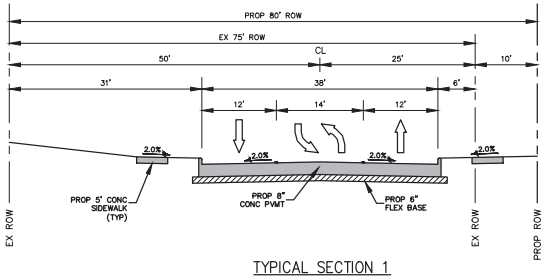
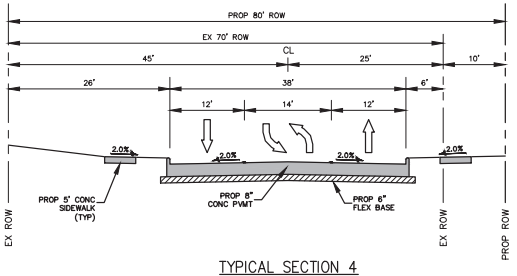
OPTION 3

38' WIDE, 8" CONCRETE ROADWAY ON 6" FLEX BASE
CONCRETE CURB & GUTTER WITH UNDERGROUND STORM SEWER SYSTEM
ROADWAY, TRAFFIC & PEDESTRIAN IMPROVEMENTS
DRAINAGE IMPROVEMENTS
ADDITIONAL RIGHT OF WAY/EASEMENTS REQUIRED



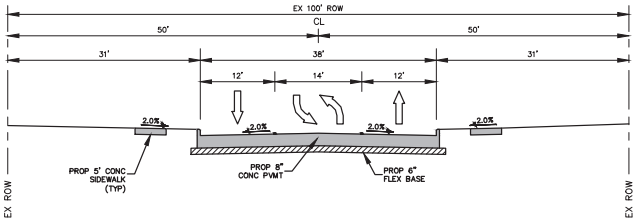
TYPICAL SECTION 1

STA 2+98 TO STA 10+62
STA 20+90 TO STA 25+34
STA 88+00 TO STA 97+98



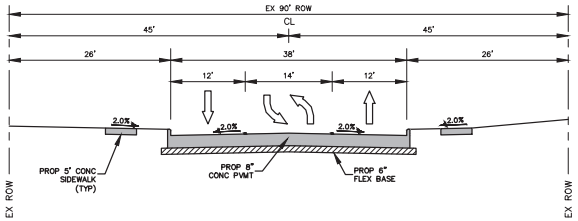
TYPICAL SECTION 4

STA 46+38 TO STA 49+39



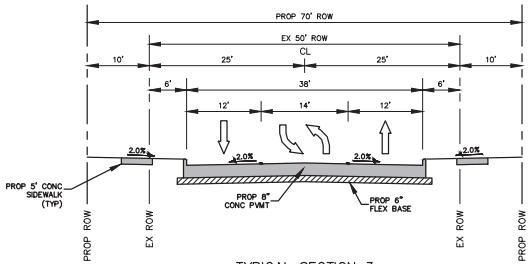
TYPICAL SECTION 2

STA 10+62 TO STA 20+90



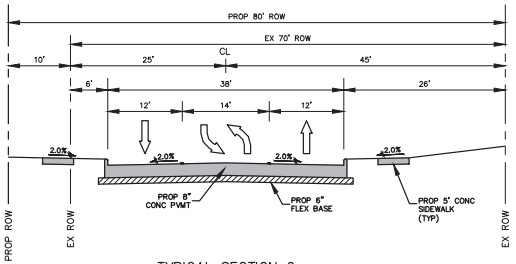
TYPICAL SECTION 5

STA 49+39 TO STA 56+14



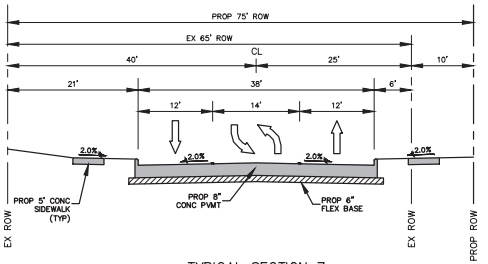
TYPICAL SECTION 3

STA 25+34 TO STA 46+38
STA 66+03 TO STA 68+25
STA 82+07 TO STA 88+00
STA 97+98 TO STA 114+86



TYPICAL SECTION 6

STA 56+14 TO STA 66+03



TYPICAL SECTION 7

STA 68+25 TO STA 82+07

Rev	Description	Date
△		

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COLLIN COUNTY
ENGINEERING DEPARTMENT
MCKINNEY, TEXAS

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E. STONE RD IMPROVEMENTS STUDY
(FROM W. A. ALLEN BLVD TO BENNETT RD)
EXHIBIT 7
PROPOSED TYPICAL SECTIONS
OPTION 3

