Final Design Concept Report

US 60, GRAND AVENUE
35th Avenue/Indian School Road Traffic Interchange

FEDERAL NO. 060-B(227)T
PROJECT NO. F0272 01L

Prepared For:

Arizona Department of Transportation

Prepared By:

AECOM

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JULY 2024

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ADOT
Infrastructure Delivery and Operations

PROJECT DETERMINATION FORM

Project Number	County and ADOT District	Project Name and Highway	Final Project Assessment Date
60 MA 159 F0272 01C	Maricopa	35TH AVE / INDIAN SCHOOL RD INTERSECTION	July, 2024
RARF 60-B(227)T	Central	US60 (Grand Avenue)	

Project Description:	Intersection Improvement by constructing elevated intersection between 35th Ave and Indian School Road

Existing Program	
Yes	No
✓	

Program Year	Programmed Budget
2025	$218,000,000.00
	PA Construction Cost Estimate
	$224,465,400

Operating Partnership Category					
S	F	T	D	Z	N/A
		X			

Public Hearing: In the Highway Development Process, at least one public hearing or the opportunity for a hearing will be offered for any project that:

X	Requires a significant amount of new right-of-way:
X	Substantially changes the layout or function of connecting roadway or the facility being improved;
X	Has a significant adverse impact on abutting real property;

X	Otherwise has a significant social, economic, environmental or other effect
	Is controversial on environmental grounds;
	Or has significant floodplain encroachment
	None of the above conditions apply

Recommends:

Yes:	No:				
	X	Public Forum	Environmental Category		
	X	Offer a combined Location / Design Hearing	Class 1	Class II	Class III
	X	Offer Separate Location/Design Hearing			X
X		Hold a Design Public Hearing			

DocuSigned by: Olivier Mirza — 7/22/2024
Olivier Mirza — Project Manager, Project Management Group — Date

DocuSigned by: Paul O'Brien — 7/24/2024
Paul O'Brien — Manager, Environmental Planning — Date

Concur:

DocuSigned by: Hiren Shah — 7/22/2024
Hiren Shah — Pre-Design, Standards, and Compliance Manager — Date

DocuSigned by: Randy Everett — 7/22/2024
Randy Everett — District Engineer, Central District — Date

Approved:

DocuSigned by: Michael DenBleyker — 7/26/2024
Michael DenBleyker — Roadway Group Manager, Roadway Engineering Group — Date

DocuSigned by: — 7/25/2024
David Benton — Bridge Group — Date

Comments:

Two public meetings and one Public hearing were held before finalizing the DCR and issuing the Project EA.

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1.0 INTRODUCTION

1.1 FOREWORD

This Draft-Final Design Concept Report (DCR) describes the development and evaluation of safety and operational improvement alternatives for the intersection of United States Route 60 (US 60) and 35th Avenue/Indian School Road (at US 60 milepost 159). This project is located within the Arizona Department of Transportation's (ADOT's) Central Construction District within Maricopa County. The study area is located within the jurisdictional limits of the City of Phoenix. Project location and vicinity maps are provided with **Figure 1** and **Figure 2,** respectively.

The Maricopa Association of Governments (MAG) *US 60/Grand Avenue Corridor Optimization, Access Management Plan, and System Study* (COMPASS), completed in 2015, was conducted to identify a long-term solution for accommodating travel demand and adjacent property access as well as establish operating principles to improve the effectiveness of traffic operations along US 60. The COMPASS investigated numerous concepts including traffic signal phasing, high-capacity transit, access management, and upgrading US 60 to a freeway-type facility. At the US 60/Indian School Road intersection, the COMPASS recommended reconstructing 35th Avenue to elevate it over the BNSF Railway and reconstructing Indian School Road to provide a new elevated intersection between 35th Avenue and Indian School Road. Subsequently, the Arizona Transportation Board has approved funding in the current *ADOT 5-Year Transportation Facilities Construction Program (2024-2028)* to design and construct this project.

The purpose of this study is to evaluate the safety and operational characteristics of the existing US60/35th Avenue/Indian School Road intersection and evaluate alternatives to provide a new intersection or interchange configuration that would increase the intersection capacity and reduce the vehicle/train conflicts with the BNSF Railway while retaining traffic connections between these high-volume roadways. An Environmental Assessment (EA) will be developed in support of this study.

Agency and public input helped to identify a wide range of design concepts for consideration. A multi-tiered process was used to evaluate and screen design concepts. This process identified the alternatives recommended for detailed evaluation in the DCR and EA, which includes:

- No-Build Alternative
- Alternative 2: Create a new, elevated intersection between 35th Avenue and Indian School Road. Both 35th Avenue and Indian School Road would be elevated over US 60 and the BNSF Railway.

This report describes the development and evaluation of the various concepts and alternatives. The Preferred Alternative was selected based upon an evaluation of traffic operations, railroad acceptance, right-of-way impacts, ability to provide for local access, estimated project cost, constructability, utility considerations, environmental considerations, local agency input, and public input. Public agencies that have been involved with the project include ADOT, MAG, and the City of Phoenix.

Figure 1 – Project Location Map

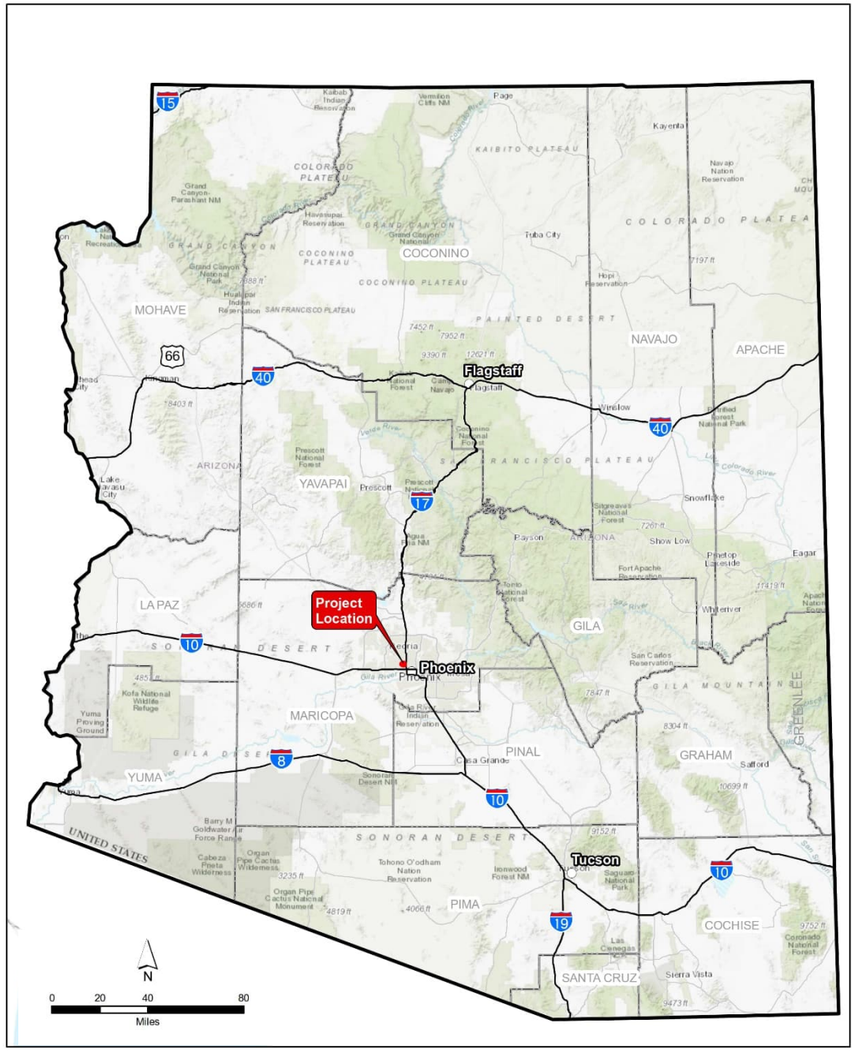


Figure 2 – Vicinity Map

1.2 NEED FOR THE PROJECT

US 60 is a major element of the adopted Regional Transportation Plan Freeway Program (RTPFP). The segment of US 60 between I-17 and State Route (SR) 101L is one of the primary urban arterial corridors serving regional commuter and freight traffic supporting the City of Phoenix, City of Glendale, and City of Peoria. To the northwest, it is also a vital link in the Statewide Highway System serving as the continuation of US 93 linking the Phoenix metropolitan area to Las Vegas, Nevada

Indian School Road is an east-west Principal/Major Arterial that passes through the central portion of the Phoenix metropolitan area and is located approximately two miles north of I-10. It is one of the few arterials that provides a continuous east-west connection from SR 101 in the City of Scottsdale to SR 303 in the City of Goodyear and it provides one of the few arterial street bridge crossings of the Agua Fria River, resulting in substantial travel demand for commuting traffic.

35th Avenue is a north-south arterial that passes through the central portion of the Phoenix metropolitan area spanning a length of 23 miles connecting south Phoenix to north Phoenix. It is located approximately one mile west of I-17 and is one of the few arterials that provides a bridge crossing of the Salt River.

All three roadways serve regional or sub-regional mobility with US 60 being one of the primary urban arterial corridors in the west valley. Projected increases in population, housing, and employment will lead to increased travel demand. US 60 currently carries approximately 45,000 vehicles per day and 35th Avenue carries approximately 25,000 vehicles per day within the study area, which is currently causing traffic congestion at the US60/35th Avenue intersection during the A.M. and P.M. peak travel periods. Future traffic volume projections indicate the congestion will continue to worsen, causing further travel delays and increased travel times for those using the US 60 and 35th Avenue corridors. Improvements to the US60/35th Avenue/Indian School Road intersection are necessary to increase the intersection capacity and alleviate existing and future levels of traffic congestion which will maintain the functionality and mobility along US 60 through the intersection and serve regional commuter and freight traffic supporting the west valley.

The MAG *US 60/Grand Avenue Corridor Optimization, Access Management Plan, and System Study* (COMPASS), completed in 2015, was conducted to identify a long-term solution for accommodating travel demand and adjacent property access as well as establish operating principles to improve the effectiveness of traffic operations. The COMPASS investigated numerous concepts including traffic signal phasing, high-capacity transit, access management, and upgrading US 60 to a freeway-type facility. At the US60/Indian School Road intersection, the COMPASS recommended reconstructing 35th Avenue to elevate it over the BNSF Railway and reconstructing Indian School Road to provide a new elevated intersection between 35th Avenue and Indian School Road. It recommended leaving US 60 at-grade, removing a majority of the existing ramps/frontage roads that provide connections to 35th Avenue and Indian School Road, and included access management improvements such as closing driveways.

There are two existing at-grade BNSF Railway crossings at the project location: one on 35th Avenue and one on the eastbound and westbound Indian School Road ramps/frontage roads west of 35th Avenue. In 2016, the Federal Railroad Administration (FRA) released a list of the railroad crossings with the highest number of reported incidents over the previous decade. The 35th Avenue crossing had a total of 21 incidents reported between 2005 and 2015 which ranked second in the nation. During periods of train activity, 35th Avenue is impassible at this location causing excessive travel delays for commuters and emergency vehicles. Emergency vehicle response times are also negatively impacted during these highly congested conditions. At-grade vehicle conflicts increase liability exposure for railroads and the public and these conflicts interrupt vehicle, pedestrian and bicycle traffic and can increase emergency response times. Therefore, improvements are needed to enhance safety by reducing the vehicle/ train conflicts.

The *Arizona State Rail Plan* (ADOT 2011) documented a comprehensive assessment of Arizona's rail needs and identified at-grade rail crossings as a critical issue due to the potential conflicts between vehicles and trains. Some of the issues regarding at-grade railroad crossings included the following:

- have a higher potential for serious collisions between vehicles and trains;
- cause traffic delays for motorists, emergency responders, pedestrians, and other modes of transportation;
- interrupt nearby traffic signal operations when trains pass-by, resulting in even more delays;
- generate higher noise levels due to the train horns.

In 2010, MAG completed the *Grand Avenue Commuter Rail Corridor Development Plan* which evaluated the feasibility of commuter rail service along US 60 using the existing BNSF Railway tracks. This study recommended moving forward with planning and implementation of a commuter rail system along US 60, which could increase the volume of train traffic.

Subsequently, the purpose of this study is to evaluate the safety and operational characteristics of the existing US60/Indian School Road/35th Avenue intersection, and to evaluate alternatives to provide a new interchange configuration that would increase the intersection capacity and reduce vehicle/train conflicts while retaining the traffic connections between these high-volume regional roadways. This project would support the regional transportation and transit planning goals of providing a safe and efficient transportation system for all modes of transportation, reducing the impacts the BNSF Railway has on the response times for emergency services personnel, and providing improved safety and consistent traffic operational characteristics well into the future.

1.3 CHARACTERISTICS OF THE CORRIDOR

1.3.1 Roadway Characteristics

1.3.1.1 US 60, Grand Avenue

US 60 is part of the National Highway System and is classified as a Principal Arterial roadway with a posted speed limit of 45 mph. Between 33rd Avenue and 37th Avenue, US 60 is a six-lane roadway with a raised landscaped median to control access.

The roadway section typically includes a 12' inside lane, 11' middle lane and a 12' outside lane in the eastbound direction of travel. The westbound roadway includes a 12' inside lane, 11' middle lane and a 12' outside lane. The eastbound and westbound roadways are separated by a 12' curbed median. No bicycle lanes are provided on US 60. However, bicycles are permitted to use the roadway shoulder or outside lane.

