Interstate 35 at Waterloo Road Access Justification Report

Oklahoma & Logan Counties (Division IV)
ODOT JP 29843(04)

Prepared For:

Oklahoma Department of Transportation

December 2020

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I-35 AT WATERLOO ROAD INTERCHANGE ACCESS JUSTIFICATION REPORT

Oklahoma/Logan County, Oklahoma

ODOT JP 29843(04)

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1.0 Executive Summary

The Oklahoma Department of Transportation (ODOT) is proposing to replace the existing diamond interchange at I-35 and Waterloo Road, which is located at the Oklahoma County/Logan County border. The current interchange features twin I-35 bridges that are considered at risk of becoming structurally deficient and have vertical clearances of 13 feet, 11 inches, which is below the current standard. With a horizontal clearance under the bridges of 38 feet, additional lanes on Waterloo Road are not possible.

The lack of turn lanes under the bridge and limited capacity from single lane approaches along Waterloo Road create congestion and queues at the interchange that spill into adjacent intersections. A recent interim project to signalize the ramp intersections has provided improvement over the prior all-way stop condition – which had created northbound off ramp queues that neared the I-35 mainline – but signalized conditions still result in Level of Service (LOS) E movements and intersection blockages. In addition, the all-way stop controlled Waterloo Road at Sooner Road intersection features LOS E and F movements during both peak hours. With the growth anticipated in the area (including potential for a large development in the northwest quadrant of the interchange), the project's purpose and need is to improve safety and accommodate existing and future traffic demand at the I-35 & Waterloo Road interchange, replace the at-risk bridges, and improve vertical clearance under the I-35 bridges over Waterloo Road.

Multiple improvement options were studied for the interchange with results documented in the *Interstate 35 at Waterloo Road Traffic Analysis* (August 2015) and *Interstate 35 over Waterloo Road Preliminary Engineering Report* (November 2015). A diverging diamond interchange (DDI) configuration was selected to best serve the existing and projected volume patterns at the Waterloo Road interchange. Ramp merge and diverge distances will be improved with two-lane ramps to the south servicing the large traffic demand heading to/from Oklahoma City. Corridor improvements to widen Waterloo Road to five-lanes and signalize the Sooner Road intersection will increase safety and mobility. The project will reduce total vehicle-hours of intersection delay from the No Build scenario by approximately 85 to 90% in the design year. For safety, the conversion of diamond interchanges to DDI layouts have reduced overall crashes by 58% and injury crashes by 41% per the *Crash Modification Factor Clearinghouse.* Additional safety benefit is expected with the construction of left turn lanes along the corridor and increased merge distances at the entrance ramps and increased diverge distances at the exit ramps.

The estimated cost of the project is $39.4 million. The project will connect to a public road and provide for all traffic movements at the interchange. Lane balance on I-35 will be maintained at the interchange and access to local businesses will be kept while relocating the current Frontage Road connections further away from the I-35 ramp terminals. No design exceptions are anticipated.

Public involvement for this project involved a solicitation of input from federal, state, and local government agencies and elected officials, and a public meeting held in January 2016. The project is included in ODOT's 8 Year Work Plan and Statewide Transportation Improvement Program (STIP). It is also listed in ACOG's short range Transportation Improvement Program (TIP). Additional improvements, including corridor widening of Waterloo Road and I-35, are both referenced in ACOG's 2040 Long Range Plan.

Environmental studies and a Categorical Exclusion (CE) document under the National Environmental Policy Act (NEPA) are underway. No significant environmental impacts are anticipated as a result of the project and there is no significant public controversy on environmental grounds.

2.0 Project Background

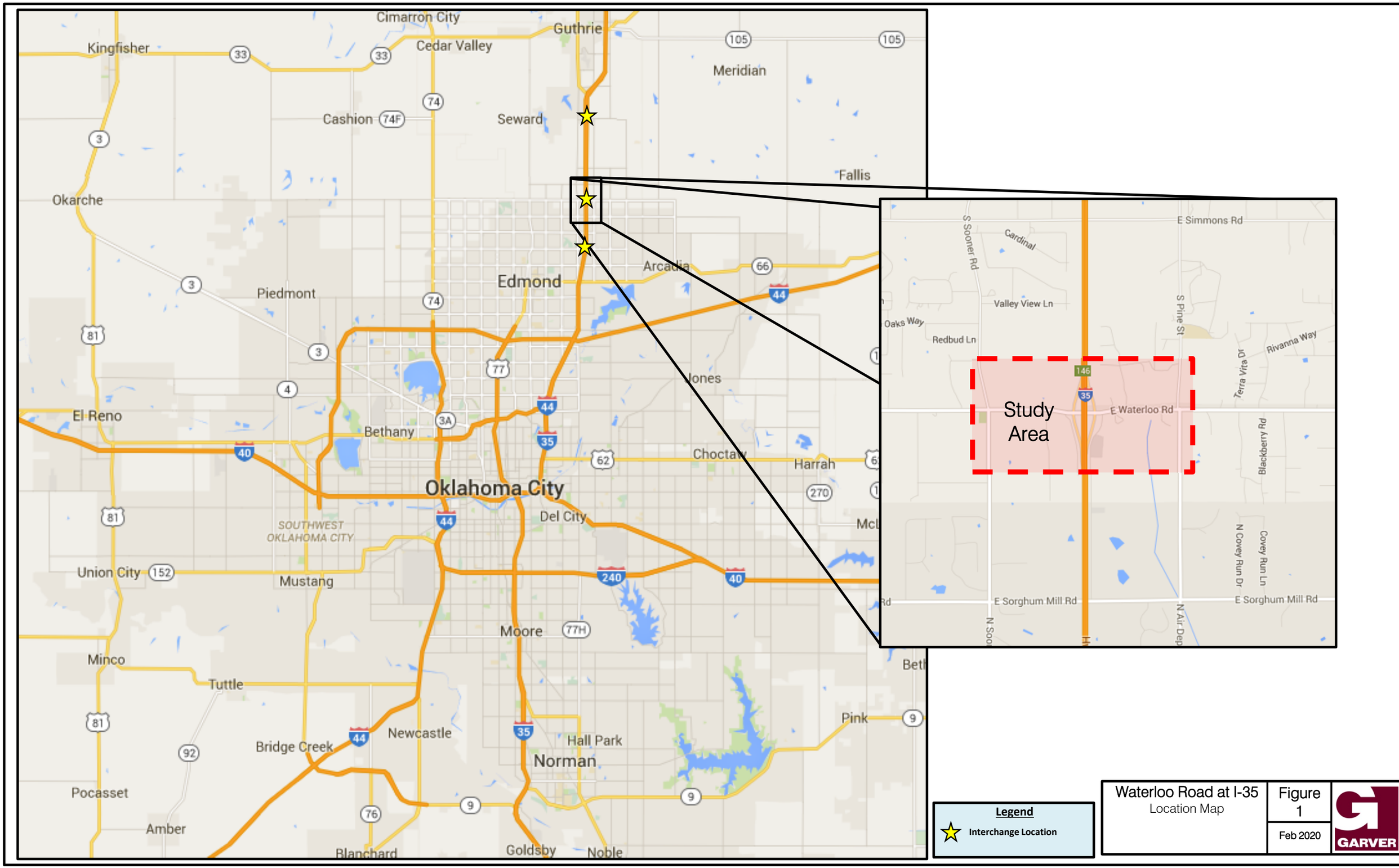
The Oklahoma Department of Transportation (ODOT) is proposing to replace a traditional diamond interchange at I-35 and Waterloo Road with a diverging diamond interchange (DDI). The project is located at the Oklahoma County/Logan County border at the northern edge of the Oklahoma City metro area and near the City of Edmond. In addition to the DDI ramp configuration, the project will include new I-35 bridges over Waterloo Road, enhanced ramp merging and diverging distances, and corridor widening on Waterloo Road on either side of the interchange. The estimated total cost of the project is $39.4 million.

2.1 Study Area

The Waterloo Road interchange with I-35 is located at Exit 146 approximately three miles north of the Covell Road interchange and five miles south of the Seward Road interchange. A location map of the study area is provided in **Figure 1**. To the east, Waterloo Road serves mostly rural and residential land uses and terminates at Anderson Road approximately 5.5 miles east of the interchange. To the west, Waterloo Road provides connection to the northern portion of the City of Edmond (population 94,054) approximately 2.0 miles from the interchange. Further west, Waterloo Road provides direct connection to SH-74 (approximately 9.5 miles) and US-81 (approximately 31.5 miles). The Waterloo Road interchange at I-35 provides residents with access to the City of Guthrie (population 11,661), approximately 13 miles to the north, and to Oklahoma City (population 655,057), which is located approximately 8 miles to the south (21 miles to the central business district).

The Waterloo Road corridor lane configuration is provided in **Figure 2**. Waterloo Road is currently a two-lane facility with an all-way stop at Sooner Road and recently installed, interim traffic signals at the I-35 ramps. Most intersection approaches are single lane with exceptions at the northbound off ramp (left and right turn lanes) and on eastbound Waterloo Road (through and right turn lane) at the southbound ramps. On I-35, two through lanes are provided in each direction with single lane ramps. Diverge/merge maneuvers use a taper style design with approximately 250’ of deceleration distance for the diverges and 450’ provided for the merges.

Congestion is common within the study area during the peak hours with queuing present at the Waterloo Road interchange ramp terminals as well as on all approaches of the Sooner Road intersection. In the PM peak, northbound off ramp queues extending near the I-35 mainline are common. Though the recently installed traffic signals at the ramps have helped reduce this queue, this modification alone does not accomplish the purpose of the project, which is to improve safety, accommodate existing and future traffic demand at the I-35 and Waterloo Road Interchange, and improve the vertical and horizontal clearance of the current bridges. The interchange presently features twin I-35 bridges that are considered at risk of becoming structurally deficient and have vertical clearances of 13 feet, 11 inches, which is below the current standard. With a horizontal clearance under the bridges of 38 feet, additional lanes on Waterloo Road are not possible.


Cimarron City
Guthrie
Kingfisher
Cedar Valley
Meridian
Cashion
Seward
Fallis
Okarche
Arcadia
Edmond
Piedmont
Jones
El Reno
Bethany
Choctaw
Harrah
Oklahoma City
Del City
SOUTHWEST OKLAHOMA CITY
Union City
Mustang
Moore
Minco
Tuttle
Newcastle
Bridge Creek
Hall Park
Norman
Pocasset
Amber
Blanchard
Goldsby
Noble
Pink
Study Area
E Simmons Rd
S Sooner Rd
Cardinal
Valley View Ln
Oaks Way
Redbud Ln
S Pine St
Rivanna Way
Terra Vita Dr
E Waterloo Rd
Blackberry Rd
N Covey Run Dr
Covey Run Ln
E Sorghum Mill Rd
N Air Depot Blvd
Legend
Interchange Location
Waterloo Road at I-35
Location Map
Figure 1
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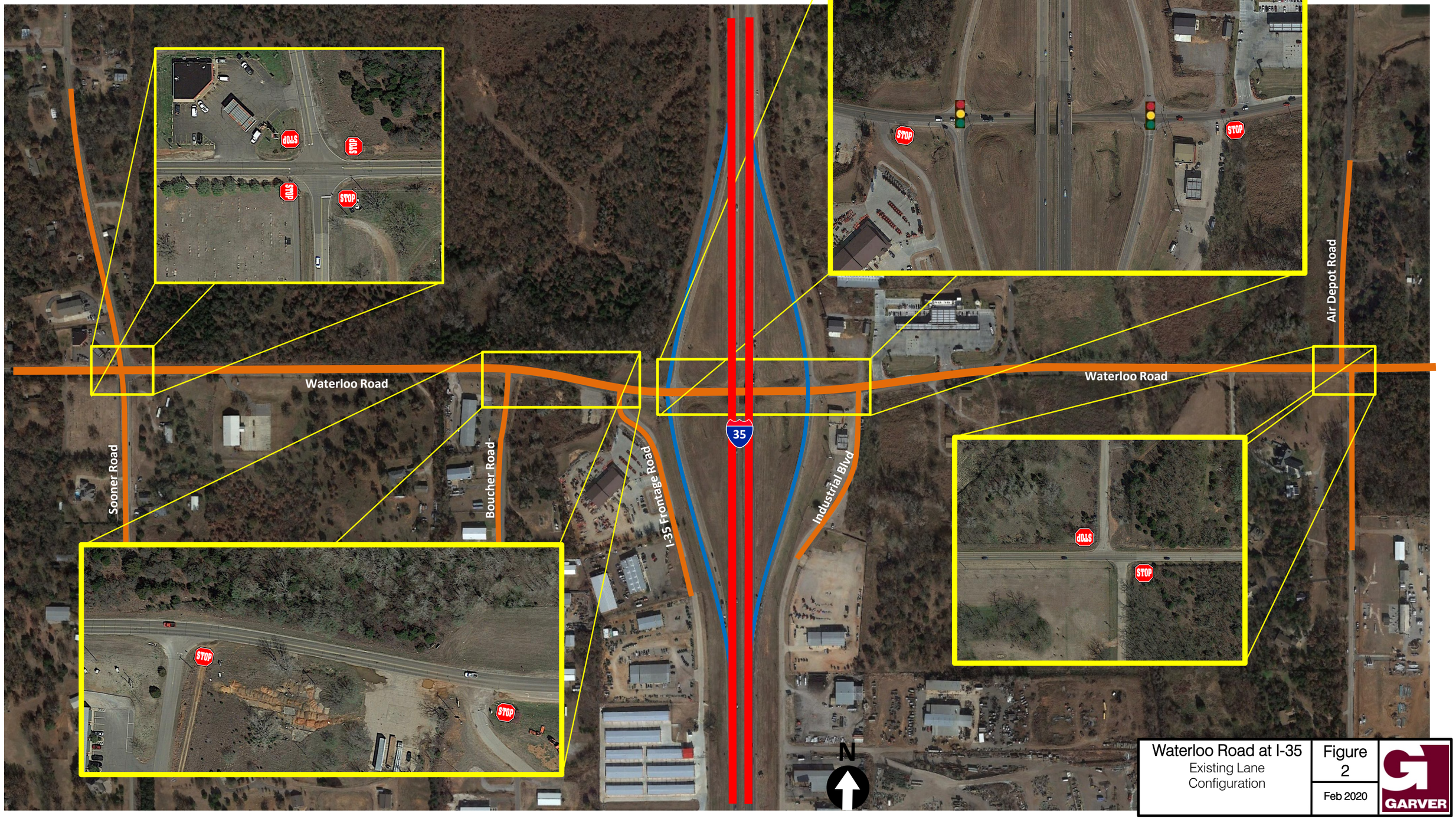

Waterloo Road at I-35
Existing Lane Configuration

Figure 2

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2.2 Prior Study

Multiple improvement options were studied for the interchange with results documented in the *Interstate 35 at Waterloo Road Traffic Analysis* (August 2015) and *Interstate 35 over Waterloo Road Preliminary Engineering Report* (November 2015). These studies included consideration of existing traffic conditions, safety, and accommodation of both expected background growth and a large mixed-use development proposed for the northwest quadrant of the interchange. Three improvement concepts, shown in **Appendix A** from the original report for reference, were selected for detailed analysis, including:

- **Alternative 1:** Modified diamond interchange with turn lanes and traffic signals at key intersections.
- **Alternative 2:** Diamond interchange with southbound loop on-ramp and turn lanes and traffic signals at key intersections.
- **Alternative 3:** Diverging Diamond Interchange (DDI) with turn lanes and traffic signals at key intersections.

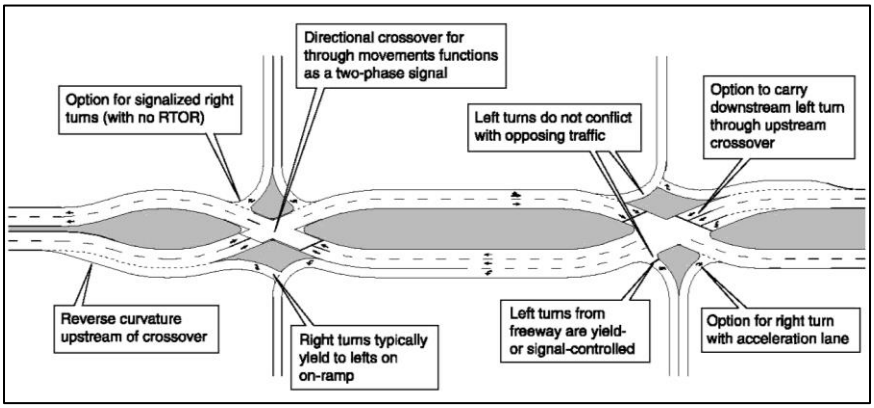
The study options were analyzed for the existing (2014), interim (2025), and design year (2040) assuming significant background growth and trip generation from a large mixed-use development to be located north of Waterloo Road between Sooner Road and I-35. Resulting traffic volumes for the existing and design year for the current configuration and proposed alternative configurations (approved by ODOT) are shown in **Appendix B**.

A comparison of the three design alternatives reveals mostly similar traffic performance for the Ultimate Configurations through the 2040 design year (see **Appendix C** for prior capacity analysis results). However, to achieve similar performance, Alternatives 1 and 2 were configured to feature geometric design issues that limit the desirability or effectiveness of those options. Alternative 1 does not include two continuous lanes on Waterloo Road through the interchange. Eastbound traffic would drop a lane at the southbound on-ramp, and westbound traffic requires a lane change in advance of the northbound ramps to continue through on Waterloo Road. For Alternative 2, a two-lane southbound loop on-ramp from Waterloo Road is needed to meet the 2040 demand. The two-lane section of the ramp would need to be long enough to get good lane utilization from Waterloo Road; however, one of the loop ramp lanes would need to terminate prior to the freeway gore. This loop ramp configuration would require dropping the lane and merging traffic while in a sharp curve (25 mph).

The Alternative 3 DDI will perform as well or better than Alternatives 1 and 2 and lacks the geometric design issues of these options. The DDI features fewer conflicts points than a diamond interchange (14 versus 26) and studies in Utah and Missouri have indicated a 45% reduction in crashes in the years following implementation of DDIs at former diamond interchange locations.

A DDI is a relatively new configuration that features directional crossovers on either side of the interchange. With these crossovers, the two directions of traffic on the non-freeway road cross so that vehicles drive on the left side of the road along the segment of the non-freeway road between the ramp termini. This eliminates the need for left-turning vehicles to clear traffic approaching from the opposing direction. In addition, vehicles on the crossroad making a left turn to/from the ramps do not conflict with

vehicles approaching from other directions. According to FHWA's *DDI Informational Guide*, the DDI can improve the operations of turns to and from the freeway facility by reducing both the number of signal phases and the number and severity of vehicle-to-vehicle conflict points compared to a conventional diamond interchange.



DDI configuration and features (Source: FHWA DDI Informational Guide*)*

In addition to the selection of the interchange alternative, the study determined the need for long term widening of I-35 south of Waterloo Road as well as the need for Waterloo Road to be a five-lane facility throughout the study area.

2.3 Study Area Updates for Access Justification Report

The DDI concept (Alternative 3) was selected by ODOT following the conclusion of the preliminary engineering phase and completion of a public meeting, and incorporation of public and agency comments. To address current congestion prior to interchange reconstruction, interim traffic signals were installed at the interchange ramps in 2017. In addition, the decision was made to provide interim capacity improvements on Waterloo Road as part of the interchange reconstruction project whereas previous designs extended only to the adjacent Frontage Roads. These improvements include widening Waterloo Road to five lanes from Sooner Road through I-35 to just west of Air Depot Boulevard as well as intersection turn lanes and installation of a traffic signal at Sooner Road.

The construction of a large travel center-style gas station (OnCue) began in 2017. This development was not identified during the preliminary engineering study and created the need to reassess access and consider additional traffic volumes generated.

To move forward with the interchange reconstruction, an Access Justification Report (AJR) is needed to describe the need for modifying the existing interchange within the criteria outlined in FHWA's Policy on Access to the Interstate System (2017 update), which lists two requirements – operational and safety analysis and access connection/design. The sections below describe these categories for the proposed DDI while providing analysis updates for any conditions that have changed since the original 2015 study. Options such as ramp metering, mass transit, and HOV improvements were not considered for this project due to low residential density and primary focus on alleviating congestion at the ramp terminals (and preventing spillback) versus I-35 mainline capacity, which ramp metering and/or HOV implementation would address.

3.0 Operational and Safety Analysis

Policy Point 1- Operational and Safety Analysis

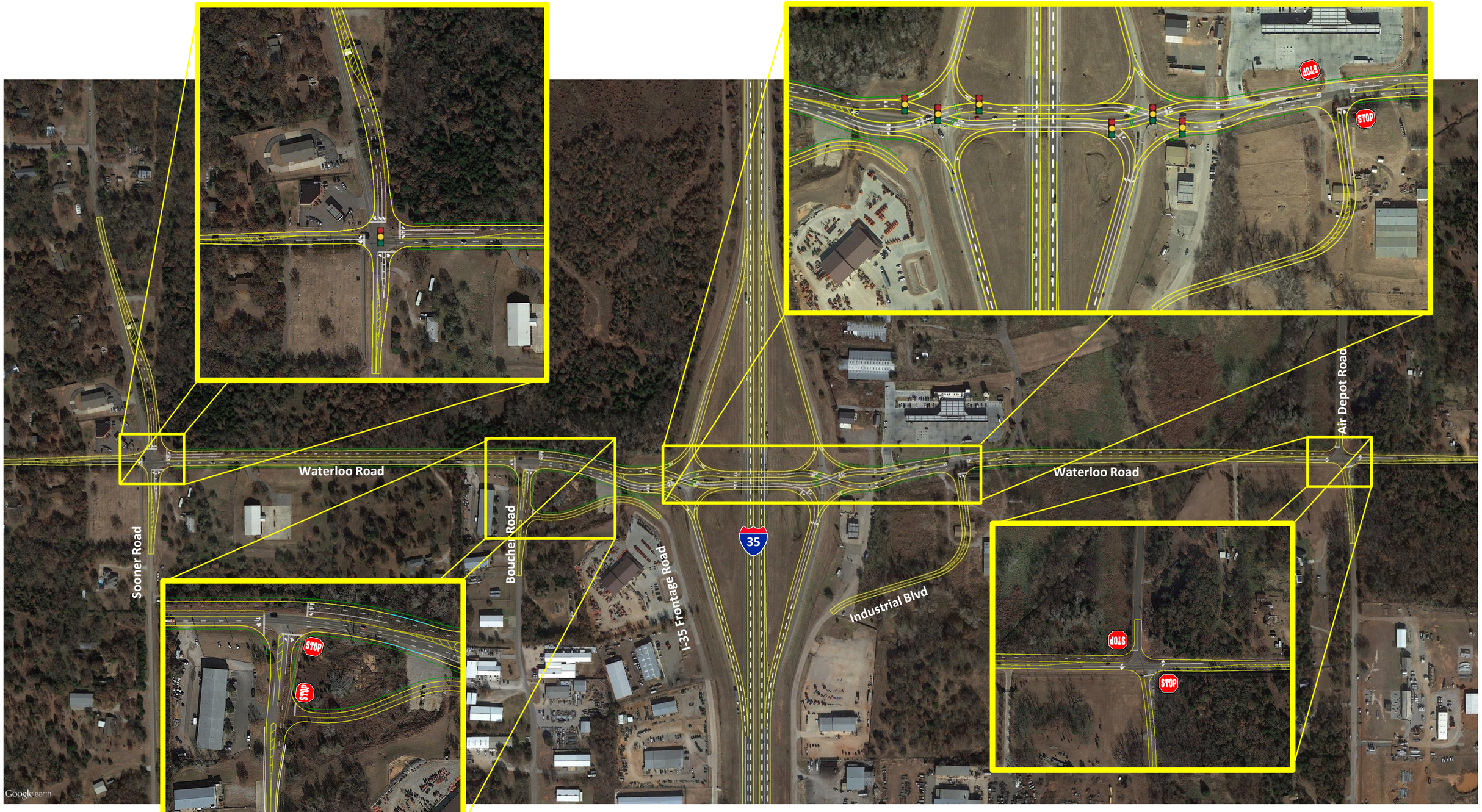
An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, and ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis should, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (Title 23, Code of Federal Regulations (CFR), paragraphs 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, should be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access should include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute, and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request should also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

An operational and safety analysis was performed per the FHWA policy point stated above to determine whether the proposed modification in access has a significant adverse impact on I-35 or on the surrounding street network. The proposed modifications to the Waterloo Road interchange and study corridor are depicted on aerial photos in **Figures 3A and 3B**. Complete preliminary design plans are provided for reference in **Appendix H**. The proposed improvements include the following:

- Replacement of I-35 bridges over Waterloo Road with vertical clearance of 16 feet 11 inches consistent with current design standards.
- DDI intersection configuration with signalization at I-35 ramps
- Single lane ramps north of Waterloo Road and two-lane ramps south of Waterloo Road with improved merge/diverge distances
- Relocation of Industrial Boulevard to line up with the eastern-most OnCue driveway to improve intersection spacing at the I-35 interchange
- Relocation of the western Frontage Road to intersect with Boucher Drive to improve intersection spacing at the I-35 interchange
- Widening of Waterloo Road to a five-lane facility from east of Sooner Road to west of Air Depot Boulevard (107 feet of horizontal clearance will be provided under the I-35 bridges)
- Intersection improvements at Sooner Road and at Air Depot Boulevard

The modifications listed above and shown in **Figures 3A and 3B** and **Appendix H** represent the improvements to be built by ODOT for this construction project. Additional connections/improvements, discussed in later sections, would be needed to provide access to any proposed development in the northwest quadrant (to be provided by others) and corridor-wide widening of Waterloo Road (to be provided by others) beyond the extents of this project.

Per policy, the study area from the original study was expanded to include the nearest adjacent interchange on I-35 in either direction – Covell Road to the south and Seward Road to the north. Traffic volumes at these adjacent interchanges were provided by ODOT for the existing (2014) and design (2040) years and are depicted in **Appendix D – Updated Traffic Volumes**. Traffic volumes on Waterloo



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Waterloo Road at I-35 Proposed Lane Configuration	Figure 3A	GARVER
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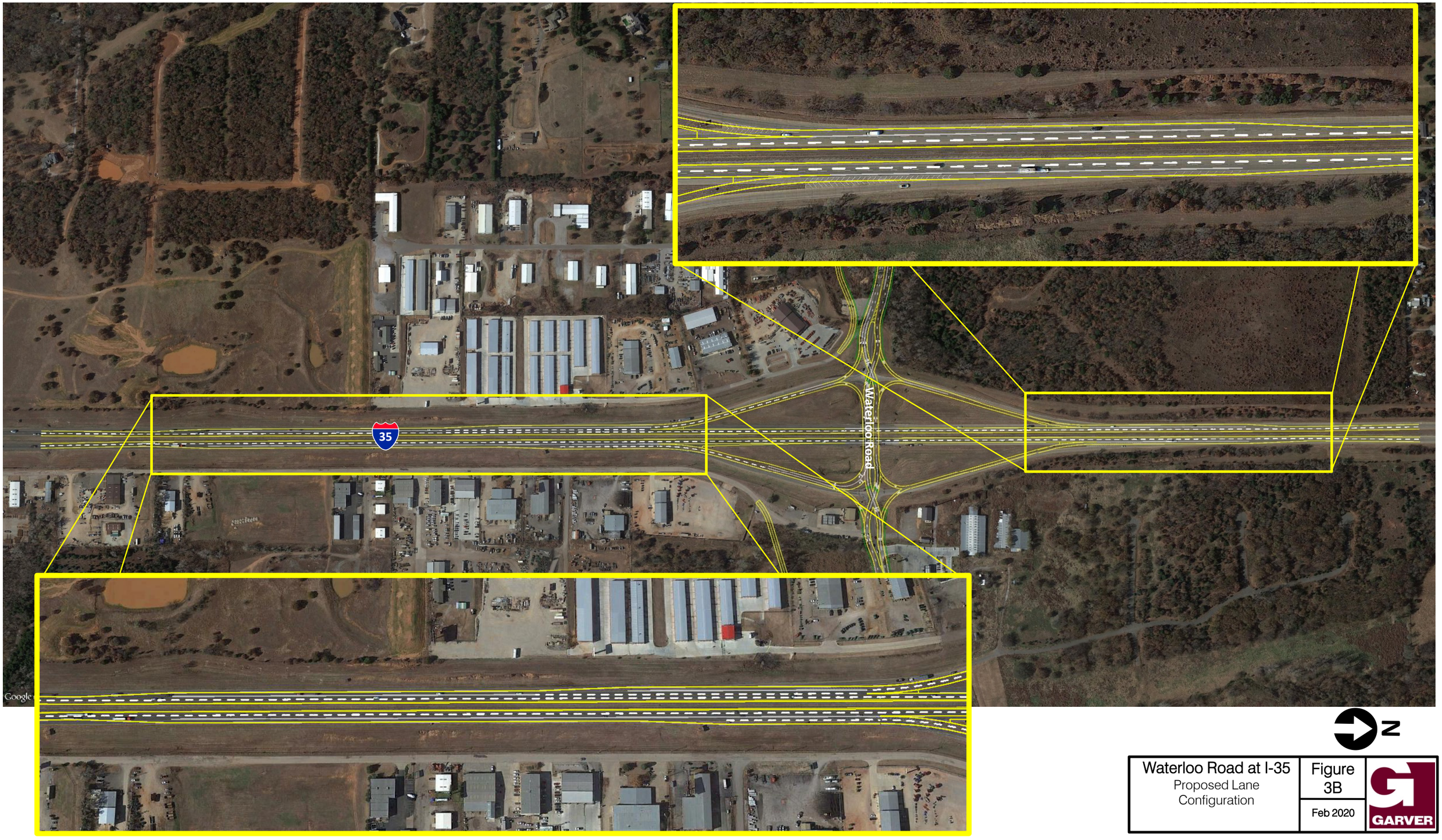

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Waterloo Road at I-35 Proposed Lane Configuration	Figure 3B Feb 2020	GARVER

Road were also re-evaluated due to the presence of the OnCue Travel Center and supplemented with new ramp counts in December 2018. Updated traffic volumes, inclusive of OnCue, with the proposed network for the anticipated opening year were calculated and are also depicted in **Appendix D**.

Additionally, the assumptions applied for the proposed development in the northwest quadrant of the Waterloo Road interchange were carried forward from the prior study – producing an interim year projection (2025) that includes the development at 50% buildout and a design year projection (2040) that assumes the development at 100% buildout. This assumption was based on 2014 marketing information received from the developer indicating a four-phase buildout, with approximately 25% slotted for Phase 1. With this information, it was reasonable to assume that a second phase of similar size would be complete within 10 years with full buildout in 20 years. Driveway assumptions – including a main access driveway opposite Boucher Drive – were carried forward from the prior study. For more information regarding the proposed development, see **Appendix G.**

As the original data collection occurred in 2014, supplemental counts were collected on Waterloo Road to ensure that area growth has not exceeded the assumptions initially made in the Preliminary Engineering Report. **Figure D-8** in **Appendix D** depicts the collected 2014 data, supplemental 2018 data, and projected opening year 2021 data on Waterloo Road and at the I-35 ramps. As shown, the 2018 data is generally lower than the 2014 data or in line with growth expectations – indicating that prior analysis assumptions are holding true.

Given the 2014/2018 comparisons and that the large, assumed development in the northwest quadrant has not been initiated as of December 2020, it is believed that the year 2040 design year volumes used in this analysis are conservative. Since the 20-year design horizon of the project has extended from year 2040 as initially studied to year 2045 (project letting plus 20 years), it is believed that reworked 2045 volumes would be similar to the 2040 volumes used in this project that include the proposed development.

3.1 Operational Analysis – Freeway Conditions

A revised operational analysis for freeway performance was performed for the current and Build configuration to include the adjacent interchanges on I-35 as well as show results using an updated methodology from the Version 6 release of the *Highway Capacity Manual* (HCM).

3.1.1 Freeway Analysis – Existing and No Build Condition

For freeway operation, Level of Service (LOS) analysis was conducted for the freeway mainline and ramp merge and diverge areas using *Highway Capacity Software* (HCS7) freeway facility module that uses the HCM for evaluation. The facilities module yields results that use both demand to capacity ratios as well as adjusting for bottlenecks in situations where upstream or downstream segments have demand that exceed capacity.

The results of this analysis for the existing and design year for the current freeway configuration are shown in **Table 1 (Existing Year, AM Peak), Table 2 (Existing Year, PM Peak), Table 3 (Design Year, AM Peak) and Table 4 (Design Year, PM Peak).** For cases where demand exceeds capacity, the density-based LOS was used with footnote explanation of constrained segments or segments subject to spillback. These tables also depict the LOS for the proposed improvement options, which will be described in the next section.

The existing year results indicate LOS E conditions at the Covell Road interchange during the AM and PM peak periods. A lack of mainline capacity south of Covell Road and minimal merge/diverge distances at the ramps contribute to this LOS.

In the design year, many freeway segments will erode to LOS E/F conditions without improvements. In the AM peak period, the analysis showed that southbound I-35 will be over capacity (LOS F) at and north of the Covell Road interchange. This bottleneck creates a capacity constraint that would spill into adjacent segments and cause LOS F conditions in the segment between Waterloo Road and Seward Road. Northbound I-35 in the AM peak would operate at LOS D or better north of Covell Road but would encounter LOS E conditions south of the Covell Road interchange. In the PM peak period, northbound I-35 volumes are constrained south of Covell Road (LOS F) conditions, which restricts the northbound demand volumes and would result in LOS E conditions between Covell Road and Waterloo Road. Southbound I-35 in the PM peak period operates at LOS D or better north of Waterloo Road, but capacity constraints at the southbound ramps from Covell Road (LOS F) conditions create upstream segments to hit LOS F conditions, including the segment between Covell Road and Waterloo Road.

3.1.2 Freeway Analysis – Build Condition

The proposed improvements for this project would provide improved merge and diverge features to the Waterloo Road interchange but would not add mainline capacity. An on-going *I-35 Corridor Study* is exploring the long-term widening needs of I-35. The 2040 Association of Central Oklahoma Governments (ACOG) long range plan includes a project to widen I-35 to six lanes from US 77 / 2nd Street to Waterloo Road.

As shown in **Tables 1 through 4**, the ramp improvements on Waterloo Road (2 lane ramps on south side of interchange, extended merge/diverge distance on the north side of interchange) will improve facility LOS with the current demand, reducing LOS C/D movements to LOS B conditions. In the design year, as was the case with the No Build, the I-35 segments south of Waterloo Road will experience LOS F in the peak directions if I-35 is not widened. **Tables 1 through 4** also show the results if a third lane on I-35 is provided south of Waterloo Road using the two-lane entry and exit ramps as an opportunity to add or drop a lane to the mainline. These results show improved operation through the Waterloo Road interchange, though capacity would still be constrained south of Covell Road (LOS F conditions).

Table 1 – Existing Year Freeway Level of Service – AM Peak Period

Direction	I-35 Segment	Type	Existing	Proposed	Proposed w/ 3rd Lane
			LOS		
NB	South of Covell Rd.	Basic	B	B	A
	Off-Ramp to Covell Rd.	Diverge	C	C	B
	Between Covell Rd. Ramps	Basic	B	B	A
	On-Ramp from Covell Rd.	Merge	B	B	B
	Between Covell Rd. and Waterloo Rd.	Basic	B	B	A
	Off-Ramp to Waterloo Rd.	Diverge	C	A	A
	Between Waterloo Rd. Ramps	Basic	B	B	B
	On-Ramp from Waterloo Rd.	Merge	B	B	B
	Between Waterloo Rd. and Seward Rd.	Basic	B	B	B
	Off-Ramp to Seward Rd.	Diverge	B	B	B
	Between Seward Rd. Ramps	Basic	B	B	B
	On-Ramp from Seward Rd.	Merge	B	B	B
	North of Seward Rd.	Basic	B	B	B
SB	North of Seward Rd.	Basic	B	B	B
	Off-Ramp to Seward Rd.	Diverge	C	C	C
	Between Seward Rd. Ramps	Basic	B	B	B
	On-Ramp from Seward Rd.	Merge	C	C	C
	Between Seward Rd. and Waterloo Rd.	Basic	C	C	C
	Off-Ramp to Waterloo Rd.	Diverge	C	B	B
	Between Waterloo Rd. Ramps	Basic	B	B	B
	On-Ramp from Waterloo Rd.	Merge	D	B	B
	Between Waterloo Rd. and Covell Rd.	Basic	D	D	C
	Off-Ramp to Covell Rd.	Diverge	E	E	C
	Between Covell Rd. Ramps	Basic	D	D	B
	On-Ramp from Covell Rd.	Merge	E	E	C
	South of Covell Rd.	Basic	E	E	C

Table 2 – Existing Year Freeway Level of Service – PM Peak

Direction	I-35 Segment	Type	Existing	Proposed	Proposed w/ 3rd Lane
			LOS		
NB	South of Covell Rd.	Basic	E	E	C
	Off-Ramp to Covell Rd.	Diverge	E	E	C
	Between Covell Rd. Ramps	Basic	D	D	B
	On-Ramp from Covell Rd.	Merge	D	D	C
	Between Covell Rd. and Waterloo Rd.	Basic	D	D	B
	Off-Ramp to Waterloo Rd.	Diverge	D	B	B
	Between Waterloo Rd. Ramps	Basic	B	B	B
	On-Ramp from Waterloo Rd.	Merge	C	B	B
	Between Waterloo Rd. and Seward Rd.	Basic	C	C	C
	Off-Ramp to Seward Rd.	Diverge	C	C	C
	Between Seward Rd. Ramps	Basic	B	B	B
	On-Ramp from Seward Rd.	Merge	C	C	C
	North of Seward Rd.	Basic	B	B	B
SB	North of Seward Rd.	Basic	B	B	B
	Off-Ramp to Seward Rd.	Diverge	C	C	C
	Between Seward Rd. Ramps	Basic	B	B	B
	On-Ramp from Seward Rd.	Merge	B	B	B
	Between Seward Rd. and Waterloo Rd.	Basic	B	B	B
	Off-Ramp to Waterloo Rd.	Diverge	B	B	B
	Between Waterloo Rd. Ramps	Basic	B	B	B
	On-Ramp from Waterloo Rd.	Merge	C	A	A
	Between Waterloo Rd. and Covell Rd.	Basic	B	B	B
	Off-Ramp to Covell Rd.	Diverge	C	C	B
	Between Covell Rd. Ramps	Basic	B	B	A
	On-Ramp from Covell Rd.	Merge	C	C	B
	South of Covell Rd.	Basic	C	C	B

Table 3 – Design Year Freeway Level of Service – AM Peak

Direction	I-35 Segment	Type	Existing	Proposed	Proposed w/ 3rd Lane
			LOS		
NB	South of Covell Rd.	Basic	E	E	C
	Off-Ramp to Covell Rd.	Diverge	E	E	C
	Between Covell Rd. Ramps	Basic	C	C	B
	On-Ramp from Covell Rd.	Merge	D	D	C
	Between Covell Rd. and Waterloo Rd.	Basic	D	D	B
	Off-Ramp to Waterloo Rd.	Diverge	D	A	A
	Between Waterloo Rd. Ramps	Basic	C	C	C
	On-Ramp from Waterloo Rd.	Merge	C	C	C
	Between Waterloo Rd. and Seward Rd.	Basic	C	C	C
	Off-Ramp to Seward Rd.	Diverge	D	D	D
	Between Seward Rd. Ramps	Basic	C	C	C
	On-Ramp from Seward Rd.	Merge	C	C	C
	North of Seward Rd.	Basic	C	C	C
SB	North of Seward Rd.	Basic	D	D	D
	Off-Ramp to Seward Rd.	Diverge	E	E	E
	Between Seward Rd. Ramps	Basic	D	D	D
	On-Ramp from Seward Rd.	Merge	F[3]	F[3]	D
	Between Seward Rd. and Waterloo Rd.	Basic	F[3]	F[3]	D
	Off-Ramp to Waterloo Rd.	Diverge	F[2]	F[2]	D
	Between Waterloo Rd. Ramps	Basic	F	F	D
	On-Ramp from Waterloo Rd.	Merge	F	F[2]	D
	Between Waterloo Rd. and Covell Rd.	Basic	F	F	D
	Off-Ramp to Covell Rd.	Diverge	F	F	D
	Between Covell Rd. Ramps	Basic	F	F	D
	On-Ramp from Covell Rd.	Merge	E[1]	E[1]	F[2]
	South of Covell Rd.	Basic	E[1]	E[1]	F

[1] Demand exceeds capacity in this segment; LOS reported is reflective of constrained volume

[2] Density on the freeway within the influence area of the ramp is greater than 45 pc/mi/ln resulting in LOS F for this segment.

[3] Density on freeway increases from congestion on downstream segments; demand indicates LOS D or better operation

Table 4 – Design Year Freeway Level of Service – PM Peak

Direction	I-35 Segment	Type	Existing	Proposed	Proposed w/ 3rd Lane
			LOS		
NB	South of Covell Rd.	Basic	F	F	F
	Off-Ramp to Covell Rd.	Diverge	E[1]	E[1]	E[1]
	Between Covell Rd. Ramps	Basic	D[1]	D[1]	D
	On-Ramp from Covell Rd.	Merge	E[1]	E[1]	D
	Between Covell Rd. and Waterloo Rd.	Basic	E[1]	D[1]	D
	Off-Ramp to Waterloo Rd.	Diverge	E[1]	B	C
	Between Waterloo Rd. Ramps	Basic	C	C	D
	On-Ramp from Waterloo Rd.	Merge	C	C	D
	Between Waterloo Rd. and Seward Rd.	Basic	C	C	E
	Off-Ramp to Seward Rd.	Diverge	D	D	E
	Between Seward Rd. Ramps	Basic	C	C	D
	On-Ramp from Seward Rd.	Merge	C	C	D
	North of Seward Rd.	Basic	C	C	D
SB	North of Seward Rd.	Basic	C	C	C
	Off-Ramp to Seward Rd.	Diverge	D	D	D
	Between Seward Rd. Ramps	Basic	C	C	C
	On-Ramp from Seward Rd.	Merge	C	C	C
	Between Seward Rd. and Waterloo Rd.	Basic	C	C	C
	Off-Ramp to Waterloo Rd.	Diverge	D	C	C
	Between Waterloo Rd. Ramps	Basic	C	C	C
	On-Ramp from Waterloo Rd.	Merge	D	B	B
	Between Waterloo Rd. and Covell Rd.	Basic	F[3]	F[3]	C
	Off-Ramp to Covell Rd.	Diverge	F[3]	F[2]	C
	Between Covell Rd. Ramps	Basic	F[3]	F	B
	On-Ramp from Covell Rd.	Merge	F[2]	F[2]	D
	South of Covell Rd.	Basic	E[1]	E[1]	C

[1] Demand exceeds capacity in this segment; LOS reported is reflective of constrained volume

[2] Density on the freeway within the influence area of the ramp is greater than 45 pc/mi/ln resulting in LOS F for this segment.

[3] Density on freeway increases from congestion on downstream segments; demand indicates LOS D or better operation

3.2 Operational Analysis – Study Intersections

A revised operational analysis for intersection performance was performed for the current and proposed configuration to include the adjacent interchanges on I-35 and to assess the updated Waterloo Road corridor characteristics (signalized configuration at the Waterloo Road/I-35 ramps and the presence of OnCue).

3.2.1 Intersection Analysis – Methodology

For intersection analysis at the interchange ramps (Waterloo and adjacent interchanges) and study intersections along the Waterloo corridor, Synchro software was used to analyze LOS by intersection movement. Highway Capacity Manual (HCM) – Version 6 results were reported at all intersections with configurations meeting HCM criteria. To supplement for the clustered signals common to DDIs, Synchro signalized methodology was reported where the HCM could not yield results.

Additionally, micro-simulation was employed to analyze Waterloo Road operations via SimTraffic, the companion software to Synchro, to supplement some of the shortcomings of the HCM procedure. When calibrated to present conditions, micro-simulation provides the best means to demonstrate the impacts of queues on nearby intersections. For example, the effects of the westbound queue along Waterloo Road as it extends across the intersection of the northbound off-ramp during the PM peak period are less accounted for by the HCM procedures but can be effectively examined using micro-simulation.

Model calibration was performed for the existing year (2014) condition for the *Interstate 35 at Waterloo Road Traffic Analysis* (August 2015) study when the ramp intersections were all-way stops. To achieve this, field observation of max queue distances were observed and compared to model results as well as travel times between known points (such as the travel time between the end of queue on the southbound ramp to a point just west of the northbound ramp intersection). Preliminary models were created using a modified version of the raw traffic volumes that accounted for some of the unmet demand but were not quite to the demand level assumed for the 2014 design volumes, which were factored using standard procedure to consider the 30th highest hour, rather than typical everyday demand.

Simulation Models Resembled Queuing Observed in Field

3.2.2 Intersection Analysis – Existing Year, Existing Configuration

Analysis for the existing year (2014) and current configuration is shown in **Tables 5 and 6** and reflects the change from all-way stop control to signal control at the I-35 ramp intersections with Waterloo Road**.** As shown, conditions are improved over the prior all-way stop configuration but are still operating with LOS D conditions (and LOS E individual movements) when tested with the existing year traffic volumes. The all-way stop at the Sooner Road intersection also features several movements over capacity with LOS F overall conditions.

Table 7 depicts the current 95th percentile queue lengths via Synchro/HCM methodology. As shown, though the interim signals have reduced queuing, the storage distance between the ramps is still exceeded in the AM peak period which would cause the queues entering the interchange to the east and west to spillback and block the adjacent Frontage Road and Industrial Boulevard intersections.

Table 5 – Existing Year, AM Peak Capacity Analysis – Existing Configuration

Signalized Junctions							
		HCM			SimTraffic		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at I-35 SB Ramps	Signal	33	C	17	13	B	7
Waterloo Road at I-35 NB Ramps	Signal	53	D	19	19	B	7
Total Signalized Delay (veh-hr)				**37**			**14**
Unsignalized Junctions							
		HCM			SimTraffic		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Stop Sign	80	F	19	242	F	41
Waterloo Road at Boucher Road	Stop Sign	21	C	0	16	B	2
Waterloo Road at Frontage Road	Stop Sign	18	C	0	16	C	1
Waterloo Road at Industrial Road	Stop Sign	21	C	0	109	F	5
Waterloo Road at Air Depot Road	Stop Sign	20	C	0	20	C	1
Total Unsignalized Delay (veh-hr)				**20**			**50**
Total Intersection Delay (veh-hr)		**57**			**64**		

*Critical approach only
+Entire junction, including uncontrolled movements

Table 6 – Existing Year, PM Peak Capacity Analysis – Existing Configuration

Signalized Junctions							
		HCM			SimTraffic		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at I-35 SB Ramps	Signal	21	C	8	10	A	4
Waterloo Road at I-35 NB Ramps	Signal	25	C	11	23	C	10
Total Signalized Delay (veh-hr)				**19**			**14**
Unsignalized Junctions							
		HCM			SimTraffic		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Stop Sign	76	F	17	62	E	13
Waterloo Road at Boucher Road	Stop Sign	17	C	0	15	B	1
Waterloo Road at Frontage Road	Stop Sign	18	C	0	20	C	1
Waterloo Road at Industrial Road	Stop Sign	27	D	1	46	E	2
Waterloo Road at Air Depot Road	Stop Sign	21	C	1	19	C	1
Total Unsignalized Delay (veh-hr)				**19**			**18**
Total Intersection Delay (veh-hr)		**38**			**32**		

*Critical approach only
+Entire junction, including uncontrolled movements

Table 7 – Existing Year Queue Analysis – Existing Configuration

Location	Queue			Intersection Movement											
				Eastbound			Westbound			Northbound			Southbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Sooner Road	Existing	Queue Length (95th %ile)	AM	395			125			15			250		
			PM	135			463			20			35		
		Available Storage[1]		**780**			**1660**			**2000**			**1360**		
Boucher Road	Existing	Queue Length (95th %ile)	AM	N/A	5		0		N/A	5			N/A		
			PM		0		0			15					
		Available Storage[1,2]			**1660**		**460**			**220**					
West Frontage Road	Existing	Queue Length (95th %ile)	AM	N/A	0		3		N/A	5			N/A		
			PM		0		0			10					
		Available Storage[1,2]			**460**		**200**			**400**					
I-35 SB Ramps	Existing	Queue Length (95th %ile)	AM	N/A	218	0 [7]	738		N/A	N/A			71		
			PM		193	0 [7]	426						94		
		Available Storage[1,3]			**200**	**200**	**510**						**940**		
I-35 NB Ramps	Existing	Queue Length (95th %ile)	AM	7		N/A	N/A	691		197	53		N/A		
			PM	153				381		489	63				
		Available Storage[1,3]		**510**				**160**		**940**	**660**				
Industrial Blvd.	Existing	Queue Length (95th %ile)	AM	0			0			23			N/A		
			PM	0			3			60					
		Available Storage[1,4,5]		**160**			**2120**			**75**					
Air Depot Blvd.	Existing	Queue Length (95th %ile)	AM	0			3			5			8		
			PM	3			0			5			15		
		Available Storage[1,6]		**2120**			**710**			**240**			**300**		

[1]For TH or shared movement (no turn lanes), storage listed is distance to nearest adjacent cross street

[2]For NB approach, assumed distance to nearest driveway

[3]For ramp, distance shown to ramp gore if not turn lane

[4]Westbound is shown as distance to nearest intersection at Air Depot Blvd. though several driveways intervene

[5]NB approach shown as distance to nearest driveway

[6]EB/WB assumed distance to nearest cross street; NB/SB assumed distance to nearest driveway

[7]Free movement - no queue per HCM

3.2.3 Operational Analysis – Build Condition Volume Shifts

The proposed DDI and associated improvements along the Waterloo Road corridor were evaluated using several analysis years. Opening year 2021 volumes were analyzed which included the recently opened OnCue but not the proposed mixed-use development in the northwest quadrant, which was not assumed until 2025. Interim year 2025 conditions were analyzed with an as-mentioned 50% buildout of the potential northwest quadrant development, and design year 2040 conditions analyzed with 100% buildout of the development. **Figures D-5 thru D-7 in Appendix D** depict these volumes and account for shifts in demand from relocating the West Frontage Road and Industrial Boulevard for the proposed condition on either side of I-35.

The intersections along Waterloo Road were analyzed using the updated configuration for opening year, interim year, and design year conditions. The interim year was analyzed to gauge the suitability of the non-interchange related improvements proposed for the Waterloo Road corridor. The design year analysis was performed to determine if the interchange configuration would hold and also verify the additional improvements needed on Waterloo Road outside of the interchange as identified in the *Interstate 35 at Waterloo Road Traffic Analysis* (August 2015).

3.2.4 Intersection Analysis – Opening Year

To test conditions in the proposed opening year of the project and include trips from the newly opened OnCue, 2021 conditions were projected. The opening year lane configuration will be identical to the configuration shown in **Figure 3A** as no development in the northwest quadrant would be in place.

Table 8 (AM Peak) and Table 9 (PM Peak) show how conditions deteriorate at the ramp intersections and Sooner Road intersection with spillback affecting nearby intersections without improvement. The proposed DDI and intersection improvements at adjacent intersections would reduce the total vehicle-hours of delay by at least 75% with the DDI operating at LOS B or better conditions.

At the relocated Industrial Boulevard/OnCue driveway, moderate delay is experienced for the side street movements. The opening year recommendation for this intersection is two-way stop control as projected signal warrants are marginal. Conditions should be monitored for potential signalization as peak hour Industrial Boulevard volumes decreased in the supplemental traffic counts collected in December 2018.

Table 10 shows the projected queue lengths in the 2021 opening year of the project for the existing and proposed conditions. The queue length analysis shows significant reduction in queuing at the I-35 interchange with internal queues between ramps no longer exceeding the storage distance and effecting other movements.

Table 8 – Opening Year, AM Peak Capacity Analysis

Signalized Junctions													
		Existing						Proposed					
Intersection	Control	HCM		SimTraffic				HCM		SimTraffic			
		Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	See Unsignalized Results						24	C	10	19	B	8
Waterloo Road at I-35 SB Ramps	Signal[2]	55	E	32	22	C	13	5	A	3	8	A	4
Waterloo Road at I-35 NB Ramps	Signal[2]	61	E	28	24	C	11	12	B	5	15	B	7
Total Signalized Delay (veh-hr)				**60**			**24**			**18**			**19**
Unsignalized Junctions													
		Existing						Proposed					
Intersection	Control	HCM		SimTraffic				HCM		SimTraffic			
		Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Stop Sign	155	F	40	508	F	107	See Signalized Results					
Waterloo Road at Boucher Road	Stop Sign	25	C	0	17	B	2	21	C	0	64	F	2
Waterloo Road at Frontage Road	Stop Sign	23	C	0	25	C	1	Frontage Road is Realigned to Boucher Road					
Waterloo Road at Industrial Road	Stop Sign	33	D	1	1864	F	55	See Industrial/Gas Station below					
Waterloo Road at Air Depot Road	Stop Sign	25	C	1	35	D	1	16	C	0	22	C	1
Waterloo Road at Industrial Road/Gas Station Driveway	Stop Sign	Does not Exist						25	C	1	47	E	2
Boucher Road at Frontage Road	Stop Sign	Does not Exist						9	A	0	6	A	0
Total Unsignalized Delay (veh-hr)				**41**			**166**			**2**			**5**
Total Intersection Delay (veh-hr)		**101**			**189**			**20**			**24**		

*Critical approach only +Entire junction, including uncontrolled movements

[2] HCM 6th Edition methodology does not support clustered intersections, Synchro results have been used for proposed condition

Table 9 – Opening Year, PM Peak Capacity Analysis

Signalized Junctions													
		Existing						Proposed					
Intersection	Control	HCM			SimTraffic			HCM			SimTraffic		
		Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	See Unsignalized Results						18	B	7	14	B	6
Waterloo Road at I-35 SB Ramps	Signal[2]	36	D	17	22	C	10	5	A	2	7	A	3
Waterloo Road at I-35 NB Ramps	Signal[2]	45	D	24	41	D	22	14	B	7	15	B	8
Total Signalized Delay (veh-hr)				**41**			**32**			**17**			**17**
Unsignalized Junctions													
		Existing						Proposed					
Intersection	Control	HCM			SimTraffic			HCM			SimTraffic		
		Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Stop Sign	156	F	37	205	F	45	See Signalized Results					
Waterloo Road at Boucher Road	Stop Sign	20	B	0	200	F	11	16	C	0	14	B	1
Waterloo Road at Frontage Road	Stop Sign	21	C	0	109	F	3	Frontage Road is Realigned to Boucher Road					
Waterloo Road at Industrial Road	Stop Sign	70	F	3	884	F	39	See Industrial/Gas Station below					
Waterloo Road at Air Depot Road	Stop Sign	25	D	1	23	C	1	14	B	0	15	B	1
Waterloo Road at Industrial Road/Gas Station Driveway	Stop Sign	Does not Exist						45	E	2	57	F	3
Boucher Road at Frontage Road	Stop Sign	Does not Exist						9	A	0	4	A	0
Total Unsignalized Delay (veh-hr)				**42**			**99**			**3**			**4**
Total Intersection Delay (veh-hr)		**83**			**131**			**20**			**21**		

*Critical approach only +Entire junction, including uncontrolled movements
[2] HCM 6th Edition methodology does not support clustered intersections, Synchro results have been used for proposed condition

Table 10 – Opening Year Queuing Analysis – Existing and Proposed Configurations

Location	Queue			Intersection Movement											
				Eastbound			Westbound			Northbound			Southbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Sooner Road	Existing	Queue Length (95th %ile)	AM	608			188			18			345		
			PM	200			750			23			45		
		Available Storage[1]		**780**			**1660**			**2000**			**1360**		
	Proposed	Queue Length (95th %ile)	AM	19	589		17	228	9	15	52		146	97	
			PM	43	283		32	358	34	16	94		60	47	
		Available Storage[1]		**210**	**780**		**250**	**1660**	**1660**	**140**	**2000**		**400**	**1360**	
Boucher Road	Existing	Queue Length (95th %ile)	AM	N/A	0		8		N/A	5			N/A		
			PM		0		0			20					
		Available Storage[1,2]			**1660**		**460**			**220**					
	Proposed	Queue Length (95th %ile)	AM	N/A	0		10	0 [7]	N/A	3	N/A	3	N/A		
			PM		0		3	0 [7]		8		8			
		Available Storage[1,2]			**1660**		**210**	**610**		**200**		**200**			
West Frontage Road[8]	Existing	Queue Length (95th %ile)	AM	N/A	0		3		N/A	8			N/A		
			PM		0		0			13					
		Available Storage[1,2]			**460**		**200**			**400**					
I-35 SB Ramps	Existing	Queue Length (95th %ile)	AM	N/A	305	0 [7]	961		N/A	N/A			125		
			PM		321	0 [7]	886						186		
		Available Storage[1,3]			**200**	**200**	**510**						**940**		
	Proposed	Queue Length (95th %ile)	AM	N/A	73	0 [7]	0 [7]	82	N/A	N/A			37	N/A	0
			PM		67	0 [7]	0 [7]	42					49		0
		Available Storage[1,3]			**610**	**610**	**435**	**570**					**880**		**400**
I-35 NB Ramps	Existing	Queue Length (95th %ile)	AM	41		N/A	N/A	1026		278		71	N/A		
			PM	47				545		648		124			
		Available Storage[1,3]		**510**				**160**		**940**		**660**			
	Proposed	Queue Length (95th %ile)	AM	0 [7]	73	N/A	N/A	155		69	N/A	0	N/A		
			PM	0 [7]	70			109		132		173			
		Available Storage[1,3]		**500**	**570**			**520**		**900**		**900**			
Industrial Blvd.[9]	Existing	Queue Length (95th %ile)	AM	0			3			43			N/A		
			PM	0			5			135					
		Available Storage[1,4,5]		**160**			**2120**			**75**					
	Proposed	Queue Length (95th %ile)	AM	13	0 [7]		0	0 [7]		20	5		10	10	
			PM	10	0 [7]		3	0 [7]		68	10		13	10	
		Available Storage[1, 5]		**150**	**520**		**100**	**1630**		**240**	**870**		**100**	**100**	
Air Depot Blvd.	Existing	Queue Length (95th %ile)	AM	0			3			8			20		
			PM	3			0			28			10		
		Available Storage[1,6]		**2120**			**710**			**240**			**300**		
	Proposed	Queue Length (95th %ile)	AM	0	0 [7]		3	0 [7]		3			10		
			PM	3	0 [7]		0	0 [7]		10			3		
		Available Storage[1,6]		**150**	**1630**		**150**	**710**		**240**			**300**		

[1]For TH or shared movement (no turn lanes), storage listed is distance to nearest adjacent cross street

[2]For NB approach, assumed distance to nearest driveway for No Build and relocated Frontage Road for Build

[3]For ramp, distance shown to ramp gore if not turn lane

[4]Westbound is shown as distance to nearest intersection at Air Depot Blvd. though several driveways intervene

[5]NB shown as distance to nearest driveway for No Build; NB TH/RT shown as distance to old Industrial Blvd driveway stub and SB is On Cue Driveway for Build

[6]EB/WB assumed distance to nearest cross street; NB/SB assumed distance to nearest driveway

[7]Free movement - no queue per HCM

[8]West Frontage Road is relocated in Build Condition

[9]Industrial Boulevard is relocated 400' east in Build Condition to align with On Cue Driveway

3.2.5 Intersection Analysis – Interim Year

In the interim year, driveways related to the proposed northwest quadrant development were added with the main signalized access point forming the north leg of the Boucher Road intersection. The lane configuration assumed for interim year analysis in the proposed condition is identical to the opening year configuration at the Sooner Road, I-35 interchange, Industrial Boulevard, and Air Depot Boulevard intersections. At Boucher Road, the signalized configuration with new turn lanes shown below is provided along with two assumed unsignalized development driveways with access to Waterloo Road. These driveway updates are needed to facilitate the assumed development and would not be part of this construction project. As of December 2020, there is no active plan to develop the northwest quadrant, but the potential impact to the study area was studied as a conservative measure.