Scale:	Date:	Job No.:	
N.T.S.	Oct 18, 2021	2100000173	----

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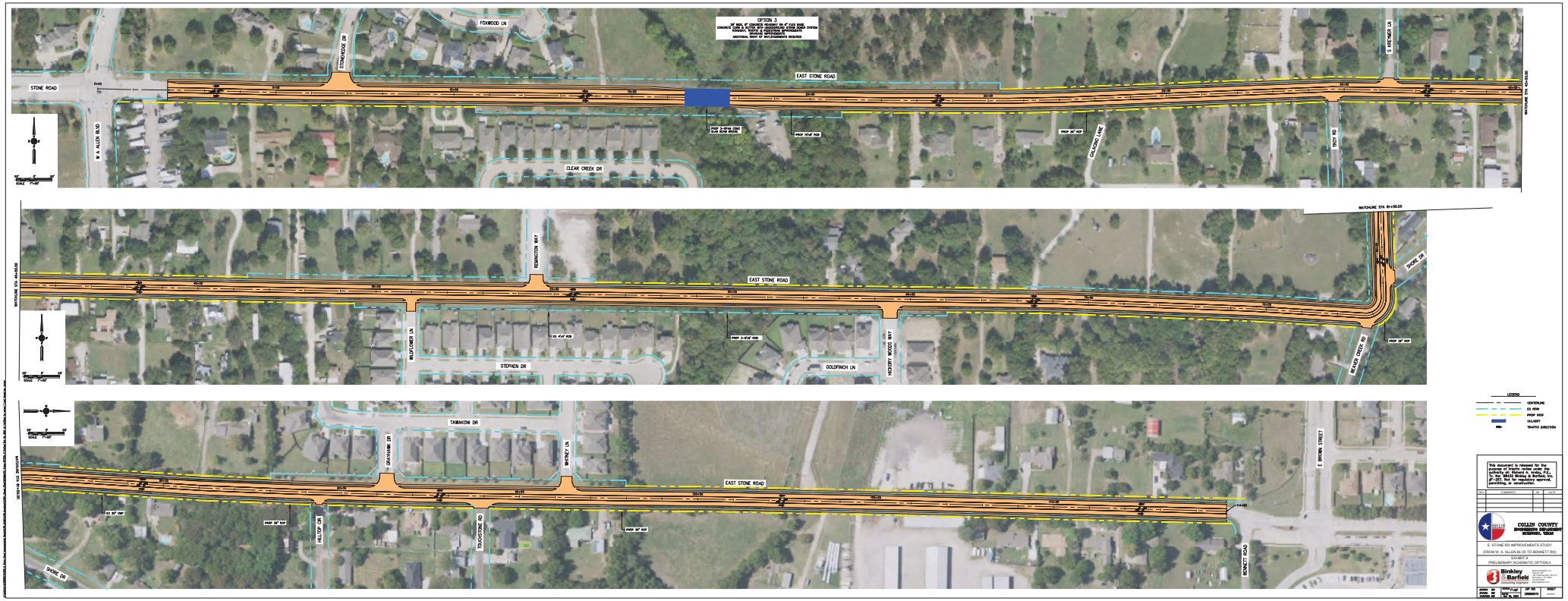