Curb, gutter and sidewalk exists along the north side of US 60. In general, no landscaping is present within these limits of US 60. Left and right-turn lanes are provided at major intersections and access points. The BNSF Railway parallels US 60 along the south side and serves as a barrier to development and limits access to US 60.

There are two existing signalized intersections on US 60 between 33rd Avenue and 37th Avenue; one at 33rd Avenue and one at 35th Avenue.

Eastbound US 60

Approaching the 37th Avenue intersection in the eastbound direction of travel, US 60 provides three through-lanes and one left-turn lane. Three through-lanes are provided on eastbound US 60 between 37th Avenue and 35th Avenue. Approaching the signalized intersection at 35th Avenue, US 60 provides three through-lanes and two left-turn lanes.

Three through-lanes continue on US 60 between 35th Avenue and the signalized intersection at 33rd Avenue. The eastbound intersection approach at 33rd Avenue provides three through-lanes and two left-turn lanes. Three through-lanes are provided on eastbound US 60 beyond the 33rd Avenue intersection.

Westbound US 60

Three through-lanes are provided on westbound US 60 approaching the 33rd Avenue signalized intersection. The westbound intersection approach includes three through-lanes, one right-turn lane and one left-turn lane.

Three through-lanes continue on US 60 between 33rd Avenue and the 35th Avenue signalized intersection. The westbound approach to the 35th Avenue intersection includes three through-lanes and two left-turn lanes. West of 35th Avenue, a ramp from westbound Indian School Road connects to westbound US 60 with a tapered entrance ramp design (lane immediately drops and does not continue to the west).

Three through-lanes are provided on US 60 between 35th Avenue and 37th Avenue. The westbound approach to the 37th Avenue intersection approach includes three through-lanes and one left-turn lane. Three through-lanes continue on US 60 west of the 37th Avenue intersection.

1.3.1.2 Indian School Road

Indian School Road is part of the National Highway System and is classified as a Major Arterial in the City of Phoenix General Plan with a posted speed of 40 mph. Indian School Road is an east-west roadway that primarily is a six-lane roadway with a curbed median with left and right-turn lanes at major intersections and access points. Between 33rd Avenue and 38th Avenue, Indian School Road elevates to pass over 35th Avenue and the BNSF Railway. Indian School Road through traffic is grade separated and does not interface with 35th Avenue, US 60, or the BNSF Railway. East and west of 35th Avenue, ramps/frontage roads are located north and south of Indian School Road to provide access to/from Indian School Road to/from 35th Avenue and US 60.

There is an existing at-grade railroad crossing of the Indian School Road frontage roads/ramps west of 35th Avenue. The railroad crossing is signalized and includes pre-emption/coordination with the BNSF Railway to clear vehicle traffic as a train approaches the crossing.

There are existing signalized intersections on Indian School Road at 31st Avenue, 33rd Avenue, and 39th Avenue.

Eastbound Indian School Road

Approaching the 39th Avenue intersection, eastbound Indian School Road provides two travel lanes. Two lanes are provided in the eastbound direction of travel between 39th Avenue and 33rd Drive. East of 38th Avenue, eastbound Indian School Road contains an exit ramp that connects to US 60 and 35th Avenue. The two through lanes on Indian School Road are grade separated and do not interface with 35th Avenue, US 60, or the BNSF Railway. Near 33rd Drive, an eastbound entrance ramp (from US 60 and 35th Avenue) adds an eastbound lane to Indian School Road. East of 33rd Avenue, eastbound Indian School Road provided three through-lanes.

Westbound Indian School Road

Three through-lanes are provided on westbound Indian School Road approaching the 33rd Avenue intersection. At 33rd Drive, westbound Indian School Road contains an exit ramp that connects to northbound 35th Avenue. Just west of 33rd Drive, westbound Indian School Road drops one lane to an exit ramp that connects to north-westbound US 60. The two through lanes on Indian School Road are grade separated and do not interface with 35th Avenue, US 60, or the BNSF Railway. Near 38th Avenue, a westbound entrance ramp (from US 60 and 35th Avenue) adds a westbound lane to Indian School Road. Three lanes are provided on westbound Indian School Road west of 38th Drive.

1.3.1.3 35th Avenue

35th Avenue is classified as an Arterial in the City of Phoenix General Plan with a posted speed of 40 mph. 35th Avenue is a north-south roadway that primarily is a five-lane roadway with a flush median providing three through-lanes in the northbound direction of travel and two through-lanes in the southbound direction of travel.

There is an existing at-grade railroad crossing of 35th Avenue south of Indian School Road. The railroad crossing is signalized and includes pre-emption/coordination with the BNSF Railway to clear vehicle traffic as a train approaches the crossing.

The roadway section includes a 10’ inside lane and a 12’ outside lane in the southbound direction of travel. The northbound roadway includes a 10’ inside lane, 10’ middle lane and a 12’ outside lane. A 10’ wide flush median is located between the northbound and southbound roadways. Curb, gutter and sidewalk (5’ wide) exists along the east and west sides of 35th Avenue.

35th Avenue intersects US 60 and Indian School Road to create a six-legged intersection and there is one other existing signalized intersection on 35th Avenue located at Clarendon Avenue. In addition to the signalized intersection, there is a pedestrian crossing signal located near Monterosa Street.

Northbound 35th Avenue

Approaching the Clarendon Avenue intersection, northbound 35th Avenue includes three through lanes and one left-turn lane. Between Clarendon Avenue and US 60, northbound 35th Avenue contains three through lanes. At the US 60 intersection, northbound 35th Avenue contains three through lanes and one left-turn lane. Just north of US 60, a ramp from westbound Indian School Road connects to northbound 35th Avenue. The ramp intersects 35th Avenue with a stop-controlled intersection. Three through-lanes continue on northbound 35th Avenue between US 60 and Glenrosa Avenue.

Southbound 35th Avenue

Approaching Glenrosa Avenue, southbound 35th Avenue includes two through lanes. Two southbound through lanes are provided south of Glenrosa Avenue. The southbound approach to the US 60 intersection provided two through lanes, a right-turn lane, and a left-turn lane. Two southbound through lanes are provided between US 60 and Clarendon Avenue. South of Clarendon Avenue, southbound 35th Avenue contains two through lanes.

1.3.2 Land Use

The project area is located in Maricopa County, Arizona, within the limits of the City of Phoenix.

The existing land use within the project area is a mixture of commercial, light industrial, residential and vacant land. South of US 60, commercial/retail and light industrial are the dominant land uses. Several commercial/retail land uses are located along 35th Avenue immediately north of Indian School Road. Residential land use within the project area is focused primarily in the northeastern portion of the project area and along 35th Avenue, north of Glenrosa Avenue.

Key transportation corridors within the project area are US 60, 35th Avenue, Indian School Road, and the BNSF Railway. The presence of the BNSF Railway corridor is a limiting factor for any new development or roadway connections to US 60 on the south side of the highway. The nearest railroad crossings are located 1.4 miles north of Indian School Road (measured along US 60) at 43rd Avenue/Camelback Road, or 0.7 miles south of Indian School Road (measured along US 60) at 31st Avenue/Osborn Road.

1.3.3 Transit Facilities and Routes

One commuter-orientated express bus route operates along US 60. The Grand Avenue Limited Route operates inbound during the AM peak period (total of two buses) from the City of Peoria to downtown Phoenix and operates in the opposite direction in the PM peak period (total of two buses).

Local bus route 41 operates along Indian School Road within the study area. The route operates in both directions (eastbound and westbound) for a majority of the day. Local Route 41 has eastbound bus stops located just east 38th Avenue and just east of 33rd Avenue. In the westbound direction, Local Route 41 has bus stops located just east of 33rd Drive and west of 39th Avenue.

Local bus route 35 operates along 35th Avenue within the study area. The route operates in both directions (northbound and southbound) for a majority of the day. Local Route 35 has northbound bus stops located just north of Clarendon Avenue, just north of Monterosa Street, and just north of Glenrosa Avenue. In the southbound direction, Local Route 35 has bus stops located just south of Glenrosa Avenue just south of Monterosa Street, and just south of Clarendon Avenue.

As described above, Local Route 35 has stops near Monterosa Street and Local Route 41 has stops near 33rd Drive. Passengers making a transfer between routes would need to walk approximately 1,400 feet between the stops.

In 2008, MAG completed the *Commuter Rail Strategic Plan* which provided a framework for implementing commuter rail in the MAG region. The Strategic Plan developed a commuter rail system concept that would radiate from downtown Phoenix and be oriented around the existing freight rail lines. The Strategic Plan included a commuter rail corridor along US 60 (Grand Avenue) which was further developed in the MAG *Grand Avenue Commuter Rail Development Plan* (2010). The MAG *Regional Commuter Rail System Study Update* (2018) updates the 2008 Strategic Plan and included commuter rail service along US 60. Based on these previous studies, no commuter rail stations are planned near the US60/Indian School Road intersection. The previous commuter rail plans included the construction of a second rail track within the study area.

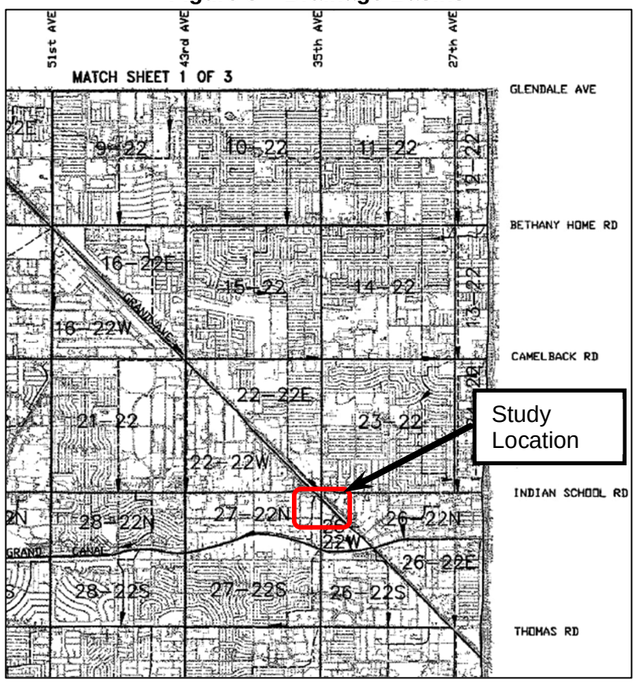
In 2015, Phoenix voters approved Proposition 104, creating the 35-year street and transit plan known as Transportation 2050 or T2050. Bus Rapid Transit (BRT) was included as a key component of T2050 to continue expanding the city's High-Capacity Transit (HCT) network. In October 2021, Phoenix City Council approved the initial BRT corridor of 35th Avenue and Van Buren Street. The BRT route will run along 35th Avenue from Olive/Dunlap Avenue to Van Buren Street and then along Van Buren Street from 35th Avenue to Central Avenue. This BRT project has also been included in the MOMENTUM 2050 Regional Transportation Plan (RTP) and Regional Strategic Transportation Infrastructure Investment Plan (RSTIIP). The City of Phoenix is currently preparing 15% design plans for the 35th Avenue BRT.

A West Phoenix HCT route has been studied for several years. Recently, the City of Phoenix established as preferred alignment for this service that runs along Indian School Road and passes through the Grand Avenue/35th Avenue/Indian School Road intersection. The West Phoenix HCT Extension has also been included in the 2050 RTP and RSTIIP, but the mode for this service and potentially the alignment itself have not been finalized.

1.3.4 Drainage Systems

The project is located within the limits of the *Maryvale Area Master Drainage Study* (AMDS), prepared by Wood, Patel & Associates for the Flood Control District of Maricopa County in 1997. The intersection bisects six of the identified drainage basins: 22-22W, 22-22E, 23-22, 26-22N, 26-22W, and 27-22N (see **Figure 3**). Flow patterns are generally from the northeast to the southwest and upstream offsite flows are routed down 35th Avenue. The two detention basins on the north side of Indian School are not noted in the AMDS, although they were in-place at the time of the report. As shown in **Figure 4**. the project does not lie in a FEMA designated Special Flood Hazard Area, per FIRM #04013C2185L, effective date: 10/16/2013.

Figure 3 – Drainage Basins



Source: Maryvale ADMP (1997)

Figure 4 – FEMA Floodplain

Source: FIRM Map #04013C2185L (2013)

Offsite Drainage

The area east of US 60 and north of Indian School Road is a blend of single-family residential, apartments, or commercial land use. Runoff from this area collects along 35th Avenue (see **Figure 5**) and flows southward on both sides of the roadway and is collected into a storm drain trunk line along 35th Avenue that appears to discharge into a ditch just south of the Grand Canal.

Runoff from the area west of 35th Avenue and north of US 60 flows along US 60 and is collected in a storm drain along US 60 which flows southeastward where it exits the project area.

The area between the BNSF Railway and 38th Drive is primarily light industrial businesses that either drain as surface flow to the West Detention Basin or are contained on those offsite parcels in privately owned retention basins. Any flow from the roadways is described below.

The offsite runoff south of Indian School Road drains into either the US 60 storm drain or the 35th Avenue storm drain.

Onsite Drainage

The existing onsite runoff for the US60/35th Avenue/Indian School Road interchange is collected into two detention basins: West Basin and East Basin, as shown in **Figure 5**.

Table 1 provides a summary of the offsite and onsite runoff to the East and West detention basins.