Development Driveways Assumed for Northwest Quadrant in Interim Year Analysis

At 50% development buildout and assuming continued background growth, the proposed intersection configuration on Sooner Road and the DDI configuration at I-35 will handle the projected demand in the Interim Year. **Table 11 (AM Peak) and Table 12 (PM Peak)** depict the Interim Year results with overall LOS B conditions shown for the DDI and LOS C or better conditions at the Sooner Road intersection. LOS C or better conditions would also be provided at the potential signalized intersection at Boucher Road/Development Driveway. At the relocated Industrial Boulevard intersection, stop-control delay on the northbound approach is projected to reach LOS F conditions. Though this construction project would help the intersection by providing opportunity for two-stage turns within the two-way left turn lane provided and providing more queue space to the I-35 ramps from the relocation, additional alternatives such as hooded lefts, right-in/right-out, and traffic signals could be studied in the future.

Table 13 shows the projected queue lengths in the 2025 interim year for the proposed conditions at the study intersections including the assumed north leg added at the Boucher Road intersection to serve the proposed development. The queue length analysis indicates that the 95th percentile queues will not exceed turn lane storage lengths at the study intersections nor will queues at the I-35 interchange create spillback at the ramps or adjacent intersections.

Table 11 – Interim Year, AM Peak Capacity Analysis

Signalized Junctions							
Intersection	Control	HCM			SimTraffic		
		Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	29	C	15	30	C	16
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	19	B	12	11	B	7
Waterloo Road at I-35 SB Ramps	Signal[2]	4	A	3	8	A	6
Waterloo Road at I-35 NB Ramps	Signal[2]	15	B	9	18	B	11
Total Signalized Delay (veh-hr)				**40**			**40**
Unsignalized Junctions							
Intersection	Control	HCM			SimTraffic		
		Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Industrial Road/Gas Station Driveway	Stop Sign	34	D	1	142	F	5
Waterloo Road at Air Depot Road/Pine Street	Stop Sign	27	D	1	21	C	1
Waterloo Road at Trinity Driveway #3	Stop Sign	16	C	0	20	C	1
Waterloo Road at Trinity Driveway #2	Stop Sign	16	C	0	18	C	1
Boucher Road at Frontage Road	Stop Sign	9	A	2	5	A	1
Total Unsignalized Delay (veh-hr)				**4**			**9**
Total Intersection Delay (veh-hr)		**44**			**49**		

*Critical approach only +Entire junction, including uncontrolled movements

[2] HCM 6th Edition methodology does not support clustered intersections, Synchro results have been used for proposed condition

Table 12 – Interim Year, PM Peak Capacity Analysis

Signalized Junctions							
Intersection	Control	HCM			SimTraffic		
		Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	33	C	18	23	C	13
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	24	C	15	11	B	7
Waterloo Road at I-35 SB Ramps	Signal[2]	7	A	5	9	A	7
Waterloo Road at I-35 NB Ramps	Signal[2]	18	B	15	18	B	15
Total Signalized Delay (veh-hr)				**53**			**42**
Unsignalized Junctions							
Intersection	Control	HCM			SimTraffic		
		Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Industrial Road/Gas Station Driveway	Stop Sign	96	F	4	119	F	12
Waterloo Road at Air Depot Road/Pine Street	Stop Sign	18	C	1	24	C	1
Waterloo Road at Trinity Driveway #3	Stop Sign	13	B	0	37	E	2
Waterloo Road at Trinity Driveway #2	Stop Sign	13	B	0	23	C	1
Boucher Road at Frontage Road	Stop Sign	9	A	2	6	A	1
Total Unsignalized Delay (veh-hr)				**8**			**18**
Total Intersection Delay (veh-hr)		**60**			**60**		

*Critical approach only +Entire junction, including uncontrolled movements

[2] HCM 6th Edition methodology does not support clustered intersections, Synchro results have been used for proposed condition

Table 13 – Interim Year Queuing Analysis – Proposed

Location	Queue			Intersection Movement											
				Eastbound			Westbound			Northbound			Southbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Sooner Road	Proposed	Queue Length (95th %ile)	AM	41	824		28	313	23	18	89		214	138	
			PM	52	417		30	511	72	14	99		89	65	
		Available Storage[1]		**210**	**780**		**250**	**1660**	**1660**	**140**	**2000**		**400**	**1360**	
Boucher Road/ Trinity Driveway	Proposed	Queue Length (95th %ile)	AM	36	427		17	65	13	12	31		60	33	
			PM	19	180		4	338	1	29	42		105	46	
		Available Storage[1,2]		**200**	**1660**		**210**	**610**	**150**	**200**	**200**		**300**	**500**	
I-35 SB Ramps	Proposed	Queue Length (95th %ile)	AM	N/A	90	0 [7]	0 [7]	104	N/A	N/A			41	N/A	2
			PM		105	0 [7]	0 [7]	66					49		55
		Available Storage[1,3]			**610**	**610**	**435**	**570**					**880**		**400**
I-35 NB Ramps	Proposed	Queue Length (95th %ile)	AM	0 [7]	53	N/A	N/A	233		144	N/A	0	N/A		
			PM	0 [7]	117			153		199		311			
		Available Storage[1,3]		**500**	**570**			**520**		**900**		**900**			
Industrial Blvd. (Relocated)	Proposed	Queue Length (95th %ile)	AM	15	0 [7]		0	0 [7]		30	5		15	13	
			PM	10	0 [7]		3	0 [7]		120	13		15	13	
		Available Storage[1,4,5]		**150**	**520**		**100**	**1630**		**240**	**870**		**100**	**100**	
Air Depot Blvd.	Proposed	Queue Length (95th %ile)	AM	3	0 [7]		3	0 [7]		13			20		
			PM	5	0 [7]		0	0 [7]		23			8		
		Available Storage[1,6]		**150**	**1630**		**150**	**710**		**240**			**300**		

[1]Storage listed is distance to nearest adjacent cross street for TH movememnts

[2]Assumed NB distance to relocated West Frontage Road. For SB, assumed 500' to nearest driveway

[3]For ramp, distance shown to ramp gore if not turn lane

[4]Northbound TH/RT distance shown as distance to old Industrial driveway stub

[5]SB approach is within On Cue property

[6]EB/WB assumed distance to nearest cross street; NB/SB assumed distance to nearest driveway

[7]Free movement - no queue per HCM

3.2.6 Intersection Analysis – Design Year

The No Build and three Build analyses were modeled for the 2040 design year with results shown in **Tables 14 through 17**. These analyses assume 100% buildout of the potential northwest quadrant development.

The first build option analyzed the configuration assumed in the Interim Year analysis, which included the interchange and Waterloo Road corridor improvements that will be constructed as part of this project plus driveway assumptions to support the potential development that would be constructed by others at a later date. These results show the proposed DDI will handle the demand through the design year. However, the Sooner Road intersection will need additional improvements and unsignalized driveways will undergo large delays as mainline Waterloo Road traffic will be heavy.

Two supplemental analyses were conducted to alleviate these issues outside of the proposed DDI. An "ultimate" model was created to reflect further widening of Waterloo Road to five lanes east and west of the study corridor (as shown in ACOG's long range plan), and the resulting LOS at the Sooner Road intersection improves to LOS C or better conditions. The "ultimate" configuration would only modify the Sooner Road and Air Depot Road intersections – providing a second through lane in each direction (as shown below).

"Ultimate" Configuration Provides Additional Through Lane on Waterloo Road at Sooner Road and Air Depot Blvd. Intersections

To alleviate the severe delay shown on the stop-control northbound approach at Industrial Boulevard, an "ultimate plus signal" analysis was performed assuming a two-phase signal at Industrial Boulevard in the design year. These results show a more reasonable delay for the side street, though some side street delay will remain given the need for a coordinated system with the adjacent interchange and the time dedicated to Waterloo Road.

When comparing any build scenario to the No Build, large reductions in total intersection delay are found even if assuming the existing configuration of the Sooner Road/Waterloo Road intersection is signalized. The total vehicle-hours of intersection delay from the No Build scenario was found to decrease approximately 85 to 90% for all Build analyses.

Table 14 – Design Year, AM Peak Capacity Analysis (HCM)

Signalized Junctions													
		Existing			Proposed			Proposed (Ultimate)			Proposed (Ultimate + Signal)		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	283	F	206	62	E	46	28	C	21	28	C	21
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	99	F	90	16	B	14	31	C	28	31	C	28
Waterloo Road at I-35 SB Ramps	Signal[2]	308	F	331	9	A	10	9	A	10	9	A	10
Waterloo Road at I-35 NB Ramps	Signal[2]	379	F	297	23	C	19	23	C	19	22	C	18
Waterloo Road at Industrial Road/Gas Station Driveway	Signal	See unsignalized			See unsignalized			See unsignalized			4	A	2
Total Signalized Delay (veh-hr)				**924**			**89**			**78**			**79**
Unsignalized Junctions													
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Industrial Road	Stop Sign	580	F	15	69	F	3	69	F	3	See Signalized		
Waterloo Road at Air Depot Road	Stop Sign	1028	F	19	216	F	4	30	D	1	26	D	1
Waterloo Road at Trinity Driveway #3	Stop Sign	77	F	2	19	C	1	25	C	1	25	C	1
Waterloo Road at Trinity Driveway #2	Stop Sign	76	F	2	17	C	1	26	D	1	26	D	1
Waterloo Road at Frontage Road	Stop Sign	1613	F	14	Frontage Road is realigned to Boucher			Frontage Road is realigned to Boucher			Frontage Road is realigned to Boucher		
Boucher Road at Frontage Road	Stop Sign	Does not Exist			9	A	0	9	A	0	9	A	0
Total Unsignalized Delay (veh-hr)				**52**			**8**			**5**			**3**
Total Intersection Delay (veh-hr)		**976**			**97**			**83**			**82**		

*Critical approach only +Entire junction, including uncontrolled movements
[2] HCM 6th Edition methodology does not yield LOS for configuration; Synchro LOS shown

Table 15 – Design Year, AM Peak Capacity Analysis (SimTraffic)

Signalized Junctions													
		Existing			Proposed			Proposed (Ultimate)			Proposed (Ultimate + Signal)		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	758	F	551	67	E	49	31	C	23	32	C	24
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	45	D	41	27	C	25	29	C	26	29	C	26
Waterloo Road at I-35 SB Ramps	Signal	69	E	75	11	B	12	11	B	12	11	B	12
Waterloo Road at I-35 NB Ramps	Signal	287	F	225	28	C	23	30	C	25	31	C	25
Waterloo Road at Industrial Road/Gas Station Driveway	Signal	See unsignalized			See unsignalized			See unsignalized			33	C	20
Total Signalized Delay (veh-hr)				**892**			**109**			**86**			**108**
Unsignalized Junctions													
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Industrial Road	Stop Sign	3979	F	211	2031	F	123	2202	F	92	See Signalized		
Waterloo Road at Air Depot Road	Stop Sign	929	F	351	126	F	4	87	F	3	89	F	3
Waterloo Road at Trinity Driveway #3	Stop Sign	1240	F	45	50	E	3	101	F	6	139	F	7
Waterloo Road at Trinity Driveway #2	Stop Sign	2384	F	71	83	F	6	80	F	8	179	F	11
Waterloo Road at Frontage Road	Stop Sign	136	F	18	Frontage Road is realigned to Boucher			Frontage Road is realigned to Boucher			Frontage Road is realigned to Boucher		
Boucher Road at Frontage Road	Stop Sign	Does not Exist			4	A	0	4	A	0	4	A	0
Total Unsignalized Delay (veh-hr)				**696**			**137**			**109**			**21**
Total Intersection Delay (veh-hr)		**1587**			**246**			**195**			**128**		

*Critical approach only +Entire junction, including uncontrolled movements
^ HCM 6th Edition methodology does not yield LOS for configuration; Synchro LOS shown

Table 16 – Design Year, PM Peak Capacity Analysis (HCM)

Signalized Junctions													
		Existing			Proposed			Proposed (Ultimate)			Proposed (Ultimate + Signal)		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	308	F	229	30	C	23	23	C	17	23	C	17
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	162	F	152	32	C	31	39	D	37	39	D	37
Waterloo Road at I-35 SB Ramps	Signal[2]	315	F	307	11	B	11	11	B	11	11	B	11
Waterloo Road at I-35 NB Ramps	Signal[2]	342	F	308	30	C	29	30	C	29	31	C	29
Waterloo Road at Industrial Road/Gas Station Driveway	Signal	See unsignalized			See unsignalized			See unsignalized			10	B	6
Total Signalized Delay (veh-hr)				**996**			**93**			**94**			**101**
Unsignalized Junctions													
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Industrial Road	Stop Sign	1248	F	56	441	F	16	441	F	16	See Signalized		
Waterloo Road at Air Depot Road	Stop Sign	875	F	31	47	E	2	53	F	2	17	C	1
Waterloo Road at Trinity Driveway #3	Stop Sign	164	F	7	18	C	1	29	D	1	29	D	1
Waterloo Road at Trinity Driveway #2	Stop Sign	151	F	6	26	D	1	30	D	1	30	D	1
Waterloo Road at Frontage Road	Stop Sign	3151	F	46	Frontage Road is realigned to Boucher			Frontage Road is realigned to Boucher			Frontage Road is realigned to Boucher		
Boucher Road at Frontage Road	Stop Sign	Does not Exist			9	A	0	9	A	0	9	A	0
Total Unsignalized Delay (veh-hr)				**146**			**21**			**21**			**4**
Total Intersection Delay (veh-hr)		**1142**			**114**			**115**			**105**		

*Critical approach only +Entire junction, including uncontrolled movements
^ HCM 6th Edition methodology does not yield LOS for configuration; Synchro LOS shown

Table 17 – Design Year, PM Peak Capacity Analysis (SimTraffic)

Signalized Junctions

		Existing			Proposed			Proposed (Ultimate)			Proposed (Ultimate + Signal)		
Intersection	**Control**	**Delay (sec/veh)**	**LOS**	**Delay (veh-hr)**	**Delay (sec/veh)**	**LOS**	**Delay (veh-hr)**	**Delay (sec/veh)**	**LOS**	**Delay (veh-hr)**	**Delay (sec/veh)**	**LOS**	**Delay (veh-hr)**
Waterloo Road at Sooner Road	Signal	638	F	474	36	D	27	23	C	17	23	C	17
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	179	F	168	26	C	25	27	C	26	28	C	27
Waterloo Road at I-35 SB Ramps	Signal	87	F	84	15	B	15	13	B	13	14	B	14
Waterloo Road at I-35 NB Ramps	Signal	466	F	419	25	C	24	23	C	22	25	C	24
Waterloo Road at Industrial Road/Gas Station Driveway	Signal	See unsignalized			See unsignalized			See unsignalized			10	B	6
Total Signalized Delay (veh-hr)				**1146**			**90**			**78**			**88**

Unsignalized Junctions

Intersection	**Control**	**Delay (sec/veh)***	**LOS***	**Delay (veh-hr)+**	**Delay (sec/veh)***	**LOS***	**Delay (veh-hr)+**	**Delay (sec/veh)***	**LOS***	**Delay (veh-hr)+**	**Delay (sec/veh)***	**LOS***	**Delay (veh-hr)+**
Waterloo Road at Industrial Road	Stop Sign	4515	F	277	2135	F	100	1783	F	81	See Signalized		
Waterloo Road at Air Depot Road	Stop Sign	507	F	51	320	F	11	102	F	3	72	F	3
Waterloo Road at Trinity Driveway #3	Stop Sign	1677	F	110	809	F	44	483	F	25	475	F	24
Waterloo Road at Trinity Driveway #2	Stop Sign	2479	F	146	183	F	11	139	F	8	163	F	9
Waterloo Road at Frontage Road	Stop Sign	853	F	33	Frontage Road is realigned to Boucher			Frontage Road is realigned to Boucher			Frontage Road is realigned to Boucher		
Boucher Road at Frontage Road	Stop Sign	Does not Exist			5	A	0	5	A	0	6	A	0
Total Unsignalized Delay (veh-hr)				**616**			**166**			**118**			**36**
Total Intersection Delay (veh-hr)		**1762**			**256**			**196**			**125**		

*Critical approach only

+Entire junction, including uncontrolled movements

dology does not yield LOS for configuration; Synchro LOS shown

Table 18 shows the projected queue lengths in the 2040 design year for the existing and proposed conditions at the study intersections, including analysis for the ultimate and ultimate plus signal at Industrial scenarios. The queue length analysis indicates that the 95th percentile queues for the proposed conditions will not result in spillback between the I-35 ramps or from the adjacent intersections to the interchange. In the No Build, severe spillback would occur all along the study corridor.

Table 18 – Design Year Queuing Analysis – Existing and Proposed

Location	Queue			Intersection Movement											
				Eastbound			Westbound			Northbound			Southbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Sooner Road	Existing	Queue Length (95th %ile)	AM	1674			1072			357			1326		
			PM	1252			1947			399			920		
		Available Storage[1]		**780**			**1660**			**2000**			**1360**		
	Proposed	Queue Length (95th %ile)	AM	63	1341		52	133	0	31	270		461	267	
			PM	176	649		46	966	73	27	235		197	165	
		Available Storage[1]		**210**	**780**		**250**	**1660**	**1660**	**140**	**2000**		**400**	**1360**	
	Proposed (Ultimate)[10]	Queue Length (95th %ile)	AM	79	500		51	228	27	22	178		311	192	
			PM	82	226		72	295	66	23	178		162	124	
		Available Storage[1]		**210**	**780**		**250**	**1660**	**1660**	**140**	**2000**		**400**	**1360**	
Boucher Road/ Trinity Driveway	Existing	Queue Length (95th %ile)	AM	36	1911		9	291	21	55			554		19
			PM	62	1118		2	1556	19	119			1019		112
		Available Storage[1,2,11]		**200**	**1660**		**150**	**460**	**200**	**220**			**300**		**500**
	Propoed	Queue Length (95th %ile)	AM	33	583		63	322	81	18	72		192	68	
			PM	72	467		20	500	0	51	72		307	85	
		Available Storage[1,2]		**200**	**1660**		**210**	**610**	**150**	**200**	**200**		**300**	**500**	
	Proposed (Ultimate)[10]	Queue Length (95th %ile)	AM	89	714		63	322	81	18	72		192	68	
			PM	89	514		20	500	0	51	72		307	85	
		Available Storage[1,2]		**200**	**1660**		**210**	**610**	**150**	**200**	**200**		**300**	**500**	
West Frontage Road[8]	Existing	Queue Length (95th %ile)	AM	N/A	0		8		N/A	130			N/A		
			PM		0		3			210					
		Available Storage[1,2]			**460**		**200**			**400**					
I-35 SB Ramps	Existing	Queue Length (95th %ile)	AM	N/A	811	0 [7]	3132		N/A	N/A			560		
			PM		1253	0 [7]	2593						632		
		Available Storage[1,3]			**200**	**200**	**510**						**940**		
	Proposed	Queue Length (95th %ile)	AM	N/A	288	0 [7]	0 [7]	311	N/A	N/A			46		137
			PM		226	0 [7]	0 [7]	197					58	N/A	130
		Available Storage[1,3]			**610**	**610**	**435**	**570**					**880**		**400**
	Proposed (Ultimate)	Queue Length (95th %ile)	AM	N/A	292	0 [7]	0 [7]	311	N/A	N/A			46		137
			PM		221	0 [7]	0 [7]	197					58	N/A	130
		Available Storage[1,3]			**610**	**610**	**435**	**570**					**880**		**400**
	Proposed (Ultimate + Signal)	Queue Length (95th %ile)	AM	N/A	292	0 [7]	0 [7]	302	N/A	N/A			46		137
			PM		221	0 [7]	0 [7]	196					58	N/A	130
		Available Storage[1,3]			**610**	**610**	**435**	**570**					**880**		**400**

[1]For TH or shared movement (no turn lanes), storage listed is distance to nearest adjacent cross street

[2]For no build, assumed NB distance to nearest driveway. For Build, assumed NB distance to relocated West Frontage Road and SB 500' to nearest driveway

[3]For ramp, distance shown to ramp gore if not turn lane

[4]Westbound is shown as distance to nearest intersection at Air Depot Blvd. though several driveways intervene

[5]NB shown as distance to nearest driveway for No Build; NB TH/RT shown as distance to old Industrial Blvd driveway stub and SB is On Cue Driveway for Build

[6]EB/WB assumed distance to nearest cross street; NB/SB assumed distance to nearest driveway

[7]Free movement - no queue per HCM

[8]West Frontage Road is relocated in Build Condition

[9]Industrial Boulevard is relocated 400' east in Build Condition to align with On Cue Driveway

[10]No difference in queue lengths between Ultimate and Ultimate+Signal at this location

[11]For no build, assumed the NW quadrant would develop and north leg at Boucher intersection to provide signalized access with base turn lanes

[12]No difference in queue lengths between Proposed and Proposed (Ultimate)

Table 18 (Continued) – Design Year Queuing Analysis – Existing and Proposed

Location	Queue			Intersection Movement											
				Eastbound			Westbound			Northbound			Southbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
I-35 NB Ramps	Existing	Queue Length (95th %ile)	AM	900		N/A	N/A	2561		1224		76	N/A		
			PM	1390				1442		1791		692			
		Available Storage[1,3]		**510**				**160**		**940**		**660**			
	Proposed[12]	Queue Length (95th %ile)	AM	0 [7]	100	N/A	N/A	378		267	N/A	37	N/A		
			PM	0 [7]	237			190		293		551			
		Available Storage[1,3]		**500**	**570**			**520**		**900**		**900**			
	Proposed (Ultimate + Signal)	Queue Length (95th %ile)	AM	0 [7]	100	N/A	N/A	401		267	N/A	37	N/A		
			PM	0 [7]	237			235		293		551			
		Available Storage[1,3]		**500**	**570**			**520**		**900**		**900**			
Industrial Blvd.[9]	Existing	Queue Length (95th %ile)	AM	0			3			260			N/A		
			PM	0			8			505					
		Available Storage[1,4,5]		**160**			**2120**			**75**					
	Proposed[12]	Queue Length (95th %ile)	AM	23	0 [7]		3	0 [7]		78	10		30	18	
			PM	13	0 [7]		5	0 [7]		265	20		25	18	
		Available Storage[1, 5]		**150**	**520**		**100**	**1630**		**240**	**870**		**100**	**100**	
	Proposed (Ultimate + Signal)	Queue Length (95th %ile)	AM	77	56		9	239		136	40		58	51	
			PM	25	264		15	77		205	50		63	53	
		Available Storage[1, 5]		**150**	**520**		**100**	**1630**		**240**	**870**		**100**	**100**	
Air Depot Blvd.	Existing	Queue Length (95th %ile)	AM	5			3			158			193		
			PM	8			3			300			135		
		Available Storage[1,6]		**2120**			**710**			**240**			**300**		
	Proposed	Queue Length (95th %ile)	AM	5	0 [7]		3	0 [7]		98			63		
			PM	8	0 [7]		3	0 [7]		80			25		
		Available Storage[1,6]		**150**	**1630**		**150**	**710**		**240**			**300**		
	Proposed (Ultimate)	Queue Length (95th %ile)	AM	5	0 [7]		3	0 [7]		23			23		
			PM	8	0 [7]		3	0 [7]		88			13		
		Available Storage[1,6]		**150**	**1630**		**150**	**710**		**240**			**300**		
	Proposed (Ultimate + Signal)	Queue Length (95th %ile)	AM	5	0 [7]		3	0 [7]		20			23		
			PM	8	0 [7]		0	0 [7]		28			5		
		Available Storage[1,6]		**150**	**1630**		**150**	**710**		**240**			**300**		

[1]For TH or shared movement (no turn lanes), storage listed is distance to nearest adjacent cross street

[2]For no build, assumed NB distance to nearest driveway. For Build, assumed NB distance to relocated West Frontage Road and SB 500' to nearest driveway

[3]For ramp, distance shown to ramp gore if not turn lane

[4]Westbound is shown as distance to nearest intersection at Air Depot Blvd. though several driveways intervene

[5]NB shown as distance to nearest driveway for No Build; NB TH/RT shown as distance to old Industrial Blvd driveway stub and SB is On Cue Driveway for Build

[6]EB/WB assumed distance to nearest cross street; NB/SB assumed distance to nearest driveway

[7]Free movement - no queue per HCM

[8]West Frontage Road is relocated in Build Condition

[9]Industrial Boulevard is relocated 400' east in Build Condition to align with On Cue Driveway

[10]No difference in queue lengths between Ultimate and Ultimate+Signal at this location

[11]For no build, assumed the NW quadrant would develop and north leg at Boucher intersection to provide signalized access with base turn lanes

[12]No difference in queue lengths between Proposed and Proposed (Ultimate)

3.2.7 Study Intersection Summary

The following provides a summary of the recommended configuration of the study intersections along Waterloo Road by analysis year phase. This proposed project (shown in **Figure 3A and Appendix H)** will provide the ultimate configuration at the I-35 interchange ramps and relocate the nearby Frontage Roads. Future projects to add northwest quadrant development access and to make Waterloo Road a regional five-lane facility beyond the project extents would be provided by others.

- **Waterloo Road at Sooner Road**
  - **Opening/Interim Year:** Signalize intersection and provide **Figure 3A** configuration
  - **Design Year:** Long term corridor widening of entirety of Waterloo Road corridor is needed, which will provide a second through lane in both directions

- **Waterloo Road at Boucher Road**
  - **Opening Year:** Without development in the northwest quadrant, this intersection should open as a three-leg intersection with lane configuration as depicted in **Figure 3A**
  - **Interim Year/Design Year:**
    - If the northwest quadrant develops, a north leg could be provided by others and signalized with turn lane configuration as shown in **Section 3.2.5**.
    - Without development, the intersection could continue to operate with **Figure 3A** configuration. If delay were to increase as stop-control, hooded lefts, right-in/right-out and signalization should be considered in the future.

- **Waterloo Road at West Frontage Road**
  - This intersection will be relocated to intersect with Boucher Road to allow more separation between the interchange and adjacent cross-streets (see **Figure 3A).**

- **Waterloo Road at I-35 Interchange**
  - The configuration shown in **Figure 3A** will apply through the design year

- **Waterloo Road at Industrial Boulevard**
  - This intersection will be relocated to the east to align with OnCue driveway to allow more separation between the interchange and adjacent cross-streets (see **Figure 3A).**
  - **Opening Year:** Provide configuration shown in **Figure 3A** with stop control on side streets
  - **Interim Year/Design Year:**
    - As traffic volumes grow, assess need for traffic signal or access management alternative (hooded lefts, right-in/right-out). If signalized in future, recommend two-phase operation to minimize potential for queue interference.

- **Waterloo Road at Air Depot Boulevard**
  - **Opening/Interim Year:** Provide **Figure 3A** configuration (left turn lanes on Waterloo Road plus north-south alignment).
  - **Design Year:** In conjunction with long term corridor widening plans, provide second through lane on eastbound and westbound approaches.

3.3 Adjacent Interchanges

At the adjacent interchanges at Seward Road and Covell Road, all ramp intersections are presently unsignalized with one-way stop control for off ramp movements (see **Table 19 and 20** for existing year capacity analysis and **Tables 21 and 22** for design year capacity analysis). At the Seward Road interchange, current operations are LOS B or better, but the design year demand would create the need for additional improvements (potentially signalization) to remove LOS E/F conditions on the ramps. At the Covell Road interchange, congestion is presently experienced for the northbound off-ramp left turn movement in the PM peak period. As this interchange will experience significant growth by the design year, modification to intersection control type and/or additional turn lane improvements will be necessary to provide satisfactory conditions and keep delay to a moderate level.

Table 19 – Existing Year, AM Peak Capacity Analysis – Adjacent Interchanges

Unsignalized Junctions							
		HCM			SimTraffic		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Seward Rd at SB I-35 Ramps	Stop Sign	13	B	1	14	B	1
Seward Rd at NB I-35 Ramps	Stop Sign	14	B	1	15	B	1
Covell Rd at SB I-35 Ramps	Stop Sign	17	C	1	17	C	1
Covell Rd at NB I-35 Ramps	Stop Sign	18	C	2	60	F	9
Total Unsignalized Delay (veh-hr)				4			12
Total Intersection Delay (veh-hr)		4			12		

*Critical approach only
+Entire junction, including uncontrolled movements

Table 20 – Existing Year, PM Peak Capacity Analysis – Adjacent Interchanges

Unsignalized Junctions							
		HCM			SimTraffic		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Seward Rd at SB I-35 Ramps	Stop Sign	11	B	1	10	B	1
Seward Rd at NB I-35 Ramps	Stop Sign	7	A	0	10	A	1
Covell Rd at SB I-35 Ramps	Stop Sign	12	B	2	17	C	1
Covell Rd at NB I-35 Ramps	Stop Sign	14	B	1	29	D	4
Total Unsignalized Delay (veh-hr)				4			6
Total Intersection Delay (veh-hr)		4			6		

*Critical approach only
+Entire junction, including uncontrolled movements

Table 21 – Design Year, AM Peak Capacity Analysis – Adjacent Interchanges

Signalized Junctions

Intersection	Control	Existing HCM Delay (sec/veh)	Existing HCM LOS	Existing HCM Delay (veh-hr)	Existing SimTraffic Delay (sec/veh)	Existing SimTraffic LOS	Existing SimTraffic Delay (veh-hr)	Proposed HCM Delay (sec/veh)	Proposed HCM LOS	Proposed HCM Delay (veh-hr)	Proposed SimTraffic Delay (sec/veh)	Proposed SimTraffic LOS	Proposed SimTraffic Delay (veh-hr)
Covell Rd at SB I-35 Ramps (With Improvements)	Signal	See Unsignalized Results						16	B	16	23	C	24
Covell Rd at NB I-35 Ramps (With Improvements)	Signal	See Unsignalized Results						22	C	15	22	C	15
Total Signalized Delay (veh-hr)				**0**			**0**			**31**			**39**

Unsignalized Junctions

Intersection	Control	Existing HCM Delay (sec/veh)	Existing HCM LOS	Existing HCM Delay (veh-hr)	Existing SimTraffic Delay (sec/veh)	Existing SimTraffic LOS	Existing SimTraffic Delay (veh-hr)	Proposed HCM Delay (sec/veh)	Proposed HCM LOS	Proposed HCM Delay (veh-hr)	Proposed SimTraffic Delay (sec/veh)	Proposed SimTraffic LOS	Proposed SimTraffic Delay (veh-hr)
Covell Rd at SB I-35 Ramps	Stop Sign	253	F	12	2014	F	944	See Signalized Results					
Covell Rd at NB I-35 Ramps	Stop Sign	1452	F	264	1550	F	415	See Signalized Results					
Seward Rd at SB I-35 Ramps	Stop Sign[2]	77	F	4	62	F	4	77	F	4	62	F	4
Seward Rd at NB I-35 Ramps	Stop Sign[2]	28	D	1	25	C	2	28	D	1	25	C	2
Total Unsignalized Delay (veh-hr)				**281**			**1365**			**6**			**6**
Total Intersection Delay (veh-hr)		**281**			**1365**			**37**			**45**		

*Critical approach only +Entire junction, including uncontrolled movements

[2] No Improvements tested at Seward Road

Table 22 – Design Year, PM Peak Capacity Analysis – Adjacent Interchanges

Signalized Junctions

Intersection	Control	Existing HCM Delay (sec/veh)	Existing HCM LOS	Existing HCM Delay (veh-hr)	Existing SimTraffic Delay (sec/veh)	Existing SimTraffic LOS	Existing SimTraffic Delay (veh-hr)	Proposed HCM Delay (sec/veh)	Proposed HCM LOS	Proposed HCM Delay (veh-hr)	Proposed SimTraffic Delay (sec/veh)	Proposed SimTraffic LOS	Proposed SimTraffic Delay (veh-hr)
Covell Rd at SB I-35 Ramps (With Improvements)	Signal	See Unsignalized Results						8	A	8	12	B	12
Covell Rd at NB I-35 Ramps (With Improvements)	Signal	See Unsignalized Results						38	D	36	47	D	45
Total Signalized Delay (veh-hr)				**0**			**0**			**44**			**57**

Unsignalized Junctions

Intersection	Control	Existing HCM Delay (sec/veh)	Existing HCM LOS	Existing HCM Delay (veh-hr)	Existing SimTraffic Delay (sec/veh)	Existing SimTraffic LOS	Existing SimTraffic Delay (veh-hr)	Proposed HCM Delay (sec/veh)	Proposed HCM LOS	Proposed HCM Delay (veh-hr)	Proposed SimTraffic Delay (sec/veh)	Proposed SimTraffic LOS	Proposed SimTraffic Delay (veh-hr)
Covell Rd at SB I-35 Ramps	Stop Sign	1304	F	36	848	F	91	See Signalized Results					
Covell Rd at NB I-35 Ramps	Stop Sign	6087	F	2033	3448	F	953	See Signalized Results					
Seward Rd at SB I-35 Ramps	Stop Sign[2]	56	F	6	169	F	17	56	F	6	169	F	17
Seward Rd at NB I-35 Ramps	Stop Sign[2]	52	F	4	111	F	9	52	F	4	111	F	9
Total Unsignalized Delay (veh-hr)				**2080**			**1070**			**10**			**26**
Total Intersection Delay (veh-hr)		**2080**			**1070**			**55**			**83**		

*Critical approach only +Entire junction, including uncontrolled movements

[2] No Improvements tested at Seward Road

3.4 Safety Analysis

Crash data from 2008-2017 was obtained from the ODOT online crash database for the I-35 corridor and at the three interchanges including Covell Road, Waterloo Road and Seward Road. Crash diagrams are provided in **Appendix E** for the entire extended study area for crashes occurring on the I-35 corridor. A total of 805 crashes were recorded over the 10-year period with 11 fatal crashes, 86 injury crashes, 126 possible injury crashes, and 582 property damage only crashes. The fatal crashes occurred at the following locations:

- Fixed object crash near Covell Road at northbound on-ramp (2012)
- Barrier cable crash just north of Covell Road (DWI in wet conditions) (2016)
- Sideswipe crash near southbound exit ramp to Covell Road (wet conditions) (2008)
- Fixed object (barrier cable) crash near Simmons Road overpass (2012)
- Fixed object (barrier cable) crash north of Simmons Road overpass (2012)
- Two southbound rollover crashes in similar locations north of weigh station (2010 and 2012)
- Fixed object crash south of Seward Road interchange (2011)
- Rear end crash just south of southbound entrance ramp at Seward Road interchange (2008)
- Pedestrian crash/DWI just south of northbound exit ramp at Seward Road interchange (2010)
- Pedestrian crash near southbound exit ramp at Seward Road interchange (2017)

Of the 805 crash records included in ODOT data, 710 crashes occurred along the I-35 mainline. These crashes included 238 crashes with fixed objects, 247 rear end crashes, and 130 sideswipes in the same direction. Near the Waterloo Road interchange, approximately 40 crashes (rear end, side swipe, and rollover) occurred near the heavy southbound merge and 30 at the northbound diverge. At the northbound ramp intersection, 10 crashes involving angle turning were found with an additional 20 rear end crashes. At the southbound ramp intersections, 18 crashes were tallied with about half rear ends and half angle turning.

The proposed DDI configuration will help to reduce crashes in the study area. The configuration is well-suited for the volume patterns of heavy left turns experienced at the interchange, which will help prevent ramp queues from extending towards the mainline. In addition, the additional merge/diverge distances and relocation of the adjacent Frontage Roads on Waterloo Road will improve spacing and simplify turning movements.

Due to the project being interchange specific and not focused on a lengthy corridor, it was determined that a comparison to ODOT statewide average crash rate benchmark by facility type was not appropriate. In addition, ODOT does not calculate crash rate averages by intersections, so intersection comparison was not possible. Rather, a review of potential reductions using countermeasures from the *Crash Modification Factor Clearinghouse* was applied and indicates the following potential crash reductions associated with the proposed improvements to the Waterloo Road corridor and interchange:

- Reduction of up to 58% overall crashes and 41% injury crashes at the ramp terminals due to the DDI configuration (Four Star, CMF ID 9658/8278)

- Since 2009 (in 2008, the intersection was converted to an all-way stop), there were 5 injury/fatality crashes and 23 property damage only crashes. Applying the CMF, the DDI would reduce this nine-year total to 3 injury/fatal and 9 property damage only crashes

- Reduction of 31%-34% overall crashes at unsignalized intersections with installation of left turn lane (Three Star, CMF 3005/3017)

- Reductions due to increased merge distance at entrance ramps (CMF 5215, not rated but captured in HSM)
  - 33% overall crashes at Waterloo Road northbound entrance ramp
    - Applying this reduction to the seven crashes recorded over the 10-year study horizon would eliminate approximately 2 crashes
  - Approximately 80% with two lane southbound entrance ramp
    - Applying this reduction to the 40 crashes recorded over the 10-year study horizon would eliminate approximately 32 crashes

- Reductions due to increased diverge distance at exit ramps (CMF 4679, 3 star)
  - The CMF indicates that increasing deceleration lane from 201-300' to 601-700' results in a crash reduction of over 80%.
    - Current diverges provide 201-300' deceleration and proposed diverges will exceed 700'.
      - Applying this reduction to the diverges (which have witnessed a total of 42 crashes over the 10-year study horizon) would eliminate approximately 34 crashes.

4.0 Access Connection and Design

Policy Point 2 – Access Connection and Design

The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access, such as managed lanes (e.g., transit or high occupancy vehicle and high occupancy toll lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)). In rare instances where all basic movements are not provided by the proposed design, the report should include a full-interchange option with a comparison of the operational and safety analyses to the partial-interchange option. The report should also include the mitigation proposed to compensate for the missing movements, including wayfinding signage, impacts on local intersections, mitigation of driver expectation leading to wrong-way movements on ramps, etc. The report should describe whether future provision of a full interchange is precluded by the proposed design.

The proposed access will connect to a public road and provide for all traffic movements as well as provide a pedestrian area between the ramp termini of the DDI to allow for future installation of sidewalks if desired. The proposed access will be designed to meet or exceed current standards as specified in *AASHTO's A Policy on Geometric Design of Highways* and in *AASHTO's A Policy on Design Standards – Interstate System*. Design exceptions are not anticipated at this time; however, during the design phase of the project, if design criteria is not met, then a design exception will be prepared.

The project will provide two lane ramps (entrance and exit) on the south side of the interchange. The inner ramp lane in each direction will develop or terminate approximately one-half mile south of the ramp gores while the outside ramp lane will develop or terminate approximately 750 feet south of the gores. This proposed staggered ramp design will accommodate lane balance at the interchange and meet *AASHTO A Policy on Geometric Design of Highways* guidance per Section 10.9.5.9. At entrances, the number of lanes beyond the merge point is not less than the sum of all traffic lanes on the merging roadways minus one. At exits, the number of approach lanes on the freeway is equal to the number of lanes on the freeway beyond the exit, plus the number of lanes on the exit, minus one.

With the relocation of the current Frontage Road connections further away from the ramps, access to local businesses will be maintained and future growth in the northwest quadrant has been accommodated by considering Boucher Road a future signal location.

The proposed DDI configuration and improvements to the ramp locations will require new freeway wayfinding signage. The proposed signing plan is depicted in **Figure F-1 in Appendix F.**

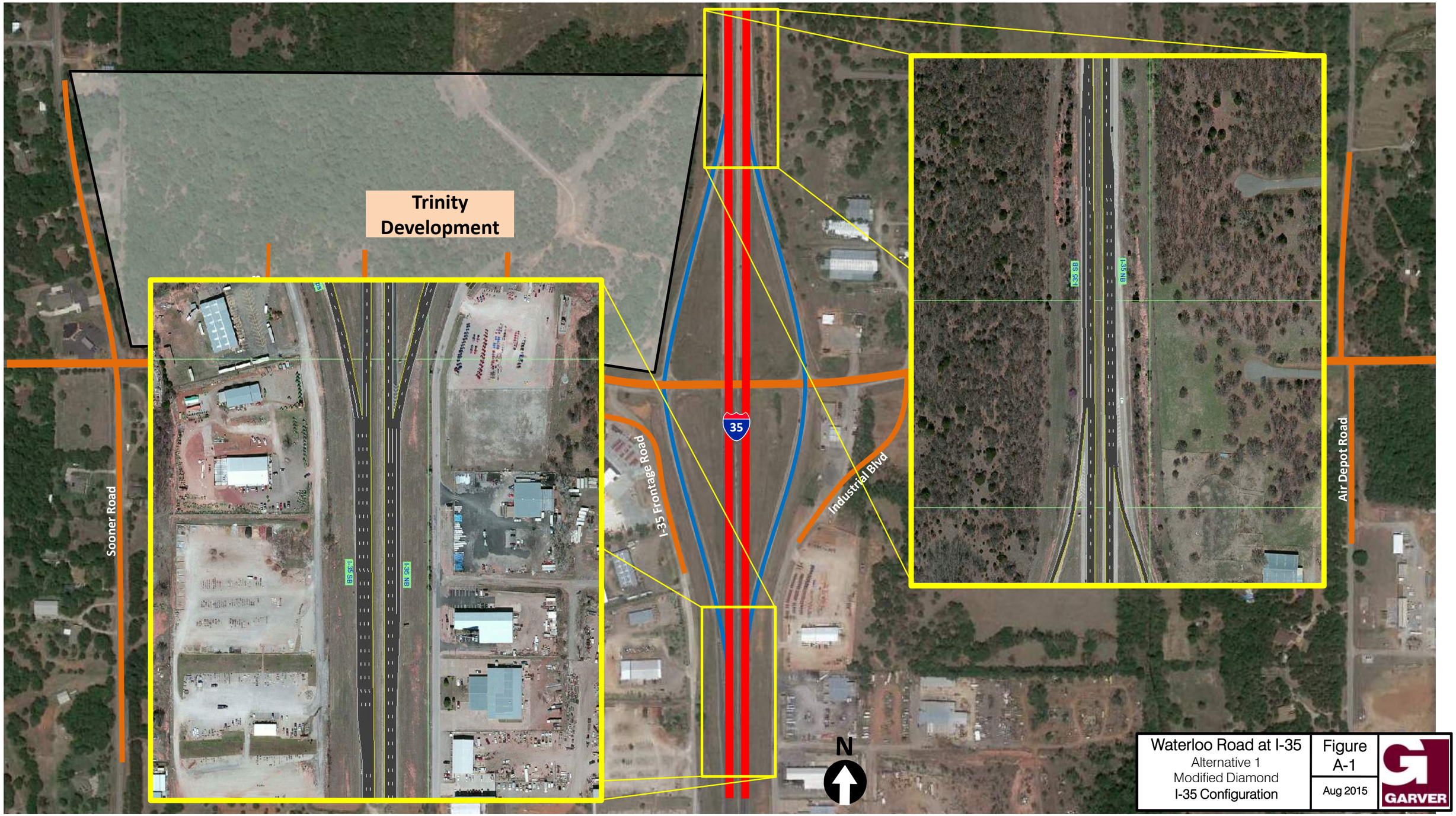
5.0 Conclusions

The Waterloo Road interchange and arterial improvements are currently under design. The public involvement effort for this project involved a solicitation of input from federal, state, and local government agencies and elected officials, and a public meeting held in January 2016. Approximately 375 people attended the public meeting. Comments from the agencies and the public were compiled into a summary document which contributed to ODOT's decision on the preferred alternative. The project is currently included in ODOT's 8 Year Work Plan and Statewide Transportation Improvement Program (STIP). It is also listed in ACOG's short range Transportation Improvement Program (TIP). Additional improvements, including the need for corridor widening of Waterloo Road and I-35 are both referenced in ACOG's 2040 Long Range Plan.

Environmental studies and a Categorical Exclusion (CE) document under the National Environmental Policy Act (NEPA) are underway. No significant environmental impacts are anticipated as a result of the project and there is no significant public controversy on environmental grounds.

The DDI configuration will serve the existing and projected volume patterns at the Waterloo Road interchange – reducing delay and intersection conflict points. Ramp merge and diverge distances will be improved with two lane ramps to the south servicing the large traffic demand heading to/from Oklahoma City. Corridor improvements on Waterloo Road will increase safety and mobility. No reasonable improvements to the existing roadway and/or adjacent access points would satisfy the project purpose and need. ODOT has already provided an "interim" solution with the temporary signalization of the ramp terminals and right turn lane addition to the southbound on ramp and is assisting the County with widening beyond the interchange and signalizing Sooner Road.

Appendix A – Alternatives from Preliminary Engineering Study



Waterloo Road at I-35
Alternative 1
Modified Diamond
I-35 Configuration

Figure A-1

Aug 2015

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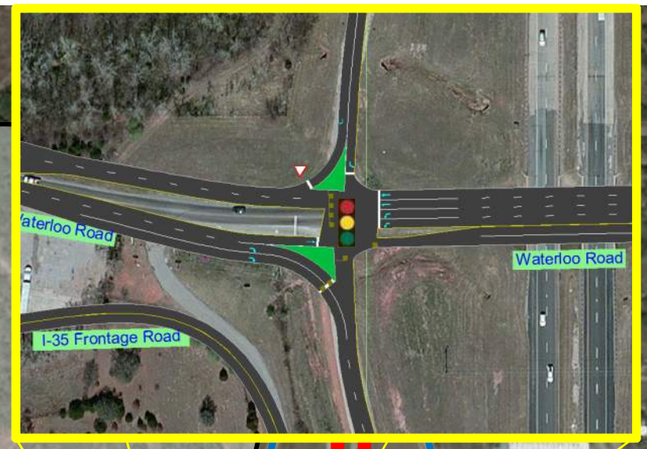

Trinity Development

Driveway #3

Driveway #2

Driveway #1

Sooner Road

I-35 Frontage Road

35

Waterloo Road

Air Depot Road

N

Waterloo Road at I-35
Alternative 1
Modified Diamond
Ultimate Configuration

Figure A-2

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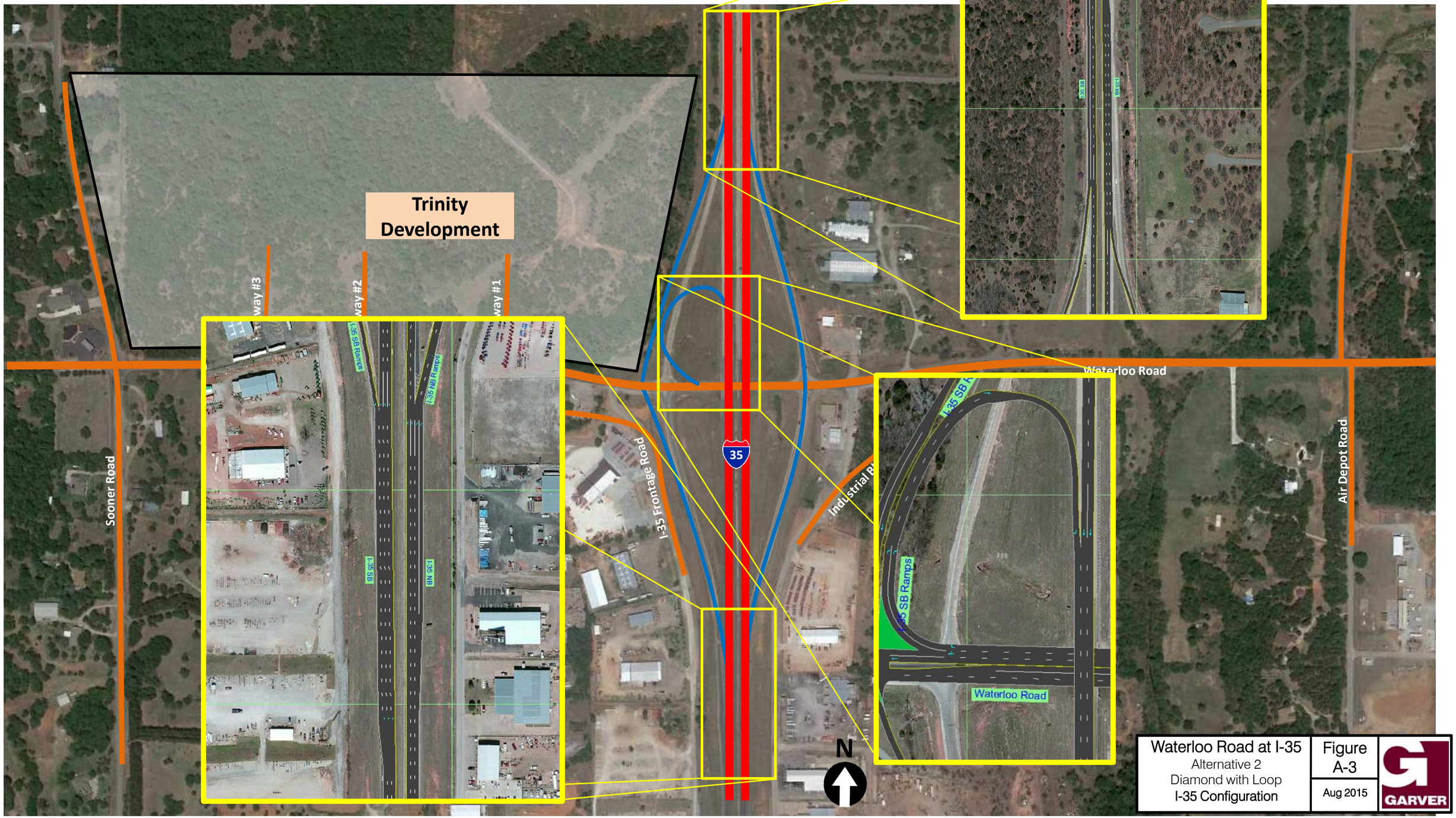

Waterloo Road at I-35
Alternative 2
Diamond with Loop
I-35 Configuration

Figure A-3

Aug 2015

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Trinity Development

Driveway #3

Driveway #2

Driveway #1

Sooner Road

I-35 Frontage Road

35

Air Depot Road

Waterloo Road

N

Waterloo Road at I-35
Alternative 2
Diamond with Loop
Ultimate Configuration

Figure A-4

Aug 2015

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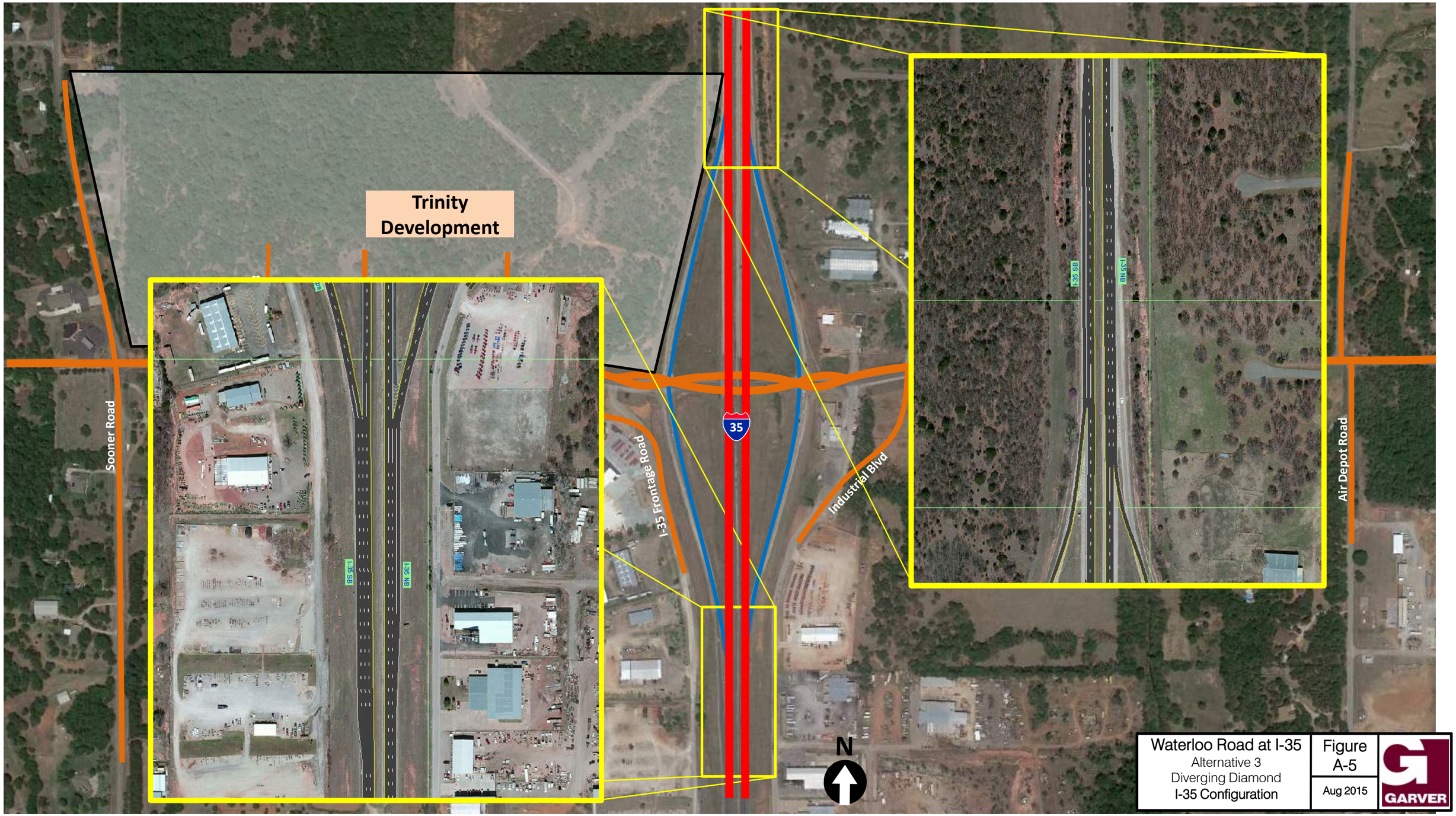
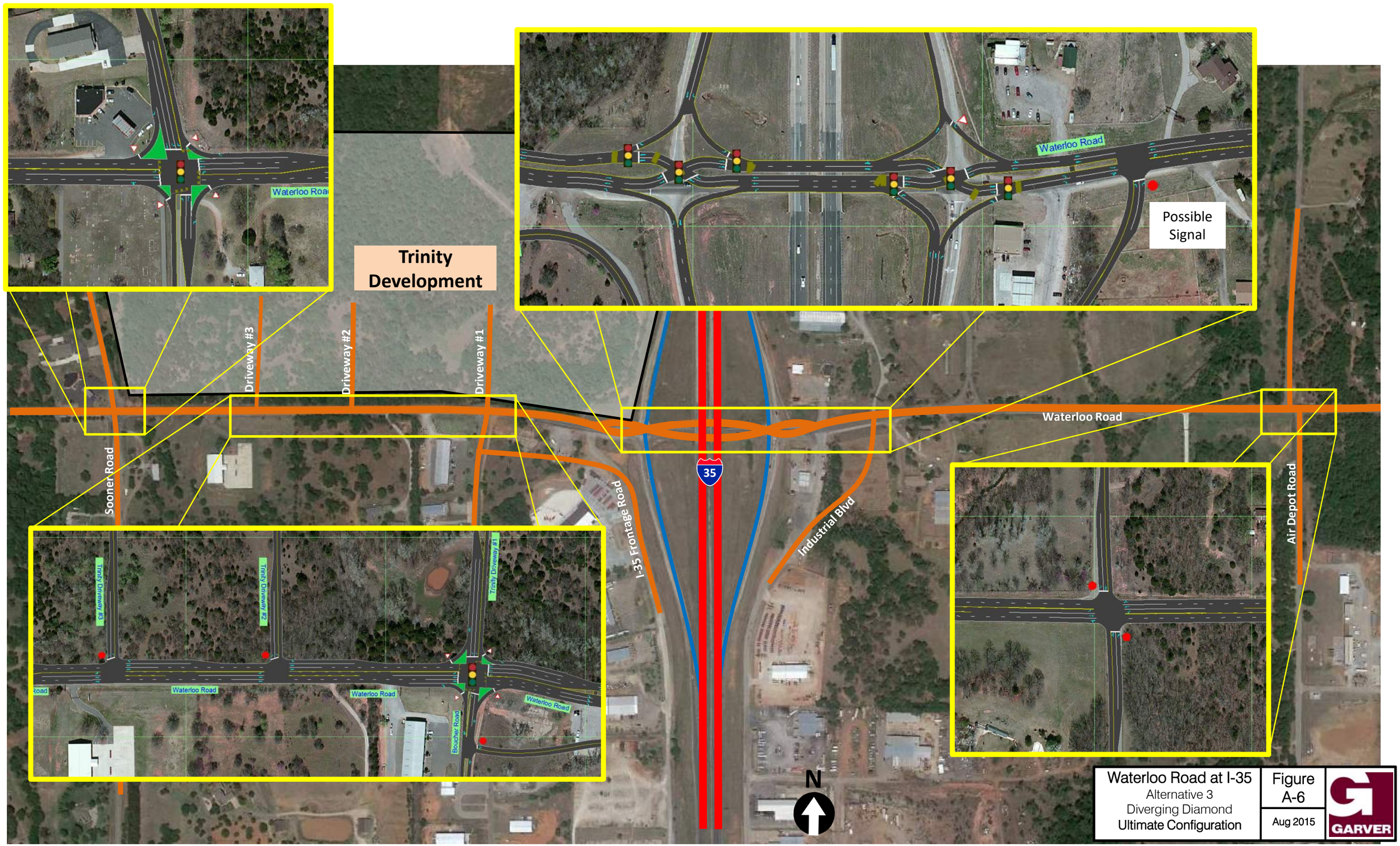


Waterloo Road at I-35 Alternative 3 Diverging Diamond I-35 Configuration	Figure A-5 Aug 2015	GARVER



Waterloo Road at I-35
Alternative 3
Diverging Diamond
Ultimate Configuration

Figure A-6

Aug 2015

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Appendix B – Traffic Volumes from Preliminary Engineering Study

① Waterloo Road at Sooner Road

Completed: 9/16/2014 (AM) and 9/16/2014 (PM), #1001

(32) 33	(26) 53	(92) 332	↖	37 (210)	
			←	173 (287)	
			↙	7 (30)	
(63) 8			↑		
(228) 370			→	4 (15)	11 (88)
(11) 3			↘		42 (19)

② Waterloo Road at Boucher Road

Completed: 9/16/2014 (AM) and 9/16/2014 (PM), #1002

		←	211 (514)	
		↙	36 (8)	
(335) 732	↑			
(4) 8	→	10 (19)	5 (54)	

③ Waterloo Road at I-35 Frontage Road

Completed: 9/30/2014 (AM) and 9/30/2014 (PM), #1003

		←	243 (538)	
		↙	12 (2)	
(368) 742	↑			
(3) 10	→	0 (4)	1 (15)	

④ Waterloo Road at I-35 SB Ramps

Completed: 9/16/2014 (AM) and 9/17/2014 (PM), #2001

(79) 48	(4) 0	(38) 23	←	200 (424)
			↙	416 (204)
(179) 113	→			
(255) 615	↘			

⑤ Waterloo Road at I-35 NB Ramps

Completed: 9/17/2014 (AM) and 9/17/2014 (PM), #2002

		↖	44 (32)	
		←	411 (261)	
(72) 71	↖			
(143) 49	←	189 (371)	1 (0)	136 (423)

⑥ Waterloo Road at Industrial Blvd.