COLLIN COUNTY
ENGINEERING DEPARTMENT
MCKINNEY, TEXAS

E. STONE RD IMPROVEMENTS STUDY
(FROM W. A. ALLEN BLVD TO BENNETT RD)

EXHIBIT B
PRELIMINARY SCHEMATIC OPTION 3

Binkley & Barfield

6.0 ENGINEERS OPINION OF PROBABLE CONSTRUCTION COST

6.1 Option 1

Table 5: Option 1 - Engineer's Opinion of Construction Cost

Item	Description	Units	Bid Quantity	Engineer's Estimate	
				Unit Price	Total
1	REMOVE ASPHALT PAVEMENT	SY	26,343	$20.00	$526,866.67
2	REMOVE CONCRETE DRIVEWAY	SY	942	$20.00	$18,833.33
3	UNCLASSIFIED STREET EXCAVATION	CY	4,391	$25.00	$109,763.89
4	6" FLEXBASE	SY	27,661	$28.00	$774,494.00
5	2" HMAC SURFACE (TYPE D)	TN	2,928	$110.00	$322,080.00
6	4" HMAC BASE (TYPE B)	TN	5,856	$100.00	$585,600.00
7	5" CONCRETE DRIVEWAY PAVEMENT	SY	942	$62.00	$58,383.33
8	4" YELLOW PAVEMENT MARKING	LF	22,580	$3.00	$67,740.00
9	BLOCK SODDING	SY	10,036	$5.00	$50,177.78
				Sub-Total =	**$2,513,939.00**
				Mobilization (5%) =	$125,700.00
				Contingency (20%) =	$502,800.00
				SWPPP & Erosion Control =	$120,000.00
				Traffic Control =	$250,000.00
				Total =	**$3,512,439.00**

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6.2 Option 2

Table 6: Option 2 - Engineer's Opinion of Construction Cost

Item	Description	Units	Bid Quantity	Engineer's Estimate	
				Unit Price	Total
1	REMOVE ASPHALT PAVEMENT	SY	26,343	$20.00	$526,866.67
2	REMOVE CONCRETE DRIVEWAY	SY	1,413	$20.00	$28,250.00
3	REMOVE 15"-24" RCP DRIVEWAY CULVERT	LF	1,215	$20.00	$24,300.00
4	REMOVE 30" CMP	LF	85	$20.00	$1,700.00
5	REMOVE 36" CMP	LF	71	$25.00	$1,775.00
6	REMOVE 72" CMP	LF	200	$65.00	$13,000.00
7	REMOVE 72" RIVETED METAL PIPE CULVERT	LF	64	$70.00	$4,480.00
8	REMOVE CULVERT HEADWALL	EA	12	$750.00	$9,000.00
9	UNCLASSIFIED STREET EXCAVATION	CY	5,436	$25.00	$135,898.15
10	EMBANKMENT & COMPACTION	CY	544	$20.00	$10,871.85
11	6" FLEXBASE	SY	34,246	$28.00	$958,897.33
12	8" CONCRETE PAVEMENT	SY	32,616	$75.00	$2,446,166.67
13	5" CONCRETE DRIVEWAY PAVEMENT	SY	942	$62.00	$58,383.33
14	4" YELLOW PAVEMENT MARKING	LF	45,160	$3.00	$135,480.00
15	BLOCK SODDING	SY	10,036	$5.00	$50,177.78
16	FURNISH & INSTALL METAL BEAM GUARD FENCE	LF	3,600	$55.00	$198,000.00
17	EXTEND 30" CMP	LF	10	$50.00	$500.00
18	EXTEND 4'x4' RCB	LF	10	$400.00	$4,000.00
19	CONSTRUCT 15"-24" DRIVEWAY CULVERT	LF	1,215	$100.00	$121,500.00
20	CONSTRUCT 36" RCP	LF	350	$170.00	$59,500.00
21	CONSTRUCT 10'x8' RCB CULVERT	LF	70	$900.00	$63,000.00
22	3 SPAN PRESTRESSED SLAB BEAM BRIDGE	SF	4,725	$145.00	$685,125.00
23	CONSTRUCT CONCRETE HEADWALL	EA	18	$12,000.00	$216,000.00
24	ADJUST STORM SEWER MANHOLE TO GRADE	EA	5	$1,000.00	$5,000.00
25	ADJUST WATER VALVE TO GRADE	EA	10	$250.00	$2,500.00
26	REMOVE AND RESET WATER METER	EA	10	$300.00	$3,000.00
27	REMOVE AND REPLACE WATER METER BOX	EA	10	$350.00	$3,500.00
28	ADJUST FIRE HYDRANT TO GRADE	EA	10	$1,300.00	$13,000.00
29	ADJUST SANITARY SEWER MANHOLE TO GRADE	EA	5	$1,000.00	$5,000.00
30	REMOVE AND REPLACE MAILBOX	EA	81	$290.00	$23,490.00
31	ROW ACQUISITION	SY	15,721	$36.00	$565,968.00
				Sub-Total =	**$6,374,329.78**
				Mobilization (5%) =	$318,700.00
				Contingency (20%) =	$1,274,900.00
				SWPPP & Erosion Control =	$120,000.00
				Traffic Control =	$250,000.00
				Total =	**$8,337,929.78**