Table 1 – Existing Basin Flows

Basin	Offsite			Onsite		
	Area (acres)	Q50 Flow (cfs)	Volume (ac-ft)	Area (acres)	Q50 Flow (cfs)	Volume (ac-ft)
West Basin	17.8	75.7	3.4	8.9	35.4	1.7
East Basin	22.6	73.1	4.3	8.2	30.4	1.6

The West Basin is located immediately north of Indian School Road and west of 35th Avenue. The existing capacity of the basin is 19.1 acre-feet, per the existing topography mapping. The total 100-year, 2-hour detention volume is 5.08 acre-feet from both offsite and onsite sources. The bottom elevation of the existing West Basin is approximately 1106 feet. The offsite flows primarily discharge from the area east of 38th Drive and south of the BNSF Railway. The onsite runoff that reaches the West Basin comes from 38th Drive, Indian School Road through lanes (west of 35th Avenue), and the Indian School Road westbound on-ramp.

The East Basin is located immediately north of Indian School Road and east of 35th Avenue. The existing capacity of the basin is 18.9 acre-feet, per the existing topographic mapping. The total 100-year, 2-hour detention volume is 5.85 acre-feet from both offsite and onsite sources. The bottom elevation of the existing East Basin is approximately 1108 feet. The offsite contributing area to the basin is primarily from the area east of 35th Avenue and north of Indian School Road. The onsite runoff that reaches the East Basin comes from Indian School Road through lanes (east of 35th Avenue), and the westbound Indian School Road to westbound US 60 ramp.

Existing Storm Drains

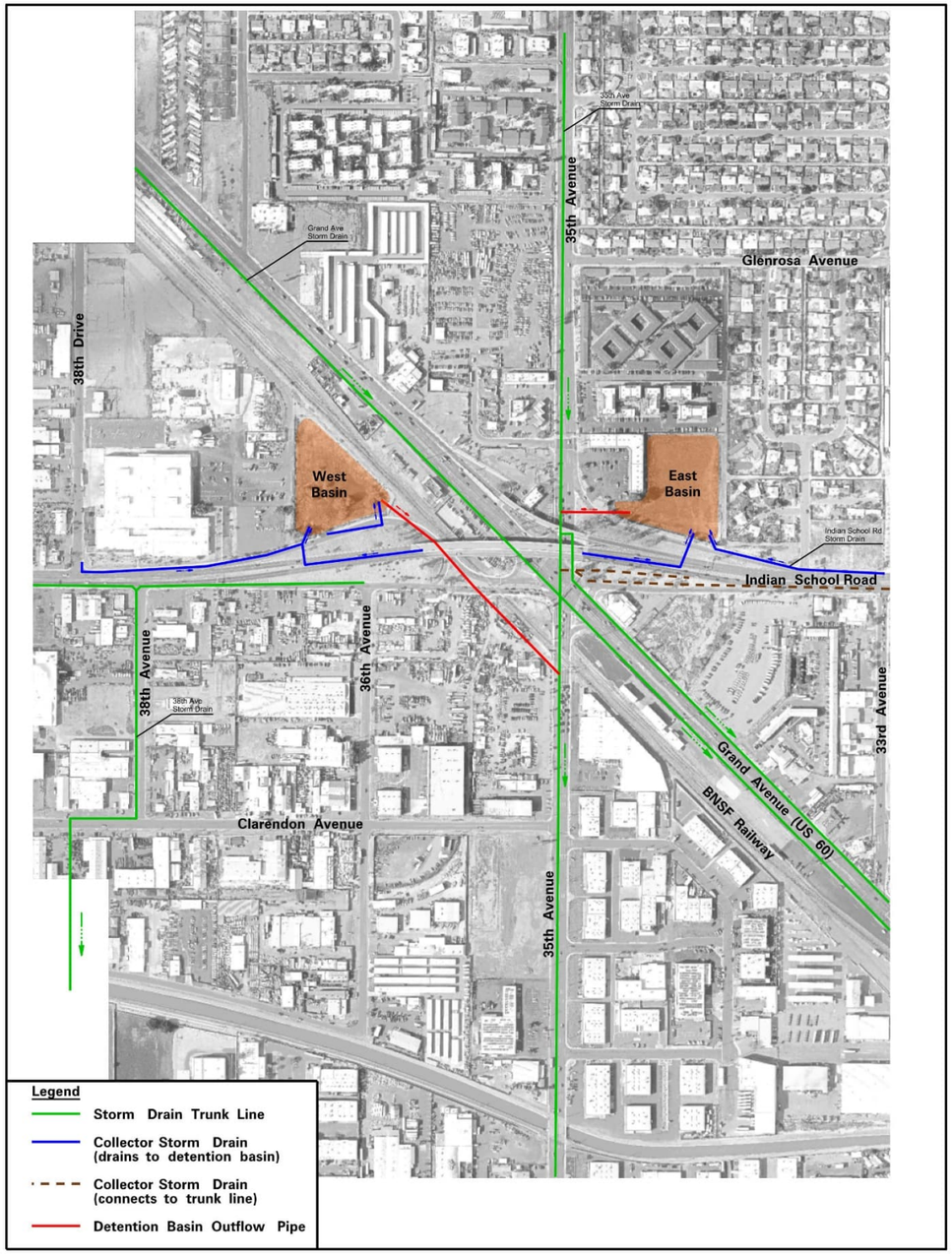
All storm drains described herein are owned and maintained by the City of Phoenix. The ADOT record drawings indicate that the existing pipes are reinforced concrete pipe (RGRCP). The street catch basins are a mix of grated, curb opening, or combination inlets depending on the location. Infield areas use area inlets that are connected to the city storm drain network.

An existing 48-inch diameter RGRCP storm drain is located along 35th Avenue that drains from north to south. This City of Phoenix storm drain trunk line is the primary outfall for the two detention basins.

The West Basin outflow pipe is an 18-inch RGRCP that parallels the BNSF right-of-way and discharges into the 35th Avenue storm drain approximately 350 feet south of US 60. The inflow pipe into the basin is a 54-inch RGRCP that discharges into the west side of the West Basin.

The East Basin outflow pipe is an 18-inch RGRCP that discharges into the 35th Avenue storm drain approximately 300-feet north of US 60. The primary inflow pipe is a 48-inch diameter RGRCP that collects runoff from Indian School Road east approach and discharges into the southeast corner of the basin. A 15-inch RGRCP storm drain collects runoff from the Indian School Road westbound to northbound 35th Avenue ramp and discharges in the south side of the East Basin.

Figure 5 – Existing Drainage System



Along Indian School Road, a 24-inch storm drain is located along the south side of the roadway that starts at 32nd Avenue and discharges into the 35th Avenue storm drain. An auxiliary 24-inch storm drain runs parallel to the first 24-inch storm drain but is located 25-feet north. The two parallel 24-inch storm drains join at a manhole just before tying into the 35th Avenue storm drain. These two parallel storm drains do not connect to either of the detention basins at the interchange.

Along US 60, a 36-inch storm drain is located along the south side of the roadway that collects US 60 runoff. The alignment varies somewhat through the interchange but is primarily located along the eastbound lanes of US 60. A second, smaller storm drain (18-inch diameter RGRCP) appears to originate at a catch basin on 35th Avenue under the interchange and follows along the westbound lanes of US 60. Both storm drains capture runoff from US 60 and drain to the southeast. These two parallel storm drains do not connect to either of the detention basins at the interchange.

Near 36th Avenue, a 24-inch diameter storm drain follows along the Indian School Road eastbound exit ramp and drains westward to a south-flowing storm drain along 38th Avenue. This storm drain trunk line is 42-inch diameter and routes southward to ultimately reach a storm drain system along the Grand Canal.

1.3.5 Utilities

Many utility owners have utilities within the project limits including the City of Phoenix, Arizona Public Service (APS), Salt River Project (SRP), CenturyLink, Cox, Southwest Gas, Sprint, Zayo, and MCI (Verizon).

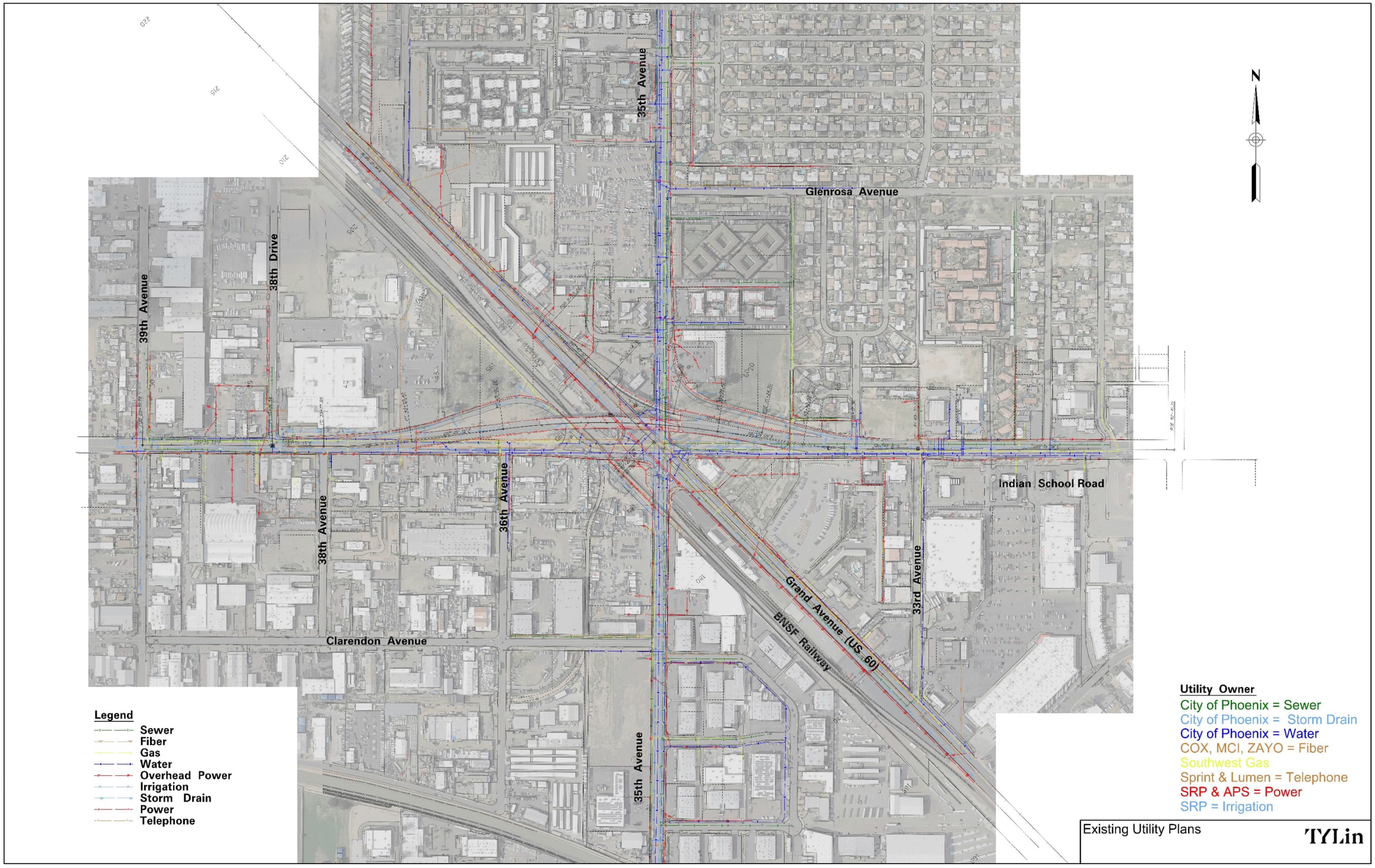
Existing utilities within the study area were identified based on previous utility surveys and as-built information obtained from ADOT, the City of Phoenix and utility companies. Major utilities are listed in **Table 2** and shown in **Figure 6.**

Table 2 – Utilities in the Project Area

Roadway	Location	Utility Description
US 60 (Grand Avenue)	South side of US 60	APS overhead power (230kV)
	North side of US 60	SRP overhead power (69kV)
	North of centerline (north of Indian School Rd	Cox fiber optic
	South of centerline (south of Indian School Rd)	Cox fiber optic
	North of centerline (outer lane) south of Indian School Rd	2” gas line
	North of centerline (outer lane) 700’ south of 37th Ave, north of Indian School Rd	2-1/2” gas line

Roadway	Location	Utility Description
US 60 (Grand Avenue)	South of BNSF railroad north of Indian School Rd.	Southwest Gas 4” STL
	North of centerline (outer lane)	CenturyLink telecommunications and fiber optic
	North of centerline (under curb/sidewalk)	City of Phoenix 12” water
	South of centerline (north of SD) south of Indian School Rd.	City of Phoenix 18” sewer
	North of centerline (behind S/W) north of Indian School Rd	City of Phoenix 10” sewer
	Between BNSF railroad tracks and western BNSF R/W	BNSF communication/fiber optic
35th Avenue	Both sides of 35th Ave from Weldon Ave to Monterosa St	SRP overhead power (12KV)
	East side of 35th Ave, north of Monterosa St	SRP overhead power (12KV)
	West of centerline (outer lane) south of railroad tracks	Southwest Gas 4” STL
	East of centerline, north of US 60	Southwest Gas 2” STL
	East of centerline	City of Phoenix 8” water line
	West of centerline	City of Phoenix 66” water line
	East of centerline	City of Phoenix 6” water line; 8” north of Glenrosa Ave
	West of centerline, north of US 60	City of Phoenix 4” water line
	West of centerline	SRP 54” irrigation; transitions to 48” just south of railroad tracks; runs under sidewalk north of Grand Ave
	East of centerline (outer lane), south of US 60	City of Phoenix 8” sewer
	West of centerline (at sidewalk), south of US 60	City of Phoenix 8” sewer
	East of centerline, between US 60 and 850’ north of Glenrosa Ave	City of Phoenix sewer - two sewer lines (8” and 18”) from Grand Ave to roughly 850’ north of Glenrosa Ave intersection where they join together
	East of centerline, north of Glenrosa Ave.	City of Phoenix 18” sewer line
	Within BNSF R/W	BNSF signal communication and power
Indian School Road	North of centerline, west of US 60	Southwest Gas 4” mainline
	South of centerline, east of US 60	Southwest Gas 2” mainline
	South of railroad	Southwest Gas 4” mainline; running southeast across Indian School Road just south of BNSF Railroad.
	South of centerline, west of US 60	City of Phoenix 4” waterline
	North of centerline, west of US 60	City of Phoenix 8” waterline; shifts south of centerline at 36th Ave and runs along north side of EB Frontage Rd.
	South of centerline, east of US 60	City of Phoenix 48” waterline and 4” waterline (run along EB Frontage Rd)
	South of centerline, east of 33rd Ave	City of Phoenix 8” waterline (south of 4” waterline)
	South of centerline, 39th Ave to 38th Dr	City of Phoenix 8” sewer line
	North of centerline, 39th Ave to 38th Dr	City of Phoenix 8” sewer line
	South of centerline, West of US 60	City of Phoenix 8” sewer line (abandoned) along EB Frontage Rd; still active north /south along 36th Ave
	South of centerline, West of 35th Ave	City of Phoenix fiber optic line along EB Frontage Rd
	At 35th Avenue/Indian School Rd intersection	City of Phoenix fiber optic line crosses through overhead traffic signal structure
	South of centerline, East of 35th Ave	City of Phoenix fiber optic line along EB Ramp
	Within BNSF R/W	BNSF signal communication and power

Figure 6 – Existing Utilities



1.3.6 Existing Structures

1.3.6.1 Bridges

There are two existing bridge structures within this segment of Grand Avenue that were built in 1978 under Project No. BR-74081.0.