Completed: 9/18/2014 (AM) and 9/18/2014 (PM), #3001

		←	447 (228)	
		↙	14 (17)	
(482) 88	→			
(60) 74	↘	37 (109)	11 (28)	

⑦ Waterloo Road at Air Depot Road

Completed: 10/01/2014 (AM) and 9/18/2014 (PM), #3002

(30) 30	(3) 7	(1) 2	↖	1 (6)	
			←	436 (211)	
			↙	124 (9)	
(68) 8			↑		
(450) 78			→	3 (5)	0 (9)
(6) 19			↘		0 (20)

	Daily	AM	PM
NB	2708	127	380
SB	2684	353	151

Date: 9-16-14

	Daily	AM	PM
EB	4284	444	351
WB	3921	261	354

Date: 9-16-14

	Daily	AM	PM
EB	5446	696	376
WB	5419	342	539

Date: 9-16-14

	Daily	AM	PM
NB	888	68	122
SB	732	77	70

Date: 9-16-14

	Daily	AM	PM
EB	5281	688	337
WB	4870	177	545

T (AADT): 12%
T (DHV): 19%
T3 = 6%
Date: 9-30-14 to 10-01-14

	Daily	AM	PM
NB	396	16	55
SB	455	48	36

Date: 9-16-14

	Daily	AM	PM
NB	187	6	14
SB	365	30	29

Date: 9-16-14

	Daily	AM	PM
NB	-	-	-
SB	7396	1009	467

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
NB	7590	385	791
SB	-	-	-

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
EB	2844	299	318
WB	7380	480	523

Date: 9-16-14

	Daily	AM	PM
NB	-	-	-
SB	1256	80	128

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
EB	5932	716	401
WB	5512	289	547

Date: 9-30-14 to 10-01-14

	Daily	AM	PM
NB	415	30	57
SB	556	58	43

Date: 9-16-14

	Daily	AM	PM
NB	1308	109	112
SB	-	-	-

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
EB	5734	253	569
WB	4401	375	308

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
NB	-	-	-
SB	6185	1044	454

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
EB	4365	172	571
WB	4173	423	249

T (AADT): 9%
T (DHV): 22%
T3 = 3%
Date: 9-30-14 to 10-01-14

	Daily	AM	PM
NB	538	16	96
SB	460	44	28

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
NB	1764	127	164
SB	-	-	-

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
EB	2332	137	365
WB	2476	417	190

T (AADT) : 15%
T (DHV): 11%
T3 = 4%
Date: 9-17-14 to 9-18-14

	Daily	AM	PM
NB	1605	137	149
SB	-	-	-

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
EB	5786	865	364
WB	5281	373	555

T (AADT) : 7%
T (DHV): 8%
T3 = 5%
Date: 9-30-14 to 10-01-14

	Daily	AM	PM
NB	5444	357	735
SB	-	-	-

Date: 9-17-14 to 9-18-14

	Daily	AM	PM
EB	4586	395	495
WB	4036	311	289

Date: 9-30-14 to 10-01-14

	Daily	AM	PM
NB	323	15	35
SB	381	129	22

Date: 9-17-14 to 9-18-14

Waterloo Road
Sooner Road
Boucher Road
I-35 Frontage Road
Industrial Blvd
Air Depot Road
Covell Road
Covell Road Interchange
35

N

Legend

18 AM Turning Movement Count
(18) PM Turning Movement Count

Waterloo Road at I-35
RAW 2014
Traffic Volumes
Existing Configuration

Figure B-1

May 2015

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① Waterloo Road at Sooner Road

[400] (35) 40	[450] (20) 70	[1650] (100) 310	↖ 50	(220)	[1650]
			← 250	(380)	[3550]
			↙ 15	(40)	[250]
[400]	(60)	15 ↗			
[3550]	(315)	485 →	10 (10) [100]	20 (70) [450]	40 (15) [250]
[100]	(10)	10 ↘			

② Waterloo Road at Boucher Road

		← 315	(625)	[5370]
		↙ 45	(10)	[270]
[5370]	(430) 820 →	5 (20) [130]		10 (45) [270]
[130]	(5) 20 ↘			

⑥ Waterloo Road at Industrial Blvd.

		← 680	(245)	[4580]
		↙ 15	(25)	[140]
[4580]	(600) 230 →	50 (90) [950]		20 (45) [140]
[950]	(60) 85 ↘			

⑦ Waterloo Road at Air Depot Road

[370] (10) 40	[50] (5) 10	[40] (10) 5	↖ 10	(5)	[40]
			← 645	(235)	[4200]
			↙ 30	(5)	[150]
[370]	(40)	10 ↗			
[4200]	(595)	215 →	5 (20) [100]	5 (10) [50]	5 (30) [150]
[100]	(5)	20 ↘			

Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

③ Waterloo Road at I-35 Frontage Road

		← 355	(620)	[5560]	
		↙ 20	(10)	[190]	
[5560]	(470) 815 →	5 (15) [80]		10 (20) [190]	
[80]	(5) 15 ↘				

④ Waterloo Road at I-35 SB Ramps

[780] (80) 65	[20] (0) 0	[400] (50) 40	← 310	(550)	[4970]
			↙ 565	(260)	[3750]
[2220]	(200) 200 →				
[3530]	(290) 625 ↘				

⑤ Waterloo Road at I-35 NB Ramps

		↖ 50	(40)	[400]	
		← 680	(295)	[5130]	
[780]	(65) 80 ↗				
[1840]	(185) 160 →	195 (515) [3590]	0 (0) [20]	155 (475) [3690]	

N

Legend

18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35 2014 Design Traffic Volumes Existing Configuration	Figure B-2	May 2015

GARVER

① Waterloo Road at Sooner Road

[600] (55) 60	[650] (30) 95	[2300] (140) 430	← 70 (305) [2300]		
			← 380 (580) [5400]		
			← 20 (55) [350]		
[600] (90) 25 →			↖ 15 (15) [150]	↑ 30 (95) [650]	↗ 55 (20) [350]
[5400] (480) 735 →					
[150] (15) 15 ↘					

② Waterloo Road at Boucher Road

			← 470 (920) [7950]		
			← 55 (15) [350]		
[7950] (640) 1200 →			↖ 5 (25) [150]		↗ 15 (55) [350]
[150] (5) 25 ↘					

⑥ Waterloo Road at Industrial Blvd.

			← 1025 (375) [6900]		
			← 20 (30) [200]		
[6900] (915) 350 →			↖ 65 (115) [1200]		↗ 25 (55) [200]
[1200] (75) 105 ↘					

⑦ Waterloo Road at Air Depot Road

[500] (15) 55	[50] (5) 15	[50] (15) 10	← 15 (10) [50]		
			← 980 (355) [6400]		
			← 45 (10) [250]		
[500] (55) 15 →			↖ 5 (30) [150]	↑ 5 (15) [50]	↗ 10 (45) [250]
[6400] (905) 325 →					
[150] (5) 30 ↘					

Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

③ Waterloo Road at I-35 Frontage Road

			← 520 (915) [8200]		
			← 25 (15) [250]		
[8200] (690) 1195 →			↖ 5 (20) [100]		↗ 15 (25) [250]
[100] (5) 20 ↘					

④ Waterloo Road at I-35 SB Ramps

[1200] (120) 100	[30] (0) 0	[600] (75) 60	← 445 (810) [7250]		
			← 850 (385) [5650]		
[3250] (300) 295 →					
[5200] (415) 915 ↘					

⑤ Waterloo Road at I-35 NB Ramps

			← 75 (60) [600]		
			← 1015 (430) [7500]		
[1200] (100) 120 →					
[2650] (275) 235 →			↖ 280 (765) [5400]	↑ 0 (0) [30]	↗ 220 (715) [5450]

Legend

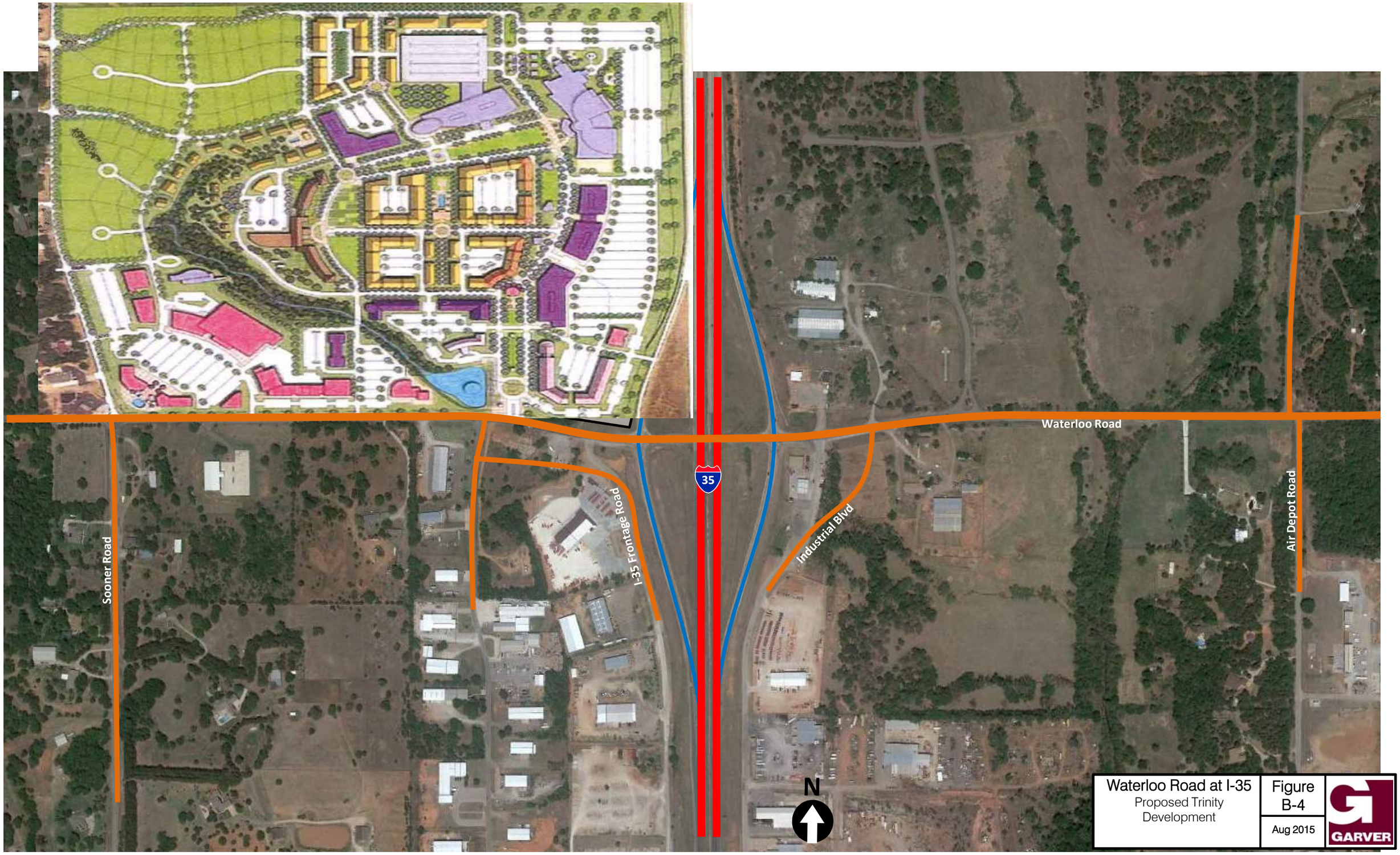
18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35
2040 – Background Growth
Existing Configuration

Figure B-3

May 2015

GARVER

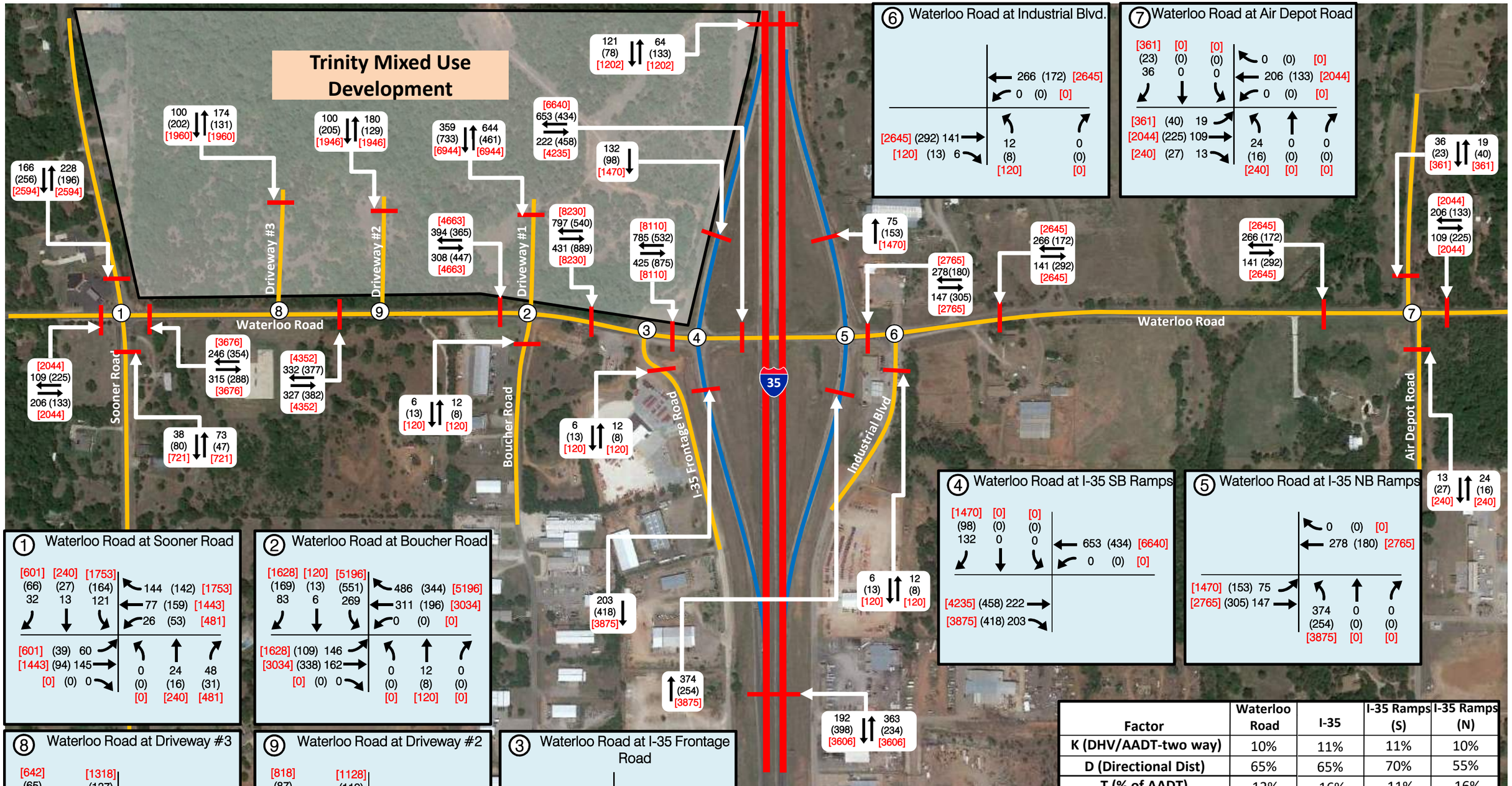


Waterloo Road at I-35
Proposed Trinity Development

Figure B-4

Aug 2015

GARVER



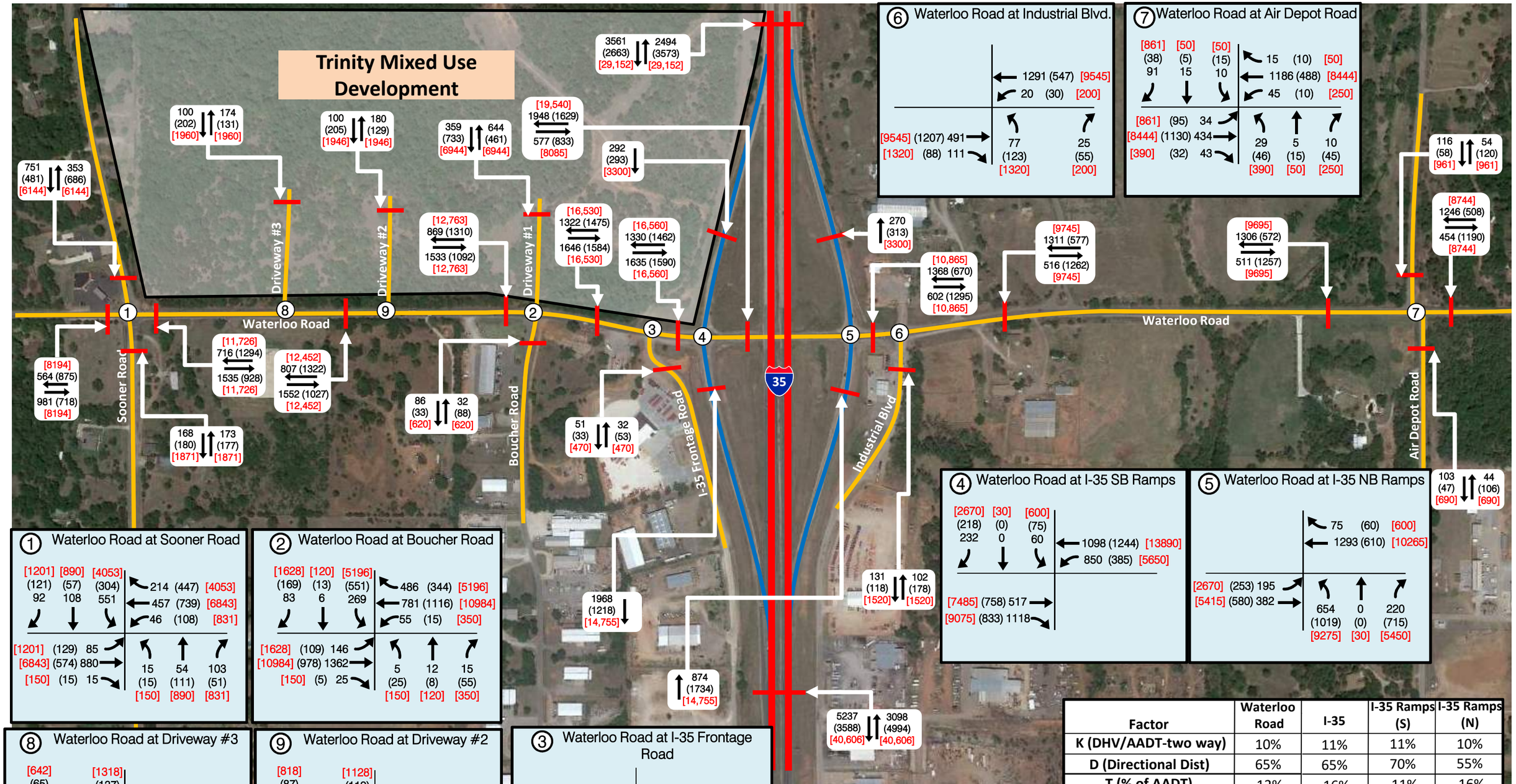
Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

Waterloo Road at I-35
2040 – Total Trip Generation
Existing Configuration

Figure B-5

May 2015

GARVER



Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

Waterloo Road at I-35
2040 Design Traffic
Existing Configuration

Figure B-6

May 2015

GARVER

① Waterloo Road at Sooner Road

[400] (35) 40	[450] (20) 70	[1650] (100) 310
50 (220) [1650]		
250 (380) [3550]		
15 (40) [250]		
[400] (60) 15		
[3550] (315) 485		
[100] (10) 10		
10 (10) [100]	20 (70) [450]	40 (15) [250]

② Waterloo Road at Boucher Road

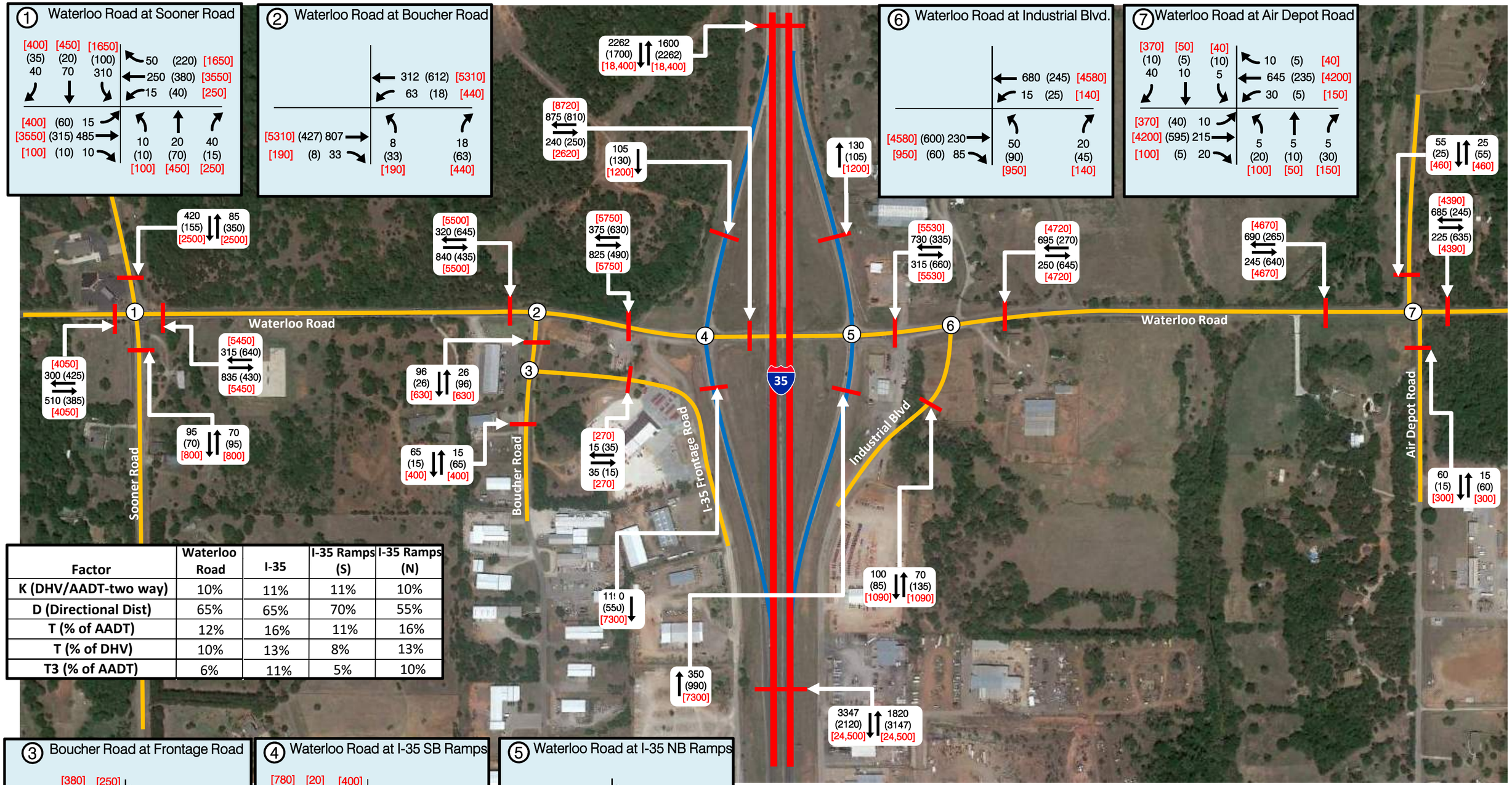
	312 (612) [5310]	
	63 (18) [440]	
[5310] (427) 807		
[190] (8) 33		
8 (33) [190]	18 (63) [440]	

⑥ Waterloo Road at Industrial Blvd.

	680 (245) [4580]	
	15 (25) [140]	
[4580] (600) 230		
[950] (60) 85		
50 (90) [950]	20 (45) [140]	

⑦ Waterloo Road at Air Depot Road

[370] (10) 40	[50] (5) 10	[40] (10) 5
10 (5) [40]		
645 (235) [4200]		
30 (5) [150]		
[370] (40) 10		
[4200] (595) 215		
[100] (5) 20		
5 (20) [100]	5 (10) [50]	5 (30) [150]



Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

③ Boucher Road at Frontage Road

[380] (13) 63	[250] (13) 33	13 (33) [250]
		2 (2) [20]
13 (63) [380]	2 (2) [20]	

④ Waterloo Road at I-35 SB Ramps

[780] (80) 65	[20] (0) 0	[400] (50) 40
		310 (550) [4970]
		565 (260) [3750]
[2220] (200) 200		
[3530] (290) 625		

⑤ Waterloo Road at I-35 NB Ramps

		50 (40) [400]
		680 (295) [5130]
[780] (65) 80		
[1840] (185) 160		
195 (515) [3590]	0 (0) [20]	155 (475) [3690]

N

Legend

18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35
2014 Design Traffic
Alternative 1
Modified Diamond

Figure B-7

May 2015

GARVER

Trinity Mixed Use Development

Waterloo Road
Sooner Road
Boucher Road
I-35 Frontage Road
Industrial Blvd
Air Depot Road
Driveway #1
Driveway #2
Driveway #3

① Waterloo Road at Sooner Road

[1201] [890] [4053]
(121) (57) (304)
92 108 551
214 (447) [4053]
457 (739) [6843]
46 (108) [831]
[1201] (129) 85
[6843] (574) 880
[150] (15) 15
15 (15) [150]
54 (111) [890]
103 (51) [831]

② Waterloo Road at Boucher Road

[1628] [240] [5076]
(169) (27) (538)
83 13 263
474 (336) [5076]
780 (1100) [10924]
76 (26) [560]
[1628] (109) 146
[10924] (977) 1346
[210] (6) 41
6 (41) [210]
24 (16) [240]
26 (76) [560]

③ Boucher Road at Frontage Road

[580] [430]
(29) (29)
82 47
28 (49) [430]
4 (4) [40]
28 (84) [580]
4 (4) [40]

④ Waterloo Road at I-35 SB Ramps

[2670] [30] [600]
(218) (0) (75)
232 0 60
1098 (1244) [13890]
850 (385) [5650]
[7485] (758) 517
[9075] (833) 1118

⑤ Waterloo Road at I-35 NB Ramps

75 (60) [600]
1293 (610) [10,265]
[2670] (253) 195
[5415] (580) 382
654 (1019) [9275]
0 (0) [30]
220 (715) [5450]

⑥ Waterloo Road at Industrial Blvd.

1291 (547) [9545]
20 (30) [200]
[9545] (1207) 491
[1320] (88) 111
77 (123) [1320]
25 (55) [200]

⑦ Waterloo Road at Air Depot Road

[861] [50] [50]
(38) (5) (15)
91 15 10
15 (10) [50]
1186 (488) [8444]
45 (10) [250]
[861] (95) 34
[8444] (1130) 434
[390] (32) 43
29 (46) [390]
5 (15) [50]
10 (45) [250]

⑧ Waterloo Road at Driveway #3

[642] [1318]
(65) (137)
32 67
119 (88) [1318]
689 (1234) [11134]
[642] (43) 55
[11134] (890) 1484

⑨ Waterloo Road at Driveway #2

[818] [1128]
(87) (119)
42 58
104 (75) [1128]
765 (1235) [11635]
[818] (54) 77
[11635] (973) 1475

Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

N

Legend

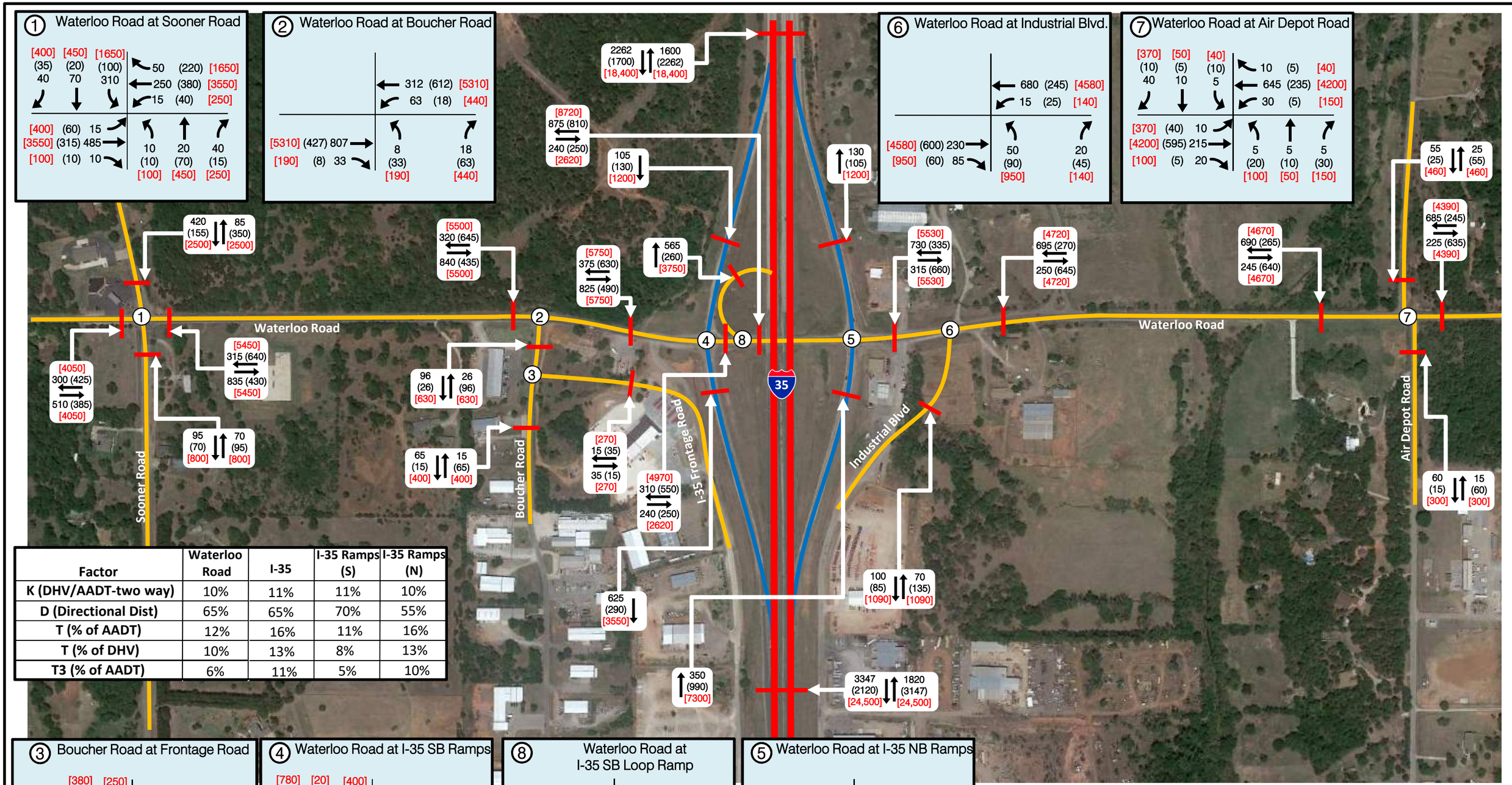
18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35
2040 Design Traffic
Alternative 1
Modified Diamond

Figure B-8

May 2015

GARVER



1 Waterloo Road at Sooner Road

[400] (35) 40	[450] (20) 70	[1650] (100) 310
↖ 50 (220) [1650]		
← 250 (380) [3550]		
↙ 15 (40) [250]		
[400] (60) 15 ↗		
[3550] (315) 485 →	10 (10) [100]	20 (70) [450]
[100] (10) 10 ↘		40 (15) [250]

2 Waterloo Road at Boucher Road

	← 312 (612) [5310]	
	↙ 63 (18) [440]	
[5310] (427) 807 →	8 (33) [190]	18 (63) [440]
[190] (8) 33 ↘		

6 Waterloo Road at Industrial Blvd.

	← 680 (245) [4580]	
	↙ 15 (25) [140]	
[4580] (600) 230 →	50 (90) [950]	20 (45) [140]
[950] (60) 85 ↘		

7 Waterloo Road at Air Depot Road

[370] (10) 40	[50] (5) 10	[40] (10) 5
↖ 10 (5) [40]		
← 645 (235) [4200]		
↙ 30 (5) [150]		
[370] (40) 10 ↗		
[4200] (595) 215 →	5 (20) [100]	5 (10) [50] 5 (30) [150]
[100] (5) 20 ↘		

Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

3 Boucher Road at Frontage Road

[380] (13) 63	[250] (13) 33	↖ 13 (33) [250]
		← 2 (2) [20]
	13 (63) [380]	2 (2) [20]

4 Waterloo Road at I-35 SB Ramps

[780] (80) 65	[20] (0) 0	[400] (50) 40
		← 310 (550) [4970]
[2220] (200) 200 →		
[3530] (290) 625 ↘		

8 Waterloo Road at I-35 SB Loop Ramp

	↖ 565 (260) [3750]
	← 310 (550) [4970]
[2620] (250) 240 →	

5 Waterloo Road at I-35 NB Ramps

		↖ 50 (40) [400]
		← 680 (295) [5130]
[780] (65) 80 ↙		
[1840] (185) 160 →	195 (515) [3590]	0 (0) [20] 155 (475) [3690]

N

Legend

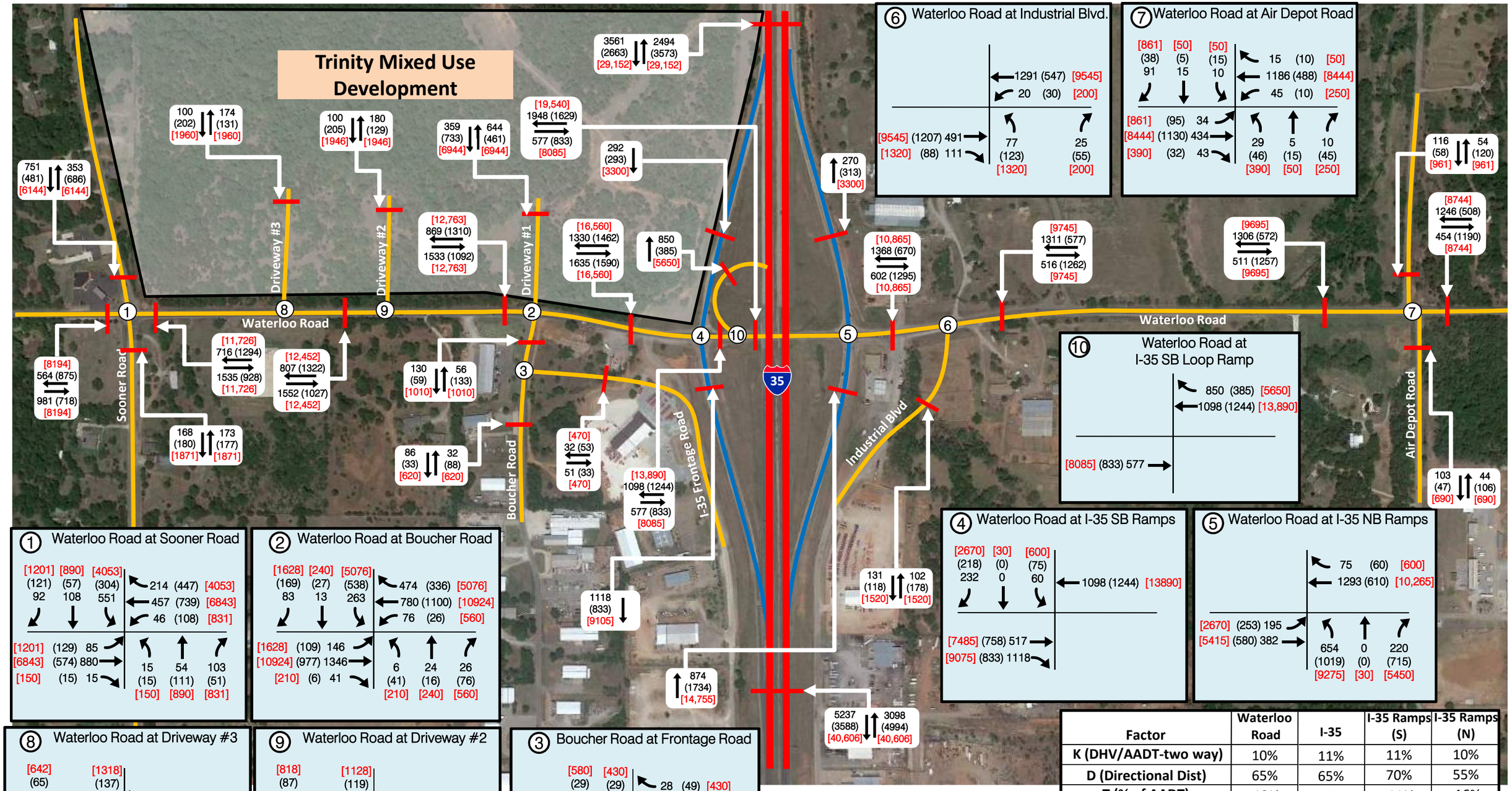
18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35
2014 Design Traffic
Alternative 2
Diamond w/ Loop Ramp

Figure B-9

May 2015

GARVER



6 Waterloo Road at Industrial Blvd.

1291 (547) [9545]
20 (30) [200]
[9545] (1207) 491
[1320] (88) 111
77 (123) [1320]
25 (55) [200]

7 Waterloo Road at Air Depot Road

[861] [50] [50]
(38) (5) (15)
91 15 10
15 (10) [50]
1186 (488) [8444]
45 (10) [250]
[861] (95) 34
[8444] (1130) 434
[390] (32) 43
29 (46) [390]
5 (15) [50]
10 (45) [250]

10 Waterloo Road at I-35 SB Loop Ramp

850 (385) [5650]
1098 (1244) [13,890]
[8085] (833) 577

1 Waterloo Road at Sooner Road

[1201] [890] [4053]
(121) (57) (304)
92 108 551
214 (447) [4053]
457 (739) [6843]
46 (108) [831]
[1201] (129) 85
[6843] (574) 880
[150] (15) 15
15 (15) [150]
54 (111) [890]
103 (51) [831]

2 Waterloo Road at Boucher Road

[1628] [240] [5076]
(169) (27) (538)
83 13 263
474 (336) [5076]
780 (1100) [10924]
76 (26) [560]
[1628] (109) 146
[10924] (977) 1346
[210] (6) 41
6 (41) [210]
24 (16) [240]
26 (76) [560]

4 Waterloo Road at I-35 SB Ramps

[2670] [30] [600]
(218) (0) (75)
232 0 60
1098 (1244) [13890]
[7485] (758) 517
[9075] (833) 1118

5 Waterloo Road at I-35 NB Ramps

75 (60) [600]
1293 (610) [10,265]
[2670] (253) 195
[5415] (580) 382
654 (1019) [9275]
0 (0) [30]
220 (715) [5450]

8 Waterloo Road at Driveway #3

[642] [1318]
(65) (137)
32 67
119 (88) [1318]
689 (1234) [11134]
[642] (43) 55
[11134] (890) 1484

9 Waterloo Road at Driveway #2

[818] [1128]
(87) (119)
42 58
104 (75) [1128]
765 (1235) [11635]
[818] (54) 77
[11635] (973) 1475

3 Boucher Road at Frontage Road

[580] [430]
(29) (29)
82 47
28 (49) [430]
4 (4) [40]
28 (84) [580]
4 (4) [40]

Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

N

Legend

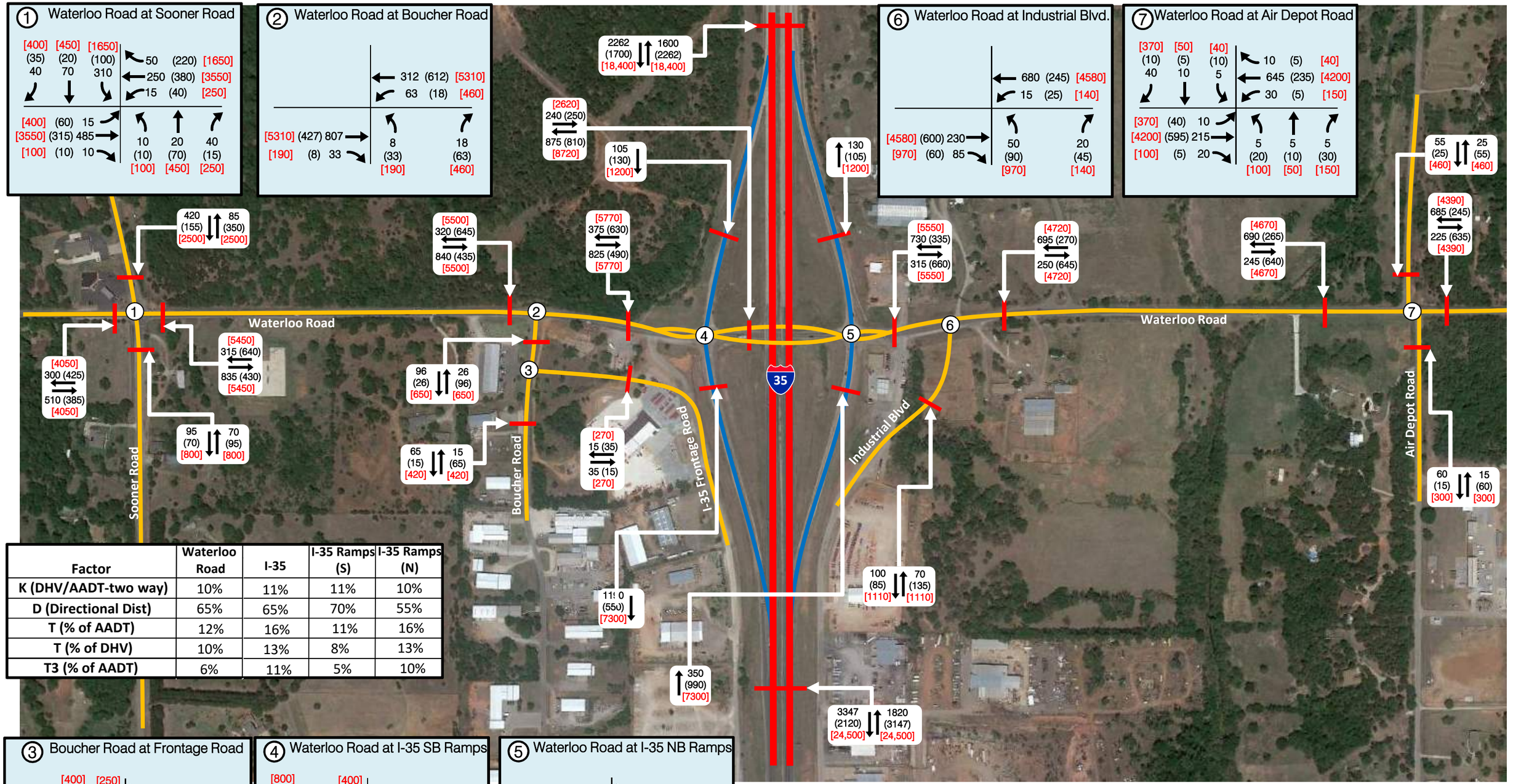
18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35
2040 Design Traffic
Alternative 2
Diamond w/ Loop Ramp

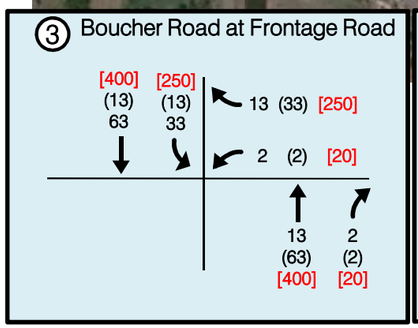
Figure B-10

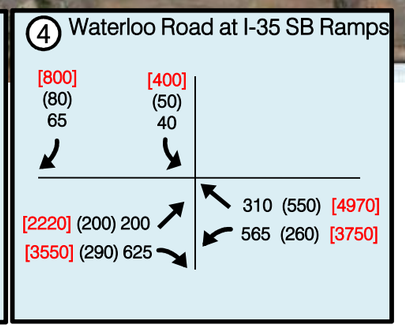
May 2015

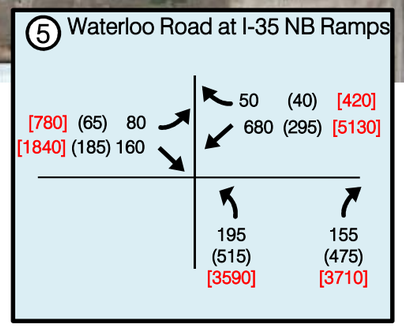
GARVER



Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%







Legend

18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35
2014 Design Traffic
Alternative 3
Diverging Diamond

Figure B-11

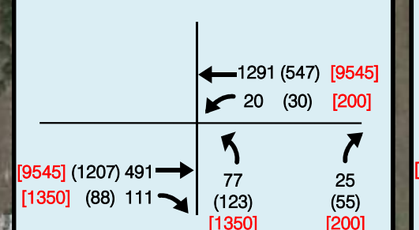
May 2015

GARVER

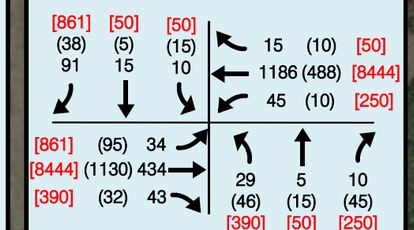
Trinity Mixed Use Development

Waterloo Road
Sooner Road
Boucher Road
I-35 Frontage Road
Industrial Blvd
Air Depot Road
Driveway #1
Driveway #2
Driveway #3
35

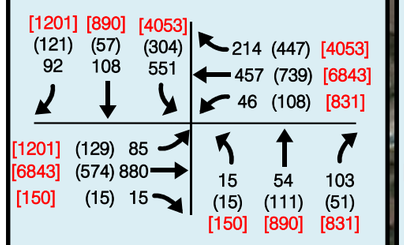
⑥ Waterloo Road at Industrial Blvd.



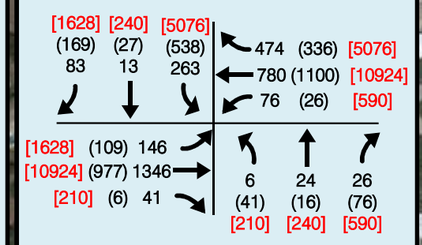
⑦ Waterloo Road at Air Depot Road



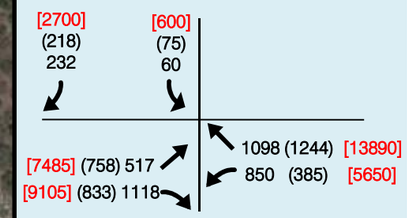
① Waterloo Road at Sooner Road



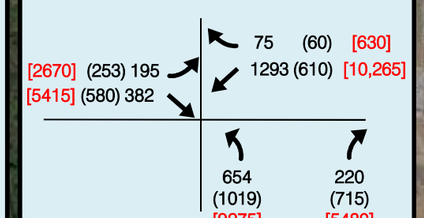
② Waterloo Road at Boucher Road



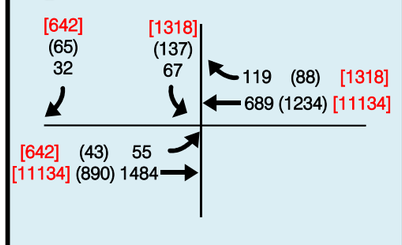
④ Waterloo Road at I-35 SB Ramps



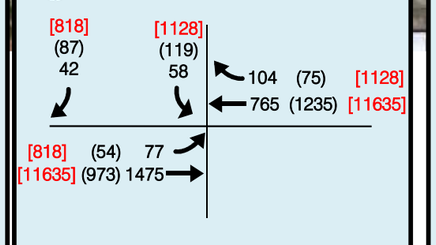
⑤ Waterloo Road at I-35 NB Ramps



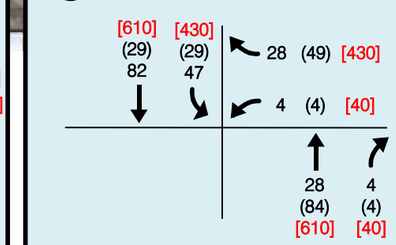
⑧ Waterloo Road at Driveway #3



⑨ Waterloo Road at Driveway #2



③ Boucher Road at Frontage Road



Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

N

Legend

18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35
2040 Design Traffic
Alternative 3
Diverging Diamond

Figure B-12

May 2015

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Appendix C – Capacity Analysis Results from Preliminary Engineering Study

Table C-1:: 2014 AM Freeway LOS (2010 HCM) – Interstate 35 (Existing Configuration)

Direction	Existing			Proposed (Alt.1)			Proposed (Alt.2)			Proposed (Alt.3)		
	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS
NB	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	A	South of Waterloo Rd.	Basic	A	South of Waterloo Rd.	Basic	A
	Ramp to Waterloo Rd.	Off	B	Ramp to Waterloo Rd.[1]	Off	A	Ramp to Waterloo Rd.[1]	Off	A	Ramp to Waterloo Rd.[1]	Off	A
	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B
	Ramp from Waterloo Rd.	On	B	Ramp from Waterloo Rd.	On	B	Ramp from Waterloo Rd.	On	B	Ramp from Waterloo Rd.	On	B
	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B
SB	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C
	Ramp to Waterloo Rd.	Off	C	Ramp to Waterloo Rd.	Off	B	Ramp to Waterloo Rd.	Off	B	Ramp to Waterloo Rd.	Off	B
	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B	North of Loop Ramp	Basic	B	Between ramps at Waterloo Rd.	Basic	B
							South of Loop Ramp	Basic	B			
	Ramp from Waterloo Rd.	On	D	Ramp from Waterloo Rd.[2]	On	B	Loop Ramp from Waterloo Rd.	On	Lane Addition[3]	Ramp from Waterloo Rd.[2]	On	B
							Ramp from Waterloo Rd.	On	B			
	South of Waterloo Rd.	Basic	D	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	C

[1] Configuration includes a two lane off ramp with the inside ramp lane being a drop lane and outside lane being a diverge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the drop lane would be a freeway lane and the outside ramp lane would handle 40%of the ramp volume.