Note: Estimate does not include relocation of franchise utilities

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6.3 Option 3

Table 7: Option 3 - Engineer's Opinion of Construction Cost

Item	Description	Units	Bid Quantity	Engineer's Estimate	
				Unit Price	Total
1	REMOVE ASPHALT PAVEMENT	SY	26,343	$20.00	$526,866.67
2	REMOVE CONCRETE DRIVEWAY	SY	2,543	$20.00	$50,850.00
3	REMOVE 15"-24" RCP DRIVEWAY CULVERT	LF	1,215	$20.00	$24,300.00
4	REMOVE 30" CMP	LF	85	$20.00	$1,700.00
5	REMOVE 36" CMP	LF	71	$25.00	$1,775.00
6	REMOVE 72" CMP	LF	200	$65.00	$13,000.00
7	REMOVE 72" RIVETED METAL PIPE CULVERT	LF	64	$70.00	$4,480.00
8	REMOVE CULVERT HEADWALL	EA	12	$750.00	$9,000.00
9	UNCLASSIFIED STREET EXCAVATION	CY	7,945	$25.00	$198,620.37
10	EMBANKMENT & COMPACTION	CY	794	$20.00	$15,889.63
11	6" FLEXBASE	SY	50,052	$28.00	$1,401,465.33
12	8" CONCRETE PAVEMENT	SY	47,669	$75.00	$3,575,166.67
13	5" CONCRETE DRIVEWAY PAVEMENT	SY	942	$62.00	$58,383.33
14	MONOLITHIC CURB	LF	22,580	$16.00	$361,280.00
15	CONCRETE SIDEWALK	SY	12,296	$50.00	$614,777.78
16	4" YELLOW PAVEMENT MARKING	LF	45,160	$3.00	$135,480.00
17	PAVEMENT ARROWS	EA	22	$65.00	$1,430.00
18	BLOCK SODDING	SY	20,071	$5.00	$100,355.56
19	FURNISH & INSTALL METAL BEAM GUARD FENCE	LF	1,800	$55.00	$99,000.00
20	EXTEND 4'x4' RCB	LF	20	$400.00	$8,000.00
21	CONSTRUCT 10' CURB INLET	EA	44	$10,000.00	$440,000.00
22	CONSTRUCT 30" RCP	LF	8,468	$140.00	$1,185,450.00
23	CONSTRUCT 36" RCP	LF	350	$170.00	$59,500.00
24	CONSTRUCT 9'x6' RCP	LF	210	$750.00	$157,500.00
25	CONSTRUCT 10'x8' RCB CULVERT	LF	70	$900.00	$63,000.00
26	3 SPAN PRESTRESSED SLAB BEAM BRIDGE	SF	4,725	$145.00	$685,125.00
27	CONSTRUCT CONCRETE HEADWALL	EA	18	$12,000.00	$216,000.00
28	ADJUST STORM SEWER MANHOLE TO GRADE	EA	5	$1,000.00	$5,000.00
29	ADJUST WATER VALVE TO GRADE	EA	10	$250.00	$2,500.00
30	REMOVE AND RESET WATER METER	EA	10	$300.00	$3,000.00
31	REMOVE AND REPLACE WATER METER BOX	EA	10	$350.00	$3,500.00
32	ADJUST FIRE HYDRANT TO GRADE	EA	10	$1,300.00	$13,000.00
33	ADJUST SANITARY SEWER MANHOLE TO GRADE	EA	5	$1,000.00	$5,000.00
34	REMOVE AND REPLACE MAILBOX	EA	81	$290.00	$23,490.00
35	ROW ACQUISITION	SY	15,721	$36.00	$565,968.00
				Sub-Total =	**$10,629,853.33**
				Mobilization (5%) =	$531,500.00
				Contingency (20%) =	$2,126,000.00
				SWPPP & Erosion Control =	$120,000.00
				Traffic Control =	$250,000.00
				Total =	**$13,657,353.33**

Note: Estimate does not include relocation of franchise utilities

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