The existing Indian School Road Overpass structure (Structure No. 09704) carries Indian School Road traffic over US 60, the eastbound Indian School ramp connection to westbound Indian School, the southwestern US 60 to westbound Indian School ramp connection, and BNSF Railway tracks. The existing bridge is a 7'-0" deep, cast-in-place post-tensioned concrete box girder structure that consists of 5 spans measuring 111'-11 ¾", 129'-1", 105'-0", 164'-4", and 139'-7 ¼" along the construction centerline. The structure is built on a horizontal curve. Substructure units for the bridge are consecutively numbered from Abutment 1 at the western end of the bridge, Piers 2 through 5, to Abutment 6 on the eastern edge of the bridge. Both abutments are stub abutments founded on a dual row of 3'-0" diameter concrete drilled shafts. The front row of shafts at each abutment are battered at a slope of 3H:12V. Pier Nos. 2,3 and 5 are each supported by two integral 6'-3" square concrete columns supported on a concrete mat footing founded on a triple row of 4'-0" diameter concrete drilled shafts. Pier No. 4 is supported by two integral 6'-3" wide by 8'-7" long concrete columns supported by individual square mat foundation each supported by a 3 x 3 grid of 4'-0" diameter concrete drilled shafts.

The existing Indian School Road Ramp R1 Overpass (Structure No. 09705) carries westbound Indian School Road traffic to north-westbound US 60 traffic over 35th Avenue. The existing bridge is a 6'-0" deep, cast-in-place post-tensioned concrete box girder structure that consists of 3 spans measuring 102'-0", 145'-0" and 137'-2 ¼" along the construction centerline. The structure is built on a horizontal curve. Substructure units for the bridge are consecutively numbered from Abutment 1 on the western edge of the bridge, Piers 2 and 3, to Abutment 4 at the eastern edge of the bridge. Both abutments are stub abutments founded on a dual row of 3'-0" diameter concrete drilled shafts. The front row of shafts at each abutment are battered at a slope of 3H:12V. Pier Nos. 2 and 3 are supported by single integral 6'-3" wide by 4'-3" long concrete columns supported by individual square mat foundations each founded on a 3 x 3 grid of 4'-0" diameter concrete drilled shafts.

Bridge inspection reports conducted in 2019 for both structures were furnished by the City of Phoenix. The overall structure appraisal rating (N67) for the existing Indian School Road Overpass structure (Structure No. 09704) is "7 Above Min Criteria." The existing deck and expansion joints have repair recommendations for a localized deck spalls/delaminations and the repair/replacement of existing modular joints. Hairline cracks were observed in the superstructure. Similar cracking is observed in the substructure. The minimum vertical clearance noted in the report is 15.92 feet, but the report does not indicate where this minimum clearance occurs nor is there a clearance diagram that depicts where this measurement occurs. The existing structure also has a posted minimum vertical clearance of 16'-0" over 35th Avenue as shown in **Figure 7**. It is posted in both directions of travel; the sign posted in the southbound direction of 35th Avenue is on the R1 Ramp structure which is immediately north of the Indian School Road Overpass. A vertical clearance of 19'-0" is posted over the westbound Indian School frontage road as shown in **Figure 8**.

Figure 7 – Posted Minimum Vertical Clearance Over 35th Avenue (Looking North)

Figure 8 – Posted Minimum Vertical Clearance Indian School/US 60 Ramp Connections (Looking North)

The overall structure appraisal rating (N67) for the existing Indian School Road Ramp R1 Overpass structure (Structure No. 09705) is "7 Above Min Criteria." The existing deck has hairline cracks over approximately 30 percent of the entire deck area. Three small, patched deck cutouts have failed. The superstructure was noted as having a small impact spall on the north fascia over the third span (35th Avenue) as well as a few hairline cracks. Abutments had some minor vertical cracking. Piers were not accessible during the 2019 routine bridge inspection. The minimum vertical clearance noted in the report is 16.5 feet, but the report does not indicate where this minimum vertical clearance occurs nor is there a clearance diagram that depicts where this measurement occurs. The only sign posted on the structure is 16'-0" on the north side of the structure over 35th Avenue, presumably for the Indian School Road Overpass structure (Structure No. 09704) that is located immediately to the south of this structure.

1.3.6.2 Retaining Walls

There are two existing retaining walls within the project vicinity.

The first wall ties into the southwestern corner of the Indian School Ramp R1 bridge structure. It measures 266'-2 ½" in length. The taller portions of the wall adjacent to the bridge structure are concrete retaining walls supported on a concrete footing founded on a pair of concrete drilled shafts. The row located in front of the outside face of wall is battered at a slope of 3H:12V. The wall portion supported by drilled shafts measures 130'-2 ½" in length. The remainder of the wall is a conventional cast-in-place concrete retaining wall supported on a continuous concrete spread footing. The full length of the wall stem incorporates an integral roadway barrier along the top.

The second wall is a conventional cast-in-place concrete retaining wall built along the north side of Indian School Road, west of the Indian School Road Overpass structure. The wall extends from existing Indian School Road construction centerline Station 38+25.72 to Station 42+74.47.

1.3.7 BNSF Railway

The BNSF Railway is adjacent and parallel to US 60. The BNSF Railway provides a high degree of access control for US 60 throughout the corridor with roadway connections limited to the major arterial street intersections. Most of these intersections are signalized and have pre-emption/coordination with the BNSF crossing signals to clear vehicle traffic as a train approaches. The railroad right-of-way varies between 90' and 125' between 33rd Avenue and 37th Avenue.

East of 35th Avenue, the BNSF right-of-way contains one main track and three siding tracks which extend south/east for approximately 1,200'. The 35th Avenue and Indian School Road ramp crossings contain a single track. North of Indian School Road, the BNSF right-of-way contains two tracks. Approximately 800' north/west of Indian School Road, several tracks are added to provide a total of one main track and four siding tracks.

Current BNSF Railway policy prohibits track closures during the fourth quarter (October 1 through December 31) of each calendar year. In addition, work within the right-of-way may be restricted due to train movements, This moratorium applies to the entire BNSF Railway system due to the higher demands during the holiday season.

1.3.8 Right-of-Way

The existing US 60 right-of-way is approximately 100' wide from 33rd Avenue to 37th Avenue. The right-of-way is approximately 50' on both sides of US 60. The right-of-way width does vary within these limits and ranges from 90' to 112' for areas not supporting ramps. North of Indian School Road, the right-of-way widens for the Indian School Road to US 60 ramp and is approximately 145' at its widest point.

The right-of-way along Indian School Road immediately east of 33rd Avenue is 100' wide (generally 50' on each side of the section line) which is generally consistent with the roadway farther to the east. West of 33rd Avenue, the Indian School Road right-way widens to account for the ramps that connect to 35th Avenue and US 60. Immediately east of 35th Avenue, the Indian School Road right-of-way is 300' with 245' north of the section line and 55' south of the section line. Between 35th Avenue and 38th Drive, the Indian School Road right-of-way varies between 255' and 85'. West of 38th Drive, the right-of-way is approximately 84' wide with approximately 42' south and north of the section line.

The 35th Avenue right-of-way width is generally 80' throughout the study area with 40' on each side of the section line. Between Indian School Road and Glenrosa Avenue, the right-of-way width varies between 80' and 165'.

1.3.9 Signing and Lighting

Existing signing for the US 60 (Grand Avenue), 35th Avenue, and Indian School Road intersection includes a combination of standard post mounted signs, overhead directional guide signs mounted to sign bridge structures and cantilever sign structures, internally illuminated street name signs (IISNS), overhead bridge fascia mounted signs, LED blackout train preemption signs, and traffic signal pole mounted overhead signs to guide drivers through the intersection. On both the eastbound and westbound approaches of Indian School Road, advance guide signs are mounted to an overhead cantilever sign structure as well as an overhead bridge sign structure to guide drivers between the at-grade intersection or to the Indian School Road overpass. Special 3-sided internally illuminated street name signs are mounted to each end of a large tubular bridge structure which spans diagonally across the intersection. A light emitting diode (LED) blackout train preemption sign is located on the southbound 35th Avenue approach to warn drivers of BNSF railroad crossings. The remainder of the intersection's regulatory, warning, guide, and object marker signs are mounted on standard posts, mounted overhead on traffic signal poles, or mounted overhead on the bridge fascia of the Indian School Road overpasses.

Existing street lighting for the US 60, 35th Avenue, and Indian School Road intersection includes light emitting diode (LED) lighting throughout the intersection with the exception of high-pressure sodium luminaires serving as underdeck lighting beneath both the mainline Indian School Road and westbound Indian School Road off-ramp bridges. A variety of free-standing poles and utility poles are used to mount LED luminaire mast arms across the intersection at approximately 30' mounting height. Light poles are located on all corners of the intersection as well as within medians and pork-chop islands which serve to direct vehicular traffic and provide a refuge area for crossing pedestrians. On the Indian School Road mainline bridge, staggered bridge-mounted overhead lighting is present and single-side bridge mounted LED overhead lighting is used on the westbound Indian School Road off-ramp bridge. Just north of the intersection, a luminaire mast arm is mounted to the traffic signal pole of a pedestrian hybrid beacon. There is continuous lighting on all intersection approaches to the intersection.

According to ADOT's Traffic Guidelines and Processes No. 700 "Illumination", continuous lighting on conventional highways is considered to be justified where local agencies find sufficient benefit in the form of convenience, safety, policing, community promotion, and public relations.

1.3.10 Traffic Management Systems

The City of Phoenix controls and operates traffic signals for all six approaches of the US 60, 35th Avenue, and Indian School Road intersection. Signal timings have been recently optimized for coordination utilizing a 180 second cycle length during weekday AM and PM peak hours and a 150 second cycle length during the weekend mid-day peak hours. Signals are coordinated with the traffic signal controller for BNSF train preemption. This complex intersection contains several traffic signal structures including a large tubular bridge structure that spans diagonally from the southwest corner of the intersection to the northeast corner of the intersection and includes a variety of mounted traffic signals across the span. Additional traffic signal structures include several Type A poles and Type PB pedestrian push button poles which contain pedestrian push buttons, pedestrian signals, and supplemental traffic signal heads. Further supplemental traffic signal heads are mounted to nearby light poles as well as one of the Indian School Road overpass bridge bents. Additional traffic signal equipment present at the intersection includes a pan-tilt-zoom (PTZ) camera, radio wifi, and in-ground vehicle loop detectors on both 35th Avenue approaches and US 60 approaches. There is a BNSF train track crossing across two legs of the intersection, the south leg of 35th Avenue, and the west leg of Indian School Road. The west leg of the Indian School Road BNSF train track crossing has railroad crossing gates and flashing beacons present for each direction of traffic. The south leg of the 35th Avenue BNSF train track crossing has overhead cantilever sign structures with flashing beacons present for each direction of traffic. On the northbound 35th Avenue approach to the intersection, an additional traffic signal mast arm was installed about 20' south of the railroad crossing sign structure to supplement intersection traffic signalization. There is an existing pedestrian hybrid beacon on 35th Avenue a few hundred feet north of intersection, near Monterosa Street.

1.3.11 Geotechnical Conditions

The subsurface conditions within the project vicinity were determined based on review of as-built plans and readily available geotechnical data. The project site is located in the Basin and Range Geologic Province of the southwestern United States. The Basin and Range Province is characterized by a modern landscape consisting of broad alluvial valleys interspersed with and bounded by uplifted and fault-block mountain ranges, often with well-developed pediments and alluvial fans. Generally, the mountain ranges and valleys trend in a north-south to northwest-southeast direction. The modern landscape was formed by late Tertiary (Miocene-Pliocene) extensional tectonism and high-angle normal faulting followed by subsequent erosion of the uplifted mountains and depositions of the sediments in the newly-formed basins.