[2] Configuration includes a two lane on ramp with the inside ramp lane being a lane addition to the freeway and outside lane being a merge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the lane addition to compromise 60%of ramp traffic and have 40%of ramp traffic use the merge lane.

[3]No merging required for lane addition; ramp governed by capacity of ramp roadway (2100 pc/hr) and upstream/downstream freeway segments

Table C-2: 2014 PM Freeway LOS (2010 HCM) – Interstate 35 (Existing Configuration)

Direction	Existing			Proposed (Alt.1)			Proposed (Alt.2)			Proposed (Alt.3)		
	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS
NB	South of Waterloo Rd.	Basic	D	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B
	Ramp to Waterloo Rd.	Off	D	Ramp to Waterloo Rd.[1]	Off	B	Ramp to Waterloo Rd.[1]	Off	B	Ramp to Waterloo Rd.[1]	Off	B
	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B
	Ramp from Waterloo Rd.	On	C	Ramp from Waterloo Rd.	On	B	Ramp from Waterloo Rd.	On	B	Ramp from Waterloo Rd.	On	B
	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C
SB	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B
	Ramp to Waterloo Rd.	Off	B	Ramp to Waterloo Rd.	Off	B	Ramp to Waterloo Rd.	Off	B	Ramp to Waterloo Rd.	Off	B
	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B	North of Loop Ramp	Basic	B	Between ramps at Waterloo Rd.	Basic	B
							South of Loop Ramp	Basic	A			
	Ramp from Waterloo Rd.	On	C	Ramp from Waterloo Rd.[2]	On	B	Loop Ramp from Waterloo Rd.	On	Lane Addition[3]	Ramp from Waterloo Rd.[2]	On	B
							Ramp from Waterloo Rd.	On	B			
	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B

[1] Configuration includes a two lane off ramp with the inside ramp lane being a drop lane and outside lane being a diverge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the drop lane would be a freeway lane and the outside ramp lane would handle 40%of the ramp volume.

[2] Configuration includes a two lane on ramp with the inside ramp lane being a lane addition to the freeway and outside lane being a merge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the lane addition to compromise 60%of ramp traffic and have 40%of ramp traffic use the merge lane.

[3]No merging required for lane addition; ramp governed by capacity of ramp roadway (2100 pc/hr) and upstream/downstream freeway segments

Table C-3: 2025 AM Freeway LOS (2010 HCM) – Interstate 35 (Existing Configuration

Direction	Existing			Proposed (Alt.1)			Proposed (Alt.2)			Proposed (Alt.3)		
	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS
NB	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B
	Ramp to Waterloo Rd.	Off	C	Ramp to Waterloo Rd.[1]	Off	B	Ramp to Waterloo Rd.[1]	Off	B	Ramp to Waterloo Rd.[1]	Off	B
	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B
	Ramp from Waterloo Rd.	On	C	Ramp from Waterloo Rd.	On	B	Ramp from Waterloo Rd.	On	B	Ramp from Waterloo Rd.	On	B
	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B
SB	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C
	Ramp to Waterloo Rd.	Off	D	Ramp to Waterloo Rd.	Off	C	Ramp to Waterloo Rd.	Off	C	Ramp to Waterloo Rd.	Off	C
	Between ramps at Waterloo Rd.	Basic	C	Between ramps at Waterloo Rd.	Basic	C	North of Loop Ramp	Basic	C	Between ramps at Waterloo Rd.	Basic	C
							South of Loop Ramp	Basic	B			
	Ramp from Waterloo Rd.	On	E	Ramp from Waterloo Rd.[2]	On	C	Loop Ramp from Waterloo Rd.	On	Lane Addition[3]	Ramp from Waterloo Rd.[2]	On	C
							Ramp from Waterloo Rd.	On	C			
	South of Waterloo Rd.	Basic	E	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	C

[1] Configuration includes a two lane off ramp with the inside ramp lane being a drop lane and outside lane being a diverge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the drop lane would be a freeway lane and the outside ramp lane would handle 40%of the ramp volume.

[2] Configuration includes a two lane on ramp with the inside ramp lane being a lane addition to the freeway and outside lane being a merge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the lane addition to compromise 60%of ramp traffic and have 40%of ramp traffic use the merge lane.

[3]No merging required for lane addition; ramp governed by capacity of ramp roadway (2100 pc/hr) and upstream/downstream freeway segments

Table C-3: 2025 PM Freeway LOS (2010 HCM) – Interstate 35 (Existing Configuration

Direction	Existing			Proposed (Alt.1)			Proposed (Alt.2)			Proposed (Alt.3)		
	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS
NB	South of Waterloo Rd.	Basic	E	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	C
	Ramp to Waterloo Rd.	Off	D	Ramp to Waterloo Rd.[1]	Off	C	Ramp to Waterloo Rd.[1]	Off	C	Ramp to Waterloo Rd.[1]	Off	C
	Between ramps at Waterloo Rd.	Basic	C	Between ramps at Waterloo Rd.	Basic	C	Between ramps at Waterloo Rd.	Basic	C	Between ramps at Waterloo Rd.	Basic	C
	Ramp from Waterloo Rd.	On	E	Ramp from Waterloo Rd.	On	C	Ramp from Waterloo Rd.	On	C	Ramp from Waterloo Rd.	On	C
	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C
SB	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B	North of Waterloo Rd.	Basic	B
	Ramp to Waterloo Rd.	Off	C	Ramp to Waterloo Rd.	Off	B	Ramp to Waterloo Rd.	Off	B	Ramp to Waterloo Rd.	Off	B
	Between ramps at Waterloo Rd.	Basic	B	Between ramps at Waterloo Rd.	Basic	B	North of Loop Ramp	Basic	B	Between ramps at Waterloo Rd.	Basic	B
							South of Loop Ramp	Basic	B			
	Ramp from Waterloo Rd.	On	C	Ramp from Waterloo Rd.[2]	On	B	Loop Ramp from Waterloo Rd.	On	Lane Addition[3]	Ramp from Waterloo Rd.[2]	On	B
							Ramp from Waterloo Rd.	On	B			
	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B

[1] Configuration includes a two lane off ramp with the inside ramp lane being a drop lane and outside lane being a diverge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the drop lane would be a freeway lane and the outside ramp lane would handle 40%of the ramp volume.

[2] Configuration includes a two lane on ramp with the inside ramp lane being a lane addition to the freeway and outside lane being a merge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the lane addition to compromise 60%of ramp traffic and have 40%of ramp traffic use the merge lane.

[3]No merging required for lane addition; ramp governed by capacity of ramp roadway (2100 pc/hr) and upstream/downstream freeway segments

Table C-4: 2040 AM Freeway LOS (2010 HCM) – Interstate 35 (Existing Configuration

Direction	Existing			Proposed (Alt.1)			Proposed (Alt.2)			Proposed (Alt.3)		
	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS
NB	South of Waterloo Rd.	Basic	D	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B	South of Waterloo Rd.	Basic	B
	Ramp to Waterloo Rd.	Off	D	Ramp to Waterloo Rd.[1]	Off	B	Ramp to Waterloo Rd.[1]	Off	B	Ramp to Waterloo Rd.[1]	Off	B
	Between ramps at Waterloo Rd.	Basic	C	Between ramps at Waterloo Rd.	Basic	C	Between ramps at Waterloo Rd.	Basic	C	Between ramps at Waterloo Rd.	Basic	C
	Ramp from Waterloo Rd.	On	C	Ramp from Waterloo Rd.	On	C	Ramp from Waterloo Rd.	On	C	Ramp from Waterloo Rd.	On	C
	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C
SB	North of Waterloo Rd.	Basic	D	North of Waterloo Rd.	Basic	D	North of Waterloo Rd.	Basic	D	North of Waterloo Rd.	Basic	D
	Ramp to Waterloo Rd.	Off	E	Ramp to Waterloo Rd.	Off	D	Ramp to Waterloo Rd.	Off	D	Ramp to Waterloo Rd.	Off	D
	Between ramps at Waterloo Rd.	Basic	D	Between ramps at Waterloo Rd.	Basic	D	North of Loop Ramp	Basic	D	Between ramps at Waterloo Rd.	Basic	D
							South of Loop Ramp	Basic	C			
	Ramp from Waterloo Rd.	On	F	Ramp from Waterloo Rd.[2]	On	D	Loop Ramp from Waterloo Rd.	On	Lane Addition[3]	Ramp from Waterloo Rd.[2]	On	D
							Ramp from Waterloo Rd.	On	D			
	South of Waterloo Rd.	Basic	F	South of Waterloo Rd.	Basic	D	South of Waterloo Rd.	Basic	D	South of Waterloo Rd.	Basic	D

[1] Configuration includes a two lane off ramp with the inside ramp lane being a drop lane and outside lane being a diverge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the drop lane would be a freeway lane and the outside ramp lane would handle 40%of the ramp volume.

[2] Configuration includes a two lane on ramp with the inside ramp lane being a lane addition to the freeway and outside lane being a merge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the lane addition to compromise 60%of ramp traffic and have 40%of ramp traffic use the merge lane.

[3]No merging required for lane addition; ramp governed by capacity of ramp roadway (2100 pc/hr) and upstream/downstream freeway segments

Table C-6: 2040 PM Freeway LOS (2010 HCM) – Interstate 35 (Existing Configuration

Direction	Existing			Proposed (Alt.1)			Proposed (Alt.2)			Proposed (Alt.3)		
	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS	I-35 Segment	Type	LOS
NB	South of Waterloo Rd.	Basic	F	South of Waterloo Rd.	Basic	D	South of Waterloo Rd.	Basic	D	South of Waterloo Rd.	Basic	D
	Ramp to Waterloo Rd.	Off	F	Ramp to Waterloo Rd.[1]	Off	C	Ramp to Waterloo Rd.[1]	Off	C	Ramp to Waterloo Rd.[1]	Off	C
	Between ramps at Waterloo Rd.	Basic	D	Between ramps at Waterloo Rd.	Basic	D	Between ramps at Waterloo Rd.	Basic	D	Between ramps at Waterloo Rd.	Basic	D
	Ramp from Waterloo Rd.	On	D	Ramp from Waterloo Rd.	On	D	Ramp from Waterloo Rd.	On	D	Ramp from Waterloo Rd.	On	D
	North of Waterloo Rd.	Basic	D	North of Waterloo Rd.	Basic	D	North of Waterloo Rd.	Basic	D	North of Waterloo Rd.	Basic	D
	Ramp to Waterloo Rd.	Off	C	Ramp to Waterloo Rd.	Off	C	Ramp to Waterloo Rd.	Off	C	Ramp to Waterloo Rd.	Off	C
	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C	North of Waterloo Rd.	Basic	C
	Between ramps at Waterloo Rd.	Basic	C	Between ramps at Waterloo Rd.	Basic	C	North of Loop Ramp	Basic	C	Between ramps at Waterloo Rd.	Basic	C
							South of Loop Ramp	Basic	B			
	Ramp from Waterloo Rd.	On	D	Ramp from Waterloo Rd.[2]	On	B	Loop Ramp from Waterloo Rd.	On	Lane Addition[3]	Ramp from Waterloo Rd.[2]	On	B
							Ramp from Waterloo Rd.	On	C			
	South of Waterloo Rd.	Basic	D	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	C	South of Waterloo Rd.	Basic	C

[1] Configuration includes a two lane off ramp with the inside ramp lane being a drop lane and outside lane being a diverge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the drop lane would be a freeway lane and the outside ramp lane would handle 40%of the ramp volume.

[2] Configuration includes a two lane on ramp with the inside ramp lane being a lane addition to the freeway and outside lane being a merge movement. HCM methodology is not equipped to yield LOS from this configuration. However, an estimate was generated by assuming the lane addition to compromise 60%of ramp traffic and have 40%of ramp traffic use the merge lane.

[3]No merging required for lane addition; ramp governed by capacity of ramp roadway (2100 pc/hr) and upstream/downstream freeway segments

Table C-7: 2014 No Build (AM) Capacity Analysis – HCM 2010 Results

Unsignalized Junctions							
		Actual Volumes			Design Volumes		
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Sooner Road	Stop Sign	25	C	6	66	F	17
Waterloo Road at Boucher Road	Stop Sign	19	C	0	21	C	0
Waterloo Road at Frontage Road	Stop Sign	17	C	0	20	C	0
Waterloo Road at I-35 SB Ramps	Stop Sign	43	E	13	59	F	23
Waterloo Road at I-35 NB Ramps	Stop Sign	19	C	4	59	F	14
Waterloo Road at Industrial Road	Stop Sign	13	B	0	21	C	0
Waterloo Road at Air Depot Road	Stop Sign	16	C	1	20	C	0
Total Unsignalized Delay (veh-hr)				**24**			**55**
Total Intersection Delay (veh-hr)		**24**			**55**		

*Critical approach only

+Entire junction, including uncontrolled movements

Table C-8: 2014 No Build (AM) Capacity Analysis – Simulation Results

Unsignalized Junctions							
		Actual Volumes			Design Volumes		
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Sooner Road	Stop Sign	47	E	10	202	F	38
Waterloo Road at Boucher Road	Stop Sign	111	F	23	73	F	17
Waterloo Road at Frontage Road	Stop Sign	65	F	13	49	E	12
Waterloo Road at I-35 SB Ramps	Stop Sign	47	E	15	89	F	29
Waterloo Road at I-35 NB Ramps	Stop Sign	15	B	3	49	F	11
Waterloo Road at Industrial Road	Stop Sign	15	B	1	1904	F	120
Waterloo Road at Air Depot Road	Stop Sign	17	C	1	317	F	62
Total Unsignalized Delay (veh-hr)				**65**			**289**
Total Intersection Delay (veh-hr)		**65**			**289**		

*Critical approach only

+Entire junction, including uncontrolled movements

Table C-9: 2014 No Build (PM) Capacity Analysis – HCM 2010 Results

Unsignalized Junctions							
		Actual Volumes			Design Volumes		
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Sooner Road	Stop Sign	60	F	12	59	F	14
Waterloo Road at Boucher Road	Stop Sign	15	C	0	17	C	0
Waterloo Road at Frontage Road	Stop Sign	15	B	0	18	C	0
Waterloo Road at I-35 SB Ramps	Stop Sign	57	F	12	57	F	15
Waterloo Road at I-35 NB Ramps	Stop Sign	61	F	12	67	F	17
Waterloo Road at Industrial Road	Stop Sign	26	D	1	27	D	1
Waterloo Road at Air Depot Road	Stop Sign	17	C	0	21	C	1
Total Unsignalized Delay (veh-hr)				**38**			**48**
Total Intersection Delay (veh-hr)		**38**			**48**		

*Critical approach only

+Entire junction, including uncontrolled movements

Table C-10: 2040 No Build (PM) Capacity Analysis – Simulation Results

Unsignalized Junctions							
		Actual Volumes			Design Volumes		
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Sooner Road	Stop Sign	55	F	10	29	D	7
Waterloo Road at Boucher Road	Stop Sign	12	B	1	15	C	1
Waterloo Road at Frontage Road	Stop Sign	18	C	1	21	C	1
Waterloo Road at I-35 SB Ramps	Stop Sign	39	E	8	55	F	13
Waterloo Road at I-35 NB Ramps	Stop Sign	54	F	10	210	F	50
Waterloo Road at Industrial Road	Stop Sign	44	E	2	127	F	7
Waterloo Road at Air Depot Road	Stop Sign	19	C	1	19	C	1
Total Unsignalized Delay (veh-hr)				**33**			**80**
Total Intersection Delay (veh-hr)		**33**			**80**		

*Critical approach only

+Entire junction, including uncontrolled movements

Table C-11: 2040 AM Capacity Analysis (No Build and Build) – HCM 2010 Results

Signalized Junctions													
		Existing			Alt. 1			Alt. 2			Alt. 3		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	279	F	203	35	D	26	35	D	26	22	C	16
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	126	F	114	23	C	20	14	B	13	17	B	16
Waterloo Road at I-35 SB Ramps	Signal	577	F	622	28	C	30	2	A	2	9	A	10
Waterloo Road at I-35 NB Ramps	Signal	441	F	345	12	B	9	15	B	11	24	C	19
Waterloo Road at Industrial Road	Signal	See Unsignalized			4	A	2	4	A	2	5	A	3
Total Signalized Delay (veh-hr)				**1283**			**88**			**54**			**63**
Unsignalized Junctions													
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Industrial Road	Stop Sign	360	F	10	See Signalized			See Signalized			See Signalized		
Waterloo Road at Air Depot Road	Stop Sign	1006	F	19	25	D	1	39	E	1	39	E	1
Waterloo Road at Trinity Driveway #3	Stop Sign	82	F	2	22	C	1	20	C	1	33	D	1
Waterloo Road at Trinity Driveway #2	Stop Sign	83	F	2	23	C	1	18	C	1	36	E	1
Total Unsignalized Delay (veh-hr)				**32**			**2**			**2**			**3**
Total Intersection Delay (veh-hr)		**1316**			**90**			**57**			**66**		

*Critical approach only

+Entire junction, including uncontrolled movements

Table C-12: 2040 AM Capacity Analysis (No Build and Build) – Simulation Results

Signalized Junctions													
		Existing			Alt. 1			Alt. 2			Alt. 3		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	924	F	672	20	B	14	25	C	18	19	B	14
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	71	E	64	23	C	21	23	C	21	20	B	18
Waterloo Road at I-35 SB Ramps	Signal	90	F	97	16	B	18	9	A	7	12	B	13
Waterloo Road at I-35 NB Ramps	Signal	624	F	488	22	C	17	23	C	18	26	C	20
Waterloo Road at Industrial Road	Signal	See Unsignalized			7	A	4	9	A	5	13	B	7
Total Signalized Delay (veh-hr)				**1321**			**75**			**69**			**72**
Unsignalized Junctions													
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Industrial Road	Stop Sign	536	F	152	See Signalized			See Signalized			See Signalized		
Waterloo Road at Air Depot Road	Stop Sign	934	F	355	56	F	2	41	E	2	113	F	3
Waterloo Road at Trinity Driveway #3	Stop Sign	2064	F	78	42	E	4	33	D	5	41	E	4
Waterloo Road at Trinity Driveway #2	Stop Sign	2901	F	92	79	F	6	50	F	7	49	E	5
Total Unsignalized Delay (veh-hr)				**676**			**11**			**15**			**12**
Total Intersection Delay (veh-hr)		**1998**			**86**			**84**			**84**		

*Critical approach only

+Entire junction, including uncontrolled movements

Table C-13: 2040 PM Capacity Analysis (No Build and Build) – HCM 2010 Results

Signalized Junctions													
		Existing			Alt. 1			Alt. 2			Alt. 3		
Intersection	Control	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)	Delay (sec/veh)	LOS	Delay (veh-hr)
Waterloo Road at Sooner Road	Signal	318	F	236	23	C	17	21	C	15	23	C	17
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	174	F	164	27	C	23	27	C	23	39	D	33
Waterloo Road at I-35 SB Ramps	Signal	391	F	381	8	A	8	2	A	2	8	A	8
Waterloo Road at I-35 NB Ramps	Signal	370	F	333	32	C	28	27	C	24	27	C	24
Waterloo Road at Industrial Road	Signal	See Unsignalized			8	A	4	5	A	3	7	A	4
Total Signalized Delay (veh-hr)				**1114**			**80**			**67**			**87**
Unsignalized Junctions													
Intersection	Control	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+	Delay (sec/veh)*	LOS*	Delay (veh-hr)+
Waterloo Road at Industrial Road	Stop Sign	800	F	40	See Signalized			See Signalized			See Signalized		
Waterloo Road at Air Depot Road	Stop Sign	838	F	30	25	D	1	24	C	1	25	C	1
Waterloo Road at Trinity Driveway #3	Stop Sign	152	F	7	22	C	1	22	C	1	22	C	1
Waterloo Road at Trinity Driveway #2	Stop Sign	2601	F	102	23	C	1	22	C	1	22	C	1
Total Unsignalized Delay (veh-hr)				**178**			**3**			**3**			**3**
Total Intersection Delay (veh-hr)		**1292**			**84**			**71**			**90**		

*Critical approach only

+Entire junction, including uncontrolled movements

Table C-14: 2040 PM Capacity Analysis (No Build and Build) – Simulation Results

Signalized Junctions

		Existing			Alt. 1			Alt. 2			Alt. 3		
Intersection	**Control**	**Delay (sec/veh)**	**LOS**	**Delay (veh-hr)**	**Delay (sec/veh)**	**LOS**	**Delay (veh-hr)**	**Delay (sec/veh)**	**LOS**	**Delay (veh-hr)**	**Delay (sec/veh)**	**LOS**	**Delay (veh-hr)**
Waterloo Road at Sooner Road	Signal	647	F	480	19	B	14	18	B	13	19	B	14
Waterloo Road at Boucher Road/Trinity Driveway #1	Signal	226	F	213	20	C	17	18	B	16	18	B	16
Waterloo Road at I-35 SB Ramps	Signal	595	F	580	15	B	14	8	A	7	12	B	11
Waterloo Road at I-35 NB Ramps	Signal	644	F	579	25	C	22	25	C	22	20	B	18
Waterloo Road at Industrial Road	Signal	See Unsignalized			8	A	5	9	A	5	6	A	3
Total Signalized Delay (veh-hr)				**1852**			**73**			**63**			**62**

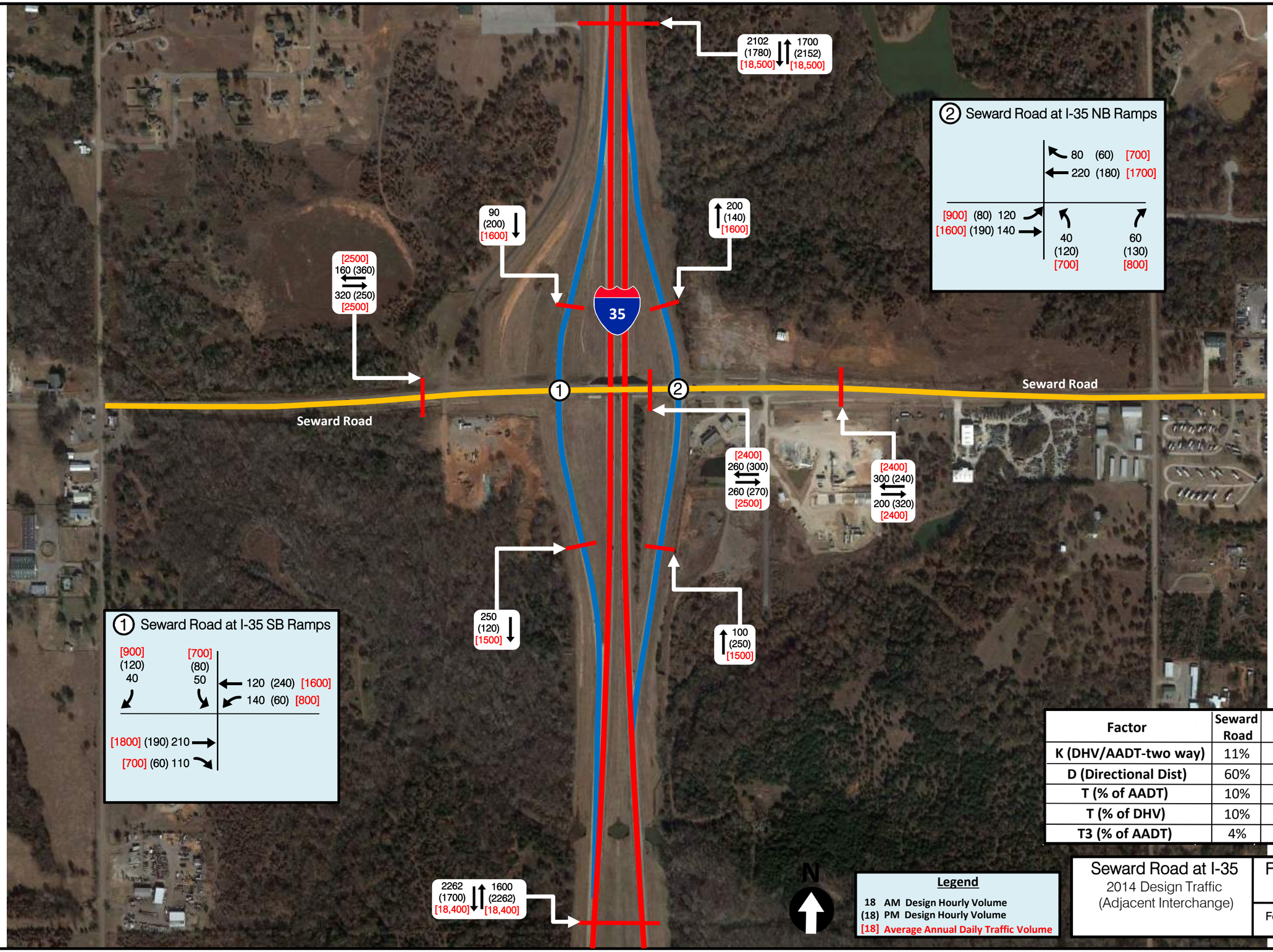
Unsignalized Junctions

Intersection	**Control**	**Delay (sec/veh)***	**LOS***	**Delay (veh-hr)+**	**Delay (sec/veh)***	**LOS***	**Delay (veh-hr)+**	**Delay (sec/veh)***	**LOS***	**Delay (veh-hr)+**	**Delay (sec/veh)***	**LOS***	**Delay (veh-hr)+**
Waterloo Road at Industrial Road	Stop Sign	2159	F	191	See Signalized			See Signalized			See Signalized		
Waterloo Road at Air Depot Road	Stop Sign	586	F	74	61	F	3	53	F	3	71	F	4
Waterloo Road at Trinity Driveway #3	Stop Sign	2612	F	159	322	F	16	209	F	11	207	F	11
Waterloo Road at Trinity Driveway #2	Stop Sign	2932	F	174	184	F	11	153	F	9	104	F	7
Total Unsignalized Delay (veh-hr)				**597**			**30**			**23**			**22**
Total Intersection Delay (veh-hr)		**2449**			**103**			**86**			**84**		

*Critical approach only

+Entire junction, including uncontrolled movements

Appendix D – Updated Traffic Volumes



② Seward Road at I-35 NB Ramps

80 (60) [700]
220 (180) [1700]
[900] (80) 120
[1600] (190) 140
40
(120)
[700]
60
(130)
[800]

① Seward Road at I-35 SB Ramps

[900]
(120)
40
[700]
(80)
50
120 (240) [1600]
140 (60) [800]
[1800] (190) 210
[700] (60) 110

Factor	Seward Road	I-35
K (DHV/AADT-two way)	11%	11%
D (Directional Dist)	60%	65%
T (% of AADT)	10%	16%
T (% of DHV)	10%	13%
T3 (% of AADT)	4%	11%

Legend

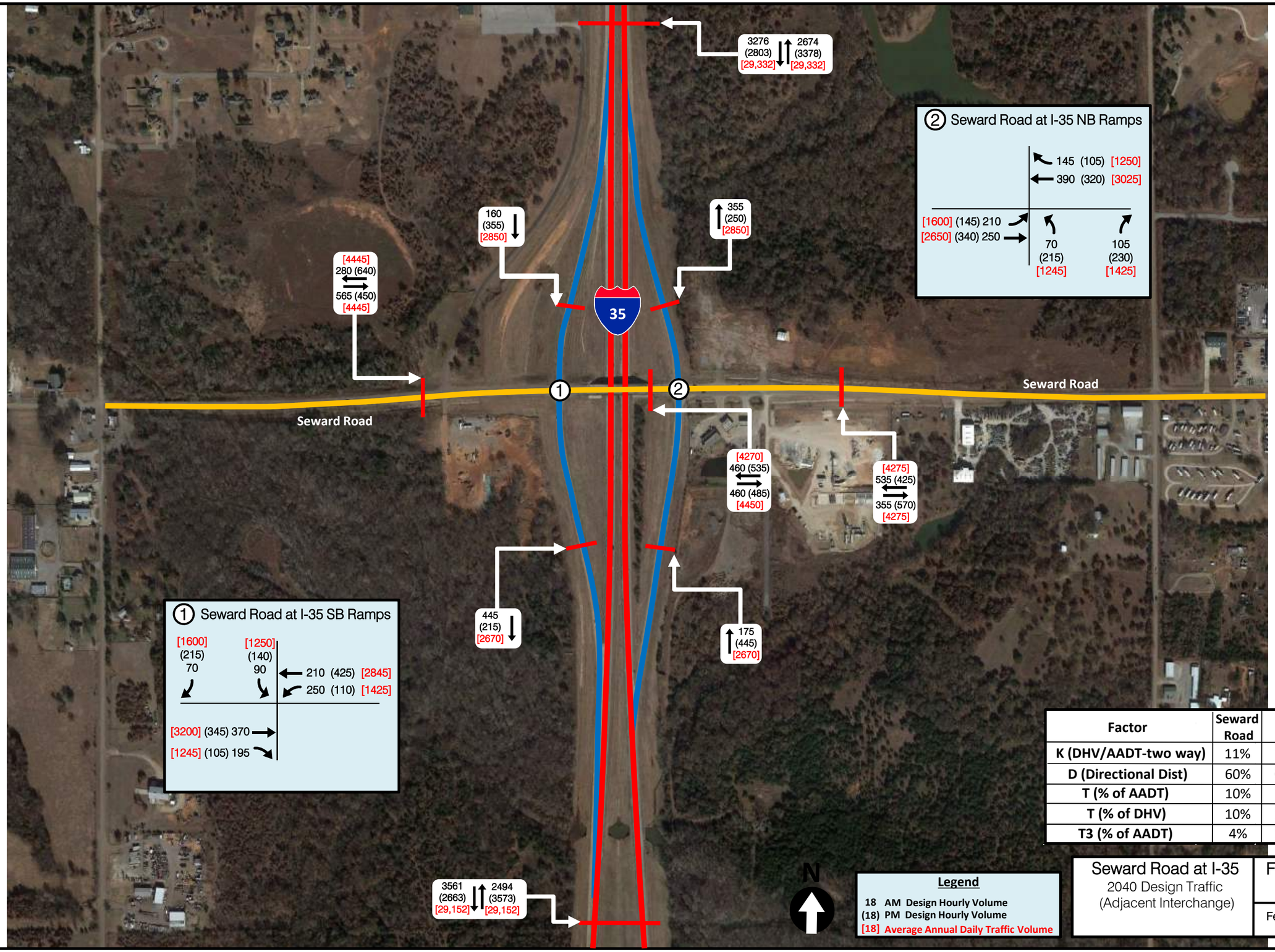
18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Seward Road at I-35
2014 Design Traffic
(Adjacent Interchange)

Figure D-1

Feb 2019

GARVER



Factor	Seward Road	I-35
K (DHV/AADT-two way)	11%	11%
D (Directional Dist)	60%	65%
T (% of AADT)	10%	16%
T (% of DHV)	10%	13%
T3 (% of AADT)	4%	11%

Legend

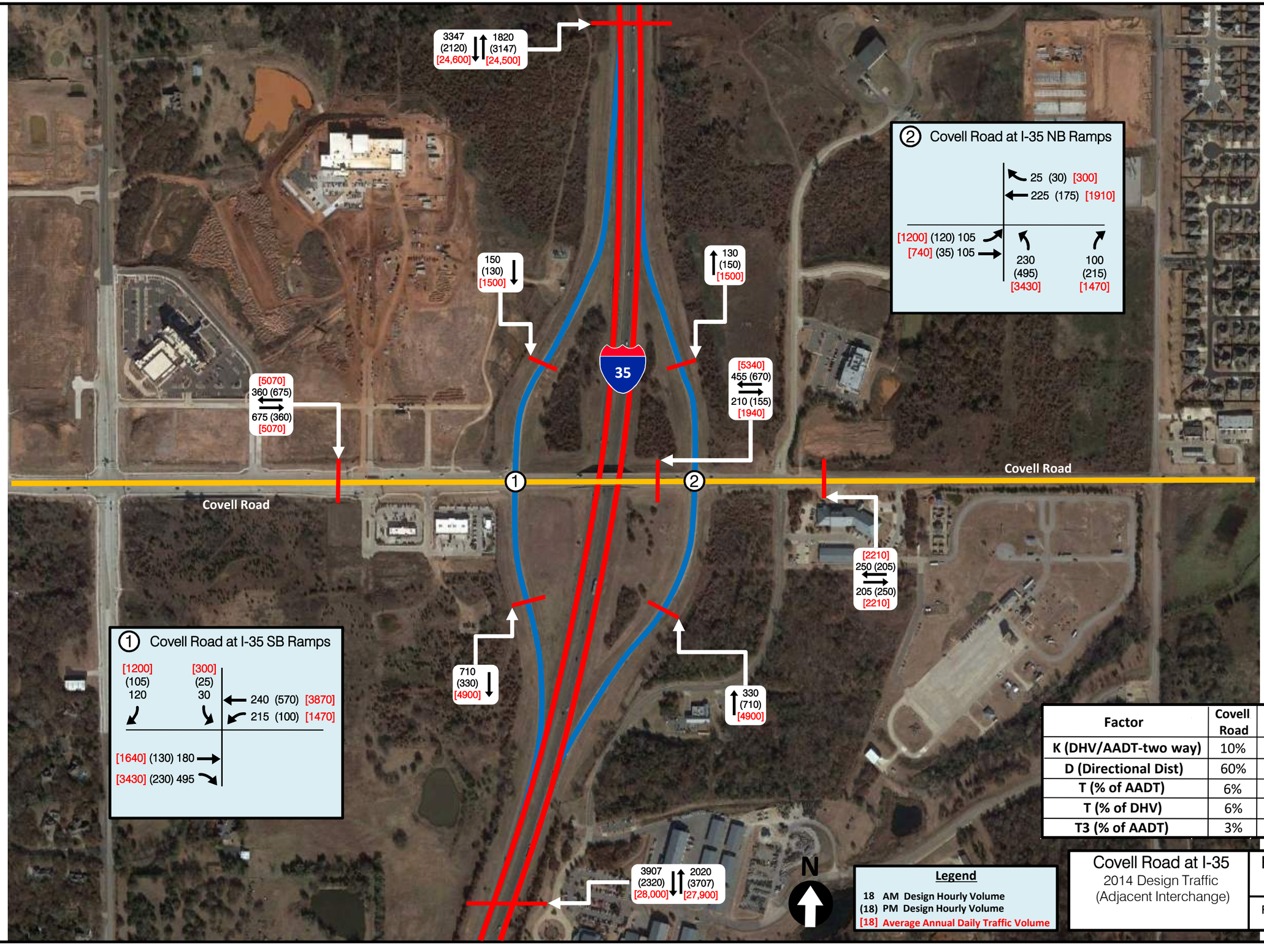
18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Seward Road at I-35
2040 Design Traffic
(Adjacent Interchange)

Figure D-2

Feb 2019

GARVER



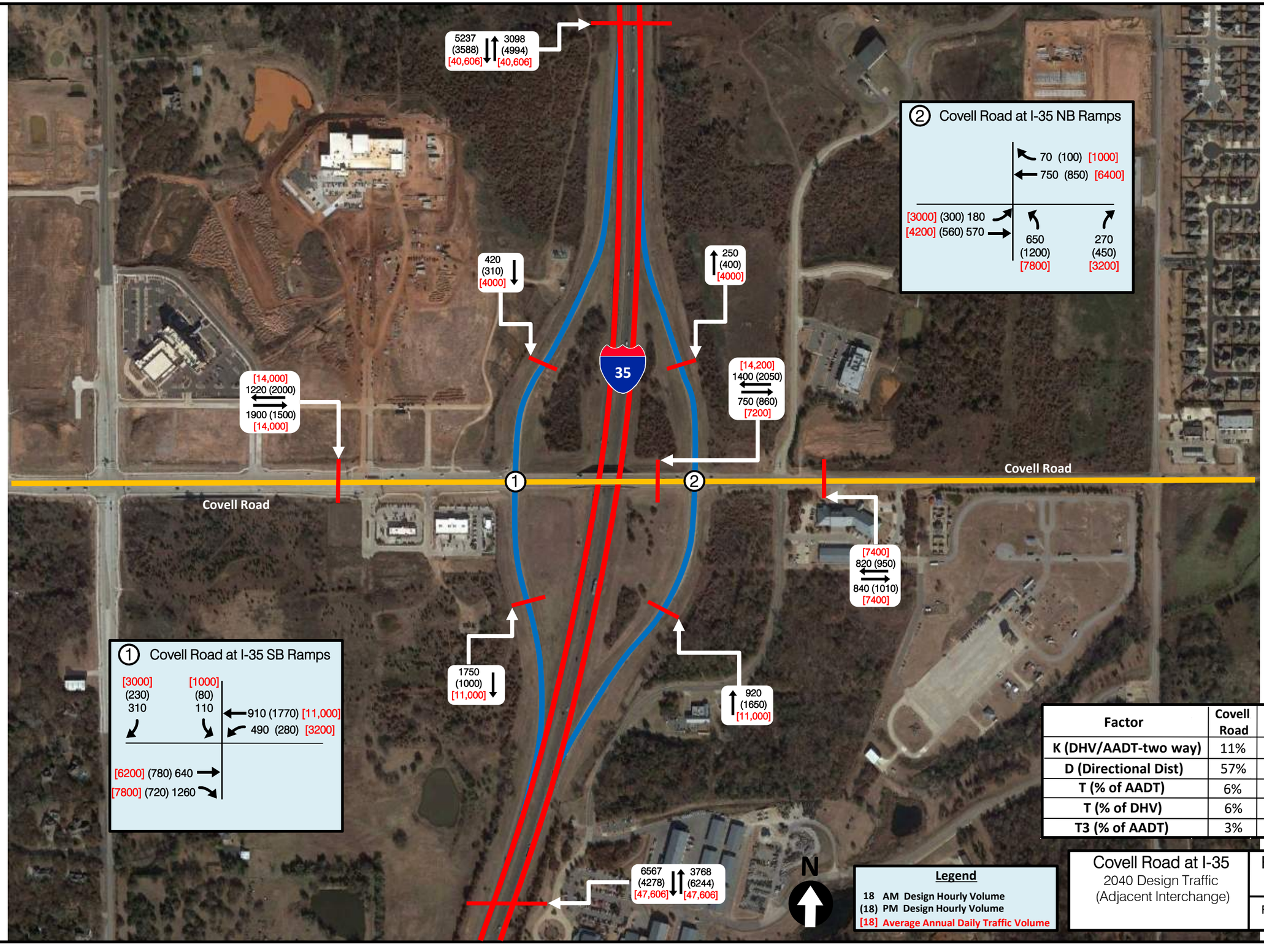
Factor	Covell Road	I-35
K (DHV/AADT-two way)	10%	11%
D (Directional Dist)	60%	65%
T (% of AADT)	6%	16%
T (% of DHV)	6%	13%
T3 (% of AADT)	3%	11%

Covell Road at I-35
2014 Design Traffic
(Adjacent Interchange)

Figure D-3

Feb 2019

GARVER



Factor	Covell Road	I-35
K (DHV/AADT-two way)	11%	11%
D (Directional Dist)	57%	65%
T (% of AADT)	6%	16%
T (% of DHV)	6%	13%
T3 (% of AADT)	3%	11%

Legend

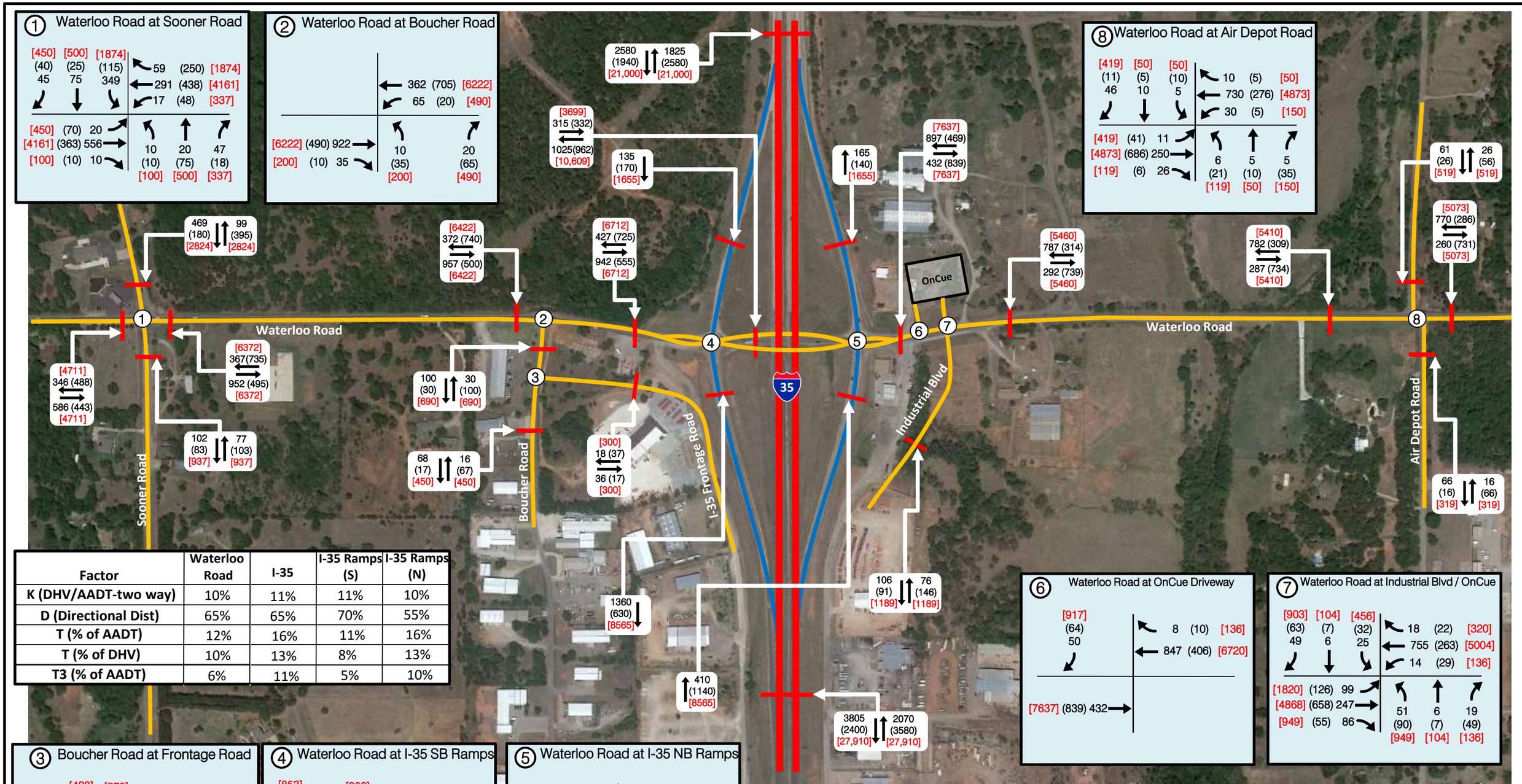
18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Covell Road at I-35
2040 Design Traffic
(Adjacent Interchange)

Figure D-4

Feb 2019

GARVER



Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

Waterloo Road at I-35
2021 Design Traffic
Alternative 3
Diverging Diamond

Figure D-5

Dec 2017

GARVER

Trinity Mixed Use Development

Waterloo Road

Driveway #3

Driveway #2

Driveway #1

Sooner Road

Boucher Road

I-35 Frontage Road

Industrial Blvd

Air Depot Road

OnCue

I-35

① Waterloo Road at Sooner Road

[801] (78) 66 | [620] (38) 86 | [2850] (202) 424
136 (331) [2850]
349 (552) [5182]
30 (74) [577]
[801] (95) 50
[5182] (439) 669
[100] (10) 10
10 (10) [100]
37 (88) [620]
71 (33) [577]

② Waterloo Road at Boucher Road

[814] (84) 42 | [120] (13) 6 | [2538] (269) 131
237 (168) [2538]
545 (851) [8119]
67 (17) [490]
[814] (54) 73
[8119] (697) 1061
[220] (7) 32
7 (32) [220]
12 (8) [120]
17 (67) [490]

③ Boucher Road at Frontage Road

[500] (19) 70 | [330] (19) 35
18 (36) [330]
3 (3) [30]
18 (71) [500]
3 (3) [30]

④ Waterloo Road at I-35 SB Ramps

[1648] (145) 143 | [852] (84) 68
706 (891) [9499]
714 (348) [5051]
[5145] (497) 377
[6002] (536) 832

⑤ Waterloo Road at I-35 NB Ramps

78 (74) [872]
1018 (510) [8567]
[1628] (152) 134
[4369] (428) 311
406 (729) [5982]
214 (618) [5071]

⑥ Waterloo Road at OnCue Driveway

[917] (64) 50
8 (10) [136]
1047 (520) [8522]
[9439] (1046) 526

⑦ Waterloo Road at Industrial Blvd / OnCue

[903] (63) 49 | [104] (7) 6 | [456] (32) 25
18 (22) [320]
948 (368) [6696]
14 (29) [136]
[1820] (126) 99
[6560] (854) 333
[1059] (67) 94
57 (99) [1059]
6 (7) [104]
19 (49) [136]

⑧ Waterloo Road at Air Depot Road

[649] (23) 64 | [50] (5) 10 | [50] (10) 5
10 (5) [50]
893 (358) [6214]
35 (5) [200]
[649] (66) 21
[6214] (844) 319
[239] (20) 32
18 (34) [239]
5 (10) [50]
5 (35) [200]

⑨ Waterloo Road at Driveway #3

[321] (33) 16 | [659] (69) 34
59 (44) [659]
504 (929) [8339]
[321] (22) 28
[8339] (658) 1142

⑩ Waterloo Road at Driveway #2

[409] (43) 21 | [564] (59) 29
52 (37) [564]
542 (930) [8589]
[409] (27) 38
[8589] (699) 1137

Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

N

Legend

18 AM Design Hourly Volume
(18) PM Design Hourly Volume
[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35
2025 Design Traffic
Alternative 3
Diverging Diamond

Figure D-6

Dec 2017

GARVER

Trinity Mixed Use Development

Waterloo Road

Driveway #3

Driveway #2

Driveway #1

Sooner Road

Boucher Road

I-35 Frontage Road

Industrial Blvd

Air Depot Road

OnCue

I-35

755 (486) [6218] 357 (691) [6218]

100 (202) [1960] 174 (131) [1960]

100 (205) [1946] 180 (129) [1946]

359 (733) [6944] 644 (461) [6944]

[8915] 622 (890) 1992 (1686) [20,369]

3561 (2663) [29,152] 2494 (3573) [29,152]

307 (313) [3595]

[12,985] 881 (1325) 1545 (1107) [12.,985]

[16,812] 1342 (1477) 1647 (1605) [16,812]

[12,332] 1445 (769) 679 (1394) [12,332]

285 (333) [3595]

[9874] 1318 (585) 523 (1270) [9874]

[9824] 1313 (580) 518 (1265) [9824]

117 (60) [979] 55 (121) [979]

[8836] 1251 (514) 459 (1197) [8836]

[8305] 570 (883) 987 (725) [8305]

[11,948] 728 (1309) 1547 (943) [11,948]

[12,674] 819 (1337) 1564 (1042) [12,674]

130 (59) [1040] 56 (133) [1040]

170 (182) [1908] 175 (179) [1908]

86 (33) [650] 32 (88) [650]

[470] 32 (53) 51 (33) [470]

1983 (1238) [15,050]

889 (1754) [15,050]

132 (120) [1569] 103 (179) [1569]

5237 (3588) [40,606] 3098 (4994) [40,606]

104 (48) [709] 45 (107) [709]

④ Waterloo Road at I-35 SB Ramps

[2644] (214) 229

[952] (99) 78

[7963] (791) 543

[8849] (815) 1103

1113 (1263) [14168]

879 (423) [6201]

⑤ Waterloo Road at I-35 NB Ramps

[2614] (249) 192

[6301] (641) 430

93 (84) [982]

1352 (685) [11,350]

640 (1001) [9019]

249 (753) [6031]

⑥ Waterloo Road at OnCue Driveway

[917] (64) 50

8 (10) [136]

1396 (705) [11,415]

[12,332] (1394) 679

① Waterloo Road at Sooner Road

[1201] (121) 92

[890] (57) 108

[4127] (309) 555

218 (452) [4127]

463 (747) [6954]

48 (111) [868]

[1201] (129) 85

[6954] (581) 886

[150] (15) 15

15 (15) [150]

54 (111) [890]

105 (54) [868]

② Waterloo Road at Boucher Road

[1628] (169) 83

[240] (27) 13

[5076] (538) 263

474 (336) [5076]

792 (1115) [11146]

76 (26) [590]

[1628] (109) 146

[11146] (992) 1358

[210] (6) 41

6 (41) [210]

24 (16) [240]

26 (76) [590]

③ Boucher Road at Frontage Road

[610] (29) 82

[430] (29) 47

28 (49) [430]

4 (4) [40]

28 (84) [610]

4 (4) [40]

⑨ Waterloo Road at Driveway #3

[642] (65) 32

[1318] (137) 67

119 (88) [1318]

701 (1249) [11356]

[642] (43) [11356]

55 (905) 1496

⑩ Waterloo Road at Driveway #2

[818] (87) 42

[1128] (119) 58

104 (75) [1128]

777 (1250) [11,857]

[818] (54) [11,857]

77 (988) 1487

⑦ Waterloo Road at Industrial Blvd / OnCue

[903] (63) 49

[104] (7) 6

[456] (32) 25

18 (22) [320]

1281 (534) [9369]

19 (29) [186]

[1820] (126) 99

[9232] (1185) 473

[1279] (83) 107

73 (118) [1279]

6 (7) [104]

24 (54) [186]

⑧ Waterloo Road at Air Depot Road

[879] (40) 92

[50] (5) 15

[50] (15) 10

15 (10) [50]

1191 (494) [8536]

45 (10) [250]

[879] (96) 35

[8536] (1137) 439

[409] (33) 44

30 (47) [409]

5 (15) [50]

10 (45) [250]

Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of AADT)	12%	16%	11%	16%
T (% of DHV)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

N

Legend

18 AM Design Hourly Volume

(18) PM Design Hourly Volume

[18] Average Annual Daily Traffic Volume

Waterloo Road at I-35

2040 Design Traffic

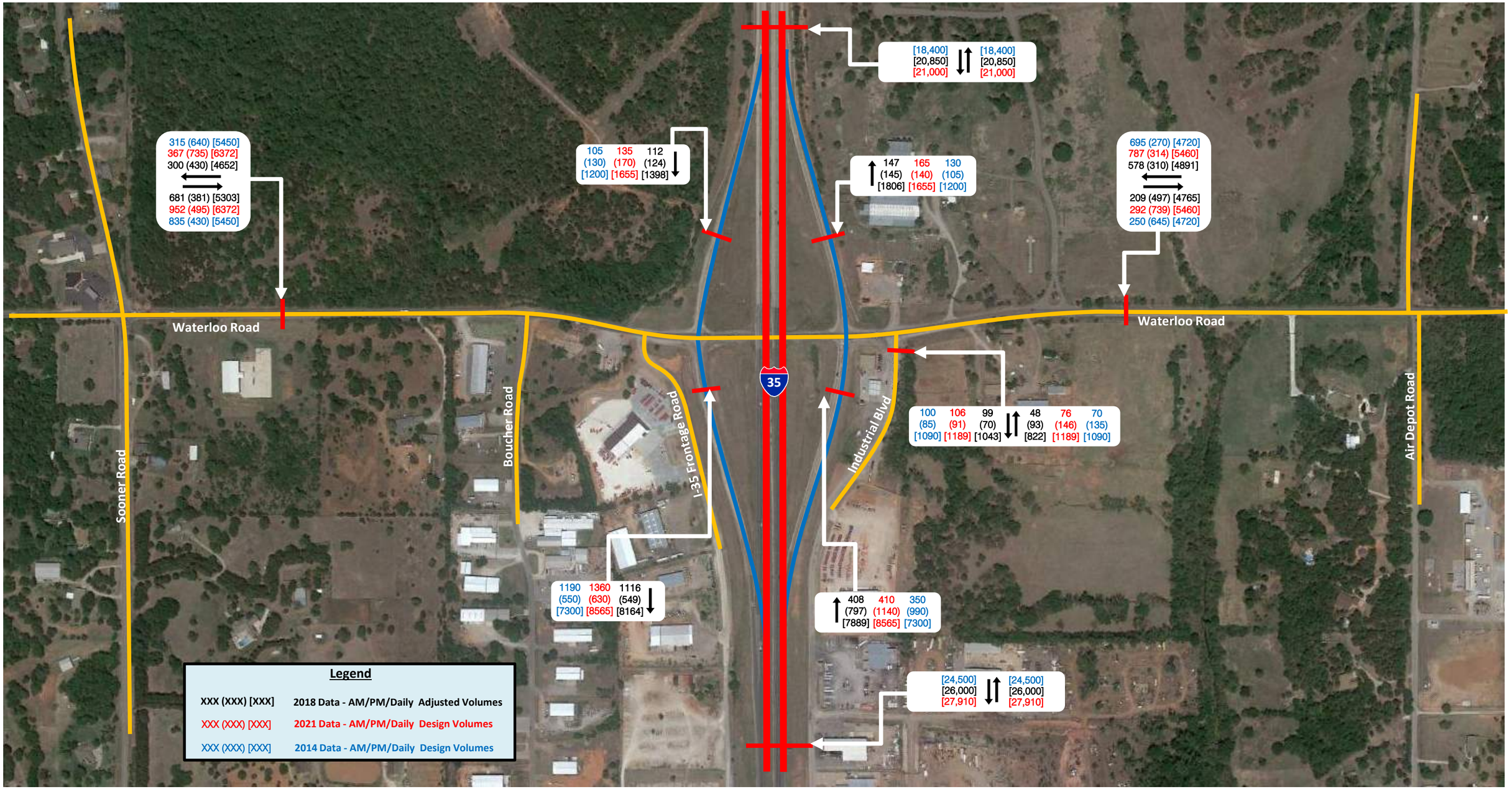
Alternative 3

Diverging Diamond

Figure D-7

Dec 2017

GARVER



N

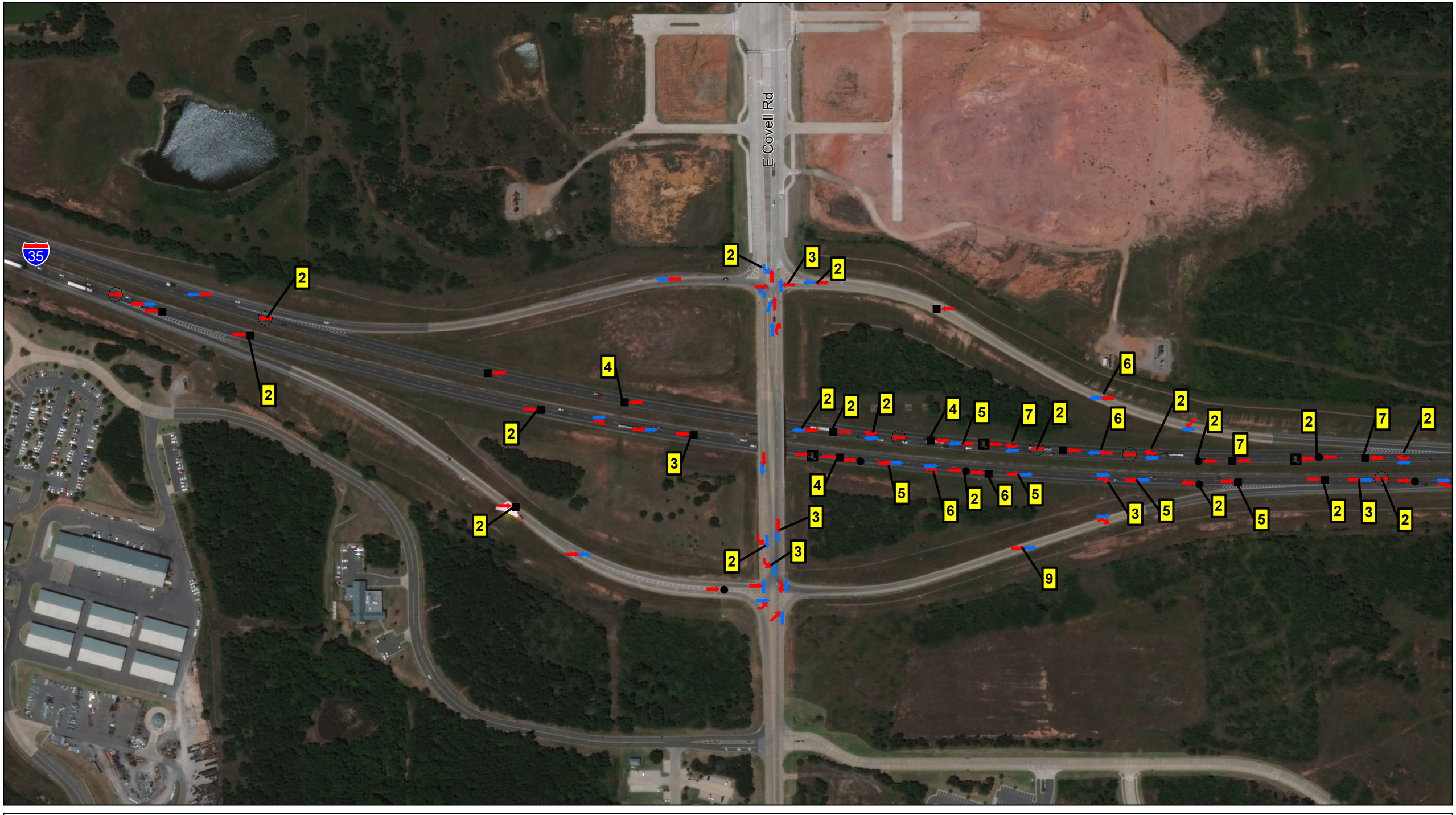
Waterloo Road at I-35
Adjusted 2018 Volumes and 2014/2021 Design Traffic Comparison