The AZGS geologic map describes a major part of the site surficial soils as unconsolidated to weakly consolidated alluvial fan, terrace, and basin-floor deposits with moderate to strong soil development. Fan and terrace deposits are primarily poorly sorted, moderately bedded gravel and sand, and basin-floor deposits are primarily sand, silt, and clay. The surficial soils overlie coarser grained deposits likely derived from historic meandering and deposition of the Salt River to the south and of Cave Creek Wash to the north.

The site soils are generally considered to be well suited for the use of either shallow spread foundations or drilled shaft foundations. Based on review of the Record Drawings, the subsurface soils consist primarily of firm to hard fine-grained sandy clay (CL) to clayey sand (SC) to depths of about 10 to 20 feet. Below these depths, coarser grained very firm to hard clayey sand (SC) and clayey gravel with sand (GC) was encountered to the full depth (maximum of 120 feet) of the completed borings.

Depletion of groundwater resources in deep alluvial basin aquifers in the western United States has and continues to cause land subsidence. Land subsidence can severely and adversely impact infrastructure by changing the ground elevation, ground slope (grade) and through the development of ground cracks, known as earth fissures, can erode into large gullies. Earth fissures have the potential to compromise the foundations of roadways, levees, and other infrastructure, which may ultimately cause failure.

Interferometric Synthetic Aperture Radar (InSAR) is a satellite-based technology that can detect ground subsidence as low as 0.2 inches. ADWR has a program that monitors land subsidence in Arizona utilizing InSAR. The project site is located at the far east end of what is termed the West Valley Land Subsidence Area. InSAR data from 2010 to 2020 (ADWR 2020) indicates the site has experienced less than 0.3 inches of land subsidence. Over the long distances where ground subsidence typically occurs, this minimal drop should not negatively impact this project.

There are no reported earth fissures within or near the project site. The nearest reported (unconfirmed) earth fissures are located roughly 8 miles northeast with numerous confirmed fissures being present in the Phoenix west valley roughly 10 to 12 miles to the west of this site. Neither ground subsidence or earth fissures are expected to impact this project.

The majority of the project alignment is underlain by relatively good quality subgrade soils. It appears likely that all site soils can be re-used as embankment fill. Testing would be required to verify whether some or all of it would qualify for structure backfill.

1.3.12 Pavement Structural Sections

As-built plans were reviewed to inventory the US 60, 35th Avenue, and Indian School Road pavement sections. Full-depth paving was identified in the as-builts listed in **Table 3**. Additional pavement improvements have likely been implemented since the dates listed in Table 3 and therefore the information may not reflect the current conditions.

Table 3 – Pavement Structural Sections

Location	Project Number	Year	Description
Indian School Road	F-022-2(3)	1975	1" (ACFC), 3" (ACB), 4" (AB), 24" (Select Material)
35th Avenue	BR-74081.00	1975	1" (ACFC), 11" (ACB)
US 60 (Grand Ave)	BR-74081.00	1964	3.5" (AC), 4" (AB), 12" (Select Material)

1.3.13 Previous Projects

The existing Indian School Road overpass was constructed in 1976 by the City of Phoenix. **Table 4** shows projects that have been constructed since 2000.

Table 4 – Previous Projects

Project Number	Location	Year	Description
City of Phoenix ST 89310065	Grand Ave / Indian School Rd intersection	2002	Grand Avenue / Indian School intersection improvements
City of Phoenix ST83120027	35th Ave & Indian School Rd	2004	Detention basin landscape
City of Phoenix ST85110078	Indian School Bridge at 35th Ave	2009	Bridge joint rehabilitation
City of Phoenix ST85110079	Indian School Bridge at 35th Ave	2009	Bridge joint rehabilitation
City of Phoenix ST85170072	Indian School Rd: 35th Ave to 27th Ave	2014	Landscape
ADOT H732801C 060-B(204)T	US 60, 71st Ave to McDowell Rd	2014	Curb, sidewalk, paving, landscaping
City of Phoenix STxxxxxxxx	35th Ave & Monterosa St	20xx	HAWK signal
City of Phoenix STxxxxxxxx	35th Ave at BNSF RR crossing	20xx	RR signals south of Indian school

2.0 TRAFFIC AND CRASH DATA

2.1 CRASH ANALYSIS

The ADOT Traffic Safety Section provided crash data for the study area along US 60, Indian School Road and 35th Avenue. There were a total of 682 reported crashes within the study area between September 1, 2014 and August 31, 2019. The following is a summary of some key characteristics of the crash data:

- Of the 682 crashes reported, 597 (88%) occurred at or near an intersection, while 85 (12%) were reported to occur mid-block (between intersections).
- Of the 682 crashes reported, 466 (68%) resulted in property damage, 206 (31%) resulted in injuries, and 10 resulted in a fatality (1%).
- 592 crashes (87%) involved another motor vehicle while the other 13% were various collisions such as a collision with a fixed object, collision with other non-fixed objects, or were classified as other or unknown.
- Of the 592 crashes with another motor vehicle, 44% (258 crashes) were rear-end crashes, 22% (129 crashes) were sideswipe crashes, and 20% (116) were left-turn crashes.
- 73% of the crashes occurred during daylight hours, 1% occurred at dusk or dawn, and the remaining 26% occurred during hours of darkness.

Table 5 illustrates the crash data summary by segment within the study area. **Table 6** illustrates the crash data summary by intersection. **Figure 9** graphically displays the crash data.

Table 5 – Segment Crash Summary (2014-2019)

Segment	No. of Crashes	Crash Frequency (Crash/Year)	Crash Rate (Crash/Million Vehicle Miles)
US 60, 33rd Ave to 35th Ave	4	0.80	0.19
US 60, 35th Ave to 37th Ave	12	2.40	0.52
35th Ave, Indian School Rd to Glenrosa Ave	12	2.40	1.53
35th Ave, Indian School Rd to Clarendon Ave	1	0.20	0.16
Indian School Rd, 33rd Ave to 35th Ave	10	2.00	0.63
Indian School Rd, 35th Ave to 39th Ave	12	2.40	0.36

Based on the City of Phoenix *2014-2016 Collision Rate Study,* the citywide average crash rate for a segment of an arterial street is 2.41 crashes per million vehicle-miles traveled from 2014 to 2016. All of the calculated segment crash rates shown in Table 5 are below the citywide average rate.

Table 6 – Intersection Crash Summary (2014-2019)

Intersection	No. of Crashes	Crash Frequency (Crash/Year)	Crash Rate (Crash/Million Vehicles)
US60/35th Ave/Indian School Rd	157	31.40	1.09
35th Ave/Clarendon Ave	45	9.00	0.71
Indian School Rd/33rd Ave	128	25.60	1.29

Based on the City of Phoenix *2014-2016 Collision Rate Study*, the citywide average crash rate for an intersection of two arterial streets is 1.23 crashes per million entering vehicles from 2014 to 2016. The citywide average crash rate for an intersection of an arterial street and a collector street is 0.73 crashes per million entering vehicles. The calculated intersection crash rates at the US 60/35th Avenue/Indian School Road intersection (arterial/arterial intersection) and 35th Avenue/Clarendon Ave intersection (arterial/collector intersection) are below the citywide averages. The calculated intersection crash rate at the Indian School Road/33rd Avenue intersection (arterial/collector intersection) is above the citywide average.

Based on the City of Phoenix 2014-2016 Collision Rate Study, the average crash frequency for an intersection of two arterial streets is 25.7 crashes/year and the average occurrence of a crash involving a fatality is 0.2 crashes/year (based on sample of 167 intersections shown in report). At the US 60/35th Avenue/Indian School Road intersection, the average crash frequency is 31.4 crashes/year and the average occurrence of a crash involving a fatality is 0.4 crashes/year, both of which are above the citywide average.

The crash frequency measures the number of crashes per year while the crash rate measures the number of crashes per million entering vehicles per year. Based on the number of crashes and the traffic volumes, the US60/35th Avenue/Indian School Road intersection is above the average number of crashes per year, but below the average crash rate (which accounts for the traffic volumes) due to the high amount of traffic using the intersection. Similarly, the Indian School Road/33rd Avenue intersection is below the average number of crashes per year, but above the average crash rate due to the lower amount of traffic using the intersection.

2.2 EXISTING TRAFFIC CONDITIONS

Historical traffic count data along US 60 was obtained from ADOT Multi-Modal Planning Division (MPD) for years 2010 through 2021. The historical traffic count data ranged from approximately 35,600 to 45,100 vehicles per day (vpd) on US 60 between 33rd Avenue and 39th Avenue during that time period. Historical data was also obtained from the MAG traffic count website. During the same time period, the historical traffic count data ranged from approximately 47,000 to 56,800 vpd on Indian School Road between 33rd Avenue and 43rd Avenue, and approximately 21,600 to 28,300 vpd on 35th Avenue between Earll Drive and Campbell Avenue. All three roadways experienced a drop in daily traffic in 2020 due to the COVID-19 pandemic.

The City of Phoenix collected traffic counts at several locations on US 60, Indian School Road and 35th Avenue in August 2019. Supplemental field counts were collected in June 2020 and March 2021. A 2% growth factor was applied to 2019 data and the supplemental data from 2020 and 2021 was used to create 2020 existing conditions volumes for use in this study. The resulting peak hour volumes are slightly higher than the 2019 counts and would represent the anticipated conditions in early 2020, prior to the COVID-19 pandemic. The existing (2020) traffic count data is shown in **Figure 10** and includes the peak hour volumes and traffic signal locations. **Figure 11** shows the lane configurations at the signalized intersections.

Figure 9 – Crash Data (2014-2019)