Figure D-8

Jan 2019

GARVER

Appendix E – Crash Data



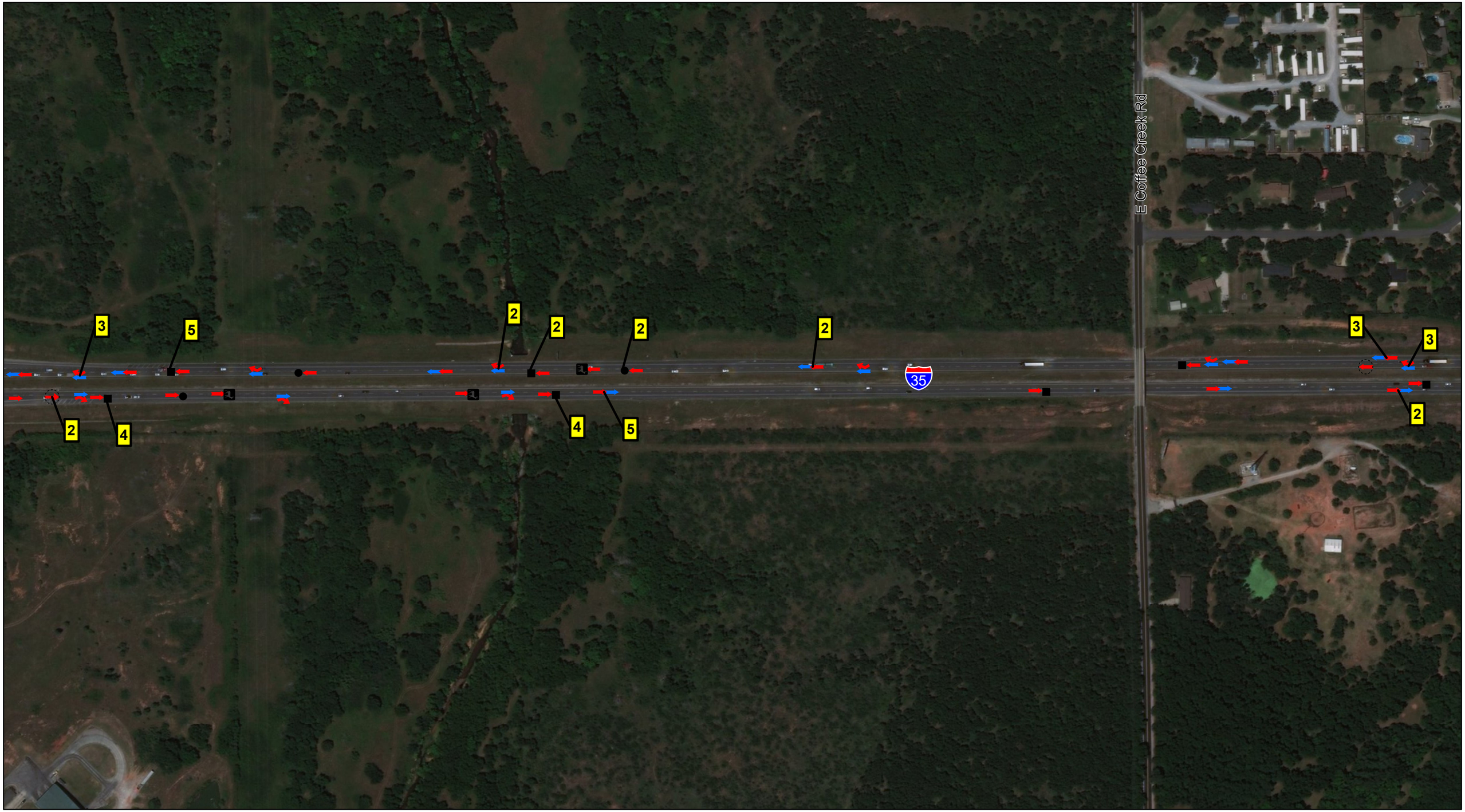
I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-1

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- # Number for Multiple Crashes

0 0.025 0.05
Miles



I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-2

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles

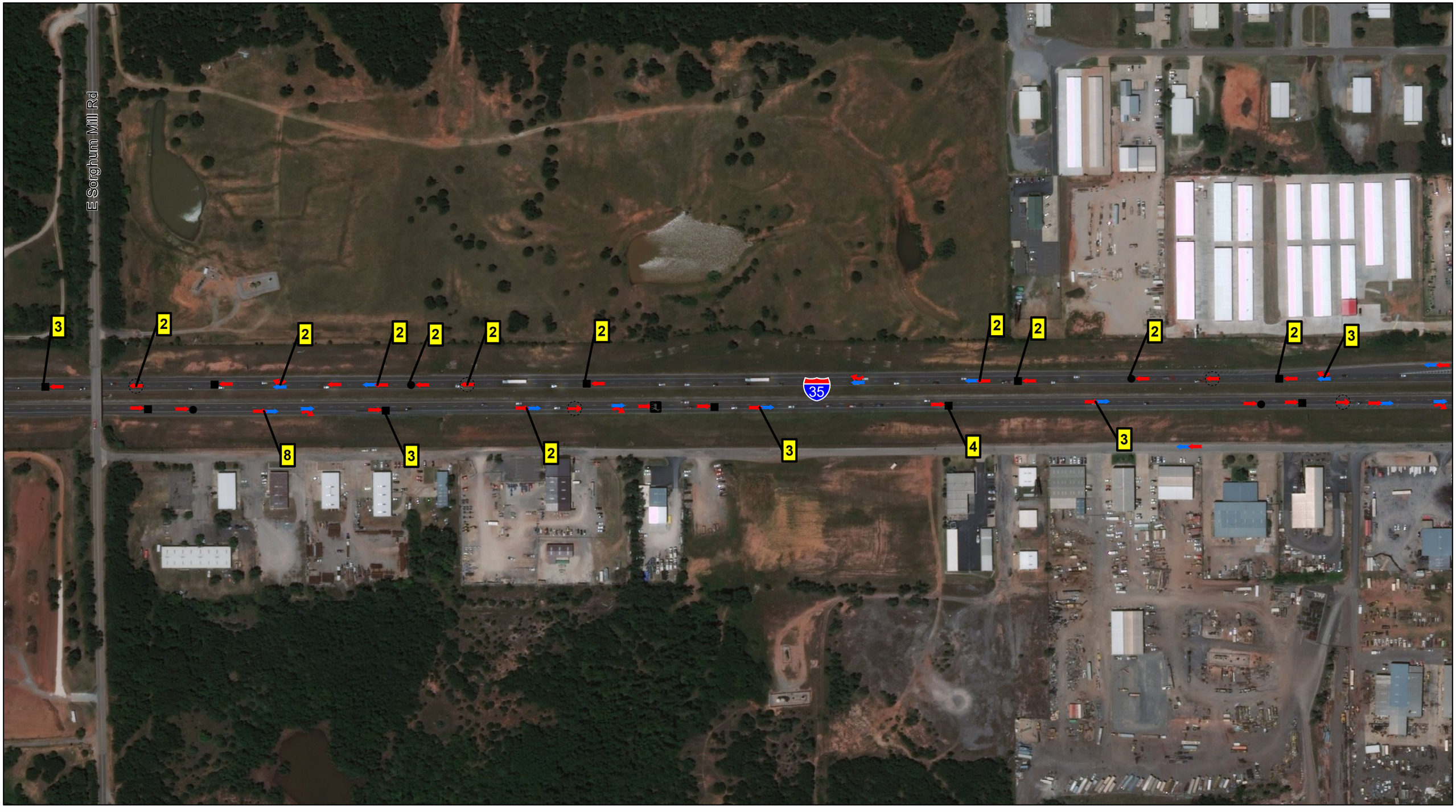
I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-3

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles



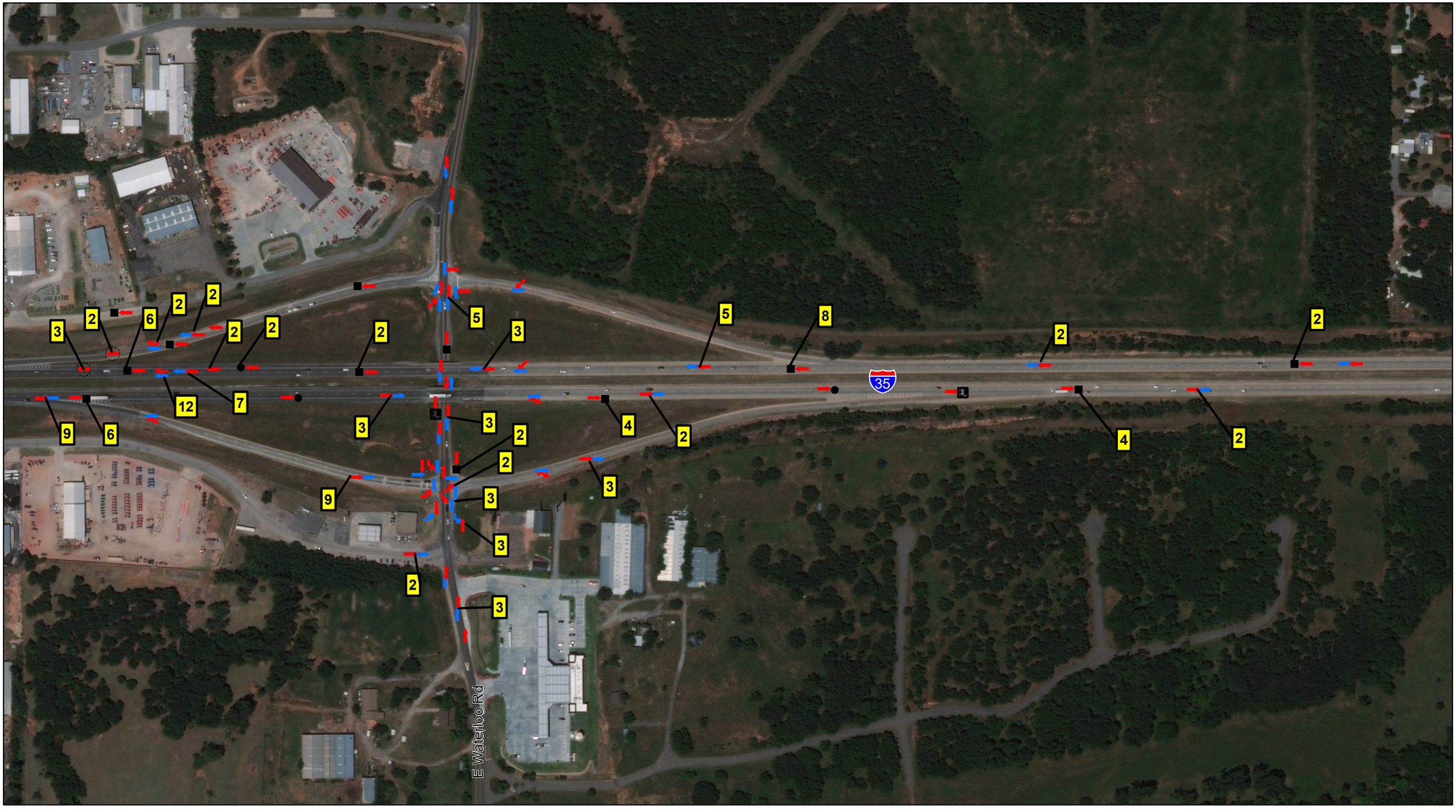
I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-4

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles



I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-5

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles

I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-6

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles

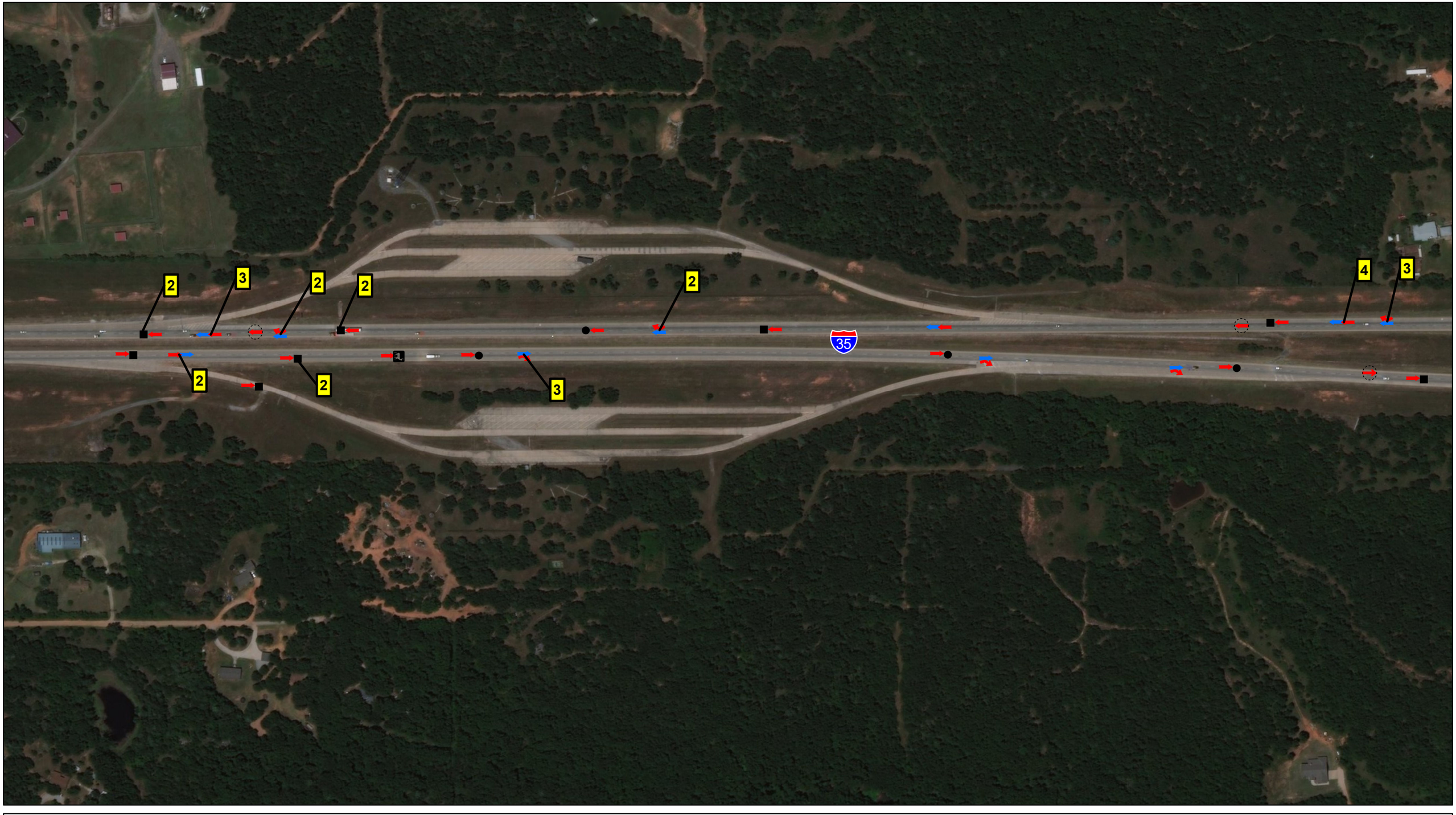
I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-7

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles



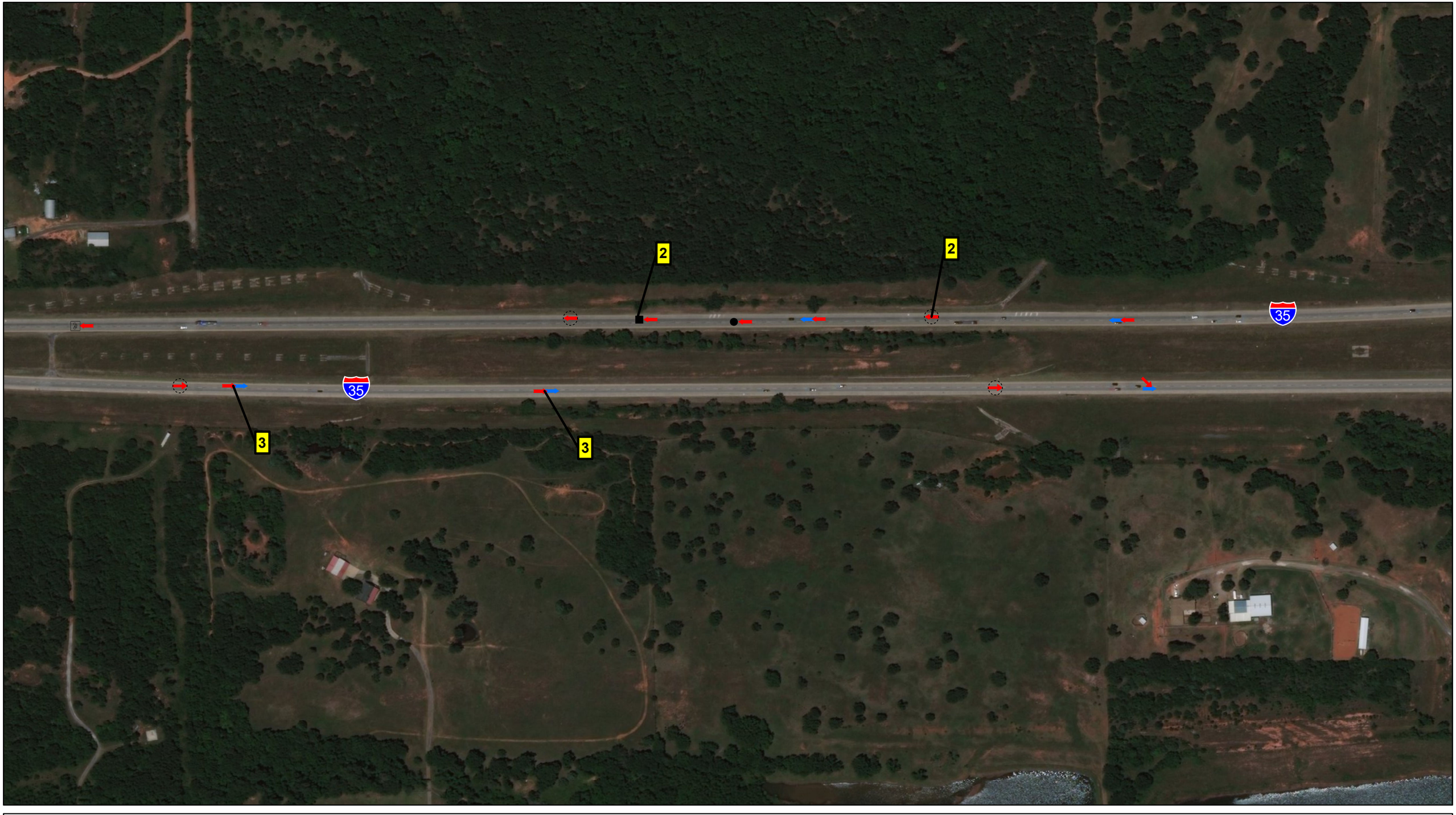
I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-8

Legend

Angle Turning	Backing	Sideswipe Opposite	Other	Animal	
Fixed Object	Right Angle	Sideswipe Same	Pedestrian	Rollover	
Head On	Rear End	Single Vehicle	Bicycle	#	Number for Multiple Crashes

0 0.025 0.05
Miles



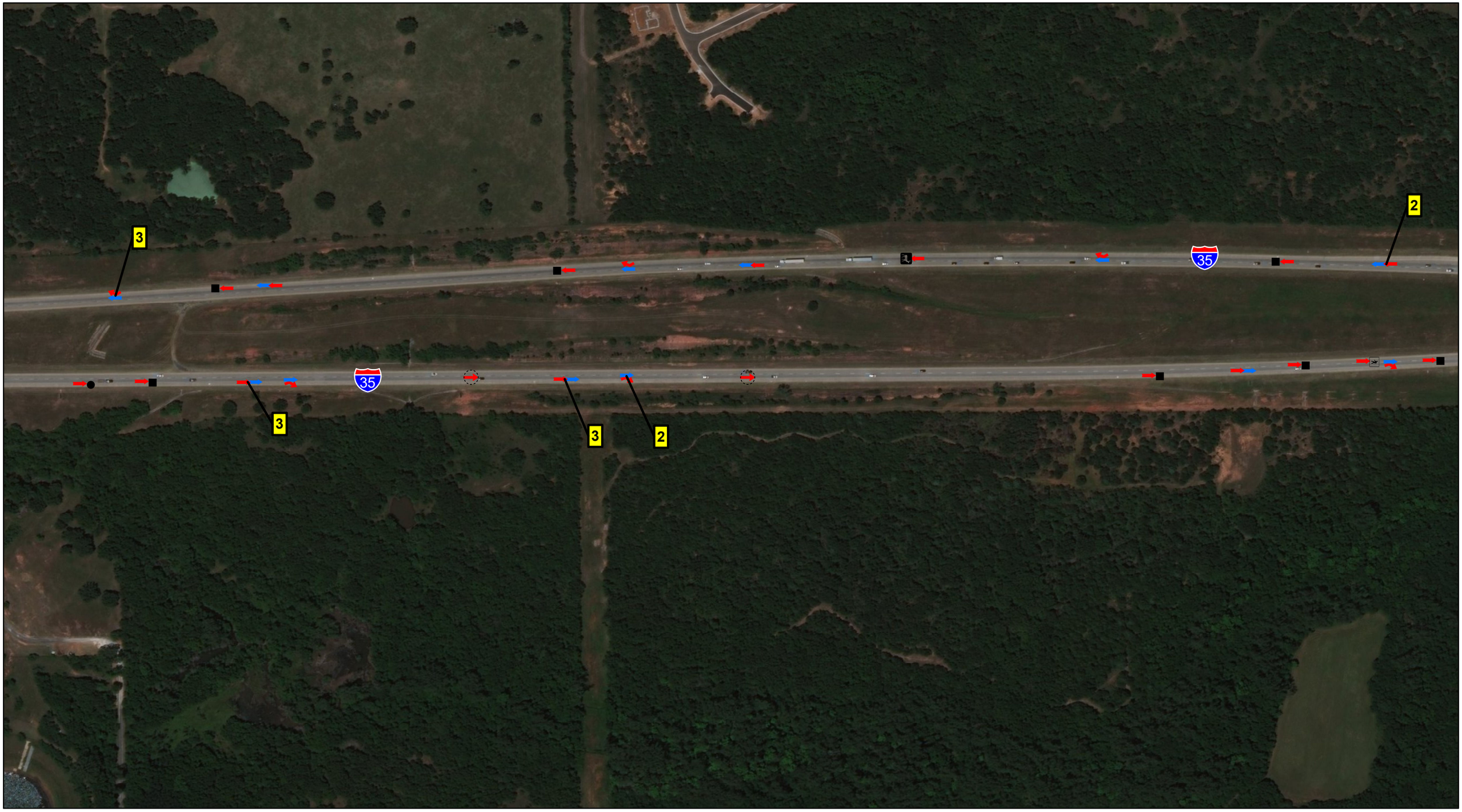
I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-9

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles



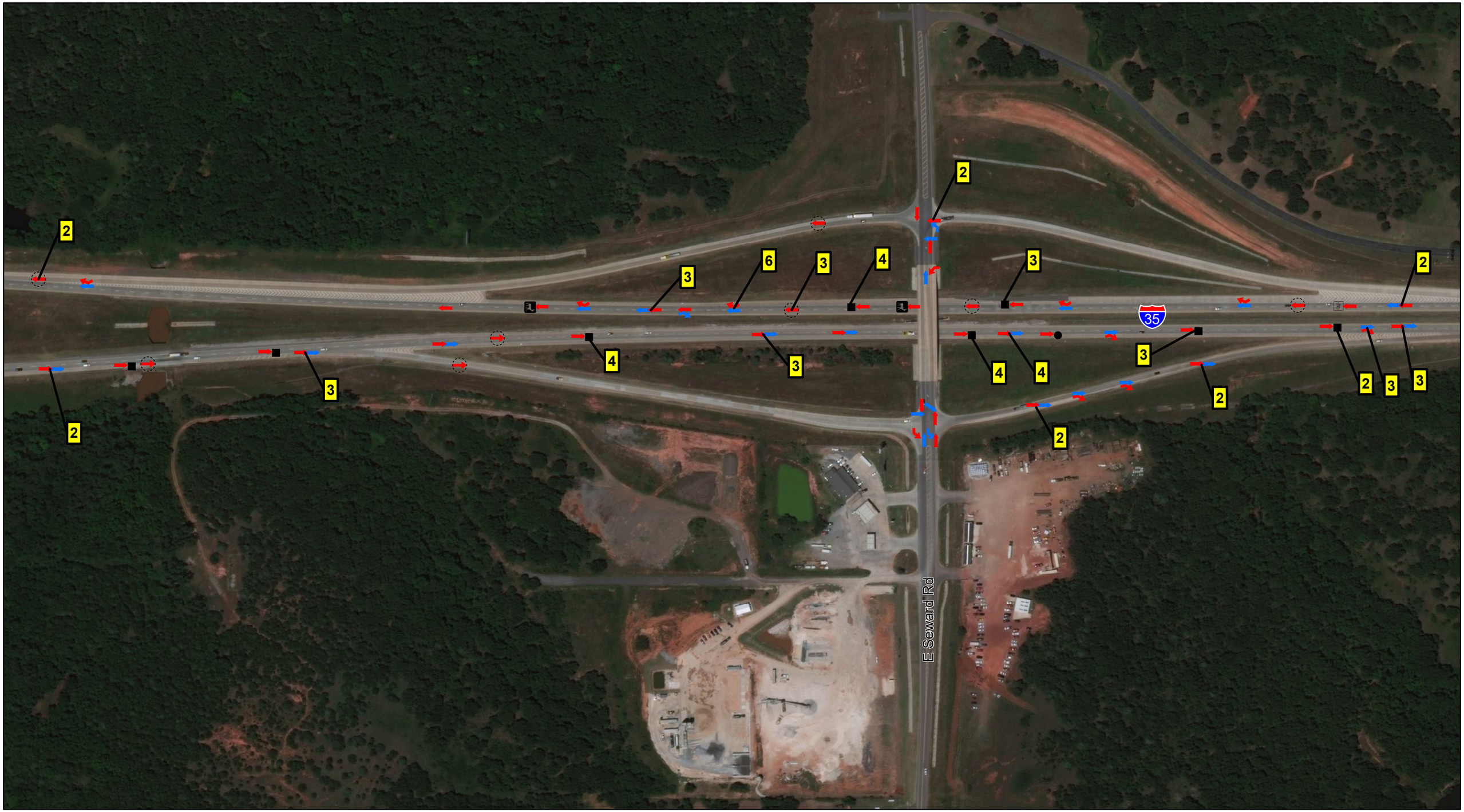
I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-10

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles



I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-11

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles

I-35 over Waterloo Rd Crash Diagrams 2008 to 2017

Figure E-12

Legend

- Angle Turning
- Backing
- Sideswipe Opposite
- Other
- Animal
- Fixed Object
- Right Angle
- Sideswipe Same
- Pedestrian
- Rollover
- Head On
- Rear End
- Single Vehicle
- Bicycle
- Number for Multiple Crashes

0 0.025 0.05
Miles

Appendix F – Signing Plan

$$USER$$ $$DATE$$ $$TIME$$
WORKSPACE: $$WORKSPACE$$
$$FILE$$

I-35 at Waterloo Rd. AJR **Wayfinding Signage for Proposed Configuration**	Figure F-1 July 2020	GARVER

Appendix G – Trip Generation Summary

Trip Generation Procedure for Trinity Development

To forecast the future trip making characteristics of the study corridor, all future developments planned for the area were considered. In 2014, the Trinity Development was proposed as a multi-phase, mixed-use development planned at the northwest quadrant of the Waterloo Road/I-35 interchange. A proposed site plan as of December 2014 is depicted in **Figure G-1**. The land uses assumed for the site plan are as follows:

- Hospital – 390,000 square feet
- Retail – 164,000 square feet
- Restaurants – 29,000 square feet
- Institutional/Educational – 110,000 square feet
- Office – 58,000 square feet
- Medical Office – 232,000 square feet
- Multi-Family Housing – 565 dwellings
- Single Family Housing – 64 dwellings
- Senior Housing – 200 dwelling units
- Skilled Nursing Housing – 90 dwellings
- Hotel – 100 rooms

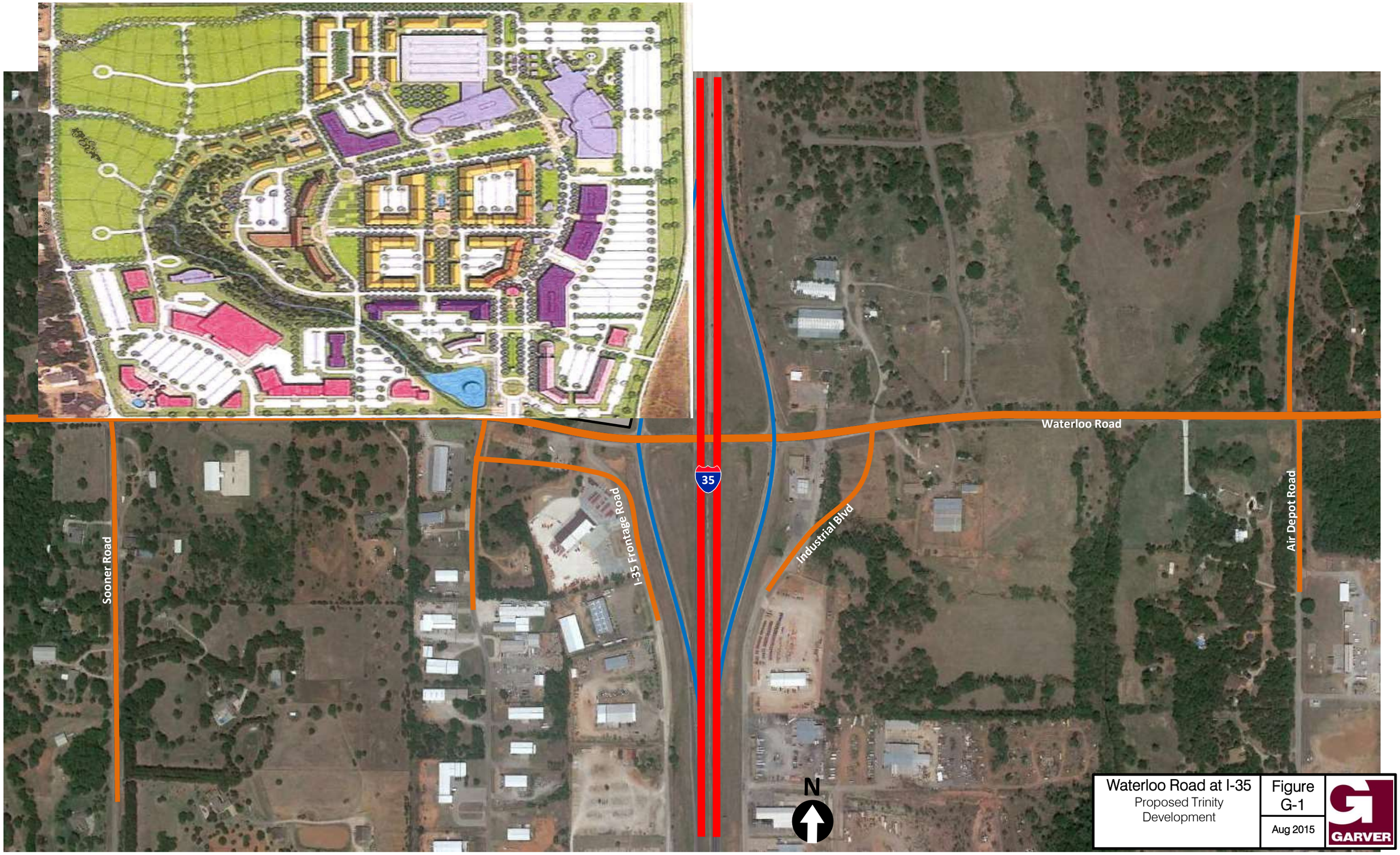
Trip generation was performed for the Trinity Development using the latest methodology from ITE's *Trip Generation Manual, 9th Edition*. **Table G-1** depicts the gross trip generation according to this methodology. As shown, the development will create more than 36,000 gross trips per day.

The interactions between adjacent land uses were analyzed in a manner consistent with the *Trip Generation Handbook, 3rd Edition*. Due to the nature and size of the site plan, the assumption was made that some trips would not be home-based or independent but would have an origin-destination (O-D) pair from inside the development. For example, restaurant customers that make a trip during the evening peak may also shop at the retail land use contained within the development. To estimate the trips internally captured, the total office, residential, retail, hotel and restaurant trips were totaled across the development and the interactions were gauged using spreadsheets from National Cooperative Highway Research Program (NCHRP*)* Report *684: Enhancing Internal Capture Estimation for Mixed-Use Developments.* The results of the internal capture analysis indicated about a 23% reduction in daily externally generated trips.

In addition to internal capture reductions, the trip generation was further modified by taking into account pass-by/diverted link trips for the retail and restaurant land uses of the Trinity Development in a manner consistent with the *Trip Generation Handbook*. Pass-by/diverted link trips are considered 'secondary' because these vehicles were previously on the roadways adjacent to the development (such as I-35) and do not add new traffic to the overall network but do add the turning movement volumes at development-related connections. After reducing for internal capture, pass-by trips were estimated to account for 11% of the daily generation and diverted link trips were estimated to account for 4%.

Table G-1: Trip Generation for Trinity Development (2040)

Scenario	Trip Type	Daily			AM			PM		
		Total	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting
2040 Full Build Out	Gross Trip Generation	36,702	18,351	18,351	2,501	1,536	965	3,241	1,348	1,893
	Internal Capture Reductions	8,368	4,184	4,184	473	236	236	812	406	406
	External Trips	28,334	14,167	14,167	2,029	1,300	729	2,429	942	1,487
	Pass-By Trips	3,218	1,609	1,609	136	68	68	242	121	121
	Diverted Link Trips	1,072	536	536	46	23	23	80	40	40
	Primary Trips	24,044	12,022	12,022	1,847	1,209	638	2,107	781	1,326



Waterloo Road at I-35
Proposed Trinity Development

Figure G-1

Aug 2015

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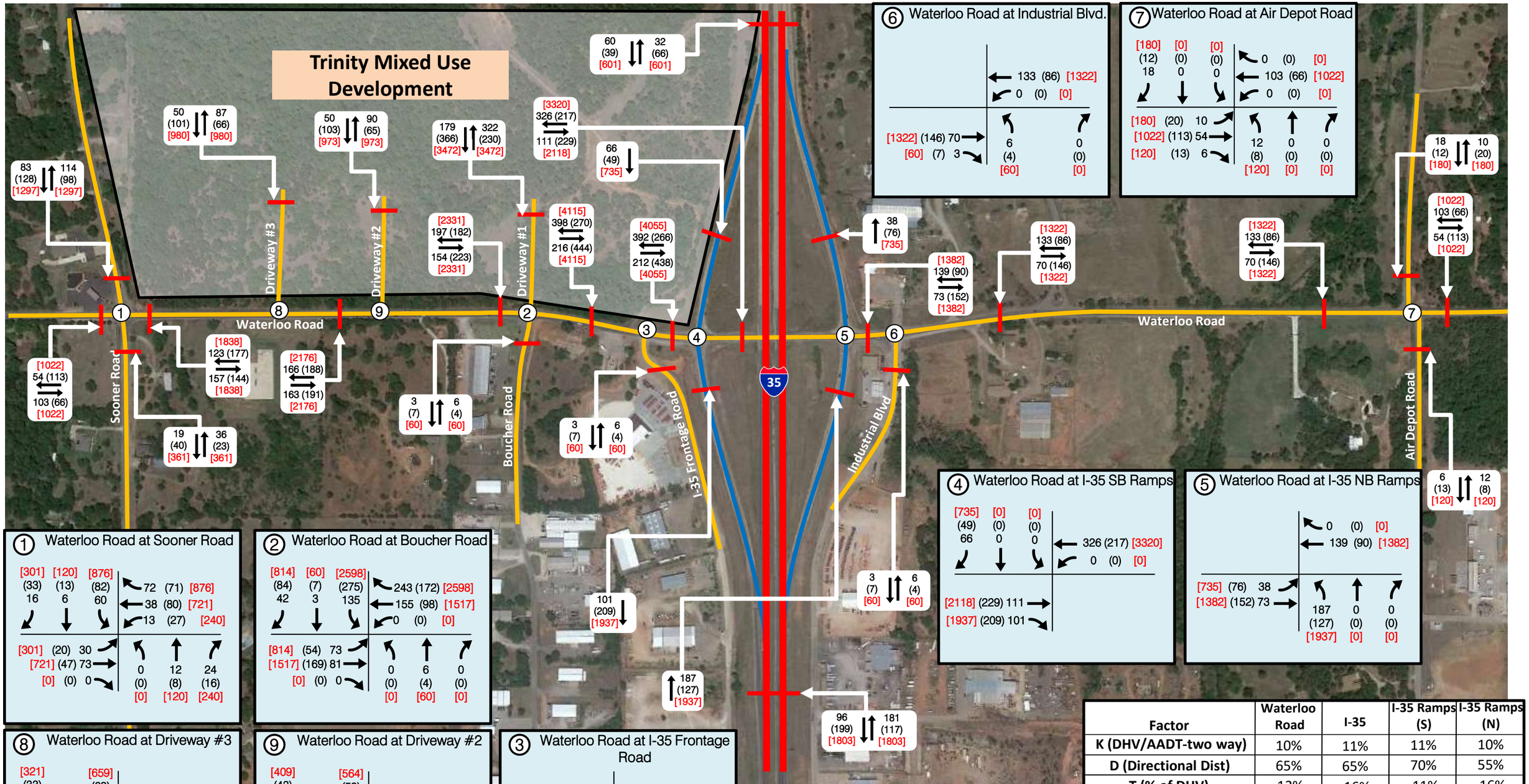
Figures G-2 and G-3 depict the expected 2025/2040 traffic volumes that would occur solely due to the Trinity Development. Trip distribution percentages were assumed throughout the study area, and then trips were assigned to the assumed driveways of the Trinity Development. Major distribution percentages for primary trips are listed below:

- I-35 North of Waterloo Road: 10%
- I-35 South of Waterloo Road: 30%
- Waterloo Road east of Air Depot Boulevard: 17%
- Waterloo Road west of Sooner Road: 17%
- Sooner Road south of Waterloo Road: 6%
- Sooner Road north of Trinity Development: 12%
- Internal Driveways within Study Area: 8%

After trips were assigned, the background growth only data was added to the Trinity Development data, and total 2025 and 2040 volumes were produced.



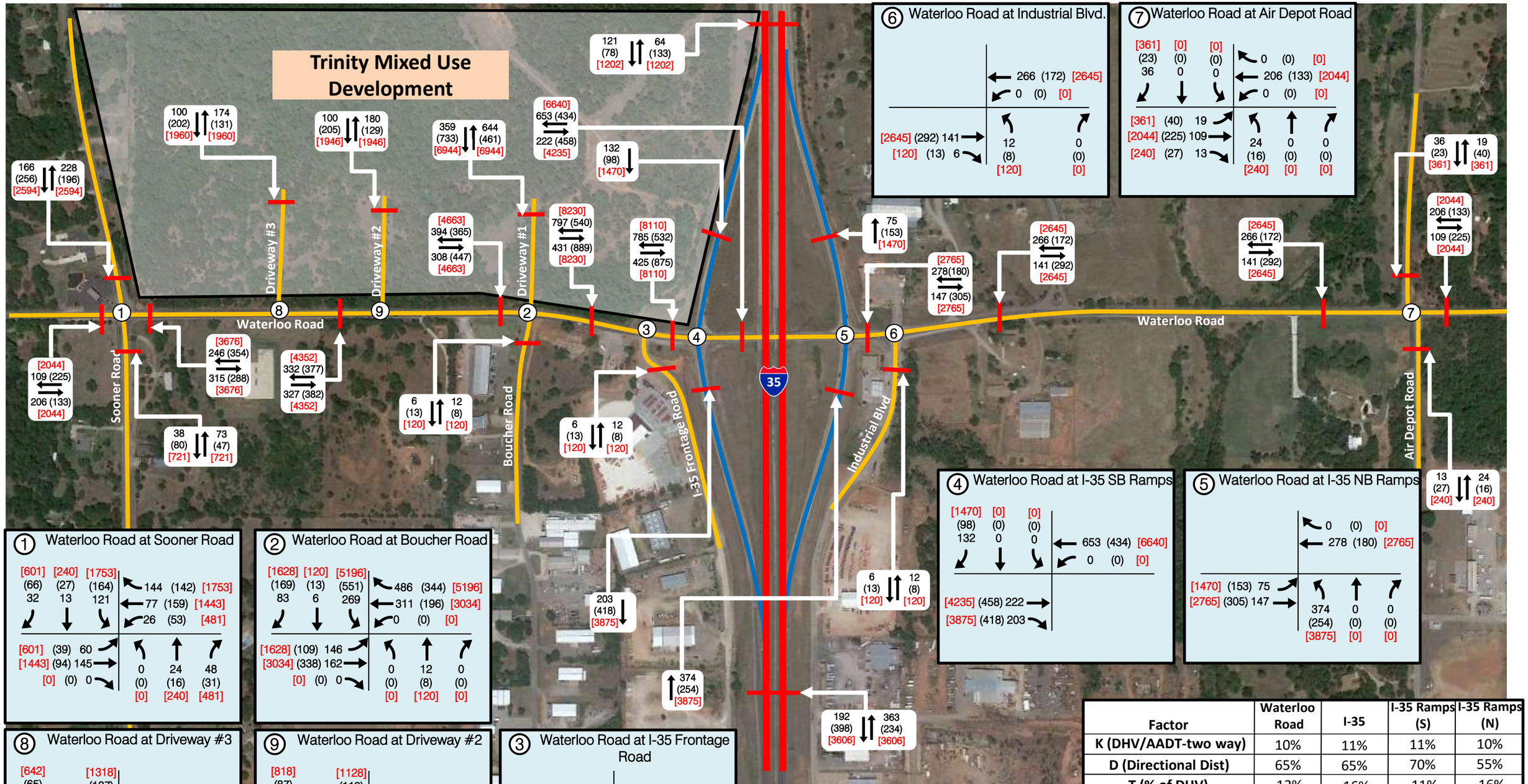
Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of DHV)	12%	16%	11%	16%
T (% of AADT)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

Waterloo Road at I-35
2025 – Total Trip Generation
Existing Configuration

Figure G-2

Aug 2015

GARVER



Factor	Waterloo Road	I-35	I-35 Ramps (S)	I-35 Ramps (N)
K (DHV/AADT-two way)	10%	11%	11%	10%
D (Directional Dist)	65%	65%	70%	55%
T (% of DHV)	12%	16%	11%	16%
T (% of AADT)	10%	13%	8%	13%
T3 (% of AADT)	6%	11%	5%	10%

Waterloo Road at I-35
2040 – Total Trip Generation
Existing Configuration

Figure G-3

Aug 2015

GARVER

Appendix H – Preliminary Design Plans

STATE OF OKLAHOMA
DEPARTMENT OF TRANSPORTATION

OKLAHOMA DEPARTMENT OF TRANSPORTATION
PROPOSED R/W
10/21/2020

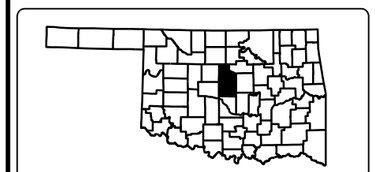
PLAN OF PROPOSED

INTERSTATE HIGHWAY

FEDERAL AID PROJECT NO. J2-9843(004)
INTERCHANGE
INTERSTATE 35 & WATERLOO ROAD

OKLAHOMA & LOGAN COUNTIES

CONTROL SECTION NO. 35-55-09 & 35-42-30
STATE JOB NO. 29843(04)
EXISTING BRIDGE-LOCATION NO. 5509-1312 EX; EXISTING NBI NO. 14103; TO BE REMOVED
EXISTING BRIDGE - LOCATION NO. 5509-1312 WX; EXISTING NBI NO. 14104; TO BE REMOVED
BRIDGE "A" LOCATION 5509-1312 EX; NEW NBI NO. XXXXX
BRIDGE "B" LOCATION 5509-1312 WX; NEW NBI NO. XXXXX


LOCATION MAP

Ⓐ BRIDGE "A"
- BEGIN C.R.L. STA. 138+18.17
- LENGTH 206.67'
- END C.R.L. STA. 140+24.83
- NEW NBI

Ⓑ BRIDGE "B"
- BEGIN C.R.L. STA. 138+18.17
- LENGTH 206.67'
- END C.R.L. STA. 140+24.83
- NEW NBI

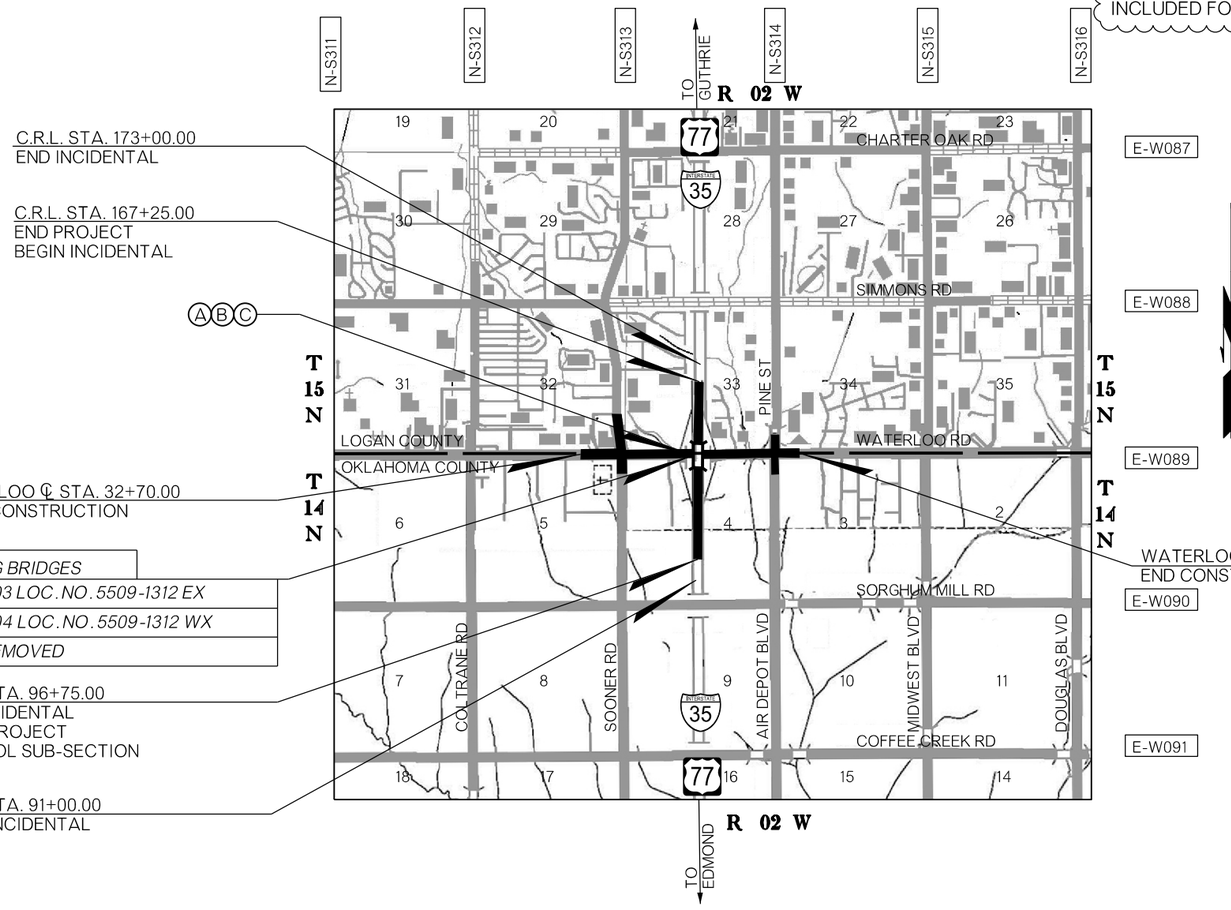
Ⓒ BRIDGE "C"
- BEGIN C.R.L. STA. 138+52.06
- LENGTH 121.15'
- END C.R.L. STA. 139+73.21

DESIGN DATA	I-35	WATERLOO
AADT 2022 =	58,981	18,171
AADT 2040 =	81,212	33,180
DHV (2-WAY) =	8,933	3,318
K (DHV/AADT) =	11%	10%
D =	65%	65%
T (% DHV) =	13%	10%
T (% AADT) =	16%	12%
T³(% AADT) =	11%	6%
V =	75MPH	45MPH
20 YR FLEX ESALS =	62.64M	12.52M

SCALES 1"
- PLAN 1" = 50'
- PROFILE HOR. 1" = 50'
- VER. 1" = 5'
- LAYOUT MAP 1" = 2,640'

CONVENTIONAL SYMBOLS
- PROPOSED ROAD
- RAILROADS
- RANGE & TOWNSHIP
- SECTION LINES
- QUARTER SECTION LINES
- FENCES
- GROUND LINE
- EXISTING ROADS
- BASE LINE
- GRADE LINES
- TELEPHONE & TELEGRAPH
- POWER LINES
- BUILDINGS
- OILWELL
- DRAINAGE STRUCTURES - IN PLACE
- DRAINAGE STRUCTURES - NEW
- RIGHT-OF-WAY LINES - EXISTING
- RIGHT-OF-WAY LINES - NEW
- CONTROLLED ACCESS
- RIGHT-OF-WAY FENCE
- BRIDGE

2009 OKLAHOMA STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION GOVERN, APPROVED BY THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, JANUARY 4, 2010.



NOTE: PROJECT LENGTH BASED ON I-35 CRL STATIONING

ROADWAY LENGTH	6,843.33	FT.	1.296	MI.
BRIDGE LENGTH	206.67	FT.	0.039	MI.
PROJECT LENGTH			1.335	MI.

EQUATIONS : NONE
EXCEPTIONS : NONE

INDEX OF SHEETS

SHEETS EXCLUDED FOR PROPOSED R/W, BUT WILL BE INCLUDED FOR FINAL PLANS.

PREPARED BY:
GARVER
6450 SOUTH LEWIS AVE., SUITE 300
TULSA, OKLAHOMA 74136
(918) 250-5922 (VOICE)
(918) 858-0107 (FAX)

THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL, SIGNED AND SEALED DOCUMENT

CERTIFICATE OF AUTHORIZATION NO. 4193 P.E., L.S. RENEWAL DATE: 6-30-2022

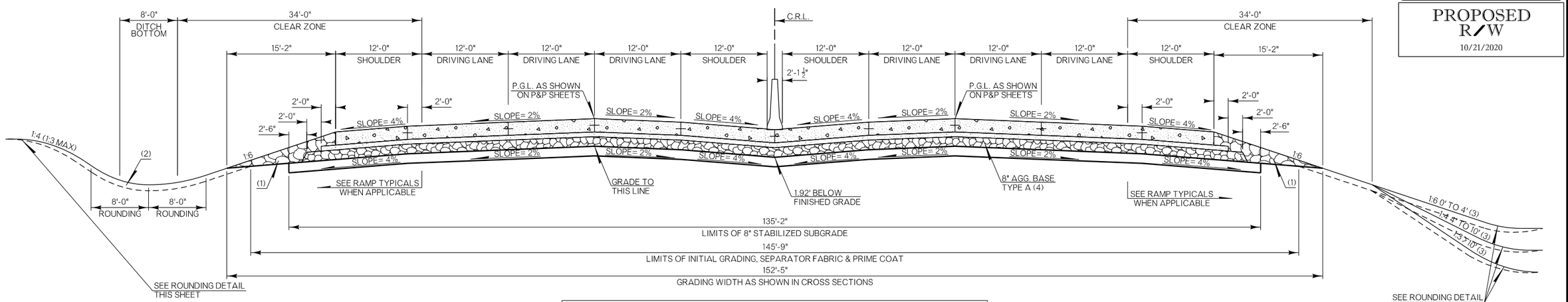
OKLAHOMA DEPARTMENT OF TRANSPORTATION	DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION
DATE APPROVED	DATE APPROVED
BY	BY
CHIEF ENGINEER	DIVISION ADMINISTRATOR

SWO 4989(1) PROJECT NO. J2-9843(004)
COUNTY OKLAHOMA & LOGAN HIGHWAY I-35 SHEET NO. 0001

P.E. NO.: 29843(01)

OKLAHOMA DEPARTMENT OF TRANSPORTATION

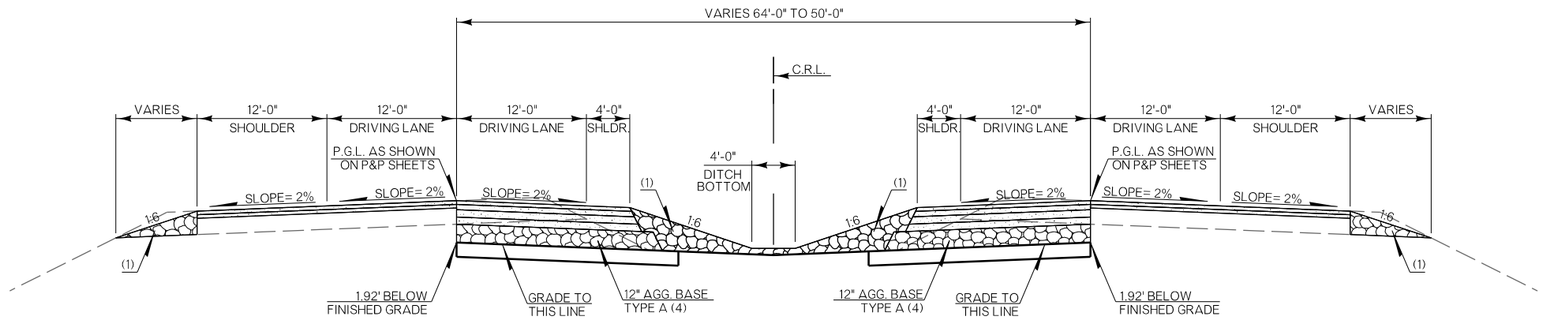
PROPOSED R/W
10/21/2020



PAVEMENT REQUIREMENT		
15" PAVT. STRUCTURE	12'-0" DRIVING LANES	10'-0" & 12'-0" PAVED SHOULDERS
SURFACE COURSE	11" DOWEL-JOINTED P.C. CONCRETE	11" TIED P.C. CONCRETE
BASE COURSE	4" CEMENT TREATED BASE	4" CEMENT TREATED BASE

TYPICAL SECTION NO. 1 - I-35 (MAINLINE)

STA. 102+00.00 TO STA 137+88.17
STA. 140+54.83 TO STA. 162+00.00



PAVEMENT REQUIREMENT			MILL AND INLAY
11" PAVT. STRUCTURE	12'-0" DRIVING LANES	4'-0" PAVED SHOULDER	12'-0" DRIVING LANE AND 12' SHOULDER
SURFACE COURSE	2" SUPERPAVE TYPE S4 (PG 76-28 OK)	2" SUPERPAVE TYPE S4 (PG 76-28 OK)	2" SUPERPAVE TYPE S4 (PG 76-28 OK)
BASE COURSE	3" SUPERPAVE TYPE S3 (PG 76-28 OK)	3" SUPERPAVE TYPE S3 (PG 76-28 OK)	2" SUPERPAVE TYPE S4 (PG 76-28 OK)
	4" SUPERPAVE TYPE S3 (PG 64-22 OK)	4" SUPERPAVE TYPE S3 (PG 64-22 OK)	
	4" SUPERPAVE TYPE S3 (PG 64-22 OK)	4" SUPERPAVE TYPE S3 (PG 64-22 OK)	

TYPICAL SECTION NO. 2 - I-35 (TIE-IN)

STA. 96+75.00 TO STA 102+00.00
STA. 162+00.00 TO STA 167+25.00

PAVEMENT SECTION SHOWN IS ASSUMED FOR ESTIMATING PURPOSES ONLY. PROJECT SPECIFIC PAVEMENT SECTION TO BE PROVIDED AT A LATER DATE AFTER GEOTECHNICAL EXPLORATION HAS BEEN CONDUCTED.

(1) BACKFILL NOTE:
TO BE BACKFILLED AS PART OF THE FINISHING OPERATIONS. QUANTITY IS MEASURED IN T.B.S.C. TYPE E.

(2) TOPSOIL NOTE:
THE CONTRACTOR SHALL STRIP ALL OF THE AVAILABLE TOPSOIL, STOCKPILE IT, AND PLACE IT BACK ON THE SECTION IN ACCORDANCE WITH SECTION 205 OF THE STANDARD SPECIFICATIONS. RESERVED TOPSOIL SHALL BE SPREAD FIRST ON THE COMPLETED SLOPES OF THE CUT SECTIONS AND THE REMAINDER ON COMPLETED FILL SLOPES OR OTHER PRIORITY AREAS LOCATED BY THE ENGINEER. ALL ADDITIONAL COSTS ASSOCIATED WITH OPERATIONS SHALL BE INCLUDED IN THE PAY ITEM FOR SALVAGED TOPSOIL, LUMP SUM.

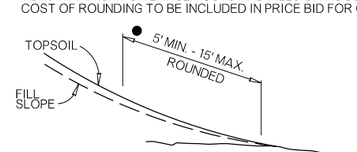
THE GRADING LINE AS SHOWN ON THE TYPICAL AND CROSS SECTIONS IS TO THE TOP OF THE TOPSOIL. EARTHWORK QUANTITIES WERE NOT ADJUSTED FOR SALVAGE AND THE TOPSOIL QUANTITY IS INCLUDED IN THE MASS LINE BALANCE.

(3) DISTANCE MEASURED VERTICALLY FROM EDGE OF FINISHED GRADE SHOULDER.

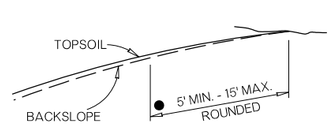
(4) PRIME COAT ON TOP OF AGGREGATE BASE.

ROUNDING DETAIL

- INTERSECTION OF CUT AND/OR FILL SLOPES WITH GROUND LINE TO BE ROUNDED AS PART OF FINISHING OPERATIONS. ROUNDING SHALL BE 5' MINIMUM FOR SMALLER CUTS AND FILLS TO 15' MAXIMUM FOR LARGER CUTS AND FILLS OR AS DESIGNATED BY THE ENGINEER. COST OF ROUNDING TO BE INCLUDED IN PRICE BID FOR OTHER ITEMS OF WORK.



TOE OF FILL ROUNDING



TOP OF CUT ROUNDING

DESIGN	AKS	11/17
DRAWN	TML	11/17
CHECKED	JES	6/18
APPROVED		
SQUAD	GARVER	

OKLAHOMA DEPARTMENT OF TRANSPORTATION

TYPICAL SECTIONS
(SHEET 1 OF 5)

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. 0002

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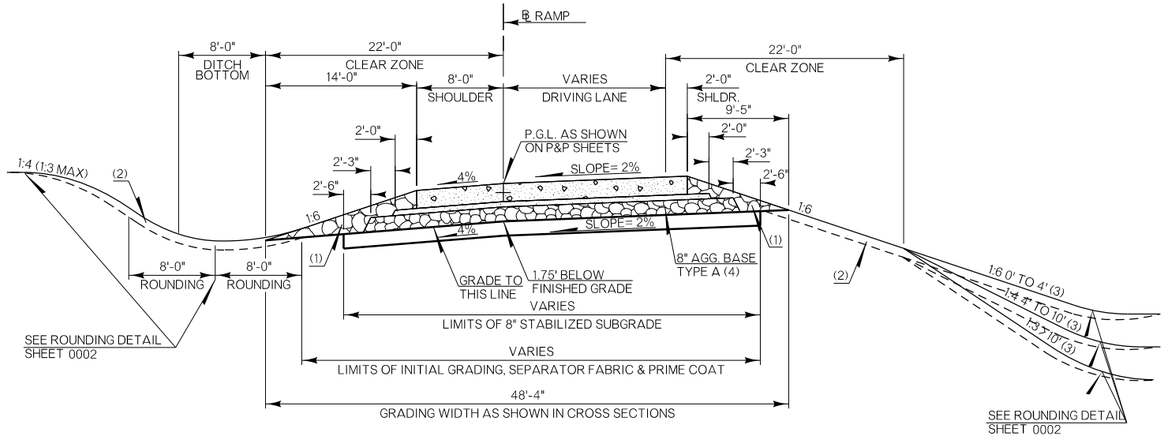
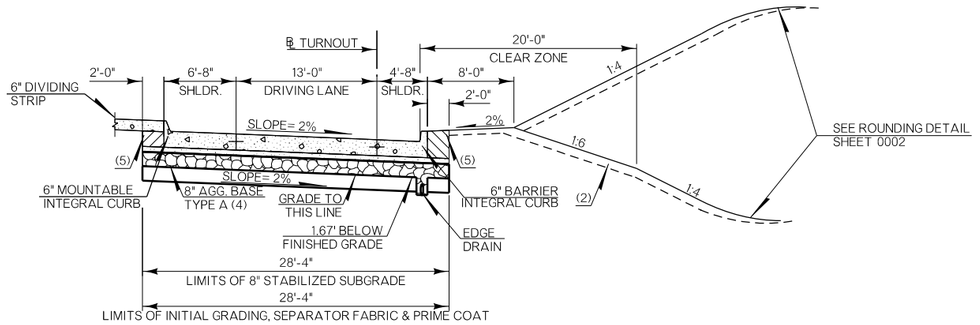


PAVEMENT REQUIREMENT		
13" PAVT. STRUCTURE	VARIABLE DRIVING LANES	8'-0" PAVED SHOULDERS
SURFACE COURSE	10" DOWEL-JOINTED P.C. CONCRETE	10" TIED P.C. CONCRETE
BASE COURSE	3" TYPE S3 (PG 64-22 OK)	3" TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 3 - RAMP (PROPER)

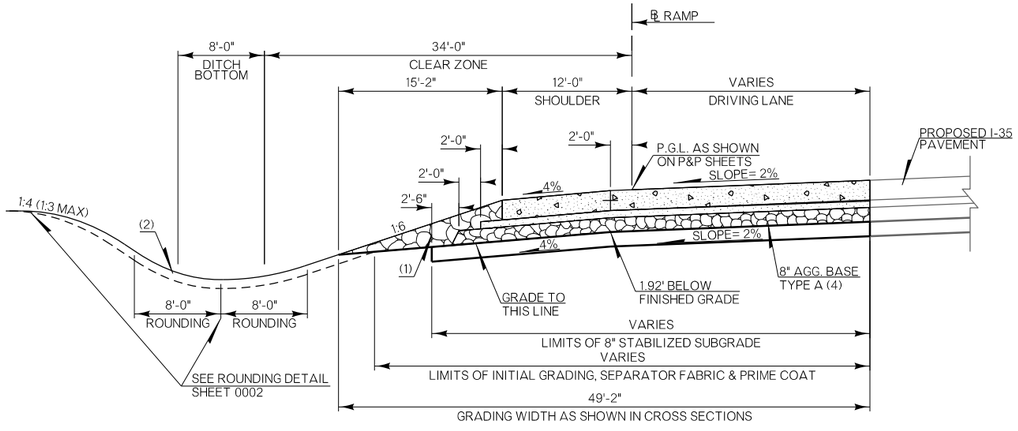
℄ RAMP A STA. 130+24.61 TO ℄ RAMP A STA 137+59.90
℄ RAMP B STA. 130+87.33 TO ℄ RAMP B STA 137+44.74
℄ RAMP C STA. 140+86.50 TO ℄ RAMP C STA 147+79.91
℄ RAMP D STA. 140+91.13 TO ℄ RAMP D STA 148+24.29



PAVEMENT REQUIREMENT	
12" PAVT. STRUCTURE	12'-0" DRIVING LANES
SURFACE COURSE	9" DOWEL-JOINTED P.C. CONCRETE
BASE COURSE	3" TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 5 - TERMINUS TURNOUT

℄ TURNOUT E-N STA. 1+00.00 TO STA 3+09.81
℄ TURNOUT E-S STA. 1+00.00 TO STA 3+48.61
℄ TURNOUT N-E STA. 1+00.00 TO STA 3+57.39
℄ TURNOUT N-W STA. 1+00.00 TO STA 3+12.96
℄ TURNOUT S-E STA. 1+00.00 TO STA 2+94.38
℄ TURNOUT S-W STA. 1+00.00 TO STA 3+61.21
℄ TURNOUT W-N STA. 1+00.00 TO STA 3+63.58
℄ TURNOUT W-S STA. 1+00.00 TO STA 3+31.13



PAVEMENT REQUIREMENT		
15" PAVT. STRUCTURE	VARIABLE DRIVING LANES	10'-0" PAVED SHOULDERS
SURFACE COURSE	11" DOWEL-JOINTED P.C. CONCRETE	11" TIED P.C. CONCRETE
BASE COURSE	4" CEMENT TREATED BASE	4" CEMENT TREATED BASE

TYPICAL SECTION NO. 4 - RAMP (ADJACENT)

℄ RAMP A STA. 102+30.03 TO ℄ RAMP A STA 130+24.61
℄ RAMP B STA. 102+30.03 TO ℄ RAMP B STA 130+87.33
℄ RAMP C STA. 147+79.71 TO ℄ RAMP C STA 160+39.21
℄ RAMP D STA. 148+24.29 TO ℄ RAMP D STA 161+51.94

PAVEMENT SECTION SHOWN IS ASSUMED FOR ESTIMATING PURPOSES ONLY. PROJECT SPECIFIC PAVEMENT SECTION TO BE PROVIDED AT A LATER DATE AFTER GEOTECHNICAL EXPLORATION HAS BEEN CONDUCTED.

(1) BACKFILL NOTE:
TO BE BACKFILLED AS PART OF THE FINISHING OPERATIONS.
QUANTITY IS MEASURED IN T.B.S.C. TYPE E.

(2) TOPSOIL NOTE:
THE CONTRACTOR SHALL STRIP ALL OF THE AVAILABLE TOPSOIL, STOCKPILE IT, AND PLACE IT BACK ON THE SECTION IN ACCORDANCE WITH SECTION 205 OF THE STANDARD SPECIFICATIONS. RESERVED TOPSOIL SHALL BE SPREAD FIRST ON THE COMPLETED SLOPES OF THE CUT SECTIONS AND THE REMAINDER ON COMPLETED FILL SLOPES OR OTHER PRIORITY AREAS LOCATED BY THE ENGINEER. ALL ADDITIONAL COSTS ASSOCIATED WITH OPERATIONS SHALL BE INCLUDED IN THE PAY ITEM FOR SALVAGED TOPSOIL, LUMP SUM.

THE GRADING LINE AS SHOWN ON THE TYPICAL AND CROSS SECTIONS IS TO THE TOP OF THE TOPSOIL. EARTHWORK QUANTITIES WERE NOT ADJUSTED FOR SALVAGE AND THE TOPSOIL QUANTITY IS INCLUDED IN THE MASS LINE BALANCE.

(3) DISTANCE MEASURED VERTICALLY FROM EDGE OF FINISHED GRADE SHOULDER.

(4) PRIME COAT ON TOP OF AGGREGATE BASE.

(5) BACKFILL NOTE:
TO BE BACKFILLED AND COMPACTED AS PART OF THE FINISHING OPERATIONS.
QUANTITY IS MEASURED IN UNCLASSIFIED BORROW.

DESIGN	AKS	11/17
DRAWN	TML	11/17
CHECKED	JES	6/18
APPROVED		
SQUAD	GARVER	

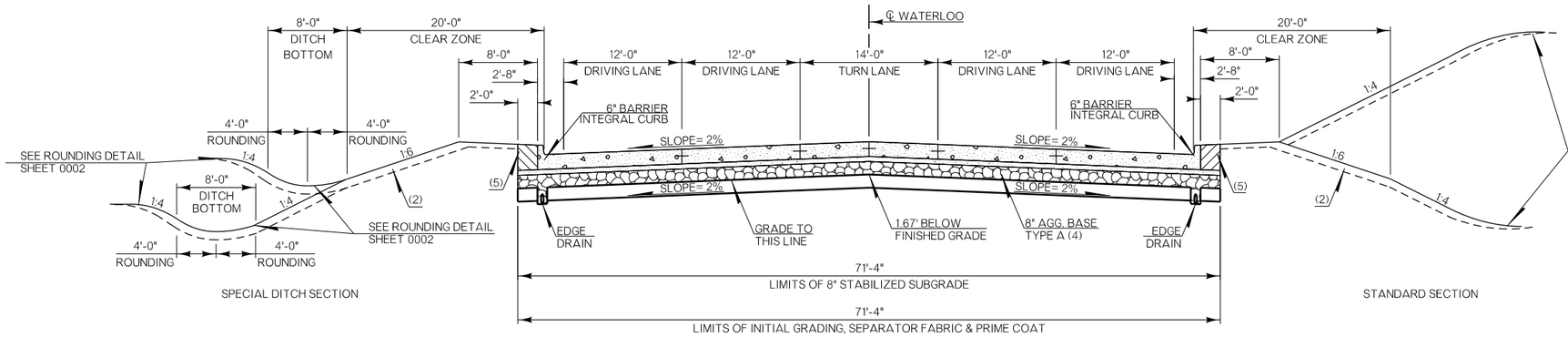
OKLAHOMA DEPARTMENT OF TRANSPORTATION

TYPICAL SECTIONS
(SHEET 2 OF 5)

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. 0003

OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W
10/21/2020



SPECIAL DITCH SECTION

STANDARD SECTION

PAVEMENT REQUIREMENT	
12" PAVT. STRUCTURE	12'-0" DRIVING LANES
SURFACE COURSE	9" DOWEL-JOINTED P.C. CONCRETE
BASE COURSE	3" TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 6 - WATERLOO ROAD (5-LANE)

C.R.L. STA. 50+00.00 TO C.R.L. STA. 60+80.00
C.R.L. STA. 73+30.00 TO C.R.L. STA. 80+00.00

(1) BACKFILL NOTE:
TO BE BACKFILLED AS PART OF THE FINISHING OPERATIONS. QUANTITY IS MEASURED IN T.B.S.C. TYPE E.

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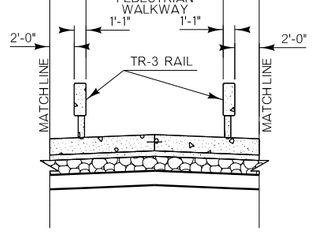
(3) DISTANCE MEASURED VERTICALLY FROM EDGE OF FINISHED GRADE SHOULDER.

(4) PRIME COAT ON TOP OF AGGREGATE BASE.

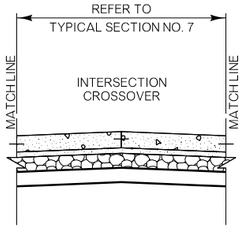
(5) BACKFILL NOTE:
TO BE BACKFILLED AND COMPACTED AS PART OF THE FINISHING OPERATIONS. QUANTITY IS MEASURED IN UNCLASSIFIED BORROW.

PAVEMENT SECTION SHOWN IS ASSUMED FOR ESTIMATING PURPOSES ONLY. PROJECT SPECIFIC PAVEMENT SECTION TO BE PROVIDED AT A LATER DATE AFTER GEOTECHNICAL EXPLORATION HAS BEEN CONDUCTED.



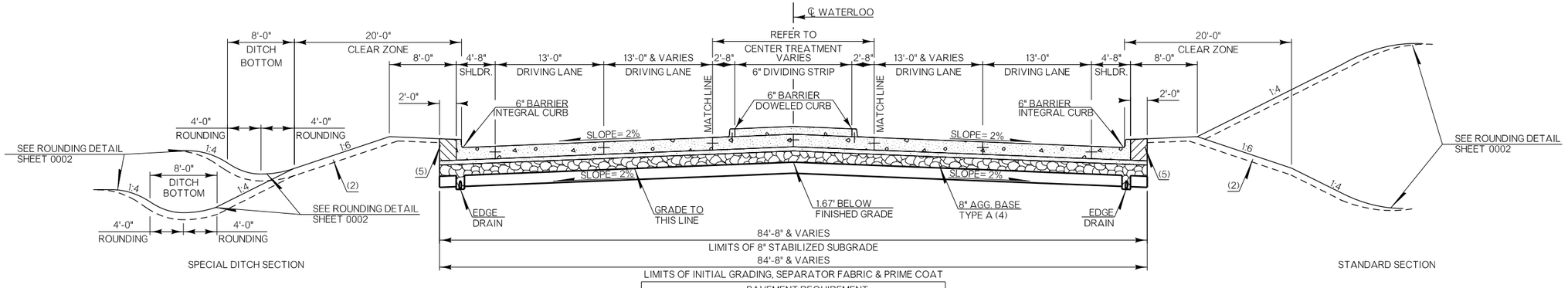
CENTER TREATMENT TYPICAL SECTION NO. 1

C.R.L. STA. 63+82.63 TO C.R.L. STA 69+41.84



CENTER TREATMENT TYPICAL SECTION NO. 2

C.R.L. STA. 62+84.55 TO C.R.L. STA. 63+82.63
C.R.L. STA. 69+41.84 TO C.R.L. STA. 70+39.98



SPECIAL DITCH SECTION

STANDARD SECTION

PAVEMENT REQUIREMENT	
12" PAVT. STRUCTURE	12'-0" DRIVING LANES
SURFACE COURSE	9" DOWEL-JOINTED P.C. CONCRETE
BASE COURSE	3" TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 7 - WATERLOO ROAD (4-LANE)

C.R.L. STA. 60+80.00 TO C.R.L. STA 73+30.00

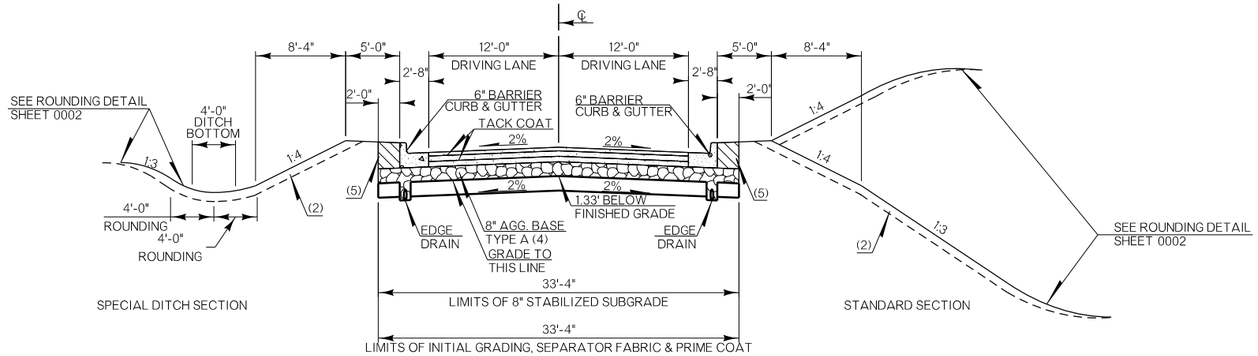
DESIGN	AKS	11/17	OKLAHOMA DEPARTMENT OF TRANSPORTATION
DRAWN	TML	11/17	
CHECKED	JES	6/18	TYPICAL SECTIONS (SHEET 3 OF 5)
APPROVED			
SQUAD	GARVER		

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. 0004

10/21/2020 11:55:41 PM L:\2014\4037270 - 000T EC-1500N I-35 over Waterloo Rd\Drawings\JP29843(04)-Typical_003.dgn

OKLAHOMA DEPARTMENT OF TRANSPORTATION

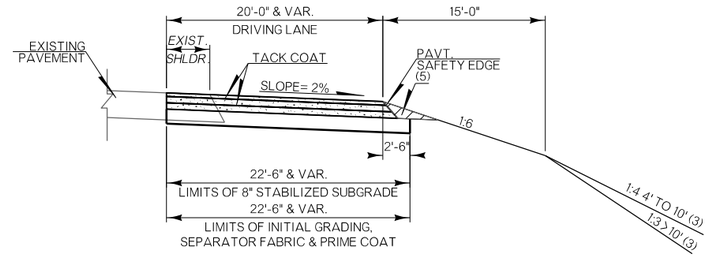
PROPOSED R/W
10/21/2020



PAVEMENT REQUIREMENT	
8" PAVT. STRUCTURE	DRIVING LANES
SURFACE COURSE	2" SUPERPAVE TYPE S4 (PG 70-28 OK)
BASE COURSE	3" SUPERPAVE TYPE S3 (PG 64-22 OK)
	3" SUPERPAVE TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 8 - SIDE ROAD (CURBED)

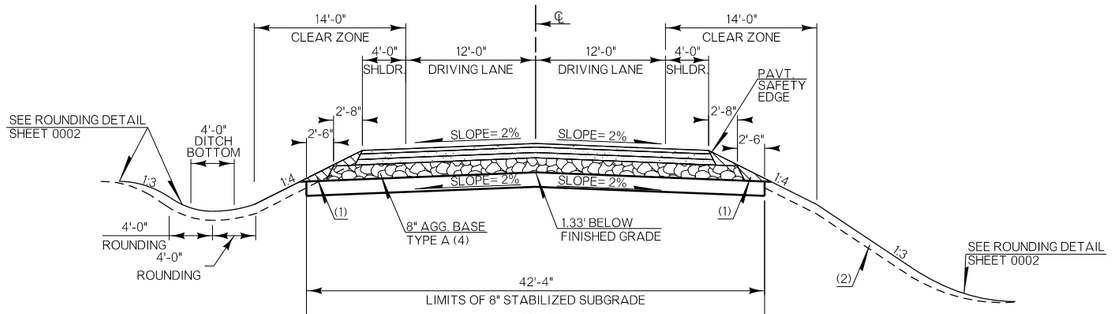
℄ BOUCHER STA. 13+82.00 TO ℄ BOUCHER STA 15+75.39
℄ FRONTAGE STA. 10+28.00 TO ℄ FRONTAGE STA 15+94.85



PAVEMENT REQUIREMENT	
9" PAVT. STRUCTURE	DRIVING LANES
SURFACE COURSE	2" SUPERPAVE TYPE S4 (PG 64-22 OK)
BASE COURSE	3.5" SUPERPAVE TYPE S3 (PG 64-22 OK)
	3.5" SUPERPAVE TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 10 - I-35 TEMPORARY WIDENING

STA. XX+XX.XX TO STA XX+XX.XX

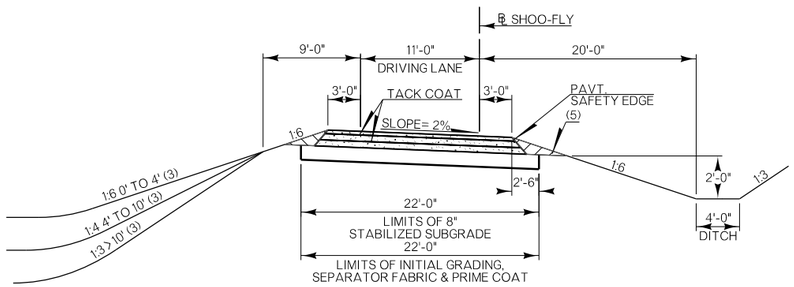


PAVEMENT REQUIREMENT		
8" PAVT. STRUCTURE	12'-0" DRIVING LANES	4'-0" PAVED SHOULDERS
SURFACE COURSE	2" SUPERPAVE TYPE S4 (PG 70-28 OK)	2" SUPERPAVE TYPE S4 (PG 70-28 OK)
BASE COURSE	3" SUPERPAVE TYPE S3 (PG 64-22 OK)	3" SUPERPAVE TYPE S3 (PG 64-22 OK)
	3" SUPERPAVE TYPE S3 (PG 64-22 OK)	3" SUPERPAVE TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 9 - SIDE ROAD (OPEN)

℄ BOUCHER STA. 11+61.65 TO ℄ BOUCHER STA 13+82.00
℄ FRONTAGE STA. 15+94.85 TO ℄ FRONTAGE STA 16+45.00
℄ INDUSTRIAL STA. 10+00.00 TO ℄ INDUSTRIAL STA 20+17.19

PAVEMENT SECTION SHOWN IS ASSUMED FOR ESTIMATING PURPOSES ONLY. PROJECT SPECIFIC PAVEMENT SECTION TO BE PROVIDED AT A LATER DATE AFTER GEOTECHNICAL EXPLORATION HAS BEEN CONDUCTED.



PAVEMENT REQUIREMENT	
9" PAVT. STRUCTURE	DRIVING LANES
SURFACE COURSE	2" SUPERPAVE TYPE S4 (PG 64-22 OK)
BASE COURSE	3.5" SUPERPAVE TYPE S3 (PG 64-22 OK)
	3.5" SUPERPAVE TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 11 - SHOO-FLY

STA. XX+XX.XX TO STA XX+XX.XX

(1) BACKFILL NOTE:
TO BE BACKFILLED AS PART OF THE FINISHING OPERATIONS.
QUANTITY IS MEASURED IN T.B.S.C. TYPE E.

(2) TOPSOIL NOTE:
THE CONTRACTOR SHALL STRIP ALL OF THE AVAILABLE TOPSOIL, STOCKPILE IT, AND PLACE IT BACK ON THE SECTION IN ACCORDANCE WITH SECTION 205 OF THE STANDARD SPECIFICATIONS. RESERVED TOPSOIL SHALL BE SPREAD FIRST ON THE COMPLETED SLOPES OF THE CUT SECTIONS AND THE REMAINDER ON COMPLETED FILL SLOPES OR OTHER PRIORITY AREAS LOCATED BY THE ENGINEER. ALL ADDITIONAL COSTS ASSOCIATED WITH OPERATIONS SHALL BE INCLUDED IN THE PAY ITEM FOR SALVAGED TOPSOIL, LUMP SUM.

THE GRADING LINE AS SHOWN ON THE TYPICAL AND CROSS SECTIONS IS TO THE TOP OF THE TOPSOIL. EARTHWORK QUANTITIES WERE NOT ADJUSTED FOR SALVAGE AND THE TOPSOIL QUANTITY IS INCLUDED IN THE MASS LINE BALANCE.

(3) DISTANCE MEASURED VERTICALLY FROM EDGE OF FINISHED GRADE SHOULDER.

(4) PRIME COAT ON TOP OF AGGREGATE BASE.

(5) BACKFILL NOTE:
TO BE BACKFILLED AND COMPACTED AS PART OF THE FINISHING OPERATIONS.
QUANTITY IS MEASURED IN UNCLASSIFIED BORROW.

DESIGN	AKS	11/17
DRAWN	TML	11/17
CHECKED	JES	6/18
APPROVED		
SQUAD	GARVER	

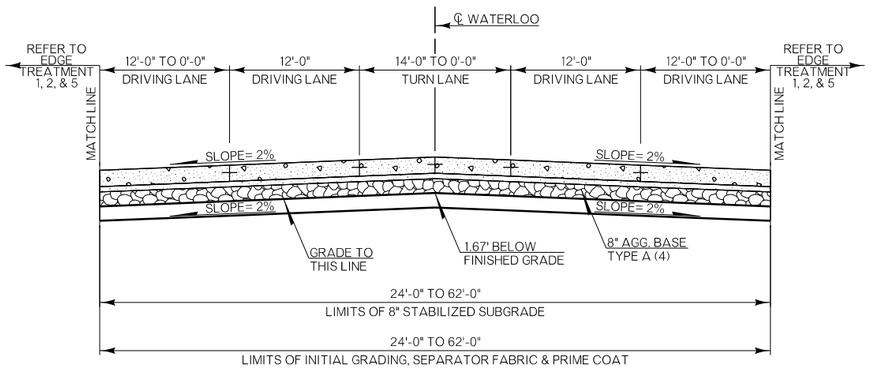
OKLAHOMA DEPARTMENT OF TRANSPORTATION

TYPICAL SECTIONS
(SHEET 4 OF 5)

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. 0005

OKLAHOMA DEPARTMENT OF TRANSPORTATION

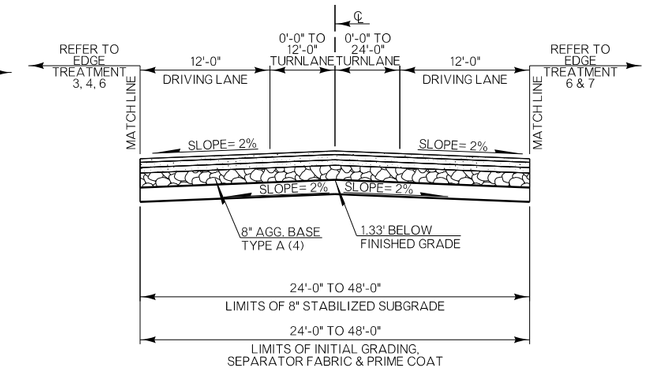
PROPOSED R/W
10/21/2020



PAVEMENT REQUIREMENT	
12" PAVT. STRUCTURE	12'-0" DRIVING LANES
SURFACE COURSE	9" DOWEL-JOINTED P.C. CONCRETE
BASE COURSE	3" TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 1 - WATERLOO ROAD (COUNTY)

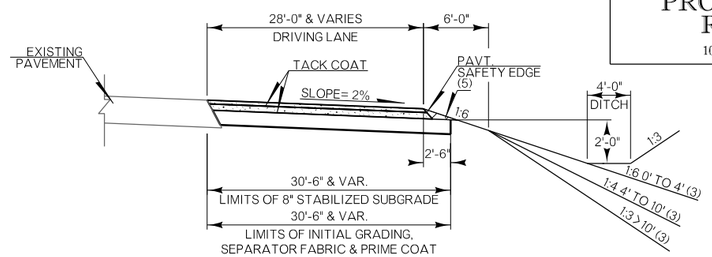
C.R.L. STA. 32+70.00 TO C.R.L. STA. 50+00.00
C.R.L. STA. 80+00.00 TO C.R.L. STA. 99+60.00



PAVEMENT REQUIREMENT		
8" PAVT. STRUCTURE	12'-0" DRIVING LANES	5'-0" PAVED SHOULDERS
SURFACE COURSE	2" SUPERPAVE TYPE S4 (PG 70-28 OK)	2" SUPERPAVE TYPE S4 (PG 70-28 OK)
BASE COURSE	3" SUPERPAVE TYPE S3 (PG 64-22 OK)	3" SUPERPAVE TYPE S3 (PG 64-22 OK)
	3" SUPERPAVE TYPE S3 (PG 64-22 OK)	3" SUPERPAVE TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 2 - SIDE ROAD (COUNTY)

℄ SOONER N STA. 10+33.00 TO ℄ SOONER N STA. 21+00.00
℄ SOONER S STA. 11+00.00 TO ℄ SOONER S STA. 14+85.96
℄ PINE STA. 10+41.00 TO ℄ PINE STA. 11+65.00
℄ AIR DEPOT STA. 10+75.00 TO ℄ AIR DEPOT STA. 14+26.04

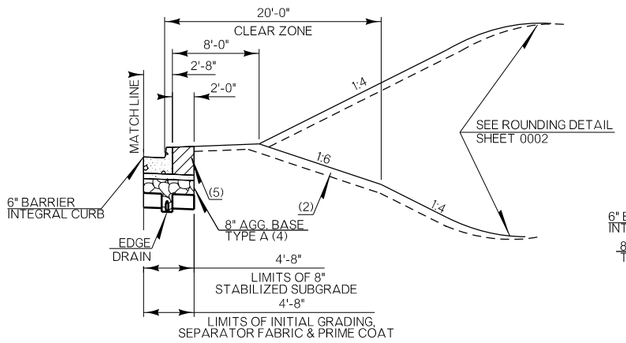


PAVEMENT REQUIREMENT	
9" PAVT. STRUCTURE	DRIVING LANES
SURFACE COURSE	2" SUPERPAVE TYPE S4 (PG 64-22 OK)
BASE COURSE	3.5" SUPERPAVE TYPE S3 (PG 64-22 OK)

TYPICAL SECTION NO. 3 - SOONER RD. TEMPORARY WIDENING

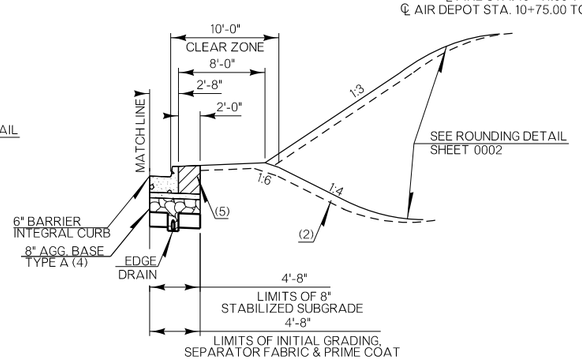
STA. 0+00.00 TO STA 6+98.81

PAVEMENT SECTION SHOWN IS ASSUMED FOR ESTIMATING PURPOSES ONLY. PROJECT SPECIFIC PAVEMENT SECTION TO BE PROVIDED AT A LATER DATE AFTER GEOTECHNICAL EXPLORATION HAS BEEN CONDUCTED.



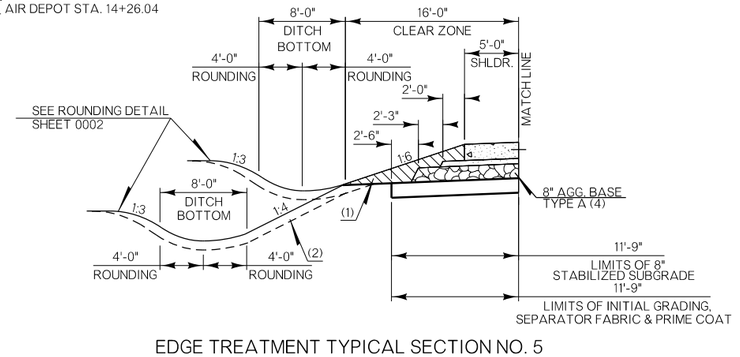
EDGE TREATMENT TYPICAL SECTION NO. 1

C.R.L. WATERLOO STA. 40+00.00 TO C.R.L. WATERLOO STA. 50+00.00 (LT)
C.R.L. WATERLOO STA. 40+00.00 TO C.R.L. WATERLOO STA. 50+00.00 (RT)
℄ SOONER S STA. 14+06.36 TO ℄ SOONER S STA. 14+85.96 (RT)
℄ SOONER N STA. 10+33.00 TO ℄ SOONER N STA. 10+90.14 (RT)



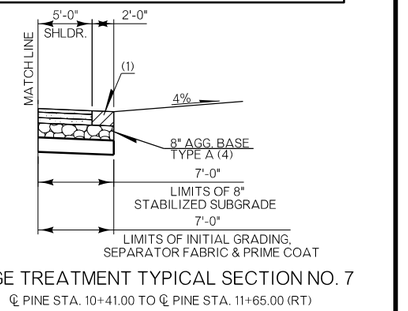
EDGE TREATMENT TYPICAL SECTION NO. 3

℄ SOONER N STA. 10+33.00 TO ℄ SOONER N STA. 11+46.00 (LT)



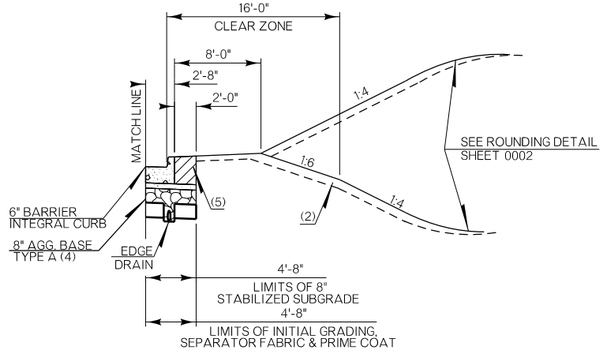
EDGE TREATMENT TYPICAL SECTION NO. 5

C.R.L. WATERLOO STA. 32+70.00 TO C.R.L. WATERLOO STA. 33+10.00 (LT)
C.R.L. WATERLOO STA. 32+70.00 TO C.R.L. WATERLOO STA. 37+40.00 (RT)
C.R.L. WATERLOO STA. 80+00.00 TO C.R.L. WATERLOO STA. 99+60.00 (LT)
C.R.L. WATERLOO STA. 80+00.00 TO C.R.L. WATERLOO STA. 99+60.00 (RT)



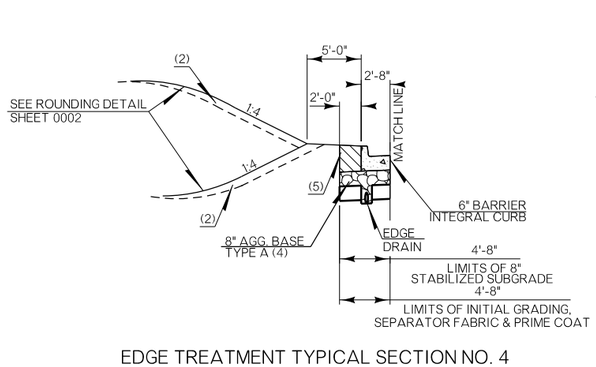
EDGE TREATMENT TYPICAL SECTION NO. 7

℄ PINE STA. 10+41.00 TO ℄ PINE STA. 11+65.00 (RT)



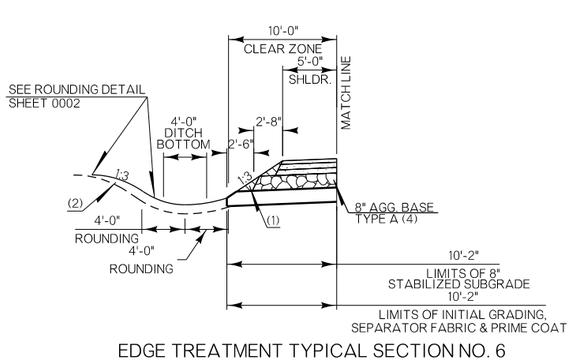
EDGE TREATMENT TYPICAL SECTION NO. 2

C.R.L. WATERLOO STA. 33+10.00 TO C.R.L. WATERLOO STA. 40+00.00 (LT)
C.R.L. WATERLOO STA. 37+40.00 TO C.R.L. WATERLOO STA. 40+00.00 (RT)



EDGE TREATMENT TYPICAL SECTION NO. 4

℄ SOONER S STA. 11+30.00 TO ℄ SOONER S STA. 14+85.96 (LT)



EDGE TREATMENT TYPICAL SECTION NO. 6

℄ SOONER S STA. 11+00.00 TO ℄ SOONER S STA. 14+06.36 (RT)
℄ SOONER S STA. 11+00.00 TO ℄ SOONER S STA. 11+30.00 (LT)
℄ SOONER N STA. 10+90.14 TO ℄ SOONER N STA. 21+00.00 (RT)
℄ SOONER N STA. 11+46.00 TO ℄ SOONER N STA. 21+00.00 (LT)
℄ AIR DEPOT STA. 10+75.00 TO ℄ AIR DEPOT STA. 14+26.04 (LT)
℄ AIR DEPOT STA. 10+75.00 TO ℄ AIR DEPOT STA. 14+26.04 (RT)
℄ PINE STA. 10+41.00 TO ℄ PINE STA. 11+65.00 (LT)

(1) BACKFILL NOTE:
TO BE BACKFILLED AS PART OF THE FINISHING OPERATIONS.
QUANTITY IS MEASURED IN T.B.S.C. TYPE E.

(2) TOPSOIL NOTE:
THE CONTRACTOR SHALL STRIP ALL OF THE AVAILABLE TOPSOIL, STOCKPILE IT, AND PLACE IT BACK ON THE SECTION IN ACCORDANCE WITH SECTION 205 OF THE STANDARD SPECIFICATIONS. RESERVED TOPSOIL SHALL BE SPREAD FIRST ON THE COMPLETED SLOPES OF THE CUT SECTIONS AND THE REMAINDER ON COMPLETED FILL SLOPES OR OTHER PRIORITY AREAS LOCATED BY THE ENGINEER. ALL ADDITIONAL COSTS ASSOCIATED WITH OPERATIONS SHALL BE INCLUDED IN THE PAY ITEM FOR SALVAGED TOPSOIL, LUMP SUM.

THE GRADING LINE AS SHOWN ON THE TYPICAL AND CROSS SECTIONS IS TO THE TOP OF THE TOPSOIL. EARTHWORK QUANTITIES WERE NOT ADJUSTED FOR SALVAGE AND THE TOPSOIL QUANTITY IS INCLUDED IN THE MASS LINE BALANCE.

(3) DISTANCE MEASURED VERTICALLY FROM EDGE OF FINISHED GRADE SHOULDER.

(4) PRIME COAT ON TOP OF AGGREGATE BASE.

(5) BACKFILL NOTE:
TO BE BACKFILLED AND COMPACTED AS PART OF THE FINISHING OPERATIONS.
QUANTITY IS MEASURED IN UNCLASSIFIED BORROW.

DESIGN	AKS	11/17
DRAWN	TML	11/17
CHECKED	JES	6/18
APPROVED		
SQUAD	GARVER	

OKLAHOMA DEPARTMENT OF TRANSPORTATION

TYPICAL SECTIONS
(SHEET 5 OF 5)

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. 0006

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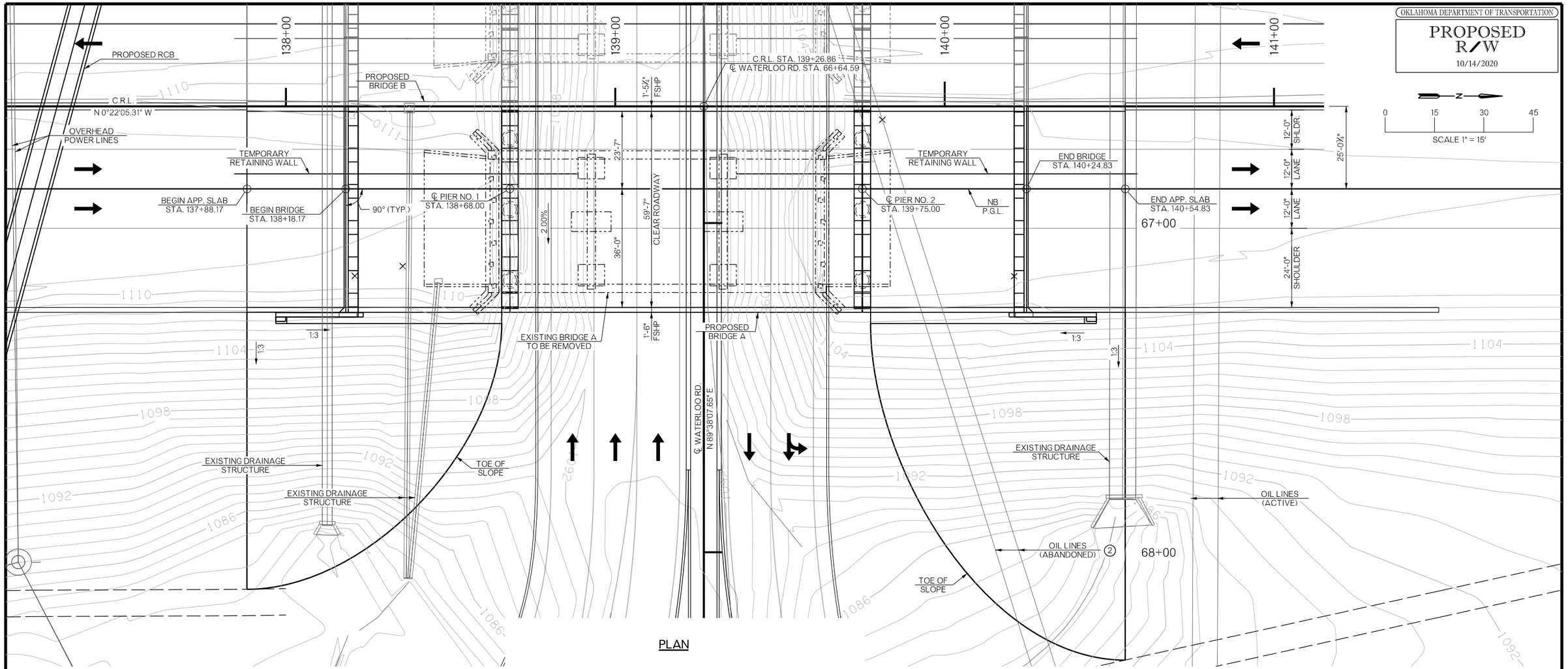
10/21/2020 11:55:46 PM

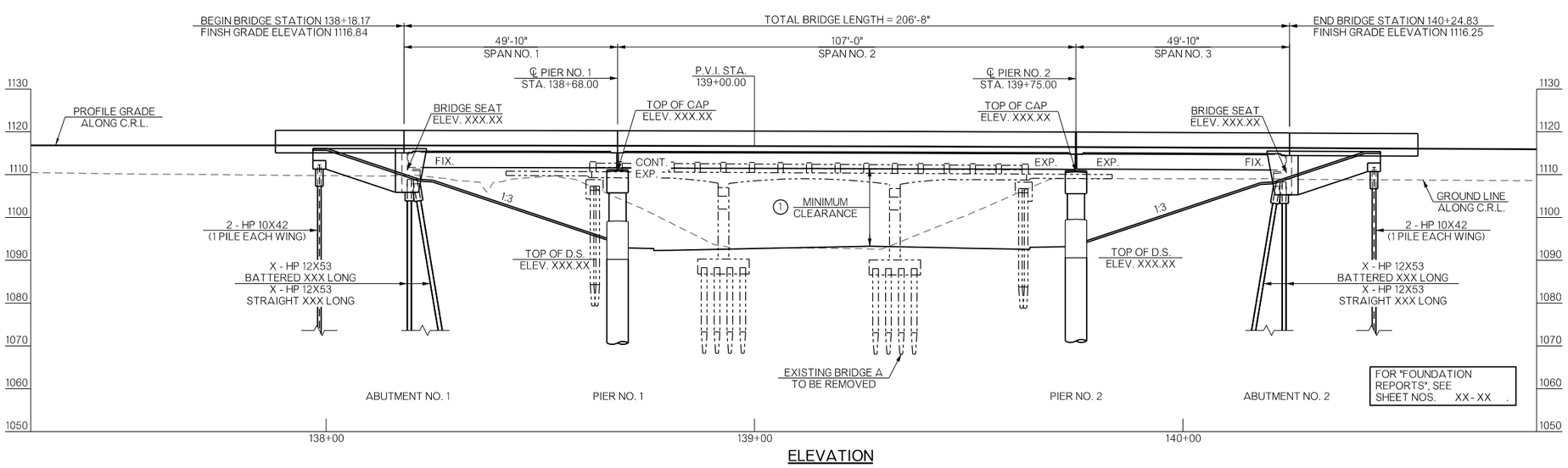
OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W
10/14/2020

0 15 30 45
SCALE 1" = 15'



PLAN



ELEVATION

BENCHMMARK BM 110
DESCRIPTION #6 REBAR
OFFSET 369.89 RT. STA. 138+10.27 EL. 1099.98

BENCHMMARK BM 133
DESCRIPTION #6 REBAR
OFFSET 381.19 LT. STA. 138+11.14 EL. 1112.30

① MINIMUM VERTICAL CLEARANCE 16'-11½"
I-35 STA. 139+32.53
OFFSET 58.80' LT.
LOW CHORD ELEV. 1111.41
FOR PLAN VIEW OF LOW CHORD SEE SHEET NO. B005 .

② SURVEY WAS UNABLE TO LOCATE ABANDONED OIL LINES. CONTRACTOR SHALL TAKE CAUTION WHEN EXCAVATING IN THE VICINITY AND BE PREPARED TO REMOVE THE ABANDONED LINES.

NOTES:
FOR DESIGN DATA, VERTICAL PROFILE DATA, & FOUNDATION DATA SEE SHEET NO. B002.

BRIDGE "A" OKLAHOMA & LOGAN COUNTIES
I-35 NB OVER WATERLOO RD.

GENERAL PLAN AND ELEVATION (SHEET 1 OF 2)

CONSTRUCT NEW 49'-107'-49'X62'-6" PLATE GIRDER SPANS W/ 42" F-SHAPED PARAPET W/ 59' CLEAR ROADWAY AT ℄ STRUCTURE STA. 139+21.50 (SKEW 0°)

DESIGN	DPE	5/18
DETAIL	SJL	1/20
CHECK	DPE	1/20

GARVER

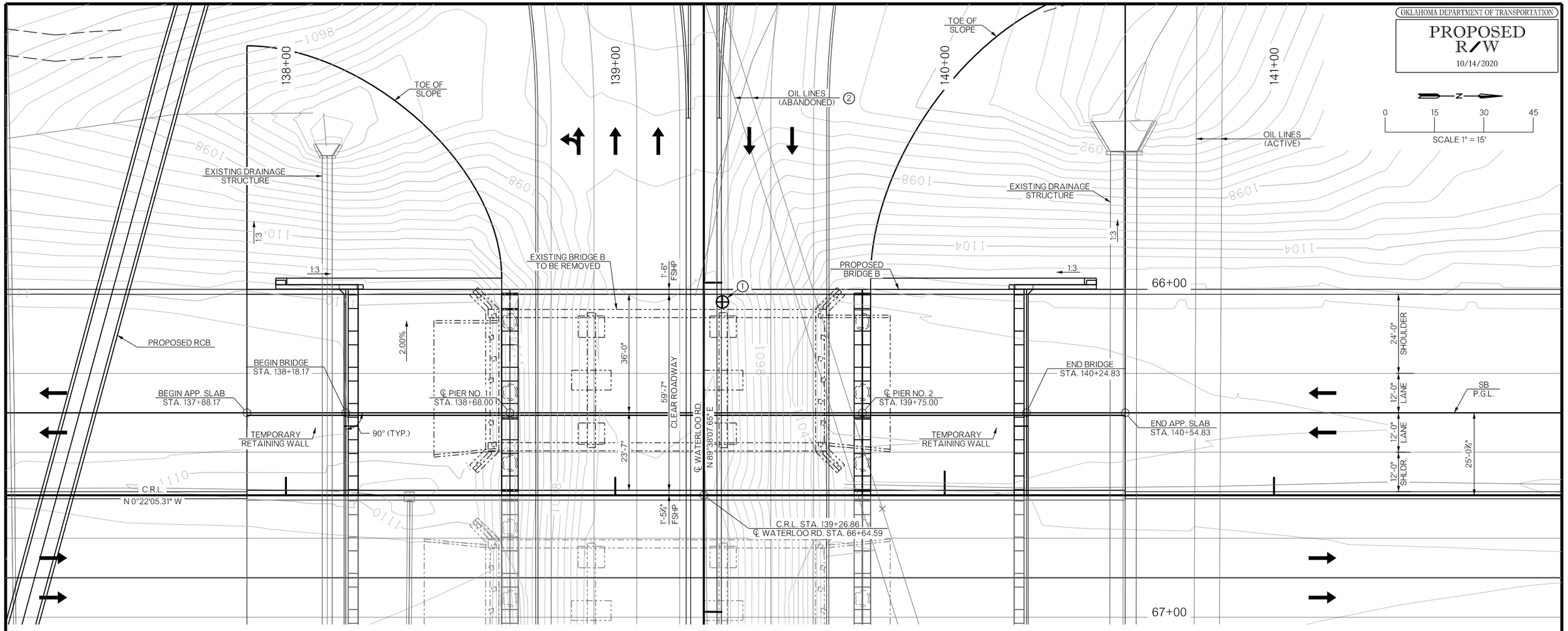
STATE OF OKLAHOMA | DEPARTMENT OF TRANSPORTATION
JOB PIECE NO. 29843(04) SHEET NO. B001

10/14/2020 3:38:31 PM L:\2014\4037270 - ODOT EC-1500N I-35 over Waterloo Rd\Drawings\Bridge\2984304-A-GENERAL PLAN AND ELEVATION 1.dgn

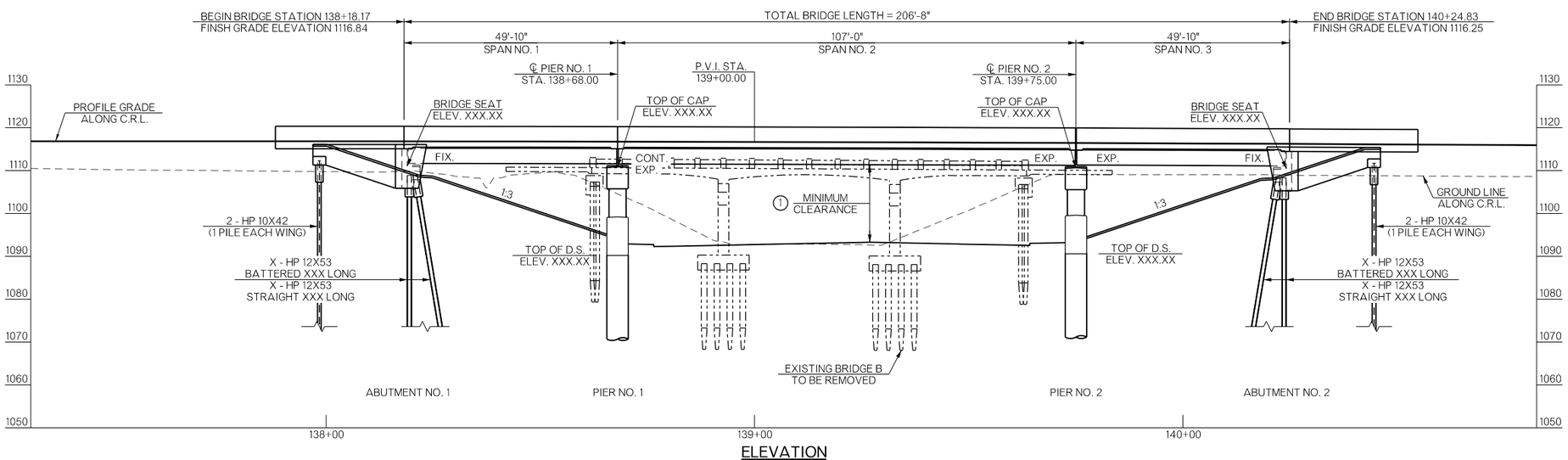
OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W
10/14/2020

0 15 30 45
SCALE 1" = 15'



PLAN



ELEVATION

BENCHMMARK BM 110
DESCRIPTION #6 REBAR
OFFSET 369.89 RT. STA. 138+10.27 EL. 1099.98

BENCHMMARK BM 133
DESCRIPTION #6 REBAR
OFFSET 381.19 LT. STA. 138+11.14 EL. 1112.30

① MINIMUM VERTICAL CLEARANCE 16'-11½"
I-35 STA. 139+32.53
OFFSET 58.80' LT.
LOW CHORD ELEV. 1111.41

② SURVEY WAS UNABLE TO LOCATE ABANDONED OIL LINES. CONTRACTOR SHALL TAKE CAUTION WHEN EXCAVATING IN THE VICINITY AND BE PREPARED TO REMOVE THE ABANDONED LINES.