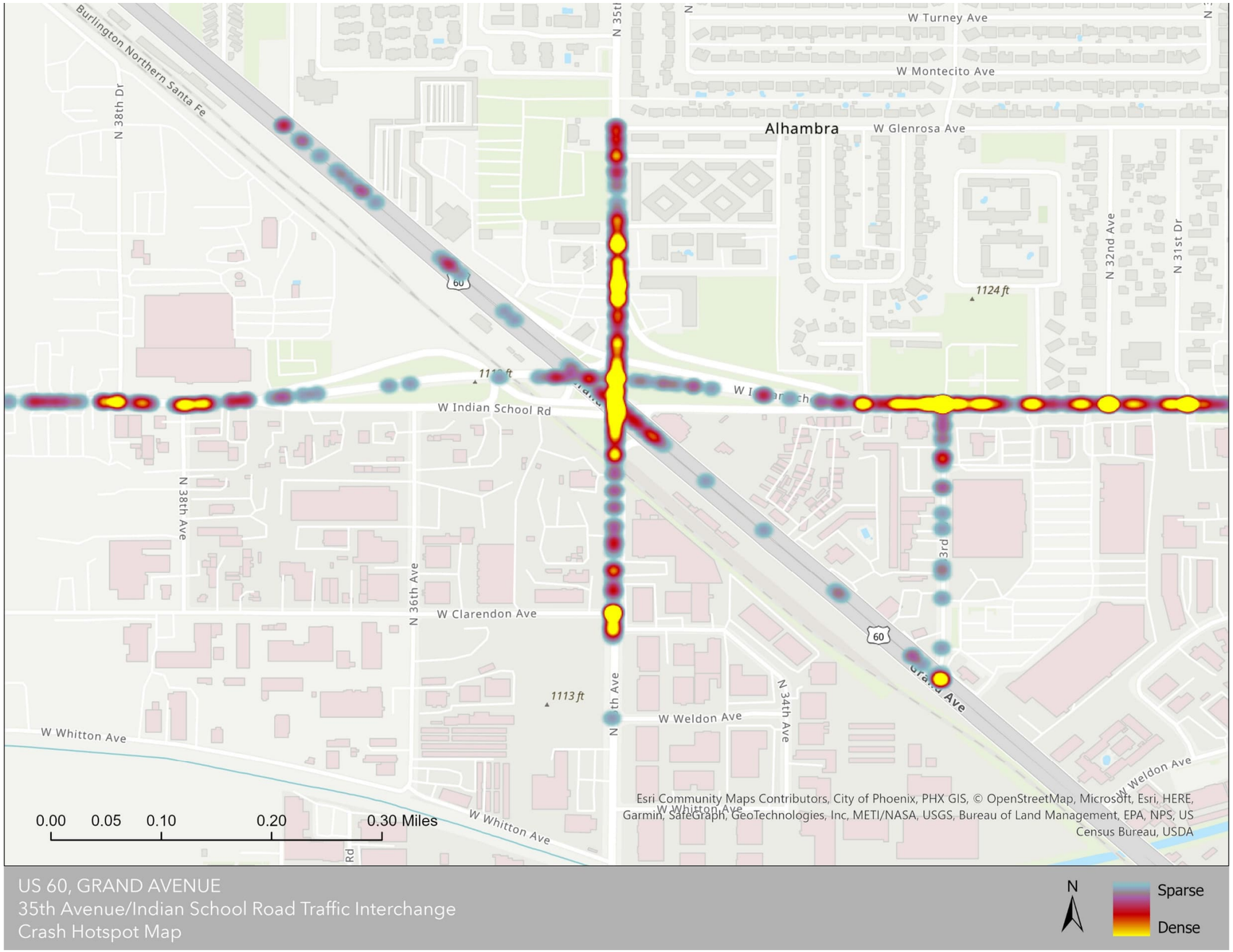


Figure 10 – Existing (2020) Traffic Volumes

Figure 11 – Existing Lane Configurations

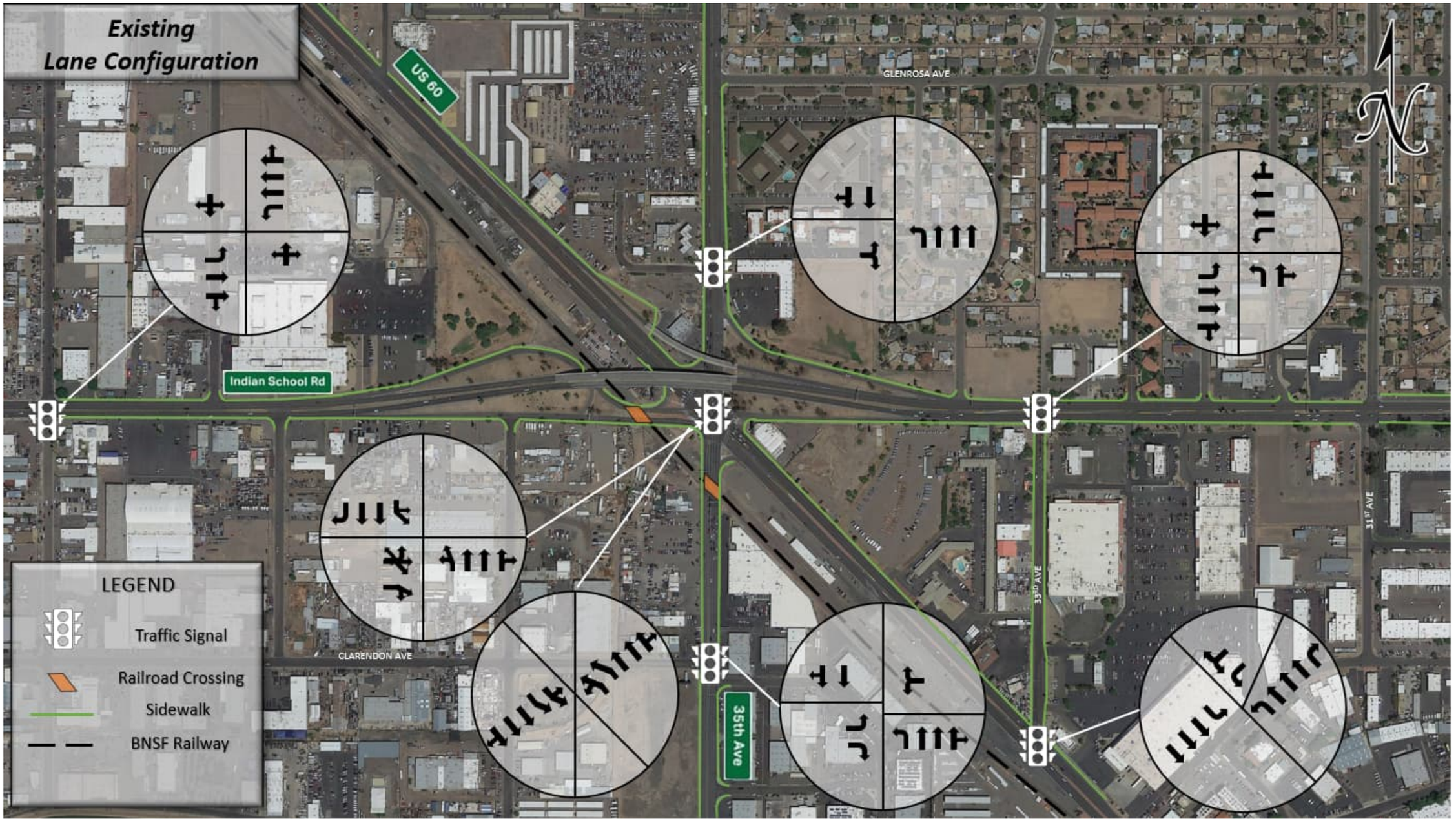


Table 7 depicts the traffic factors ('K' values and directional splits) on US 60 based on the field data collected in 2022. The portion of Average Daily Traffic (ADT) occurring within the peak hour is approximately 6% to 7%. The directional distribution on US 60 is approximately 60% in the peak direction of travel during the A.M. and P.M. peak hours, respectively.

Table 7 – US 60 Traffic Factors

Roadway	AM Peak Hour			PM Peak Hour		
		Directional Split			Directional Split	
	K value	SEB	NWB	K value	SEB	NWB
US 60, west of 35th Avenue	6%	61%	39%	7%	39%	61%

Source: 2022 field count data

The traffic factors along US 60, based on the ADOT MPD data from 2022, indicate the percentage of the ADT occurring within the peak hour is approximately 9% and the directional distribution is approximately 65% in the peak direction of travel. These factors differ from the field count data shown above as the published ADOT values are based on the 30th highest hourly volume of the year. The daily truck traffic provided by MPD shows approximately 12% of the daily traffic classified as trucks.

Table 8 shows the existing traffic factors along Indian School Road and 35th Avenue based on the 2022 field movement counts.

Table 8 - Indian School Road and 35th Avenue Traffic Factors

Roadway	AM Peak Hour			PM Peak Hour		
	K value	Directional Split		K value	Directional Split	
		WB	EB		WB	EB
Indian School Road, east of 35th Avenue	6%	41%	59%	7%	62%	38%
		NB	SB		NB	SB
35th Avenue, north of Indian School Road	6%	44%	56%	8%	63%	37%

Source: 2022 field count data

2.3 FUTURE TRAFFIC CONDITIONS

2.3.1 Description of Alternatives

The No-Build and Build Alternative were evaluated for this study. Descriptions of the No-Build and Build Alternatives are provided below.

No-Build Alternative

The No-Build Alternative would only include projects planned by other agencies and would not result in any other improvements at this location. The BRT project along 35th Avenue would be implemented, and it is assumed that the BRT project would eliminate a northbound lane on 35th Avenue, a BRT station would be located near Indian school Road, and pedestrian improvements would be constructed as part of the BRT project.

Build Alternative

The Build Alternative would include a grade-separated crossing of US 60 with 35th Avenue elevated over US 60 and the BNSF Railway. US 60 and the BNSF Railway would remain in their existing locations. A signalized intersection would be provided at the elevated intersection of 35th Avenue and Indian School Road.

Three lanes would be provided in each direction of travel on US 60. US 60 would remain at-grade. Two lanes would be provided in each direction of travel on 35th Avenue which is a reduction of one northbound lane. 35th Avenue would be elevated to pass over US 60 and the BNSF Railway tracks. Traffic on 35th Avenue would pass through the traffic signal at Indian School Road. Three lanes would be provided in each direction of travel on Indian School Road. Indian School Road would pass over US 60 and the BNSF Railway tracks. Traffic on Indian School Road would pass through the traffic signal at 35th Avenue.

A new connector roadway would be located north of US 60 and west of 35th Avenue to provide a connection between 35th Avenue and US 60. A ramp would be provided from westbound Indian School Road to northwest-bound US 60 and a ramp would be provided from US 60 to eastbound Indian School Road. Improvements would be constructed at the 33rd Avenue/Indian School Road intersection**. Appendix A** contains a memorandum regarding the re-routing of traffic and the connector road.

The BRT project along 35th Avenue would be implemented, and it is assumed the BRT would operate in exclusive lanes and a BRT stop would be provided north of Indian School Road.

2.3.2 Traffic Volume Projections

MAG maintains a regional traffic forecasting model to develop future traffic volume projections based on projected socio-economic, population, employment, origin-destination, and other regionally based data. The output from the model includes daily, peak period, and peak hour traffic volumes for the arterial transportation network system.

MAG provided traffic volume projections for Design Year 2050 for the No-Build and Build Alternatives. The 2050 model includes all transportation system improvements identified in the *Regional Transportation Plan* (RTP). The 2050 traffic volume projections that were received from MAG were post-processed in accordance with the procedures recommended by MAG.

The 2050 No-Build peak hour intersection projections were re-routed for the Build Alternative based on the proposed roadway network. Minor street and driveway field count data was also used to support the re-routing. The primary objectives of the re-routing were to address connectivity between the three major roadways and to address circulation due to changes in access to adjacent parcels and minor streets. The re-routing did not account for reductions in traffic volumes due to the anticipated right-of-way acquisitions. As part of this re-routing, a traffic analysis was conducted to assess the effects of the re-routing and to investigate potential mitigation opportunities. This analysis is documented in **Appendix A**.

The 2050 traffic volume projections and lane configurations for the No-Build Alternative are shown in **Figure 12** and **Figure 13**, respectively. The 2050 traffic volume projections and lane configurations for the Build Alternative are shown in **Figure 14** and **Figure 15**, respectively.

2.4 OPERATIONAL ANALYSIS

2.4.1 Analysis Methodology

2.4.1.1 Introduction

An operational analysis was performed for all of the signalized intersections for the Existing Conditions, No-Build Alternative, and the Build Alternative. As part of the analysis, the Synchro 11.0 computer program was used to analyze the intersection operations and signal progression along US 60, 35th Avenue, and Indian School Road. The resulting signal timings from Synchro were then input into the VISSIM computer program to provide a network simulation of the intersections within the study area.

The concept of level-of-service (LOS) uses qualitative measures that characterize operational conditions within a stream of traffic. The descriptions of individual levels-of-service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience. Six levels of service are defined for each type of facility for which the analytical procedures are available. They are given letter designations from 'A' to 'F', with LOS 'A' representing the best operational conditions and LOS 'F' representing an over-capacity condition with a high degree of congestion. Each level of service represents a range of operating conditions.

Table 9 shows the control delays and corresponding levels-of-service established in the HCM for signalized intersections.

Table 9 – Intersection Delay and Corresponding Levels-of-Service

Level-of-Service	Control Delay (sec/veh)
A	< 10
B	10 – 20
C	20 – 35
D	35 – 55
E	55 – 80
F	> 80

Source: HCM 2010, Volume 3: pg. 18-6

In accordance with the goals established by ADOT for the state highway system and by the City of Phoenix, each intersection should provide LOS 'D' or better operations for the overall intersection and for each intersection approach during the peak hours. Individual movements within an intersection approach may operate with a lower level-of service but should not create vehicle queuing that would negatively influence the other approach traffic movements.

2.4.1.2 Synchro Analysis

The signal timings for use in VISSIM were developed using Synchro 11. The following assumptions/input parameters were used in the Synchro intersection analysis:

- Peak hour factor: 0.92
- Vehicle travel speed: 45 mph
- Intersection spacing based on proposed roadway geometrics
- Percentage of heavy vehicles: 2%
- Lane widths: 12'
- Base saturation flow rate: 1,900 vphpl
- Pedestrian movements were not included in signal timings
- Right-turn-on-red movements: These traffic movements were included in the analysis and modeled in the software
- Cycle length: Optimized based on network performance

The signal timings along both Indian School Road and US 60 were analyzed as separate, independent coordinated networks for the Build Alternative to develop signal cycle lengths and splits that would provide signal progression along both roadways. The evaluation of the Existing Conditions and No-Build Alternative were based on the existing signal timings.

The Synchro analysis provided signal timings for all of the signalized intersections within the study area. This input was then followed by the VISSIM analysis for the Existing Conditions, No-Build Alternative, and the Build Alternatives.

2.4.1.3 VISSIM Analysis

The VISSIM computer program was used to provide a network simulation of the intersections within the study area. The intersection control delays, and levels-of-service shown in Table 9 were used as the LOS criteria for this analysis.

The following VISSIM model input assumptions were used for the operational analysis:

- Free flow speed of 40 mph for 35th Avenue and Indian School Road.
- Free flow speed of 45 mph for US 60.
- Free flow speed of 30 mph for other roadways
- Commercial vehicle percentage was assumed to be 5% during peak hours

In order to replicate the existing peak hour travel conditions, the A.M. and P.M. peak hour VISSIM models were calibrated based on INRIX Speed Data. The calibration process followed FHWA guidelines for developing an existing conditions model and included multiple simulation runs (10) using random seeds to account for variability in the output. Existing traffic volumes, speeds, and travel times were utilized as calibration data. Field travel times were not collected during the existing conditions evaluation due to COVID 19 restrictions and impact on existing travel patterns at the time.

The VISSIM output link volume data was compared to the input volumes for each roadway segment. At selected locations the driver behavior parameters were modified to calibrate the volume comparison.

Following the calibration process, the VISSIM model output closely replicated the existing congestion conditions observed in the study area. The lane changing and driver behavior parameters from the calibration process were used in the future condition VISSIM models. Each future condition model was run at least ten times and the model output was averaged to determine the average delay at each intersection.

Figure 12 – 2050 No-Build Conditions Traffic Volumes

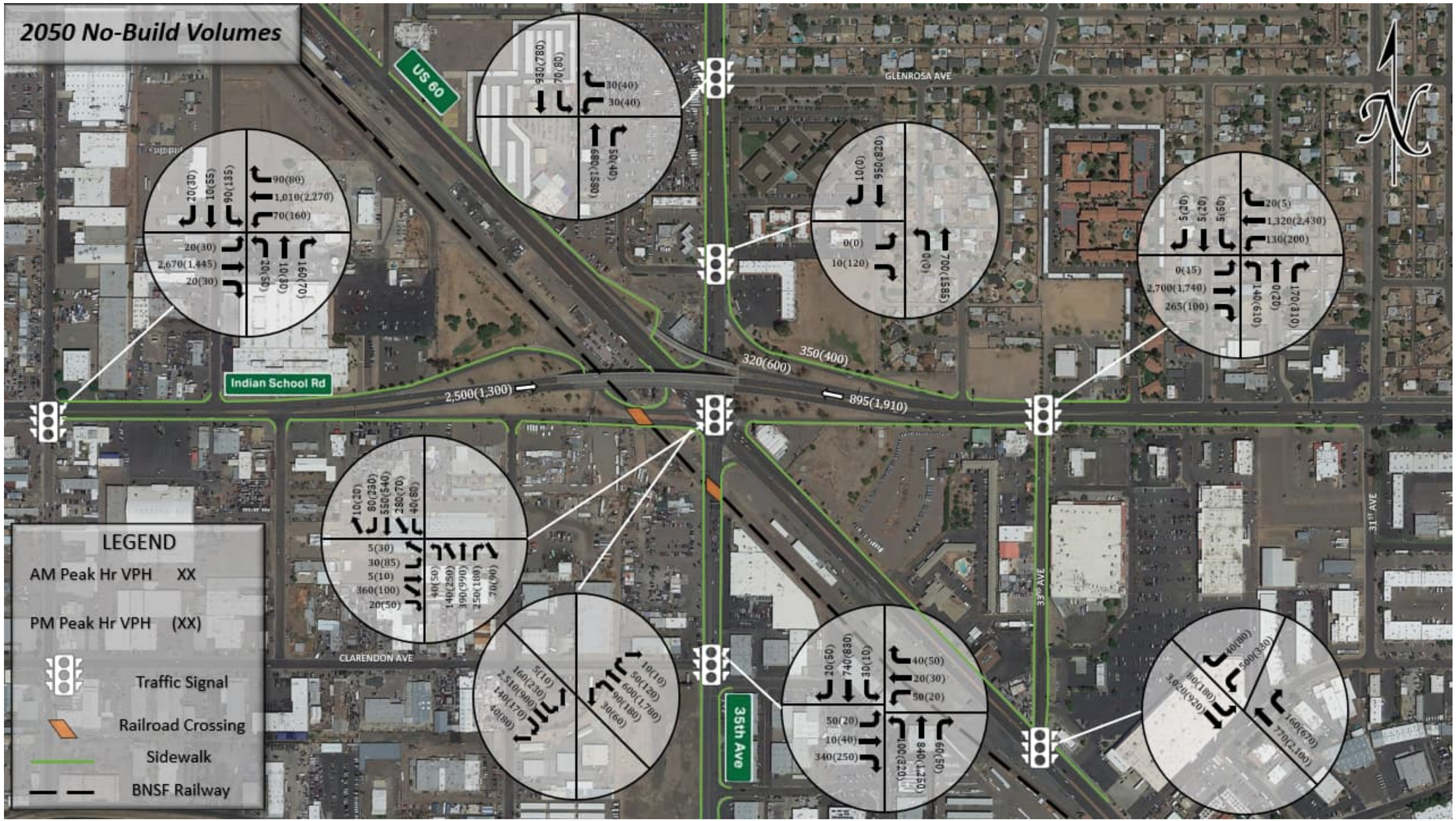


Figure 13 – 2050 No-Build Conditions Lane Configurations

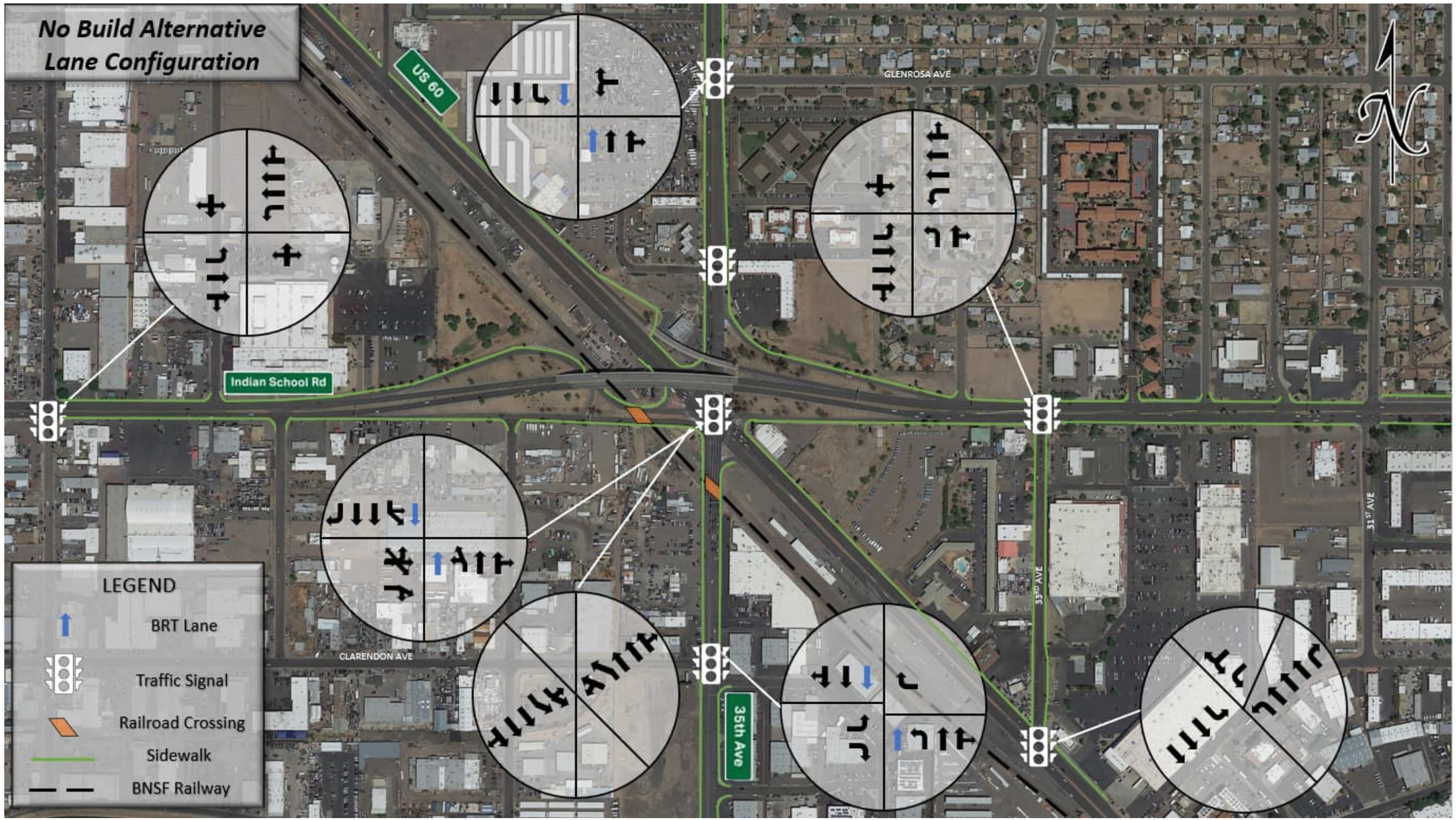


Figure 14 – 2050 Build Alternative Traffic Volumes

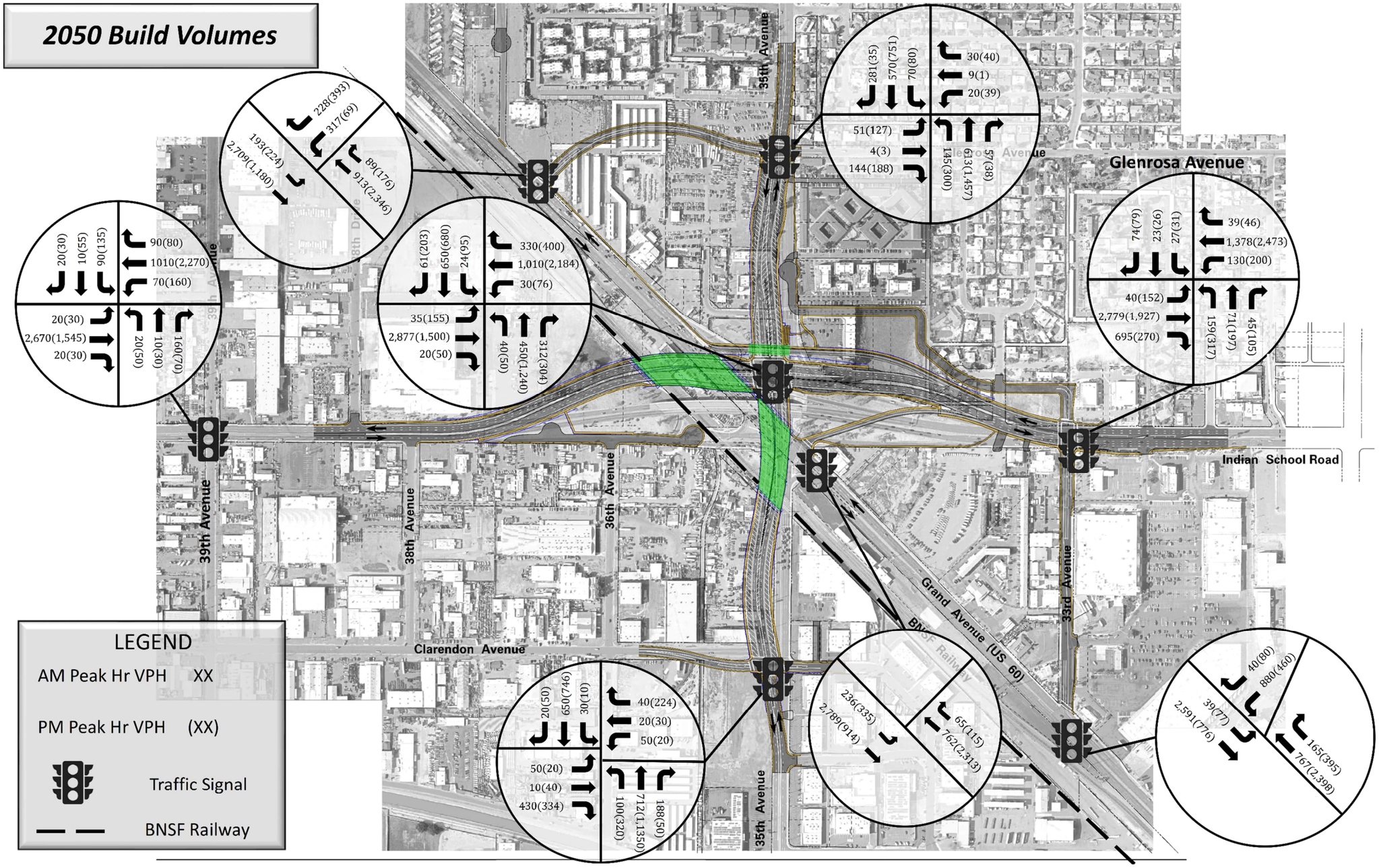
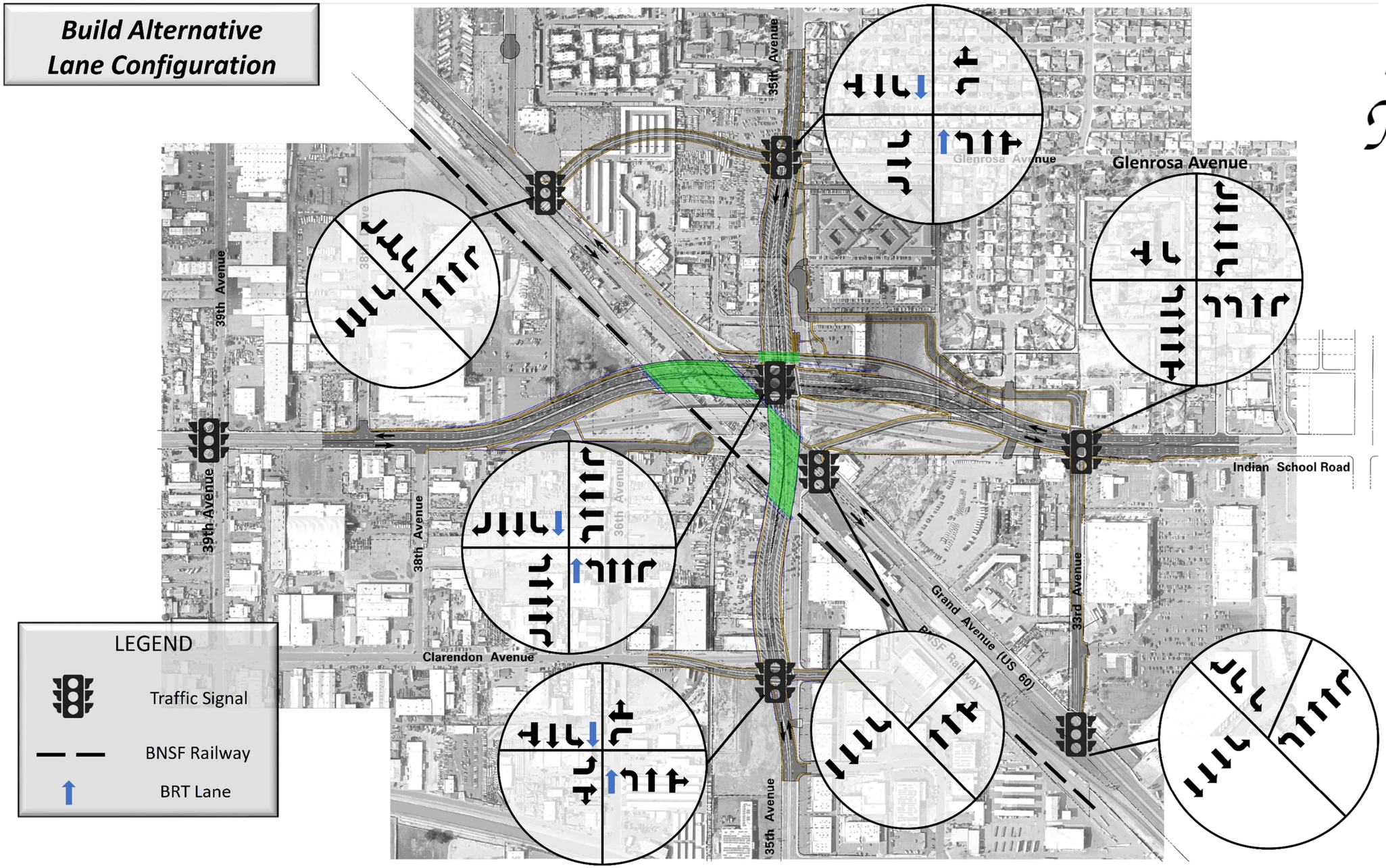


Figure 15 – 2050 Build Alternative Lane Configurations



2.4.1.4 Turn Bay Storage Length Analysis

ADOT Traffic Guidelines and Processes (TGP) 430 contains guidelines for the design and calculation of storage lengths for turn bays. Per the TGP, the storage length is a combination of the braking distance and the anticipated queue length. The TGP recommends the queue length calculation allow for 1.5 to 2 times the average number of vehicles that will queue per cycle for periodic heavy demand in traffic flow. Due to the fact that these intersections will be signalized in an urban area, the minimum braking distance contained in the TGP was used in calculating the storage length requirements. The use of the minimum braking distance assumes that a vehicle will decelerate approximately 10 mph prior to clearing the through lane. AASHTO indicates that this speed differential is commonly used on urban arterial streets.