FOR "FOUNDATION REPORTS", SEE SHEET NOS. XX - XX .

NOTES:
FOR DESIGN DATA, VERTICAL PROFILE DATA, & FOUNDATION DATA SEE SHEET NO. B006.

BRIDGE "B" OVER I-35 SB OVER WATERLOO RD.
OKLAHOMA & LOGAN COUNTIES

GENERAL PLAN AND ELEVATION (SHEET 1 OF 2)

CONSTRUCT NEW 49'-107'-49'X62'-6" PLATE GIRDER SPANS W/ 42" F-SHAPED PARAPET W/ 59' CLEAR ROADWAY AT ℄ STRUCTURE STA. 139+21.50 (SKEW 0°)

DESIGN	DPE	5/18
DETAIL	SJL	1/20
CHECK	DPE	1/20

GARVER

STATE OF OKLAHOMA
DEPARTMENT OF TRANSPORTATION
JOB PIECE NO. 29843(04) SHEET NO. B005

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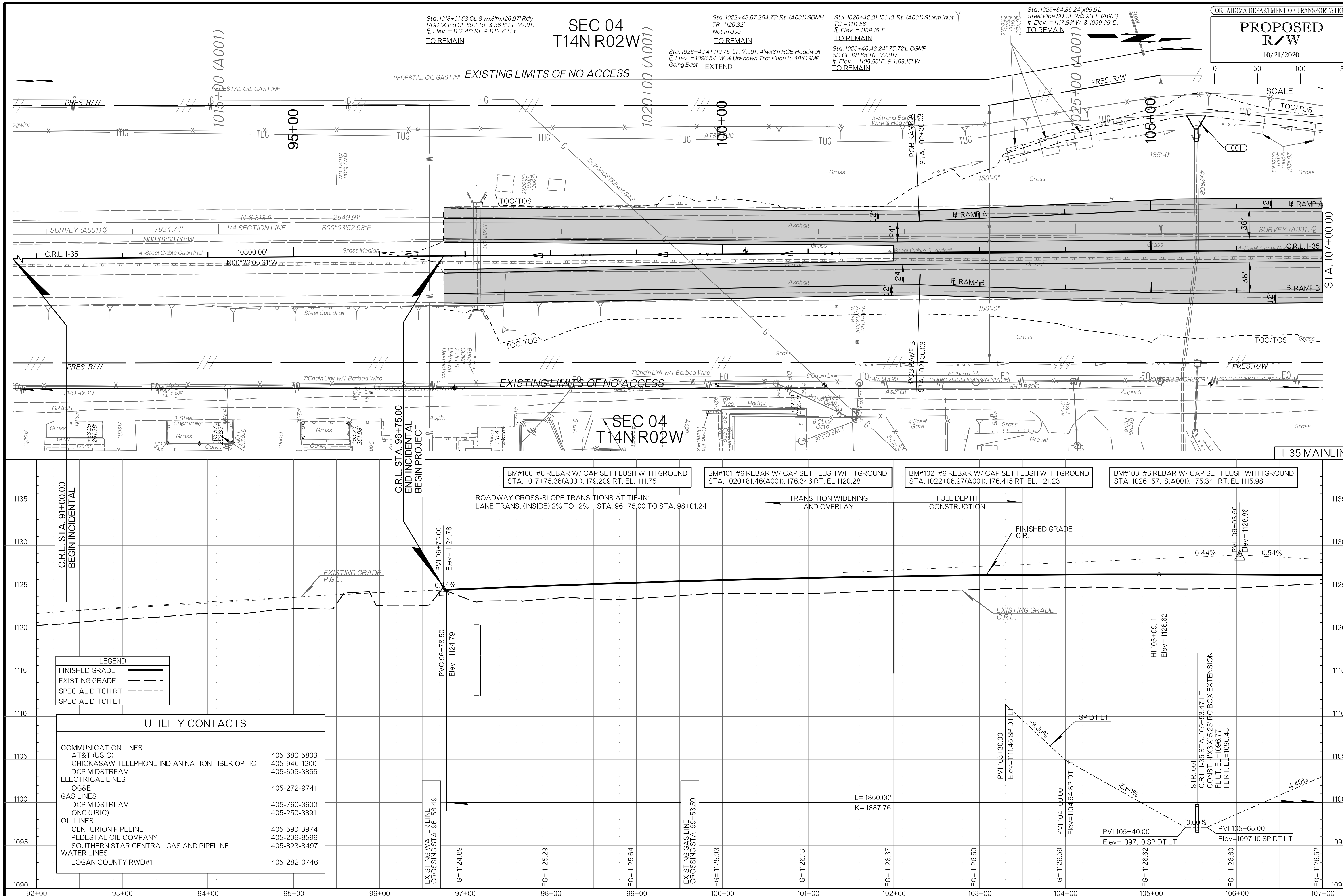
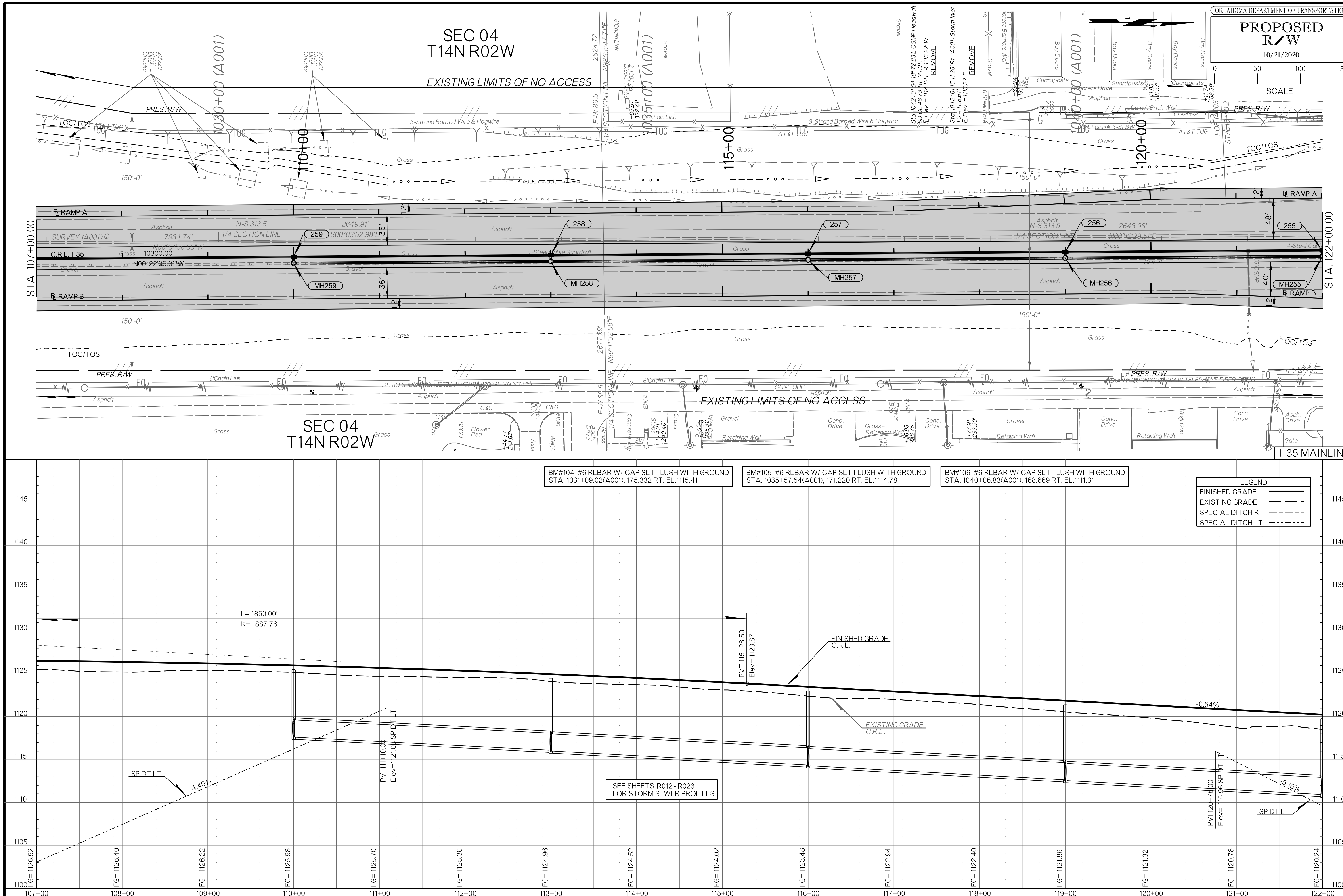


LEGEND

FINISHED GRADE	——
EXISTING GRADE	— —
SPECIAL DITCH RT	— - -
SPECIAL DITCH LT	- - - -

UTILITY CONTACTS

COMMUNICATION LINES	
AT&T (USIC)	405-680-5803
CHICKASAW TELEPHONE INDIAN NATION FIBER OPTIC	405-946-1200
DCP MIDSTREAM	405-605-3855
ELECTRICAL LINES	
OG&E	405-272-9741
GAS LINES	
DCP MIDSTREAM	405-760-3600
ONG (USIC)	405-250-3891
OIL LINES	
CENTURION PIPELINE	405-590-3974
PEDESTAL OIL COMPANY	405-236-8596
SOUTHERN STAR CENTRAL GAS AND PIPELINE	405-823-8497
WATER LINES	
LOGAN COUNTY RWD#1	405-282-0746



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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

Sta. 1045+47.03 3-36" 38.35'L CGMP FES
SD CL 175.36' Lt. (A001)
ft. Elev. = 1099.93' E. & 1100.09' W.
TO REMAIN

Sta. 1045+66.46 148.15' Rt. (A001) Storm Inlet
TG = 1102.42'
ft. Elev. = 1086.72' E. & 48" CGMP Going East
ft. Elev. = 1087.40' W. 5'x4' RCB Going West
TO REMAIN

Sta. 12+52.03 18" 54.08'L Ellip. RCP
SD CL 120.19' Rt. (A003)
ft. Elev. = 1103.88' N. & 1102.44' S.
TO REMAIN

Sta. 8+89.93 18" 29.95'L Ellip. RCP
SD CL 104.93' Rt. (A003)
ft. Elev. = 1119.78' E. & 1120.13' W.
TO REMAIN

SEC 04
T14N R02W

STA. 1051+25.46 TO STA. 1058+00.00
CONST. FENCE STYLE WWF (3BW)
702 L.F.

LIMITS OF NO ACCESS

EXISTING LIMITS OF NO ACCESS

℄ RAMP A

℄ RAMP B

℄ I-35

C.R.L. I-35

STA. 122+00.00

STA. 137+00.00

MH4 MH255 MH254 MH253 MH252 MH251

Sta. 1057+63.44 207.71' Rt. (A001) 8'wx6'h RCB Headwall
ft. Elev. = 1076.90' W. 1073.81' E. 137.26'L
EXTEND

EX-IN3

BM#107 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1044+60.31(A001), 166.121 RT. EL.1106.14

BM#108 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1049+13.06(A001), 160.451 RT. EL.1104.56

BM#109 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1053+81.03(A001), 267.010 RT. EL.1102.21

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

FINISHED GRADE C.R.L.

EXISTING GRADE C.R.L.

PVC 129+85.00 Elev= 1116.00
L= 440.00'
K= 423.08
LO 132+13.46 Elev= 1116.39
PVT 134+25.00 Elev= 1115.91

PVI 123+50.00 Elev=1101.94 SP DT LT
PVI 124+70.00 Elev=1099.54 SP DT LT
PVI 124+85.00 Elev=1099.54 SP DT LT
PVI 126+20.00 Elev=1100.35 SP DT LT
PVI 132+00.00
Elev=1111.26 SP DT LT
PVI 132+95.00 Elev= 1114.39
PVI 133+50.00 Elev=1104.63 SP DT RT
PVI 134+00.00 Elev=1102.06 SP DT LT
PVC 134+75.00 Elev= 1116.16
L= 850.00'
K= 566.67
PVI 135+20.00 Elev=1097.32 SP DT RT
PVI 136+82.00 Elev=1087.60 SP DT RT
PVI 136+92.00 Elev=1087.60 SP DT RT

-0.54% -5.10% -2.00% 0.00% 0.60% 0.50% -4.60% -4.30% -2.80% -6.00% 0.00%

SP DT LT SP DT RT

EXISTING GAS LINE CROSSING STA. 128+50.48

FG= 1120.24 FG= 1119.70 FG= 1119.16 FG= 1118.62 FG= 1118.08 FG= 1117.54 FG= 1117.00 FG= 1116.46 FG= 1115.92 FG= 1115.54 FG= 1115.39 FG= 1115.47 FG= 1115.80 FG= 1116.28 FG= 1116.65 FG= 1116.84

ROADWAY CROSS-SLOPE TRANSITIONS FOR BRIDGES A & B:
SHLDR. TRANS. (INSIDE) -4% TO 2% = STA. 135+98.81 TO STA. 137+88.17
SHLDR. TRANS. (INSIDE) 2% TO -4% = STA. 140+54.83 TO STA. 142+44.19
LANE TRANS. (INSIDE) -2% TO 2% = STA. 136+61.93 TO STA. 137+88.17
LANE TRANS. (INSIDE) 2% TO -2% = STA. 140+54.83 TO STA. 141+81.07
SHLDR. TRANS. (OUTSIDE) 4% TO 2% = STA. 137+25.05 TO STA. 137+88.17
SHLDR. TRANS. (OUTSIDE) 2% TO 4% = STA. 140+54.83 TO STA. 141+17.95

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

I-35 MAINLINE

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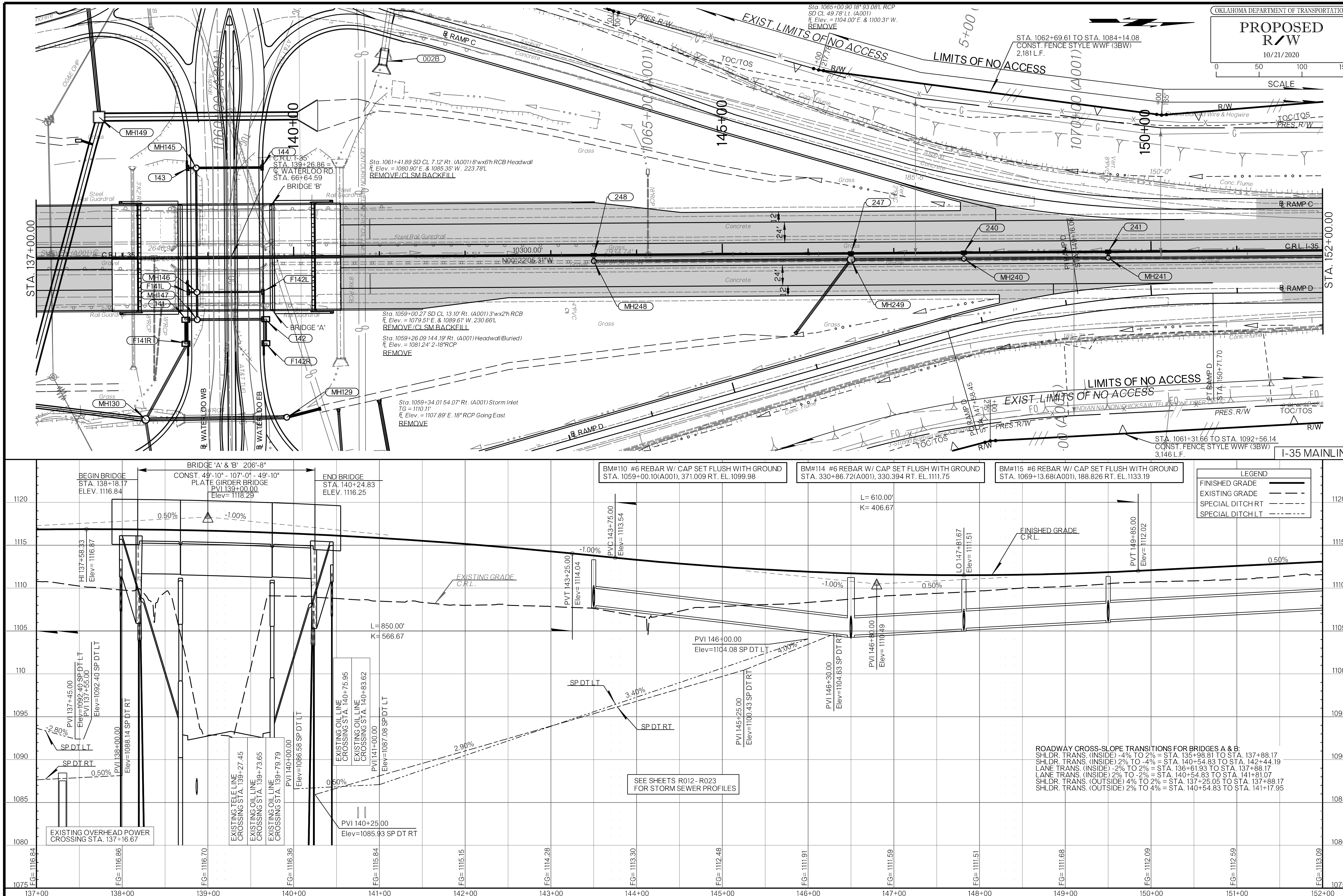
COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R048



PROPOSED R/W
10/21/2020
SCALE
0 50 100 150
LIMITS OF NO ACCESS
EXIST. LIMITS OF NO ACCESS
STA. 1062+69.61 TO STA. 1084+14.08
CONST. FENCE STYLE WWF (3BW)
2,181 L.F.
STA. 1061+31.66 TO STA. 1092+56.14
CONST. FENCE STYLE WWF (3BW)
3,146 L.F.
STA. 137+00.00
STA. 152+00.00
C.R.L. I-35
N00°22'06.31"W
BRIDGE 'B'
BRIDGE 'A'
C.R.L. I-35
STA. 139+26.86 =
C WATERLOO RD.
STA. 66+64.59
Sta. 1061+41.89 SD CL 7.12' Rt. (A001) 8'wx6'h RCB Headwall
FL Elev. = 1080.90' E. & 1085.35' W. 223.78'L
REMOVE/CLSM BACKFILL
Sta. 1059+00.27 SD CL 13.10' Rt. (A001) 3'wx2'h RCB
FL Elev. = 1079.51' E. & 1089.61' W. 230.66'L
REMOVE/CLSM BACKFILL
Sta. 1059+26.09 144.19' Rt. (A001) Headwall (Buried)
FL Elev. = 1081.24' 2-18"RCP
REMOVE
Sta. 1059+34.01 54.07' Rt. (A001) Storm Inlet
TG = 1110.11'
FL Elev. = 1107.89' E. 18" RCP Going East
REMOVE
Sta. 1065+00.90 18" 93.08'L RCP
SD CL 49.78' Lt. (A001)
FL Elev. = 1104.00' E. & 1100.31' W.
REMOVE
I-35 MAINLINE
BRIDGE 'A' & 'B' 206'-8"
CONST. 49'-10" - 107'-0" - 49'-10"
PLATE GIRDER BRIDGE
BEGIN BRIDGE
STA. 138+18.17
ELEV. 1116.84
END BRIDGE
STA. 140+24.83
ELEV. 1116.25
PVI 139+00.00
Elev= 1118.29
BM#110 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1059+00.10(A001), 371.009 RT. EL.1099.98
BM#114 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 330+86.72(A001), 330.394 RT. EL.1111.75
BM#115 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1069+13.68(A001), 188.826 RT. EL.1133.19
LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT
L= 850.00'
K= 566.67
L= 610.00'
K= 406.67
FINISHED GRADE C.R.L.
EXISTING GRADE C.R.L.
PVI 146+00.00
Elev=1104.08 SP DT LT
PVI 140+25.00
Elev=1085.93 SP DT RT
EXISTING OVERHEAD POWER
CROSSING STA. 137+16.67
EXISTING TELE LINE CROSSING STA. 139+27.45
EXISTING OIL LINE CROSSING STA. 139+73.65
EXISTING OIL LINE CROSSING STA. 139+79.79
EXISTING OIL LINE CROSSING STA. 140+75.95
EXISTING OIL LINE CROSSING STA. 140+83.62

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

ROADWAY CROSS-SLOPE TRANSITIONS FOR BRIDGES A & B:
SHLDR. TRANS. (INSIDE) -4% TO 2% = STA. 135+98.81 TO STA. 137+88.17
SHLDR. TRANS. (INSIDE) 2% TO -4% = STA. 140+54.83 TO STA. 142+44.19
LANE TRANS. (INSIDE) -2% TO 2% = STA. 136+61.93 TO STA. 137+88.17
LANE TRANS. (INSIDE) 2% TO -2% = STA. 140+54.83 TO STA. 141+81.07
SHLDR. TRANS. (OUTSIDE) 4% TO 2% = STA. 137+25.05 TO STA. 137+88.17
SHLDR. TRANS. (OUTSIDE) 2% TO 4% = STA. 140+54.83 TO STA. 141+17.95

OKLAHOMA DEPARTMENT OF TRANSPORTATION

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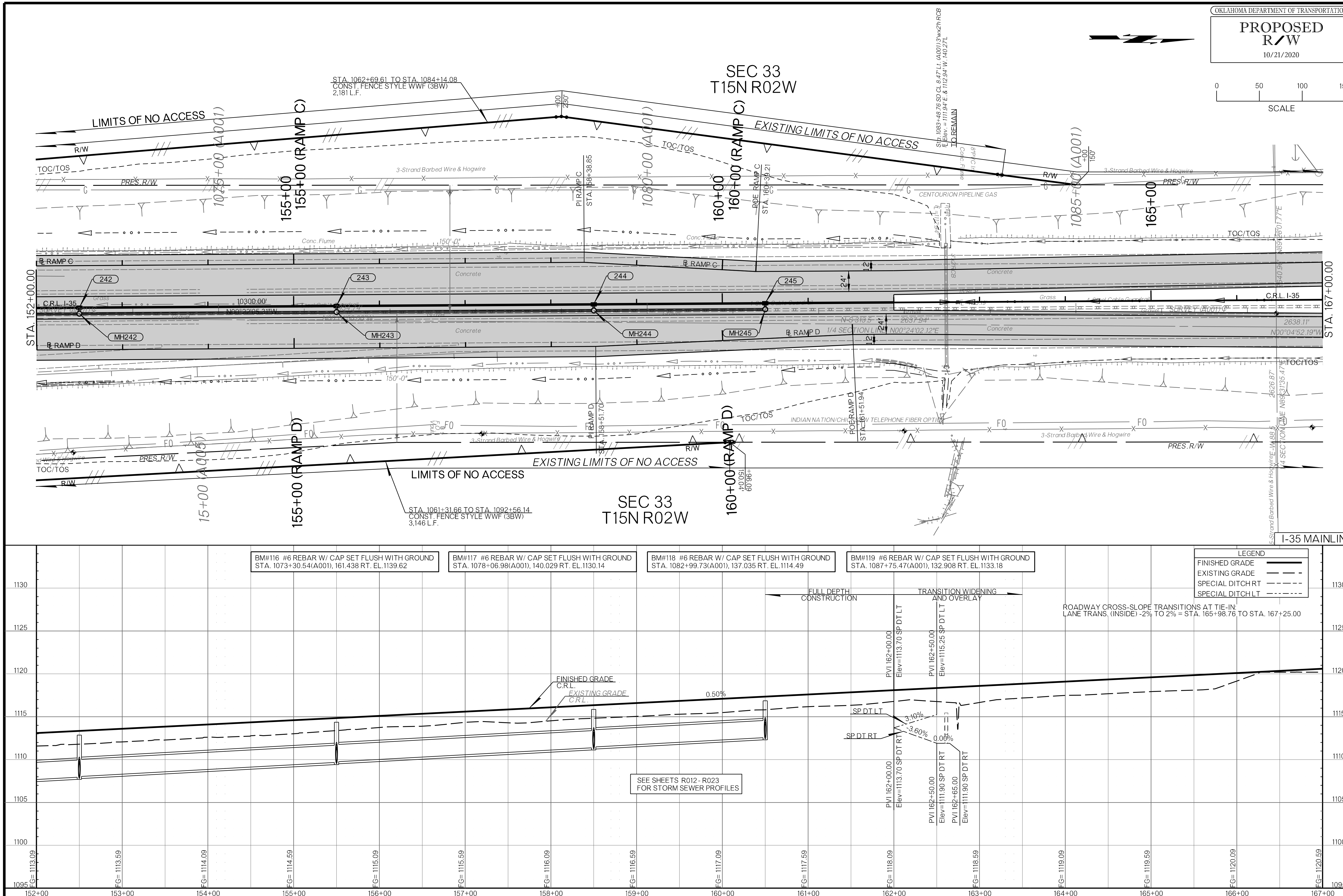

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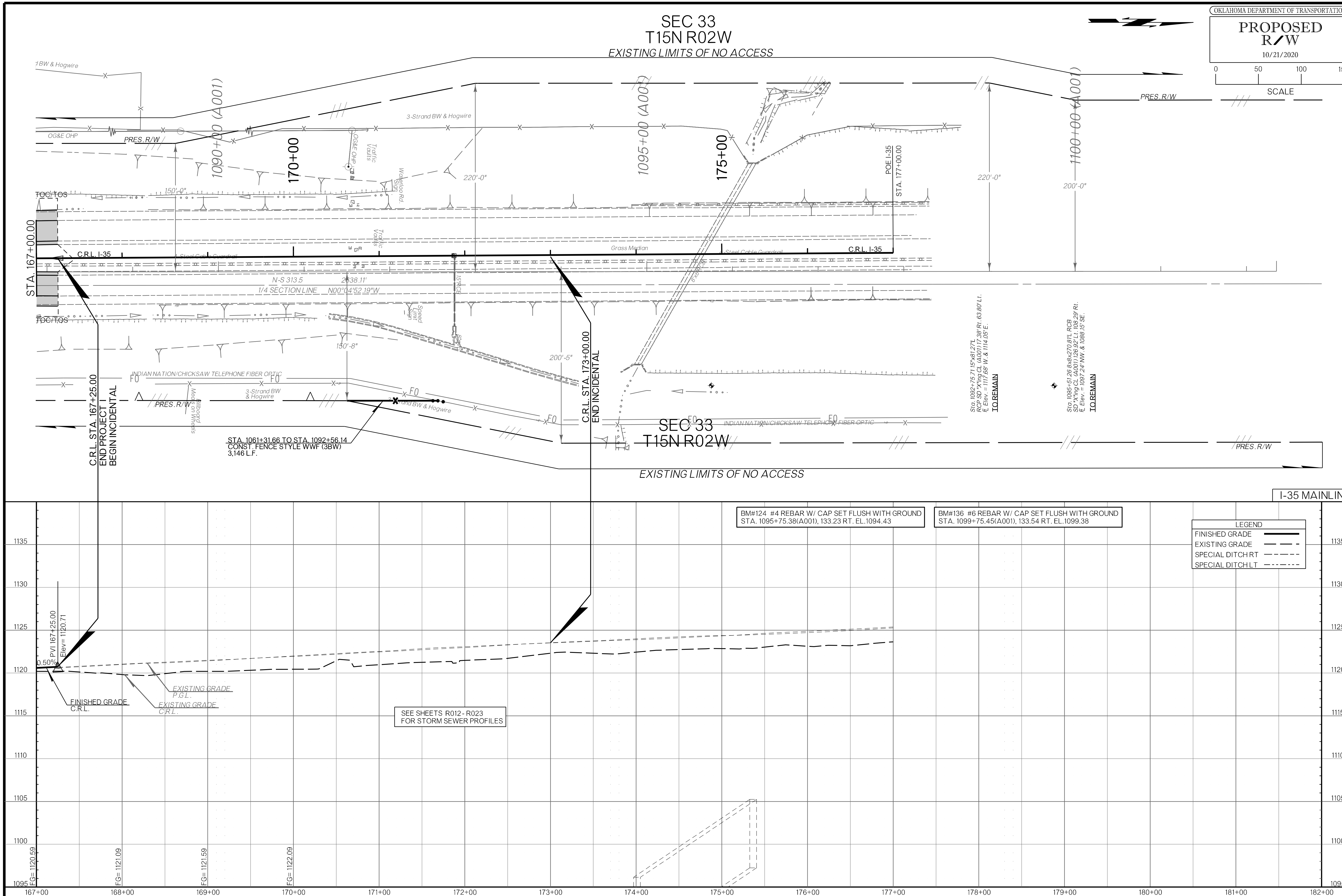

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

SEC 04 T14N R02W

SEC 33 T15N R02W

TEMP. R/W TO CONST. TEMP. PAVEMENT

STA. 1051+25.46 TO STA. 1058+00.00 CONST. FENCE STYLE WWF (3BW) 702 L.F.

EXIST. LIMITS OF NO ACCESS

LIMITS OF NO ACCESS

L.N.A.

E-W 89.25

1/16 SECTION LINE

TOC/TOS

PRES. R/W

R/W

SURVEY ℄ (A003)

℄ RAMP A

℄ RAMP C

℄ WATERLOO EB

℄ WATERLOO WB

℄ S. TURNOUT

C.R.I. I-35

RAMP A

BM#107	#6 REBAR W/ CAP SET FLUSH WITH GROUND STA. 1044+60.31(A001), 166.121 RT. EL.1106.14
BM#108	#6 REBAR W/ CAP SET FLUSH WITH GROUND STA. 1049+13.06(A001), 160.451 RT. EL.1104.56
BM#109	#6 REBAR W/ CAP SET FLUSH WITH GROUND STA. 1053+81.03(A001), 267.010 RT. EL.1102.21

LEGEND
- FINISHED GRADE
- EXISTING GRADE
- SPECIAL DITCH RT
- SPECIAL DITCH LT

VARIES (SEE SHEET XX FOR SPOT ELEVATIONS)

SUPERELEVATION TRANSITION | FULL SUPER = 6% | SUPERELEVATION TRANSITION

PVI 126+83.26 Elev= 1116.92 RC - BEGIN SUPER 126+96.45

128+49.81 6% - FULL SUPER

PVI 130+24.61 Elev= 1113.55

130+48.04 6% - FULL SUPER

132+01.40 RC - END SUPER

PVI 132+15.00 Elev= 1111.26

-1.20% -1.20% -1.50% -0.50% -1.45% -1.50% -2.70% 0.00% -1.50% 2.00% 2.00%

FINISHED GRADE ℄ RAMP

EXISTING GRADE ℄ RAMP

SP DT LT

PVI 129+00.00 Elev=1110.48 SP DT LT

PVC 130+90.00 Elev= 1112.76

PVI 131+00.00 Elev=1109.48 SP DT LT

PVT 133+40.00 Elev= 1109.39

L= 250.00' K= 833.33

PVI 137+00.00 Elev=1100.78 SP DT LT

PVI 137+95.00 Elev=1098.21 SP DT LT

PVI 138+05.00 Elev=1098.21 SP DT LT

PVC 138+20.00 Elev= 1102.19

L= 120.00' K= 34.29

LO 138+71.43 Elev= 1101.80

PVI 138+80.00 Elev= 1101.29

PVT 139+40.00 Elev= 1102.49

PVI 139+43.63 Elev= 1102.56

FINISHED GRADE WATERLOO RD.

EXISTING GAS LINE CROSSING STA. 128+51.82

EXISTING OVERHEAD POWER CROSSING STA. 138+27.73

EXISTING OIL LINE CROSSING STA. 139+08.49

EXISTING OIL LINE CROSSING STA. 139+12.32

SEE SHEETS R012 - R023 FOR STORM SEWER PROFILES

FG= 1116.80 | FG= 1115.64 | FG= 1114.67 | FG= 1113.83 | FG= 1112.64 | FG= 1111.37 | FG= 1109.98 | FG= 1108.49 | FG= 1106.99 | FG= 1105.49 | FG= 1103.99 | FG= 1102.49 | FG= 1101.92

1125 1120 1115 1110 1105 1100 1095 1090 1085 1080

126+00 127+00 128+00 129+00 130+00 131+00 132+00 133+00 134+00 135+00 136+00 137+00 138+00 139+00 140+00 107+00

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

SEC 04 T14N R02W

SEC 33 T15N R02W

SEC 04 T14N R02W

SEC 33 T15N R02W

RAMP B

BM#107 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1044+60.31(A001), 166.121 RT. EL.1106.14

BM#108 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1049+13.06(A001), 160.451 RT. EL.1104.56

BM#109 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1053+81.03(A001), 267.010 RT. EL.1102.21

LEGEND
- FINISHED GRADE
- EXISTING GRADE
- SPECIAL DITCH RT
- SPECIAL DITCH LT

VARIES
(SEE SHEET XX FOR SPOT ELEVATIONS)

PVI 127+30.96
Elev= 1116.66

127+34.66
RC- BEGIN SUPER

SUPERELEVATION TRANSITION

128+88.02
6% - FULL SUPER

FULL SUPER = 6%

PVC 130+90.00
Elev= 1113.14

130+99.75 Elev= 1113.14
6% - FULL SUPER

PVI 130+87.33
Elev= 1113.17

PVI 132+50.00
Elev= 1111.54

132+63.11
RC- END SUPER

SUPERELEVATION TRANSITION

L= 320.00'
K= 200.00

-1.00%

-2.60%

PVT 134+10.00
Elev= 1107.38

FINISHED GRADE
℄ RAMP

EXISTING GRADE
℄ RAMP

SEE SHEETS R012- R023
FOR STORM SEWER PROFILES

PVC 138+15.00
Elev= 1096.85

L= 120.00'
K= 26.09

LOW 138+82.83
Elev= 1095.97

PVT 139+35.00
Elev= 1096.49

PVI 139+45.23
Elev= 1096.70

FINISHED GRADE
WATERLOO RD.

PVI 138+75.00
Elev= 1095.29

FG= 1115.87
FG= 1114.73
FG= 1113.97
FG= 1113.04
FG= 1111.74
FG= 1109.94
FG= 1107.64
FG= 1105.04
FG= 1102.44
FG= 1099.84
FG= 1097.24
FG= 1096.03

EXISTING GAS LINE CROSSING STA. 128+49.57

EXISTING OVERHEAD POWER CROSSING STA. 138+33.81

126+00 127+00 128+00 129+00 130+00 131+00 132+00 133+00 134+00 135+00 136+00 137+00 138+00 139+00 140+00 107+00

1125 1120 1115 1110 1105 1100 1095 1090 1085 1080

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

SEC 33
T15N R02W

SEC 04
T14N R02W

STA. 23+00.00 (A002B) TO STA. 22+98.92 (A002)
CONST. FENCE STYLE WWF (3BW)
2,194 L.F.

STA. 1062+69.61 TO STA. 1084+14.08
CONST. FENCE STYLE WWF (3BW)
2,181 L.F.

LIMITS OF NO ACCESS

EXISTING LIMITS OF NO ACCESS

Sta 11+48.62' 2-36" 24.163'L CGMP SD CL 99.21'Rt. (A006) & Elev. = 1089.14' NW, & 1088.45' SE. REMOVE

Sta 11+49.42' SD CL 7.09' Lt (A006) & Elev. = 1086.95' E & 1087.14' W, 69.82'L EXTEND

RAMP C

BM#110 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1059+00.10(A001), 371.009 RT. EL.1099.98

BM#114 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 330+86.72(A001), 330.394 RT. EL.1111.75

BM#115 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1069+13.68(A001), 188.826 RT. EL.1133.19

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

EXISTING TELE LINE CROSSING STA. 139+76.16

EXISTING OIL LINE CROSSING STA. 140+43.93

EXISTING OIL LINE CROSSING STA. 140+52.46

SUPERELEVATION TRANSITION

FULL SUPER = 6%

SUPERELEVATION TRANSITION

146+32.23 RC- BEGIN SUPER

147+60.03 6% - FULL SUPER

149+90.93 6% - FULL SUPER

151+18.73 RC - END SUPER

VARIES
(SEE SHEET XX FOR SPOT ELEVATIONS)

L= 350.00'
K= 87.50

PVI 139+11.97 Elev= 1102.26

PVC 139+26.00 Elev= 1102.00

FINISHED GRADE - WATERLOO RD.

-2.00%

LO 141+01.00 Elev= 1100.25

PVI 141+01.00 Elev= 1098.50

PVT 142+76.00 Elev= 1102.00

2.00%

FINISHED GRADE ℄ RAMP

PVI 146+00.00 Elev= 1108.48

0.70%

2.00%

PVI 147+79.91 Elev= 1109.74

PVI 151+22.71 Elev= 1112.23

EXISTING GRADE ℄ RAMP

PVC 144+50.00 Elev= 1105.48

PVI 145+50.00
Elev=1099.73 SP DT LT
L= 300.00'
K= 230.77

PVT 147+50.00 Elev= 1109.53

2.40%

PVI 148+00.00 Elev= 1105.73 SP DT LT

STR. 002B
BL RAMP C STA. 140+89 RT
CONST. 8'X6'X19.5' RC BOX EXTENSION
FL LT. EL=1086.95
FL RT. EL=1086.95

STR. 002A
BL RAMP C STA. 140+77 LT
CONST. 8'X6'X12.7' RC BOX EXTENSION
FL LT. EL=1087.14
FL RT. EL=1087.14

2.80%

SP DT LT

0.00%

PVI 140+70.00
Elev=1087.13 SP DT LT

PVI 141+00.00
Elev=1087.13 SP DT LT

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

FG= 1100.83
FG= 1100.25
FG= 1100.81
FG= 1102.48
FG= 1104.48
FG= 1106.43
FG= 1107.99
FG= 1109.13
FG= 1109.88
FG= 1110.42
FG= 1111.13
FG= 1112.04

1125 1120 1115 1110 1105 1100 1095 1090 1085 1080

138+00 139+00 140+00 141+00 142+00 143+00 144+00 145+00 146+00 147+00 148+00 149+00 150+00 151+00 152+00 153+00

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R054

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

SEC 04 T14N R02W

SEC 33 T15N R02W

SEC 04 T14N R02W

140+00 (RAMP D)

145+00 (RAMP D)

150+00 (RAMP D)

10+00 (A005)

EXIST. LIMITS OF NO ACCESS

LIMITS OF NO ACCESS

STA. 1061+31.66 TO STA. 1092+56.14
CONST. FENCE STYLE WWF (3BW)
3,146 L.F.

Sta. 0+60.05, 0.38' Rt. (A005)
3'wx27'h RCB Headwall
fl. Elev. = 1082.55' E. &
1082.05' W. 119.241.
REMOVE

RAMP D

BM#110 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1059+00.10(A001), 371.009 RT. EL.1099.98

BM#114 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 330+86.72(A001), 330.394 RT. EL.1111.75

BM#115 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1069+13.68(A001), 188.826 RT. EL.1133.19

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

EXISTING OIL LINE CROSSING STA. 140+31.78
EXISTING OIL LINE CROSSING STA. 140+39.45
EXISTING OIL LINE CROSSING STA. 140+43.85
EXISTING OIL LINE CROSSING STA. 140+52.48

EXISTING TELE LINE CROSSING STA. 139+18.54

FINISHED GRADE WATERLOO RD.

PVI 139+11.84
Elev= 1096.47
PVC 139+35.00
Elev= 1096.01

L= 200.00'
K= 45.45

PVI 140+25.91
Elev=1095.10

PVI 140+35.00
Elev= 1094.01

PVT 141+35.00
Elev= 1096.41

-2.00%
2.00%
2.40%

FINISHED GRADE
℄ RAMP

EXISTING GRADE
℄ RAMP

PVC 146+06.00
Elev= 1105.29

PVI 146+55.00
Elev= 1108.89

0.60%

PVT 148+05.00
Elev= 1109.79

PVI 148+24.29
Elev= 1109.90

PVI 151+52.56
Elev= 1112.37

L= 300.00'
K= 166.67

VARIES
(SEE SHEET XX FOR SPOT ELEVATIONS)

146+73.58
RC- BEGIN SUPER

146+06.38
6% - FULL SUPER

150+23.78
6% - FULL SUPER

151+51.58
RC - END SUPER

SUPERELEVATION TRANSITION

FULL SUPER = 6%

SUPERELEVATION TRANSITION

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

FG= 1095.17
FG= 1095.70
FG= 1097.97
FG= 1100.37
FG= 1102.77
FG= 1105.17
FG= 1107.29
FG= 1108.82
FG= 1109.75

1120 1115 1110 1105 1100 1095 1090 1085 1080 1075

138+00 139+00 140+00 141+00 142+00 143+00 144+00 145+00 146+00 147+00 148+00 149+00 150+00 151+00 152+00 153+00

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COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R055

BM#130 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 11+05.91(A002B), 34.77 LT. EL.1144.77

BM#130 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 16+34.10(A002B), 30.46 LT. EL.1169.46

BM#128 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 23+32.91(A002B), 39.40 LT. EL.1167.98

SEC 32
T15N R02W

SEC 33
T15N R02W

SEC 05
T14N R02W

SEC 04
T14N R02W

OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED
R/W
10/21/2020

0 50 100 150
SCALE

BLUE RIDGE ROAD

KANALY'S RI-ANN
ADDITION

9 10 11 12 13 14 15

C.R.L. STA. 32+70.00
BEGIN CONSTRUCTION
WATERLOO RD.

15+00 (A002B)

35+00

40+00

25+00 (A002B)

20+00 (A002B)

C.R.L. WATERLOO SURVEY ℄ (A002B)

SECTION LINE N89°34'24.64"E

SECTION LINE N00°35'19.77"W

SECTION LINE N00°20'01.51"W

471.26'
N89°20'26.53"E

1028.74'
N88°34'22.65"E

2649.54'

2676.31'

N-S 313

E-W 89

℄ SOONER RD. N. STA. 10+00.00=
C.R.L. WATERLOO RD. STA. 40+13.96

℄ SOONER RD. N. STA. 15+10.55=
C.R.L. WATERLOO RD. STA. 40+02.12

STA. 13+00.00 TO STA. 13+88.67
CONST. FENCE STYLE
CLF (4FT CLASS B) 89 L.F.

STA 37+80 LT
CONST. 36' ASPH. DR.
AS DIKE

STA. 14+75.00 TO STA. 19+59.90
CONST. FENCE STYLE CLF (4FT CLASS B)
485 L.F.

STA. 264+36.56 TO STA. 269+55.64
CONST. FENCE STYLE SWF (5BW)
520 L.F.

STA 40+13.96 LT
CONST. 48' ASPH. STREET RETURN
AS DIKE

STA. 23+00.00 (A002B) TO STA. 22+98.92 (A002)
CONST. FENCE STYLE SWF (5BW)
2,194 L.F.

STA 32+70 RT
CONST. 14' CONC. DR.
W/ 12" RCP SD

CONST. 18FT
GATE STYLE
CLF (4FT HIGH)

CONST. 16FT
GATE STYLE
CLF (4FT HIGH)

STA 34+00 RT
CONST. 11' CONC. DR.
W/ 12" RCP SD

STA. 13+28.42 TO STA. 16+93.17
CONST. FENCE STYLE CLF (4FT CLASS B)
W/ GATES 334 L.F.

STA 35+50 RT
CONST. 17' ASPH. DR.
W/ 12" RCP SD

STA 37+31 RT
CONST. 11' ASPH. DR.
AS DIKE

STA 40+02.12 RT
CONST. 48' ASPH. STREET RETURN
AS DIKE

STA 42+48 RT
CONST. 12' T.B.S.C. DR.
AS DIKE

STA 44+24 RT
CONST. 22' ASPH. DR.
AS DIKE

TEMP. R/W TO
CONST. DRIVE

TEMP. R/W TO
CONST. DRIVE

TEMP. R/W TO
CONST. DRIVE

Sta. 24+48.52 12"x30.3' CGMP
SD CL. 25.2' Rt. (A002b)
fl. Elev. = 1160.54' W. & 1158.77' E.
REMOVE

Sta. 26+18.58 24"x45.2' CGMP
SD CL. 25.8' Rt. (A002b)
fl. Elev. = 1149.48' W. & 1147.98' E.
REMOVE

Sta. 27+01.48 15"x26.2' CGMP
SD CL. 111.7' Rt. (A002b)
fl. Elev. = 1144.50' W. & 1143.81' E.
TO REMAIN

Sta. 14+20.96 24"x40.3' CGMP
SD CL. 20.5' Lt. (A002b)
fl. Elev. = 1153.55' W. & 1154.95' E.
TO REMAIN

Sta. 14+70.97 15"x20.6' RCP
SD CL. 25.2' Rt. (A002b)
fl. Elev. = 1156.54' W. & 1157.15' E.
REMOVE

Sta. 16+14.53 15"x47.0' CGMP
SD CL. 19.7' Rt. (A002b)
fl. Elev. = 1162.89' W. & 1164.68' E.
REMOVE

Sta. 21+67.89 CL. 15"x68.5' Rdy.
CGMP "X"ing CL. 41.98' Rt. & 26.22' Lt. (A002b)
fl. Elev. = 1173.60' Rt. & 1172.82' Lt.
REMOVE

WATERLOO RD.

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R056

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

UTILITY CONTACTS

COMMUNICATION LINES	
AT&T (USIC)	405-680-5803
CHICKASAW TELEPHONE INDIAN NATION FIBER OPTIC	405-946-1200
DCP MIDSTREAM	405-605-3855
ELECTRICAL LINES	
OG&E	405-272-9741
GAS LINES	
DCP MIDSTREAM	405-760-3600
ONG (USIC)	405-250-3891
OIL LINES	
CENTURION PIPELINE	405-590-3974
PEDESTAL OIL COMPANY	405-236-8596
SOUTHERN STAR CENTRAL GAS AND PIPELINE	405-823-8497
WATER LINES	
LOGAN COUNTY RWD#1	405-282-0746

LEGEND
- FINISHED GRADE
- EXISTING GRADE
- SPECIAL DITCH RT
- SPECIAL DITCH LT

TRANSITION WIDENING AND OVERLAY

FULL DEPTH CONSTRUCTION

36+50.00

PROPOSED FINISH GRADE

EXISTING GROUND PROFILE

PVI 34+41.00
Elev= 1168.00

PVI 39+25.00
Elev= 1180.10

2.50%

5.00%

5.80%

232

231

226

224

MH2

PVC 32+70.00
Elev= 1159.45

PVI 32+70.00
Elev= 1157.25 SP DT LT

PVI 33+10.00
Elev=1159.57 SP DT LT

STR. 100
C.R.L. WATERLOO STA. 32+68.00
CONST. 12'X27.00' RCP S.D.
FL BK. EL=1166.64
FL AH. EL=1157.46

STR. 101
C.R.L. WATERLOO STA. 34+00.00
CONST. 12'X24.50' RCP S.D.
FL BK. EL=1162.64
FL AH. EL=1163.68

STR. 102
C.R.L. WATERLOO STA. 35+50.00
CONST. 12'X30' RCP S.D.
FL BK. EL=1167.85
FL AH. EL=1168.71

PVT 36+12.00
Elev= 1172.27

PVC 37+40.00
Elev= 1175.47

HI 38+51.45
Elev1176.86

PVT 41+10.00
Elev= 1169.36

L= 342.00'
K= 136.80

L= 370.00'
K= 44.58

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

EXISTING OVERHEAD POWER CROSSING STA. 37+72.28
FG= 1176.57

EXISTING OVERHEAD POWER CROSSING STA. 39+70.73
FG= 1174.39

EXISTING TELE LINE CROSSING STA. 40+32.64

EXISTING GAS LINE CROSSING STA. 40+56.92

FG= 1160.91
FG= 1165.33
FG= 1169.01
FG= 1171.96
FG= 1174.47
FG= 1176.60
FG= 1169.93
FG= 1164.14
FG= 1158.34
FG= 1152.54
FG= 1146.74

WATERLOO RD.

30+00 31+00 32+00 33+00 34+00 35+00 36+00 37+00 38+00 39+00 40+00 41+00 42+00 43+00 44+00 45+00

1215 1210 1205 1200 1195 1190 1185 1180 1175 1170 1165 1160 1155 1150 1145 1140 1135 1130 1125 1120 1115

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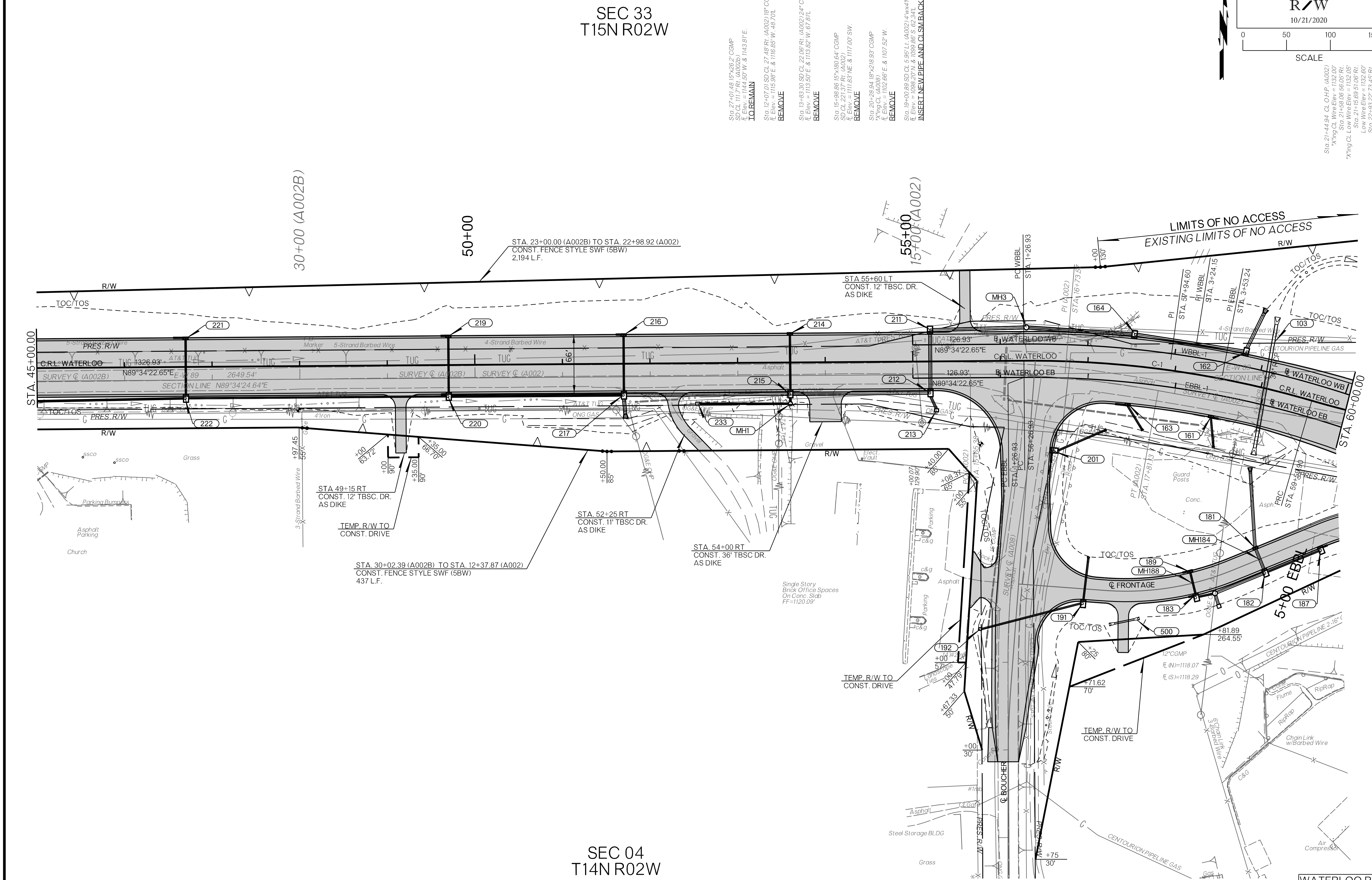
COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R057

BM#127 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 29+98.66(A002B), 34.74 RT. EL.1128.92

BM#134 ODOT SD-11 #0-55-1787 #6 REBAR W/CAP
STA. 15+78.03(A002), 79.82 RT. EL.1117.18

BM#133 ODOT SD-11 #0-55-1787 #6 REBAR W/CAP
STA. 15+78.03(A002), 79.82 RT. EL.1112.30



COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R058

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

L= 400.00'
K= 100.00

L= 330.00'
K= 275.00

PVC 46+85.00
Elev= 1136.01

PVI 48+85.00
Elev= 1124.41

PVI 50+60.00
Elev=1117.22 SP DT RT

PVI 51+75.00
Elev=1114.81 SP DT RT

PVI 52+20.00
Elev=1117.73 SP DT RT

PVT 50+85.00
Elev= 1120.81

PROPOSED FINISH GRADE

EXISTING GROUND PROFILE

SP DT RT

PVI 54+40.00
Elev=1114.42 SP DT RT

PVI 55+25.00
Elev=1111.19 SP DT RT

PVI 55+50.00
Elev=1112.44 SP DT RT

PVC 56+20.00
Elev= 1111.19

PVI 57+00.00
Elev=1108.10 SP DT RT

PVI 57+85.00
Elev= 1108.22

PVI 58+00.00
Elev=1103.60 SP DT RT

PVI 59+05.00
Elev=1101.08 SP DT RT

PVI 59+15.00
Elev=1101.08 SP DT RT

PVT 59+50.00
Elev= 1107.23

PVI 59+50.00
Elev=1106.91 SP DT RT

-5.80%
-5.80%
-1.80%
-2.10%
6.50%
-1.80%
-3.60%
-3.00%
-1.80%
-4.50%
-0.60%
-2.40%
0.00%
16.67%
-0.60%

222
220
217
215
212
211
MH3
164
162

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

STR. 103
CRL. WATERLOO STA. 59+04.84
CONST. 36"/49" RCP
FL LT. EL=1096.82
FL RT. EL=1100.77

EXISTING OVERHEAD POWER CROSSING STA. 55+04.76

EXISTING GAS LINE CROSSING STA. 56+79.62

FG= 1140.94
FG= 1135.16
FG= 1130.01
FG= 1125.86
FG= 1122.71
FG= 1120.54
FG= 1118.74
FG= 1116.94
FG= 1115.14
FG= 1113.34
FG= 1111.54
FG= 1109.86
FG= 1108.53
FG= 1107.57
FG= 1106.93

WATERLOO RD.

45+00 46+00 47+00 48+00 49+00 50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00 58+00 59+00 60+00

1135 1160 1155 1150 1145 1140 1135 1130 1125 1120 1115 1110 1105 1100 1095 1090 1085 1080 1075 1070 1065

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COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R059

OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

SEC 33 T15N R02W

SEC 04 T14N R02W

STA. 1062+69.61 TO STA. 1084+14.08
CONST. FENCE STYLE WWF (3BW)
2,181 L.F.

BM#109 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1053+81.03(A001), 267.010 RT. EL.1102.21

BM#110 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1059+00.10(A001), 371.009 RT. EL.1099.98

BM#114 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 330+86.72(A001), 330.394 RT. EL.1111.75

STA. 23+00.00 (A002B) TO STA. 22+98.92 (A002)
CONST. FENCE STYLE SWF (5BW)
2,194 L.F.

LIMITS OF NO ACCESS
EXIST. L.N.A.

STA. 1061+31.66 TO STA. 1092+56.14
CONST. FENCE STYLE WWF (3BW)
3,146 L.F.

STA. 72+65 LT
CONST. 45' CONC. DR.
AS DIKE

STA. 71+90 LT
CONST. 28' ASPH. DR.
AS DIKE

TEMP. R/W TO
CONST. TEMP. PAVEMENT

STA. 1051+25.46 TO STA. 1058+00.00
CONST. FENCE STYLE WWF (3BW)
702 L.F.

TEMP. R/W TO
CONST. DRIVE

CONST. RETAINING WALL A

C.R.L. I-35
STA. 139+26.86 =
℄ WATERLOO RD.
STA. 66+64.59

INSERT NEW PIPE AND CL SW BACKFILL

CENTURION PIPELINE 2-16" OIL LINES

℄ WATERLOO WB
℄ WATERLOO EB
C.R.L. WATERLOO
SURVEY ℄ (A002)
℄ RAMP A
℄ RAMP B
℄ RAMP C
℄ RAMP D
℄ FRONTAGE
℄ INDUSTRIAL
WATERLOO RD.

BRIDGE 'A'
BRIDGE 'B'

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R060

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED
R/W
10/21/2020

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

BRIDGE 'B'
BRIDGE 'A'
WALL A
-0.60%
PVI 63+05.83
Elev= 1105.09
-3.60%
PVC 61+05.83
Elev= 1106.29
L= 400.00'
K= 133.33
PVC 65+60.00
Elev= 1095.94
PVI 65+05.83
Elev= 1097.89
L= 280.00'
K= 49.12
LC 67+36.84
Elev1092.76
PVT 68+40.00
Elev= 1093.84
PROPOSED
FINISH
GRADE
EXISTING
GROUND
PROFILE
2.10%
MH145
MH146
MH147
PVI 67+00.00
Elev= 1090.90
PVC 73+00.00
Elev= 1103.50
L= 500.00'
K= 61.73
HI 74+29.63
Elev1104.86
EXISTING UNDERGROUND POWER
CROSSING STA. 73+95.82
EXISTING TELE LINE
CROSSING STA. 74+30.02
EXISTING OIL LINE
CROSSING STA. 61+84.20
EXISTING OIL LINE
CROSSING STA. 61+96.73
EXISTING TELE LINE
CROSSING STA. 62+98.32
EXISTING OIL LINE
CROSSING STA. 64+97.48
EXISTING OIL LINE
CROSSING STA. 65+13.71
EXISTING TELE LINE
CROSSING STA. 66+03.32
EXISTING FIBER OPTIC LINE
CROSSING STA. 70+36.50
EXISTING OVERHEAD POWER
CROSSING STA. 70+41.80
EXISTING GAS LINE
CROSSING STA. 72+17.16
FG= 1106.33
FG= 1105.39
FG= 1103.71
FG= 1101.28
FG= 1098.10
FG= 1094.66
FG= 1092.90
FG= 1093.16
FG= 1095.10
FG= 1097.20
FG= 1099.30
FG= 1101.40
FG= 1103.50
FG= 1104.79
FG= 1104.46
SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES
WATERLOO RD.

60+00 61+00 62+00 63+00 64+00 65+00 66+00 67+00 68+00 69+00 70+00 71+00 72+00 73+00 74+00 75+00 76+00

1165 1160 1155 1150 1145 1140 1135 1130 1125 1120 1115 1110 1105 1100 1095 1090 1085 1080 1075 1070 1065

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COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO R061

OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

BM#111 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 35+37.08(A002), 40.587 LT. EL.1103.75

BM#112 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 40+57.07(A002), 21.144 LT. EL.1073.59

BM#113 CITY OF EDMOND 3 1/2" BRASS CAP GPS MONUMENT
STA. 42+91.66(A002), 28.89 RT. EL.1063.05

BM#135 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 47+12.93(A002), 40.33 LT. EL.1060.39

SEC 33
T15N R02W

SEC 04
T14N R02W

WATERLOO RD.

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO R062

SEE SHEET R075
FOR COWBELL CREEK
RCB PROFILES

R023

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

L= 600.00'
K= 80.00

L= 790.00'
K= 96.34

L= 500.00'
K= 61.73

PVI 75+50.00
Elev= 1108.75

2.10%

-6.00%

WALL B

113

PVT 78+00.00
Elev= 1093.75

111

PVC 80+15.00
Elev= 1080.85

EXISTING GROUND PROFILE

PROPOSED FINISH GRADE

PVI 81+10.00
Elev=1072.96 SP DT LT

SP DT LT

-6.60%

-6.00%

PVI 84+10.00
Elev= 1057.15

104

2.20%

5.00%

0.00%

PVI 84+00.00
Elev=1053.82 SP DT LT

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

PVI 85+50.00
Elev=1058.82 SP DT LT

PVI 84+50.00
Elev=1053.82 SP DT LT

SEE SHEET R075 FOR STRUCTURE DATA

LO 85+93.05
Elev=1063.61

105

PVI 87+25.00
Elev=1055.85 SP DT LT

-1.70%

0.00%

SEE SHEET R075 FOR STRUCTURE DATA

PVI 87+00.00
Elev=1048.50 SP DT RT

PVT 88+06.00
Elev= 1065.84

2.40%

6.75%

PVI 88+00.00
Elev=1055.85 SP DT LT

STR. 106
C.R.I. WATERLOO STA. 88+18.00, RT
CONST. 36"X53 RCP S.D.
FL BK. EL=1056.68
FL AH. EL=1061.51

PVI 88+50.00
Elev=1062.60 SP DT RT

2.20%

2.80%

SP DT RT

PVC 89+30.00
Elev= 1068.59

PVI 89+00.00
Elev=1062.60 SP DT LT

WATERLOO RD.

EXISTING OVERHEAD POWER CROSSING STA. 76+54.50

FG= 1102.51
FG= 1098.94
FG= 1093.75
FG= 1087.75
FG= 1081.75
FG= 1076.12
FG= 1071.53
FG= 1067.97
FG= 1065.44
FG= 1063.96
FG= 1063.51
FG= 1064.10
FG= 1065.73
FG= 1067.93
FG= 1070.44

75+00 76+00 77+00 78+00 79+00 80+00 81+00 82+00 83+00 84+00 85+00 86+00 87+00 88+00 89+00 90+00

1135 1130 1125 1120 1115 1110 1105 1100 1095 1090 1085 1080 1075 1070 1065 1060 1055 1050 1045 1040 1035

1030 1025 1020 1015 1110 1105 1100 1095 1090 1085 1080 1075 1070 1065 1060 1055 1050 1045 1040 1025

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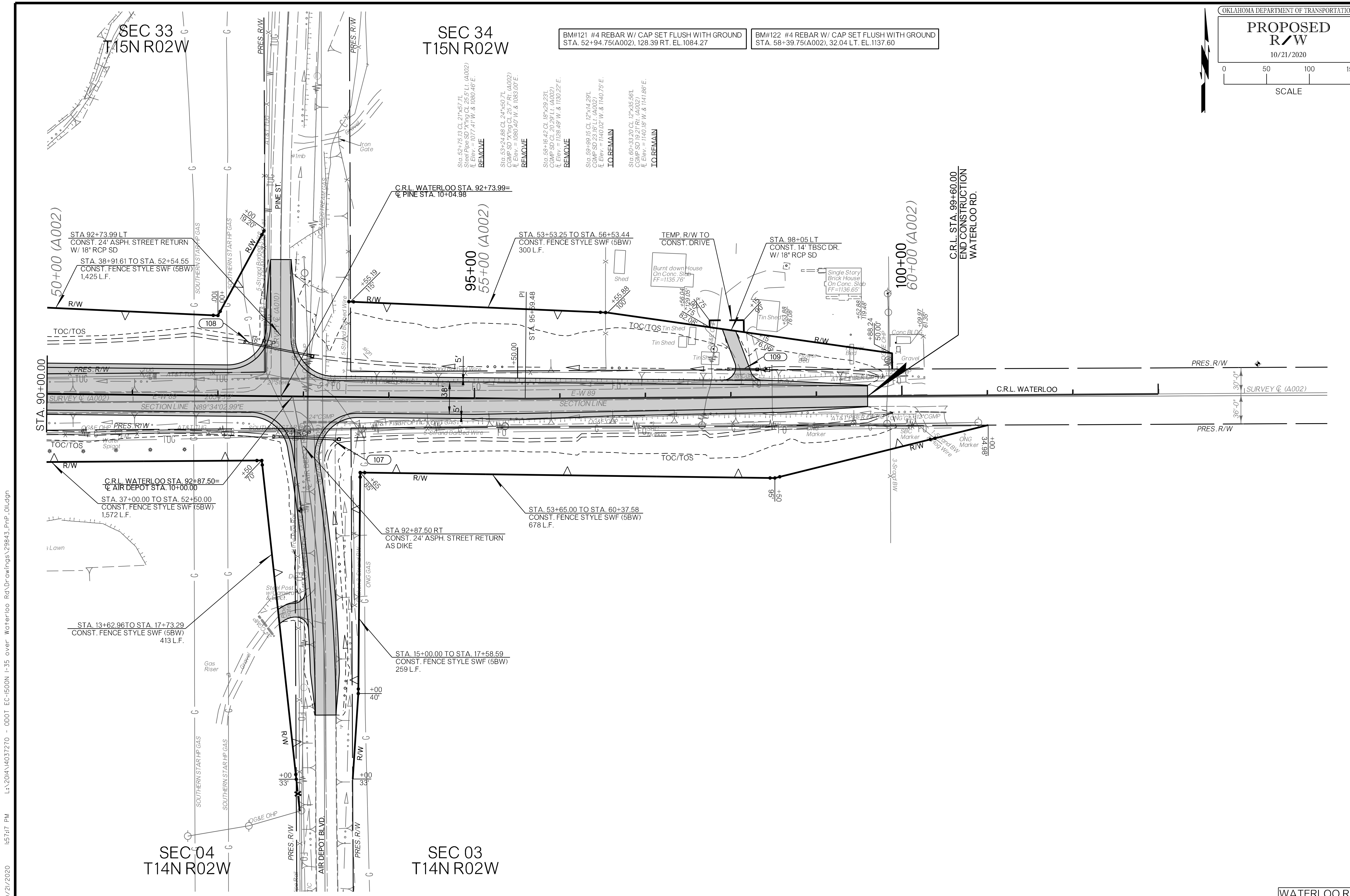
COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R063


OKLAHOMA DEPARTMENT OF TRANSPORTATION
PROPOSED R/W
10/21/2020
0 50 100 150
SCALE
SEC 33
T15N R02W
SEC 34
T15N R02W
SEC 04
T14N R02W
SEC 03
T14N R02W
BM#121 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 52+94.75(A002), 128.39 RT. EL.1084.27
BM#122 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 58+39.75(A002), 32.04 LT. EL.1137.60
C.R.L. WATERLOO STA. 92+73.99=
℄ PINE STA. 10+04.98
STA 92+73.99 LT
CONST. 24' ASPH. STREET RETURN
W/ 18" RCP SD
STA. 38+91.61 TO STA. 52+54.55
CONST. FENCE STYLE SWF (5BW)
1,425 L.F.
STA. 53+53.25 TO STA. 56+53.44
CONST. FENCE STYLE SWF (5BW)
300 L.F.
TEMP. R/W TO
CONST. DRIVE
STA. 98+05 LT
CONST. 14' TBSC DR.
W/ 18" RCP SD
C.R.L. STA. 99+60.00
END CONSTRUCTION
WATERLOO RD.
50+00 (A002)
95+00
55+00 (A002)
100+00
60+00 (A002)
STA. 90+00.00
STA. 95+59.48
PINE ST.
Burnt down House
On Conc. Slab
FF=1135.76'
Single Story
Brick House
On Conc. Slab
FF=1136.65'
TOC/TOS
PRES. R/W
SURVEY ℄ (A002)
SECTION LINE N89°34'02.99"E
E-W 89
C.R.L. WATERLOO
108
109
107
C.R.L. WATERLOO STA. 92+87.50=
℄ AIR DEPOT STA. 10+00.00
STA. 37+00.00 TO STA. 52+50.00
CONST. FENCE STYLE SWF (5BW)
1,572 L.F.
STA 92+87.50 RT
CONST. 24' ASPH. STREET RETURN
AS DIKE
STA. 53+65.00 TO STA. 60+37.58
CONST. FENCE STYLE SWF (5BW)
678 L.F.
STA. 13+62.96TO STA. 17+73.29
CONST. FENCE STYLE SWF (5BW)
413 L.F.
STA. 15+00.00 TO STA. 17+58.59
CONST. FENCE STYLE SWF (5BW)
259 L.F.
SOUTHERN STAR HP GAS
ONG GAS
OG&E OHP
AIR DEPOT BLVD.
R/W
WATERLOO RD.

OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

FULL DEPTH CONSTRUCTION

TRANSITION WIDENING AND OVERLAY

L= 600.00'
K= 80.00

L= 260.00'
K= 61.90

95+50.00

PVT 95+30.00
Elev= 1104.29

PVC 96+80.00
Elev= 1118.84

PVI 98+10.00
Elev= 1131.45

PVI 99+60.00
Elev= 1139.70

PVT 99+40.00
Elev= 1138.60

PVI 99+60.00
Elev=1137.38 SP DT LT

PVI 99+60.00
Elev=1137.02 SP DT RT

SP DT RT

SP DT RT

PVI 98+50.00
Elev=1130.20 SP DT RT

PVI 98+50.00
Elev=1130.78 SP DT LT

STR. 109
C.R.L. WATERLOO STA. 98+27.00
CONST. 18"X31"RCP S.D.
TG EL = 1129.55
FL BK. EL=1126.49
FL AH. EL=1126.98

PROPOSED FINISH GRADE

EXISTING GROUND PROFILE

PVI 94+50.00
Elev=1094.55 SP DT LT

EXISTING GAS LINE CROSSING STA. 91+72.86

EXISTING GAS LINE CROSSING STA. 92+10.62

EXISTING FIBER OPTIC LINE CROSSING STA. 92+69.42

EXISTING OVERHEAD POWER CROSSING STA. 93+04.53

EXISTING GAS LINE CROSSING STA. 93+36.21

EXISTING OVERHEAD POWER CROSSING STA. 97+71.87

EXISTING GAS LINE CROSSING STA. 98+48.53

EXISTING OVERHEAD POWER CROSSING STA. 99+83.18

107

108

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

PVI 90+50.00
Elev=1068.20 SP DT RT

PVI 91+70.00
Elev=1069.35 SP DT LT

PVI 92+30.00
Elev= 1075.19

STR. 108
C.R.L. WATERLOO STA. 92+74.00
CONST. 18"X78" RCP S.D.
TG EL = 1081.79
FL BK. EL=1074.89
FL AH. EL=1078.29

STR. 107
C.R.L. WATERLOO STA. 92+87.50
CONST. 24"X73" RCP S.D.
TG EL = 1082.71
FL BK. EL=1078.03
FL AH. EL=1078.25

PVI 93+50.00
Elev=1083.20 SP DT RT

9.70%
9.40%
9.00%
5.00%
2.20%
2.50%
5.50%
6.20%
6.00%

FG= 1074.14
FG= 1079.09
FG= 1085.29
FG= 1092.74
FG= 1101.44
FG= 1111.08
FG= 1120.78
FG= 1129.53
FG= 1136.36

WATERLOO RD.

90+00 91+00 92+00 93+00 94+00 95+00 96+00 97+00 98+00 99+00 100+00 101+00 102+00 103+00 104+00 105+00

1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150

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COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R065

OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

SEC 05
T14N R02W

SEC 32
T15N R02W

SEC 04
T14N R02W

SEC 33
T15N R02W

STA. 13+00.00 TO STA. 19+89.90
CONST. FENCE STYLE CLF (4FT CLASS B)
662 L.F.

STA. 11+28.50 LT CONST. 10' ASPH. DR. W/ ADJACENT 10' ASPH. DR. CONTRACTOR TO AVOID IMPACTS BEYOND EXISTING PAVEMENT AS ABLE.

STA. 11+28.50 RT
CONST. 12' TBSC. DR.
AS DIKE

TEMP. R/W TO CONST. DRIVE

STA. 264+36.56 TO STA. 269+55.64
CONST. FENCE STYLE SWF (5BW)
520 L.F.

STA. 23+00.00 (A002B) TO STA. 22+98.92 (A002)
CONST. FENCE STYLE SWF (5BW)
2,194 L.F.

℄ STA. 11+00
BEGIN CONSTRUCTION
SOONER RD. S.

℄ STA. 14+85.96
END CONSTRUCTION
SOONER RD. S.

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

BM#128 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 23+32.91(A002B), 39.40 LT. EL.1167.98

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

FINISHED GRADE ℄ ROAD
EXISTING GRADE ℄ ROAD
FINISHED GRADE WATERLOO RD.

PVI 11+75.00 Elev= 1179.02
PVRC 12+50.00 Elev= 1177.93
PVI 13+25.00 Elev= 1176.84
PVT 14+00.00 Elev= 1175.90
PVI 14+85.96 Elev= 1174.83

-0.20% -1.45% -1.45% -1.28% -1.25%

L= 150.00'
K= 750.00

L= 150.00'
K= 120.00

PVC 11+00.00
Elev= 1179.17

FG= 1179.17
FG= 1178.55
FG= 1177.22
FG= 1175.90

EXISTING OVERHEAD POWER CROSSING STA. 10+06.72
EXISTING OVERHEAD POWER CROSSING STA. 10+96.99
EXISTING OVERHEAD POWER CROSSING STA. 11+13.60
EXISTING TELE LINE CROSSING STA. 14+71.29
EXISTING OVERHEAD POWER CROSSING STA. 14+42.94
EXISTING OVERHEAD POWER CROSSING STA. 14+61.19

SOONER S

1200 1195 1190 1185 1180 1175 1170 1165 1160 1155

9+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R066

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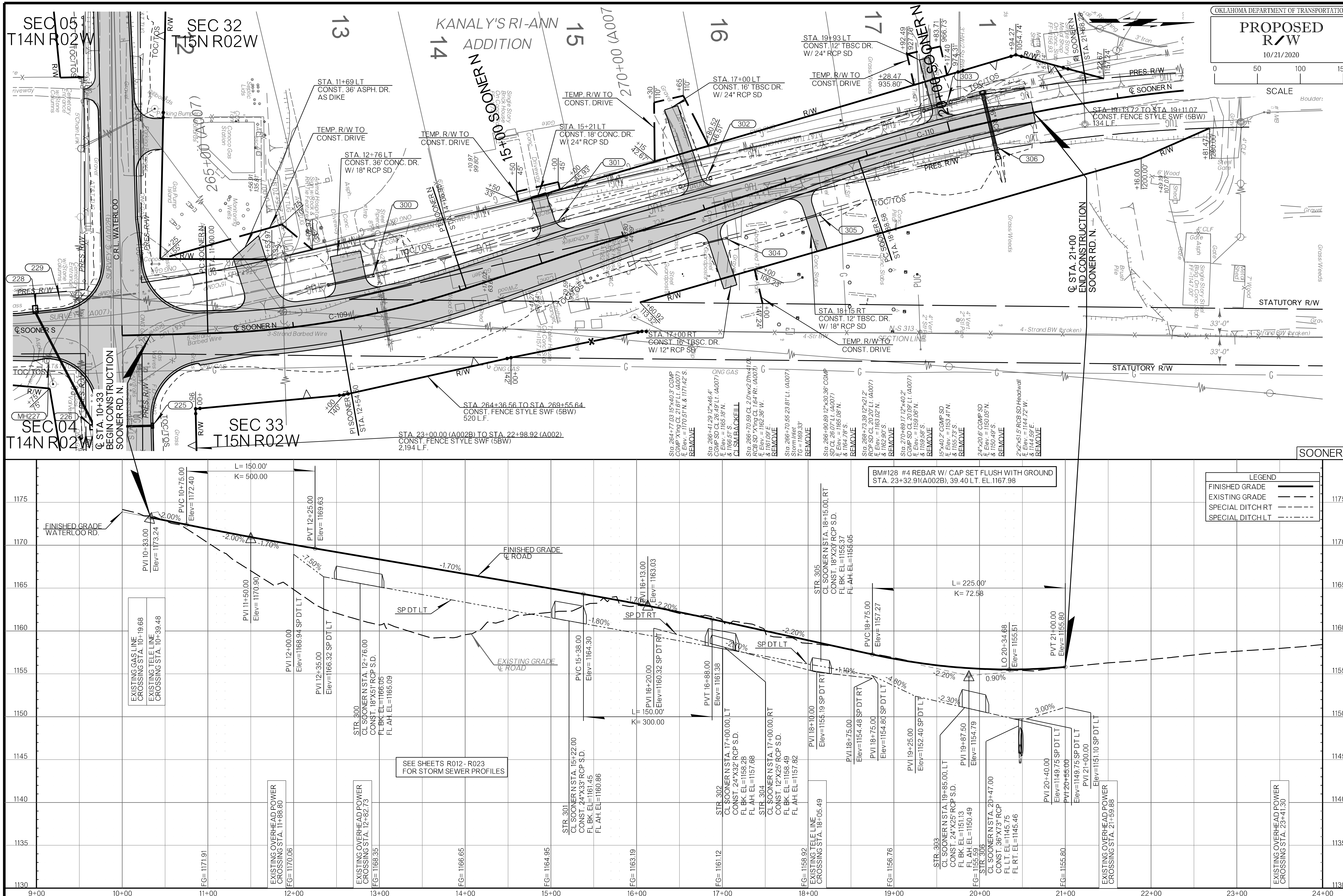
OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020



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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

SEC 04
T14N R02W

SEC 33
T15N R02W

15+00 (A008)

20+00 (A008)

C.R.L. WATERLOO

PRES. R/W

℄ BOUCHER

℄ WATERLOO EB

℄ WATERLOO WB

℄ FRONTAGE

TEMP. R/W TO CONST. DRIVE

STA. 13+65 LT
CONST. 34' ASPH. DR.
AS DIKE

STA. 23+00.00 (A002B) TO STA. 22+98.92 (A002)
CONST. FENCE STYLE SWF (5BW)
2,194 L.F.

LIMITS OF NO ACCESS

℄ STA. 11+61.65
BEGIN CONSTRUCTION
BOUCHER DR.

PC BOUCHER STA. 11+61.65

PI BOUCHER STA. 12+04.65

PT BOUCHER STA. 12+47.67

PC (A008) STA. 16+98.29

PT (A008) STA. 18+32.26

CENTURION PIPE LINE GAS

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

BM#134 ODOT SD-11 #0-55-1787 #6 REBAR W/CAP
STA. 15+78.03(A002), 79.82 RT. EL.1117.18

BM#133 ODOT SD-11 #0-55-1787 #6 REBAR W/CAP
STA. 15+78.03(A002), 79.82 RT. EL.1112.30

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

PVI 11+61.65 Elev= 1123.14
PVC 11+68.00 Elev= 1122.89
L= 120.00' K= 109.09
-4.00%
-2.90%

PVI 12+06.00 Elev=1120.80 SP DT LT
PVI 12+28.00 Elev= 1120.49
SP DT LT

PVT 12+88.00 Elev= 1118.75
FINISHED GRADE ℄ ROAD

PVI 13+05.00 Elev=1116.50 SP DT LT
PVI 13+15.00 Elev=1116.50 SP DT LT
PVI 13+40.00 Elev=1117.30 SP DT LT
PVC 13+50.00 Elev= 1116.95

PVI 14+00.00 Elev= 1116.50
L= 100.00' K= 50.00
PVRC 14+50.00 Elev= 1113.50
EXISTING GRADE ℄ ROAD

L= 100.00' K= 90.91

PVT 15+50.00 Elev= 1110.50
PVI 15+75.39 Elev= 1109.99
FINISHED GRADE WATERLOO RD.

℄ STA. 15+75.39
END CONSTRUCTION
BOUCHER DR.

PVI 15+00.00 Elev= 1111.50

EXISTING CAS LINE CROSSING STA. 11+28.51

EXISTING OVERHEAD POWER CROSSING STA. 15+40.51

EXISTING GAS LINE CROSSING STA. 15+47.75

EXISTING TELE. LINE CROSSING STA. 15+54.56

FG= 1121.65

FG= 1118.40

FG= 1115.36

FG= 1111.75

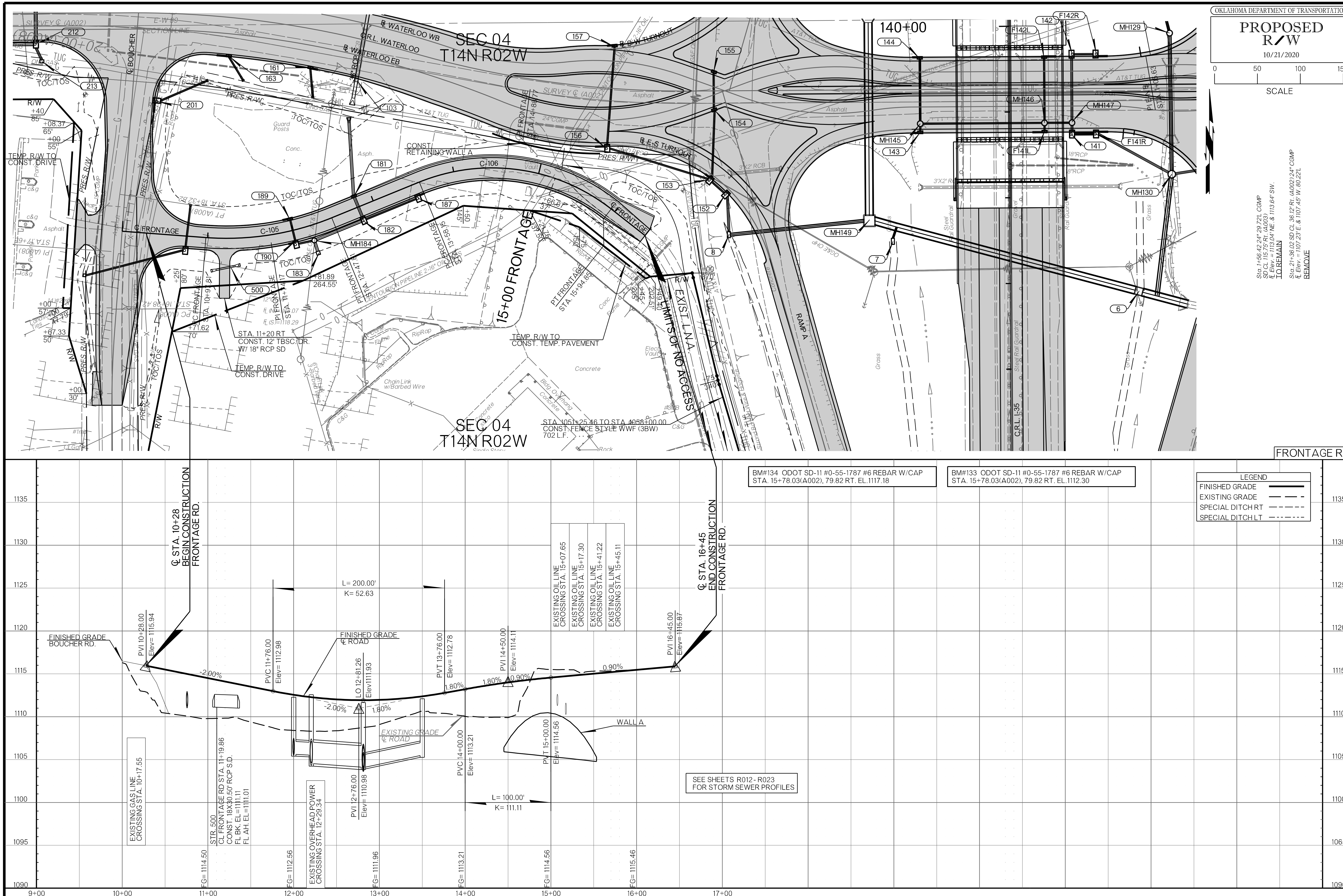
1135 1130 1125 1120 1115 1110 1105 1100 1095 1090

9+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00

BOUCHER

10/21/2020 1:57:29 PM L:\2014\14037270 - ODOT EC-1500N I-35 over Waterloo Rd\Drawings\29843_PnP_018.dgn

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R068



OKLAHOMA DEPARTMENT OF TRANSPORTATION
PROPOSED R/W
10/21/2020
SCALE
0 50 100 150
SEC 04
T14N R02W
140+00
15+00 FRONTAGE
CONST. RETAINING WALL A
TEMP. R/W TO CONST. DRIVE
TEMP. R/W TO CONST. TEMP. PAVEMENT
STA. 11+20 RT
CONST. 12' TBSC DR. W/ 18" RCP SD
STA. 1051+25.46 TO STA. 4058+00.00
CONST. FENCE STYLE WWF (3BW)
702 L.F.
LIMITS OF NO ACCESS
EXIST. L.N.A.
RAMP A
C.R.L. I-35
FRONTAGE RD.
BM#134 ODOT SD-11 #0-55-1787 #6 REBAR W/CAP
STA. 15+78.03(A002), 79.82 RT. EL.1117.18
BM#133 ODOT SD-11 #0-55-1787 #6 REBAR W/CAP
STA. 15+78.03(A002), 79.82 RT. EL.1112.30
LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT
℄ STA. 10+28
BEGIN CONSTRUCTION
FRONTAGE RD.
℄ STA. 16+45
END CONSTRUCTION
FRONTAGE RD.
L= 200.00'
K= 52.63
L= 100.00'
K= 111.11
FINISHED GRADE BOUCHER RD.
FINISHED GRADE ℄ ROAD
EXISTING GRADE ℄ ROAD
PVI 10+28.00 Elev= 1115.94
PVC 11+76.00 Elev= 1112.98
LO 12+81.26 Elev 1111.93
PVI 12+76.00 Elev= 1110.98
PVT 13+76.00 Elev= 1112.78
PVC 14+00.00 Elev= 1113.21
PVI 14+50.00 Elev= 1114.11
PVT 15+00.00 Elev= 1114.56
PVI 16+45.00 Elev= 1115.87
-2.00%
1.80%
0.90%
WALL A
EXISTING OIL LINE CROSSING STA. 15+07.65
EXISTING OIL LINE CROSSING STA. 15+17.30
EXISTING OIL LINE CROSSING STA. 15+41.22
EXISTING OIL LINE CROSSING STA. 15+45.11
EXISTING GAS LINE CROSSING STA. 10+17.55
STR. 500
CL FRONTAGE RD STA. 11+19.86
CONST. 18X30.50' RCP S.D.
FL BK. EL=1111.11
FL AH. EL=1111.01
EXISTING OVERHEAD POWER CROSSING STA. 12+29.34
SEE SHEETS R012 - R023 FOR STORM SEWER PROFILES
FG= 1114.50
FG= 1112.56
FG= 1111.96
FG= 1113.21
FG= 1114.56
FG= 1115.46
9+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00

OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

SEC 04 T14N R02W

SEC 33 T15N R02W

SEC 04 T14N R02W

INDUSTRIAL

℄ STA. 10+00 BEGIN CONSTRUCTION INDUSTRIAL BLVD.

℄ STA. 20+17.19 END CONSTRUCTION INDUSTRIAL BLVD.

LIMITS OF NO ACCESS

EXIST LIMITS OF NO ACCESS

PRES. R/W

R/W

TOC/TOS

℄ INDUSTRIAL

C-107

C-108

TEMP. RAMP TO CONST. DRIVE

STA. 11+50 LT CONST. 26' ASPH. DR. W/ 18" RCP SD

STA. 18+50 LT CONST. 12' TBSC. DR. W/ 18" RCP SD

PT INDUSTRIAL STA. 11+27.47

PC INDUSTRIAL STA. 14+81.97

PI INDUSTRIAL STA. 16+52.28

PT INDUSTRIAL STA. 17+64.76

PI INDUSTRIAL STA. 19+64.71

10'X4' RCB

STA. 18+50 RT CONST. 12' TBSC. DR. W/ 18" RCP SD CONST. 16FT GATE STYLE CLF (6FT HIGH)

STA. 30+33.27 TO STA. 37+00.00 CONST. FENCE STYLE CLF (6FT CLASS B) W/ GATE 1,122 L.F.

TEMP. R/W TO CONSTRUCT GRADE CHANNEL

STA. 37+00.00 TO STA. 52+50.00 CONST. FENCE STYLE SWF (5BW) 1,572 L.F.

TEMP. R/W TO CONST. DRIVE

STA. 38+91.61 TO STA. 52+54.55 CONST. FENCE STYLE SWF (5BW) 1,425 L.F.

WALL B

CRL WATERLOO

Sta. 1057+36.84 344.32' Rt. (A001) Storm Inlet TG = 1094.91' ft. Elev. = 1078.81' E. 2-48" CGMP 250'L ft. Elev. = 1073.81' W. 8'wx6'h RCB TO REMAIN

BM#111 #6 REBAR W/ CAP SET FLUSH WITH GROUND STA. 35+37.08(A002), 40.587 LT. EL.1103.75

BM#112 #6 REBAR W/ CAP SET FLUSH WITH GROUND STA. 40+57.07(A002), 21.144 LT. EL.1073.59

SEE SHEETS R012 - R023 FOR STORM SEWER PROFILES

LEGEND

FINISHED GRADE

EXISTING GRADE

SPECIAL DITCH RT

SPECIAL DITCH LT

PVI 10+00.00 Elev= 1101.83

PVI 11+50.00 Elev= 1101.68

PVI 20+17.19 Elev= 1102.82

FINISHED GRADE WATERLOO RD.

-0.10%

-0.10%

-5.80%

-5.80%

2.00%

2.00%

2.00%

L= 400.00' K= 31.25

L= 150.00' K= 26.32

L= 200.00' K= 40.00

PVC 10+75.00 Elev= 1101.76

PVC 13+50.00 Elev= 1090.08

PVT 12+25.00 Elev= 1097.33

PVRC 17+50.00 Elev= 1092.48

PVT 19+50.00 Elev= 1101.48

PVI 18+50.00 Elev= 1099.48

STR. 400 CL INDUSTRIAL STA. 11+50.00, LT CONST. 18"X46' RCP S.D. FL BK. EL=1097.29 FL AH. EL=1095.57

STR. 402 CL INDUSTRIAL STA. 18+50.00, LT CONST. 18"X24' RCP S.D. FL BK. EL=1095.00 FL AH. EL=1093.93

STR. 403 CL INDUSTRIAL STA. 18+50.00 RT CONST. 18"X36' RCP S.D. FL BK. EL=1094.77 FL AH. EL=1093.08

FINISHED GRADE ℄ ROAD

EXISTING GRADE ℄ ROAD

LO 15+31.25 Elev1084.82

PVI 15+50.00 Elev= 1078.48

PVI 16+35.00 Elev=1082.68 SP DT LT

PVI 16+60.00 Elev=1083.50 SP DT RT

SP DT LT

SP DT RT

2.20%

0.00%

5.00%

11.50%

15.00%

7.00%

PVI 15+80.00 Elev=1076.35 SP DT LT

PVI 15+20.00 Elev=1066.52 SP DT RT

PVI 15+65.00 Elev=1068.77 SP DT RT

STR. 401 CL INDUSTRIAL STA. 14+00.00 CONST. 10'X4'X155' RC BOX 30° RT. FWD. SKEW FL LT. EL=1071.58 FL RT. EL=1070.01

PVI 13+30.00 Elev=1071.84 SP DT LT

PVI 13+75.00 Elev=1071.84 SP DT LT

EXISTING TELE LINE CROSSING STA. 12+22.09

EXISTING TELE LINE CROSSING STA. 19+86.20

EXISTING OVERHEAD POWER CROSSING STA. 19+96.29

EXISTING GAS LINE CROSSING STA. 20+11.53

FG= 1101.83

FG= 1101.61

FG= 1098.66

FG= 1092.98

FG= 1087.58

FG= 1084.98

FG= 1085.58

FG= 1089.38

FG= 1095.67

FG= 1100.17

FG= 1102.48

1105 1100 1095 1090 1085 1080 1075 1070 1065 1060

10+00 11+00 152+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R070

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

SEC 04
T14N R02W

SEC 33
T15N R02W

SEC 03
T14N R02W

SEC 34
T15N R02W

15+00 (A009)

15+00 (A010)

15+00 PINE

STA. 37+00.00 TO STA. 52+50.00
CONST. FENCE STYLE SWF (5BW)
1,572 L.F.

STA. 38+91.61 TO STA. 52+54.55
CONST. FENCE STYLE SWF (5BW)
1,425 L.F.

STA. 12+00 LT
CONST. 16' TBSC. DR.
AS DIKE

STA. 53+65.00 TO STA. 60+37.58
CONST. FENCE STYLE SWF (5BW)
678 L.F.

STA. 53+53.25 TO STA. 56+53.44
CONST. FENCE STYLE SWF (5BW)
300 L.F.

Sta. 15+80.50 24"x29.8'
CSMP SD CL 66.92" I.I. (A009)
IL Elev. = 1082.76' N. & 1085.03' S.
TO REMAIN

Sta. 52+75.13 CL 21"x57.1'L
Steel Pipe SD "X"ing CL 25.5' Lt. (A002)
IE Elev. = 1077.41' W. & 1080.46' E.
REMOVE

Sta. 53+24.88 CL 24"x50.7'L
CSMP SD "X"ing CL 25.7' Rt. (A002)
IE Elev. = 1080.40' W. & 1083.00' E.
REMOVE

PC AIR DEPOT STA. 10+76.19

PI AIR DEPOT STA. 12+61.95

PC PINE STA. 10+54.13

PI PINE STA. 13+24.06

PT PINE STA. 15+93.72

PRES. R/W

SURVEY ℄ (A009)

SURVEY ℄ (A010)

SECTION LINE

℄ AIR DEPOT

℄ PINE

R/W

TOC/TOS

SOUTHERN STAR HP GAS

ONG GAS

DCP MIDSTREAM GAS

AT&T FIBER OPTIC

OG&E OHP

5-Strand Barbed Wire

C.R.L. WATERLOO E-W 89 SECTION LINE

C-111

N-S 314

LOGAN CNTY R/W #1

AIR DEPOT

PINE

BM#121 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 52+94.75(A002), 128.39 RT. EL.1084.27

BM#122 #4 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 58+39.75(A002), 32.04 LT. EL.1137.60

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

℄ STA. 10+75.00
BEGIN CONSTRUCTION
AIR DEPOT BLVD.

STA. 14+26.04
END CONSTRUCTION
AIR DEPOT BLVD.

STA. 10+41.00
BEGIN CONSTRUCTION
PINE ST.

℄ STA. 11+65.00
END CONSTRUCTION
PINE ST.

L= 100.00'
K= 60.61

L= 70.00'
K= 16.67

L= 60.00'
K= 23.53

L= 60.00'
K= 33.33

PVI 10+75.00 Elev= 1094.83
PVC 11+00.00 Elev= 1093.62
PVT 12+00.00 Elev= 1089.60
PVI 11+50.00 Elev= 1091.20
PVC 13+45.00 Elev= 1084.96
LO 13+98.33 Elev= 1084.10
PVT 14+15.00 Elev= 1084.19
PVI 14+26.04 Elev= 1084.30
PVI 10+41.00 Elev= 1082.79
PVI 10+75.00 Elev= 1082.11
PVRC 11+06.00 Elev= 1080.97
PVT 11+65.00 Elev= 1079.46
PVC 10+45.00 Elev= 1082.71
PVI 11+35.00 Elev= 1079.83

-4.85%
-3.20%
1.00%
2.00%
-3.80%
-1.30%

FINISHED GRADE ℄ ROAD
EXISTING GRADE ℄ ROAD
FINISHED GRADE WATERLOO RD.

STR. 107
C.R.L. AIR DEPORT 14+01.47
CONST. 24"X73' RCP
T.O.G. EL= 1082.71'
FL LT. EL=1078.03'
FL RT. EL=1078.25'

STR. 108
C.R.L. PINE 10+60.00
CONST. 18"X78' RCP
T.O.G. EL= 1081.79'
FL LT. EL=1074.89'
FL RT. EL=1078.29'

EXISTING OVERHEAD POWER CROSSING STA. 13+61.92
EXISTING OVERHEAD POWER CROSSING STA. 14+11.02
EXISTING TELE LINE CROSSING STA. 10+27.30

FG= 1093.62
FG= 1089.60
FG= 1086.40
FG= 1084.10
FG= 1081.16

SEE SHEETS R012- R023
FOR STORM SEWER PROFILES

1110 1105 1100 1095 1090 1085 1080 1075 1070 1065

10+00 11+00 12+00 13+00 14+00 15+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00

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COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R071

OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

0 50 100 150

SCALE

Sta. 28+50.49 SD CL 0.65' Rt.
(A002) 8'wx6'h RCB℄ Elev. = 1079.73' N.
& 1078.84' S. 81.46'L
INSERT NEW PIPE AND CLSM BACKFILL

Sta. 11+49.42 SD CL 7.09' Lt.
(A006) 8'wx6'h RCB Headwall
℄ Elev. = 1086.95' E. & 1087.14' W. 69.82'L
EXTEND

Sta. 11+48.62' 2-36" 24.163'L CGMP
SD CL 99.21' Rt. (A006)
℄ Elev. = 1089.14' NW. & 1088.45' SE.
REMOVE

Sta. 0+60.05 0.38' Rt. (A005)
3'wx2'h RCB Headwall
℄ Elev. = 1082.55' E. &
1082.05' W. 119.24'L
REMOVE

SEC 33
T15N R02W

BM#109 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1053+81.03(A001), 267.010 RT. EL.1102.21

BM#110 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1059+00.10(A001), 371.009 RT. EL.1099.98

STA. 1062+69.61 TO STA. 1084+14.08
CONST. FENCE STYLE WWF (3BW)
2,181 L.F.

STA. 1061+31.66 TO STA. 1092+56.14
CONST. FENCE STYLE WWF (3BW)
3,146 L.F.

STA. 23+00.00 (A002B) TO STA. 22+98.92 (A002)
CONST. FENCE STYLE SWF (5BW)
2,194 L.F.

LIMITS OF NO ACCESS
EXIST. LIMITS OF NO ACCESS

CONST. RETAINING WALL A

TEMP. R/W TO
CONST. TEMP. PAVEMENT

SEC 04
T14N R02W

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

SEE SHEETS R012 - R023
FOR STORM SEWER PROFILES

S-W TURNOUT

S-E TURNOUT

E-N TURNOUT

W-N TURNOUT

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R072

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OKLAHOMA DEPARTMENT OF TRANSPORTATION

PROPOSED R/W

10/21/2020

SCALE 0 50 100 150

BM#109 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1053+81.03(A001), 267.010 RT. EL.1102.21

BM#110 #6 REBAR W/ CAP SET FLUSH WITH GROUND
STA. 1059+00.10(A001), 371.009 RT. EL.1099.98

SEC 33
T15N R02W

SEC 04
T14N R02W

STA. 23+00.00 (A002B) TO STA. 23+98.92 (A002)
CONST. FENCE STYLE SWF (5BW)
2,194 L.F.

STA. 1061+31.66 TO STA. 1082+55.14
CONST. FENCE STYLE WWF (3BW)
3,146 L.F.

STA. 1051+25.46 TO STA. 1058+00.00
CONST. FENCE STYLE WWF (3BW)
702 L.F.

TEMP. R/W TO CONST. TEMP PAVEMENT

TEMP. R/W TO CONST. DRIVE

CONST. RETAINING WALL A

WATERLOO WB ℄

WATERLOO EB ℄

FRONTAGE RD ℄

E-W 39 SECTION LINE

BRIDGE 'A'

BRIDGE 'B'

RAMP A

RAMP B

RAMP C ℄

E-S TURNOUT ℄

W-S TURNOUT ℄

N-W TURNOUT ℄

N-E TURNOUT ℄

POB W-S ℄ STA. 1+00.00

POE W-S ℄ STA. 3+31.13

POB N-W ℄ STA. 1+00.00

POE N-W ℄ STA. 3+12.96

POB N-E ℄ STA. 1+00.00

POE N-E ℄ STA. 3+57.39

POE E-S ℄ STA. 3+48.61

PC STA. 70+35.10

PI N-E ℄ STA. 2+39.98

PI N-W ℄ STA. 2+46.58

PI W-S ℄ STA. 2+42.78

PI E-S ℄ STA. 2+46.58

EXIST. L.N.A.

L.N.A.

R/W

TOC/TOS

PRES. R/W

CENTOURION PIPELINE 2-16" OIL LINES

CENTOURION PIPELINE GAS

AT&T TUG

OG&E OHP

OG&E UG

Sta. 1057+36.84 344.32' Rt. (A001) Storm Inlet
TG = 1094.91'
ft. Elev. = 1078.81' E. 2-36" CGMP 250'L
ft. Elev. = 1073.81' W. 8'wx6'h RCB
TO REMAIN

Sta. 1057+63.44 207.71' Rt. (A001) 8'wx6'h RCB Headwall
ft. Elev. = 1076.90' W. 1073.81' E. 137.26'L
EXTEND

Sta. 21+36.02 SD CL 36.12' Rt. (A002) 24" CGMP
ft. Elev. = 1107.23' E. & 1107.45' W. 80.22'L
REMOVE

Sta. 28+50.49 SD CL 0.65' Rt. (A002) 8'wx6'h RCB
ft. Elev. = 1079.73' N. & 1078.84' S. 81.46'L
INSERT NEW PIPE AND CLSM BACKFILL

Sta. 0+79.86 SD CL 1.08' Lt. (A003) 3'wx2'h RCB
ft. Elev. = 1098.42' E. & 1099.08' W. 57.03'L
REMOVE

LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT

SEE SHEETS R012 - R023 FOR STORM SEWER PROFILES

E-S TURNOUT

W-S TURNOUT

N-W TURNOUT

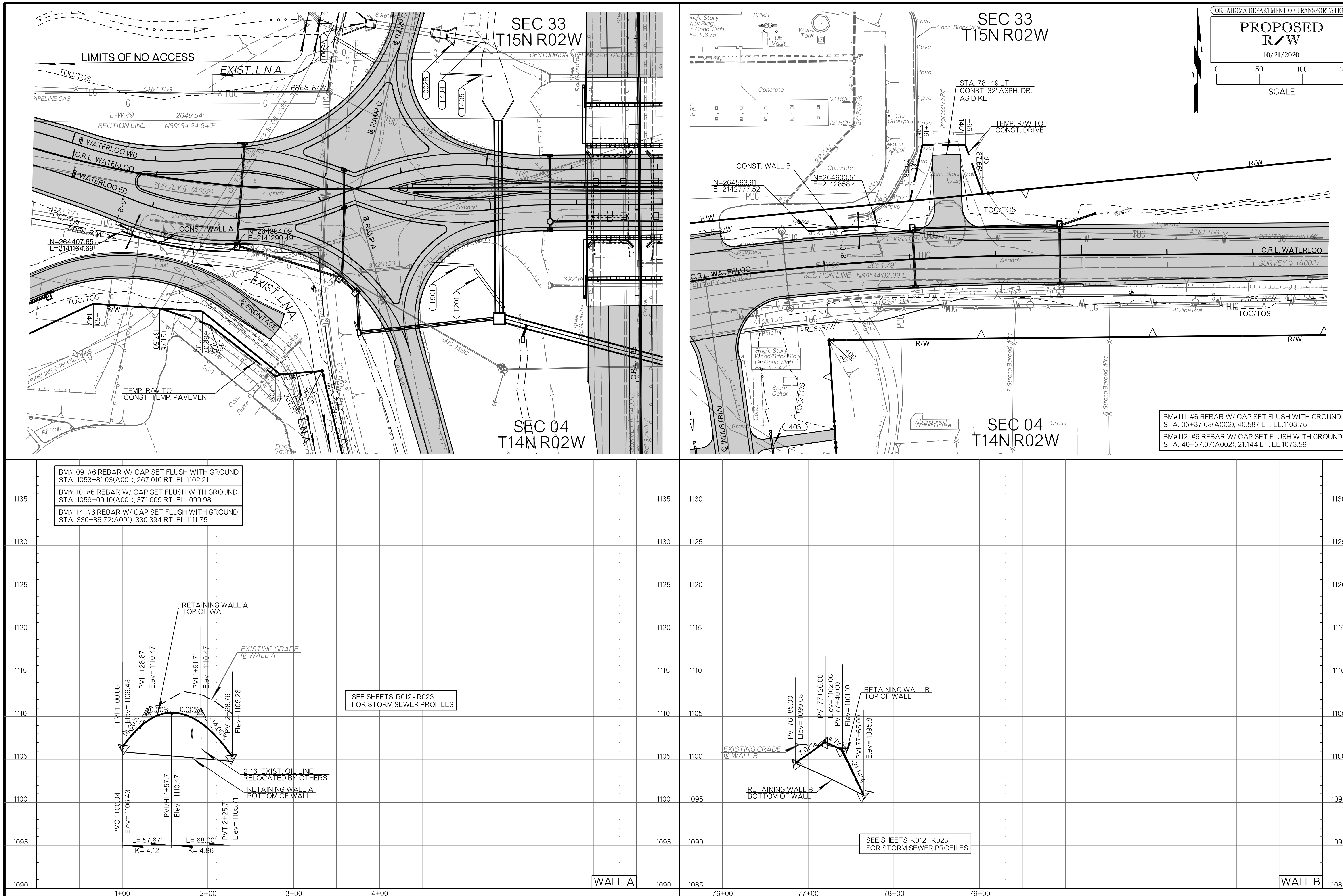
N-E TURNOUT

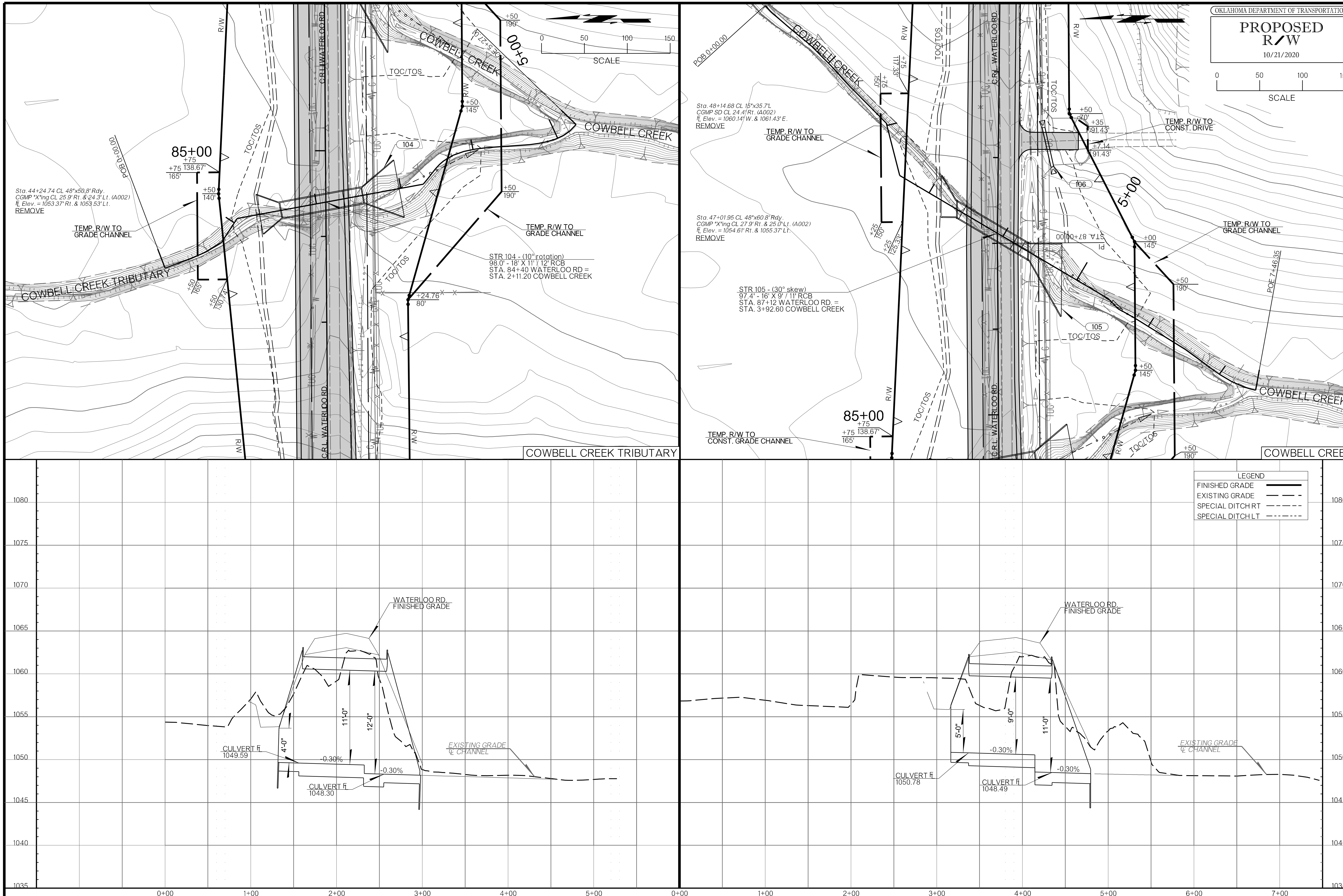
EXISTING GRADE ℄ TURN-OUT

FINISHED GRADE ℄ TURN-OUT

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R073

10/21/2020 11:57:43 PM L:\2014\4037270 - ODOT EC-1500N I-35 over Waterloo Rd\Drawings\29843_PnP_023.dgn




OKLAHOMA DEPARTMENT OF TRANSPORTATION
PROPOSED R/W
10/21/2020
SCALE
0 50 100 150
COWBELL CREEK TRIBUTARY
COWBELL CREEK
85+00
5+00
POB 0+00.00
Sta. 44+24.74 CL 48"x50.8' Rdy.
CGMP "X"ing CL 25.9' Rt. & 24.3' Lt. (A002)
℄ Elev. = 1053.37' Rt. & 1053.53' Lt.
REMOVE
TEMP. R/W TO GRADE CHANNEL
STR 104 - (10° rotation)
98.0' - 18' X 11' / 12' RCB
STA. 84+40 WATERLOO RD =
STA. 2+11.20 COWBELL CREEK
Sta. 48+14.68 CL 15"x35.7'L
CGMP SD CL 24.4' Rt. (A002)
℄ Elev. = 1060.14' W. & 1061.43' E.
REMOVE
Sta. 47+01.95 CL 48"x60.8' Rdy.
CGMP "X"ing CL 27.9' Rt. & 25.0' Lt. (A002)
℄ Elev. = 1054.61' Rt. & 1055.37' Lt.
REMOVE
STR 105 - (30° skew)
97.4' - 16' X 9' / 11' RCB
STA. 87+12 WATERLOO RD. =
STA. 3+92.60 COWBELL CREEK
TEMP. R/W TO CONST. DRIVE
TEMP. R/W TO CONST. GRADE CHANNEL
PI STA. 87+00.00
POE 7+46.35
C.R.L. WATERLOO RD.
TOC/TOS
R/W
LEGEND
FINISHED GRADE
EXISTING GRADE
SPECIAL DITCH RT
SPECIAL DITCH LT
WATERLOO RD. FINISHED GRADE
EXISTING GRADE ℄ CHANNEL
CULVERT ℄ 1049.59
CULVERT ℄ 1048.30
CULVERT ℄ 1050.78
CULVERT ℄ 1048.49
-0.30%
4'-0"
11'-0"
12'-0"
5'-0"
9'-0"
1080
1075
1070
1065
1060
1055
1050
1045
1040
1035
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00

COUNTY OKLAHOMA/LOGAN HIGHWAY I-35 STATE JOB NO. 29843(04) SHEET NO. R075


GARVER