The TGP recommends calculating the queue lengths based on the expected queue length that is formed during a red indication assuming uniform vehicle arrival rates. The red indication time was calculated by multiplying the entire cycle length by one, minus the green to cycle (g/C) ratio. Using the g/C ratio values, as opposed to the red indication time, accounts for the signal loss times associated with startup and clearance intervals.

In addition to the guidelines contained in the TGP, the VISSIM analysis reports a queue length for each movement. These two methods of queue length estimation were used to develop recommendations for the storage lengths for the intersections. In addition, the potential for the through-traffic queue to block the turn lanes was also considered in the evaluation.

2.4.2 Analysis Results

Traffic operational analyses were conducted using the VISSIM traffic simulation computer program to evaluate the level-of-service that would be provided for the Existing Conditions (2020), No-Build (2050) conditions, and Build (2050) conditions.

2.4.2.1 Existing Conditions

The A.M. and P.M. peak hour LOS analysis results for the Existing Conditions (2020) are depicted in **Figures 16** and **17**, respectively. **Table 10** presents the results of the analysis for the Existing Conditions (2020) A.M. and P.M. peak hours at the US60/35th Avenue/Indian School Road intersection.

The analysis results indicate that the overall US60/Indian School Road/35th Avenue intersection currently operates at an overall intersection LOS ‘F’ during the A.M. and P.M. peak hours. During the A.M. and P.M. peak hour, congestion (LOS ‘E’ or ‘F’) is occurring on all approaches.

Table 10 – Existing (2020) Conditions Intersection Analysis Results (VISSIM)

Intersection Location	Intersection Approach	Existing Peak Hour	Delay (Sec/Veh)	Intersection Approach LOS	Overall Intersection LOS
US60/Indian School Rd/35th Ave (signalized)	Eastbound Indian School Rd	A.M.	398	F	F
	North-Westbound US 60		90	F	
	South-Eastbound US 60		266	F	
	Northbound 35th Ave		69	E	
	Southbound 35th Ave		170	F	
	Eastbound Indian School Rd	P.M.	231	F	F
	North-Westbound US 60		146	F	
	South-Eastbound US 60		76	E	
	Northbound 35th Ave		102	F	
	Southbound 35th Ave		73	E	

Note: Colored (red) LOS letters indicate intersections or approaches that would not meet the operational goals.

2.4.2.2 No-Build Alternative

The 2050 A.M. and P.M. peak hour LOS analysis results for the No-Build Alternative are shown in **Figures 18** and **Figure 19**, respectively. **Table 11** presents the 2050 No-Build A.M. and P.M. peak hour delay and the corresponding level-of-service at the US60/35th Avenue/Indian School Road intersection.

The 2050 analysis results indicate that the US60/Indian School Road/35th Avenue intersection would operate at an overall intersection LOS ‘F’ during the 2050 A.M. and P.M. peak hours. During both the A.M. and P.M. peak hours, congestion is occurring on all intersection approaches.

The projected growth in travel demand between 2020 and 2050 will result in increased congestion in both the A.M. and P.M. peak hours at the US60/Indian School Road/35th Avenue intersection.

Table 11 – 2050 No-Build Conditions Intersection Analysis Results (VISSIM)

Intersection Location	Intersection Approach	2040 Peak Hour	Delay (Sec/Veh)	Intersection Approach LOS	Overall Intersection LOS
US60/Indian School Rd/35th Ave (signalized)	Eastbound Indian School Rd	A.M.	434	F	F
	North-Westbound US 60		108	F	
	South-Eastbound US 60		219	F	
	Northbound 35th Ave		210	F	
	Southbound 35th Ave		180	F	
	Eastbound Indian School Rd	P.M.	368	F	F
	North-Westbound US 60		142	F	
	South-Eastbound US 60		138	F	
	Northbound 35th Ave		159	F	
	Southbound 35th Ave		86	F	

Note: Colored (red) LOS letters indicate intersections or approaches that would not meet the operational goals.

Figure 16 – Existing (2020) Conditions AM Peak Hour Levels of Service

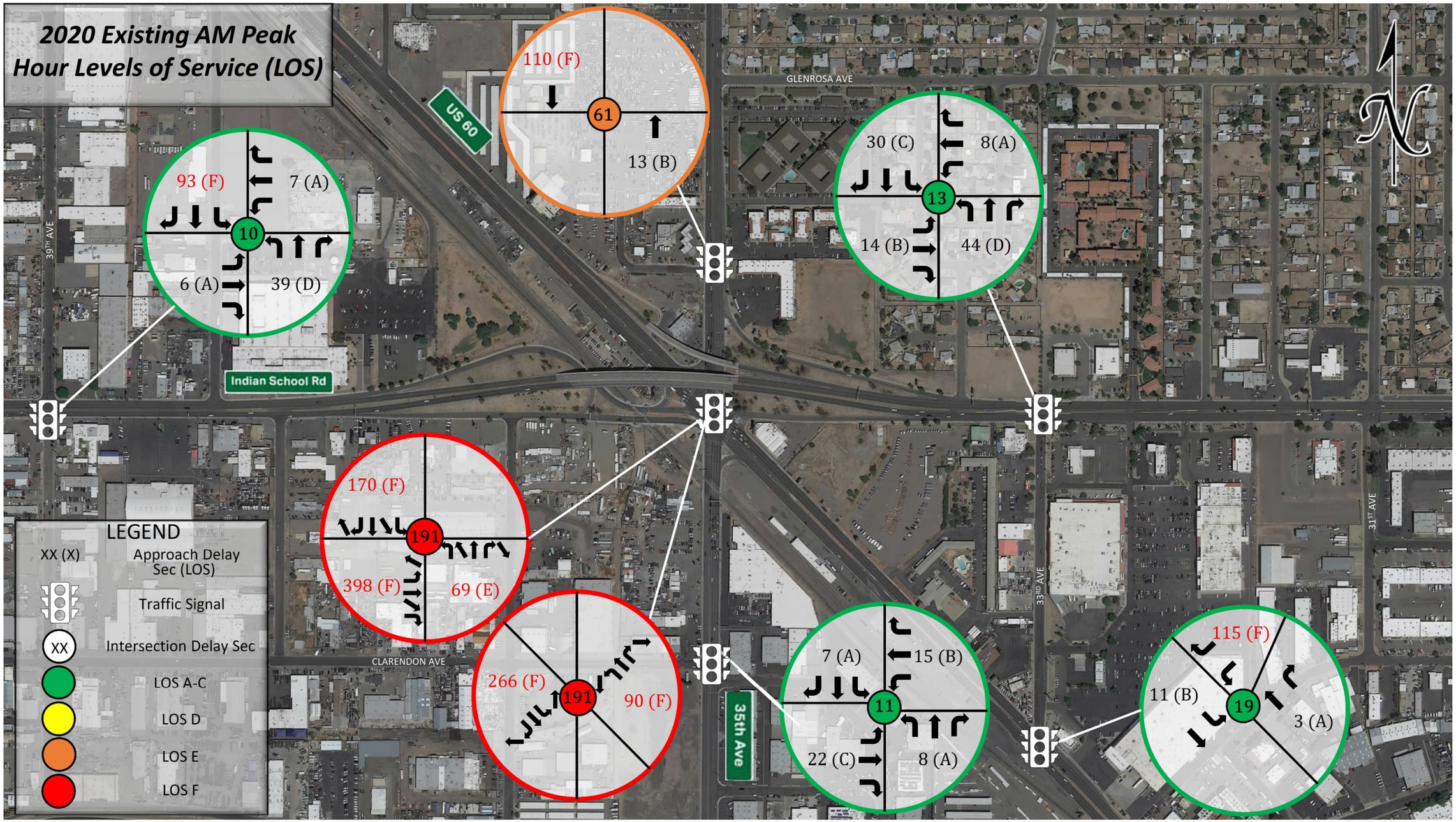


Figure 17 – Existing (2020) Conditions PM Peak Hour Levels of Service

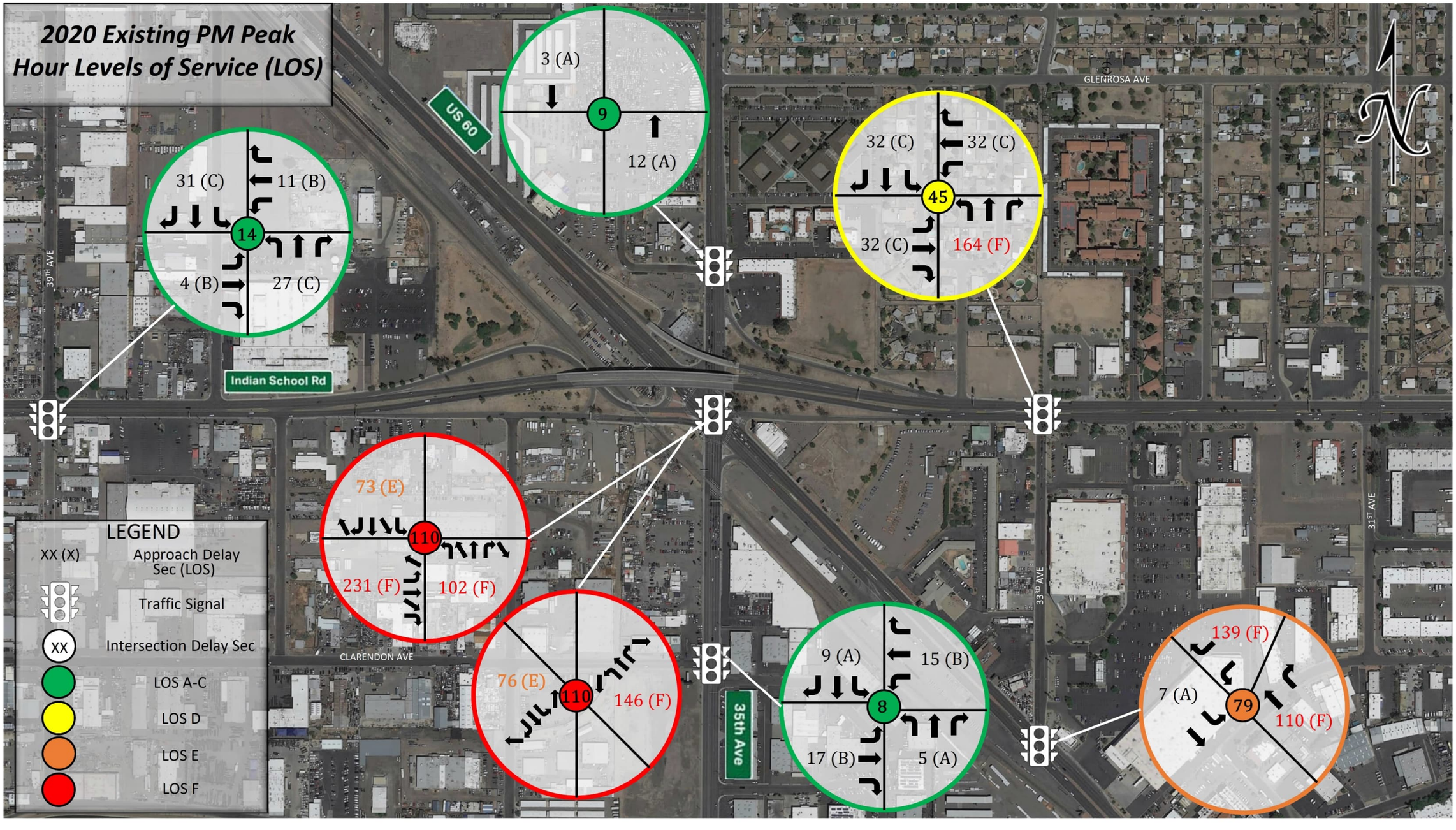


Figure 18 – 2050 No-Build Conditions AM Peak Hour Levels of Service

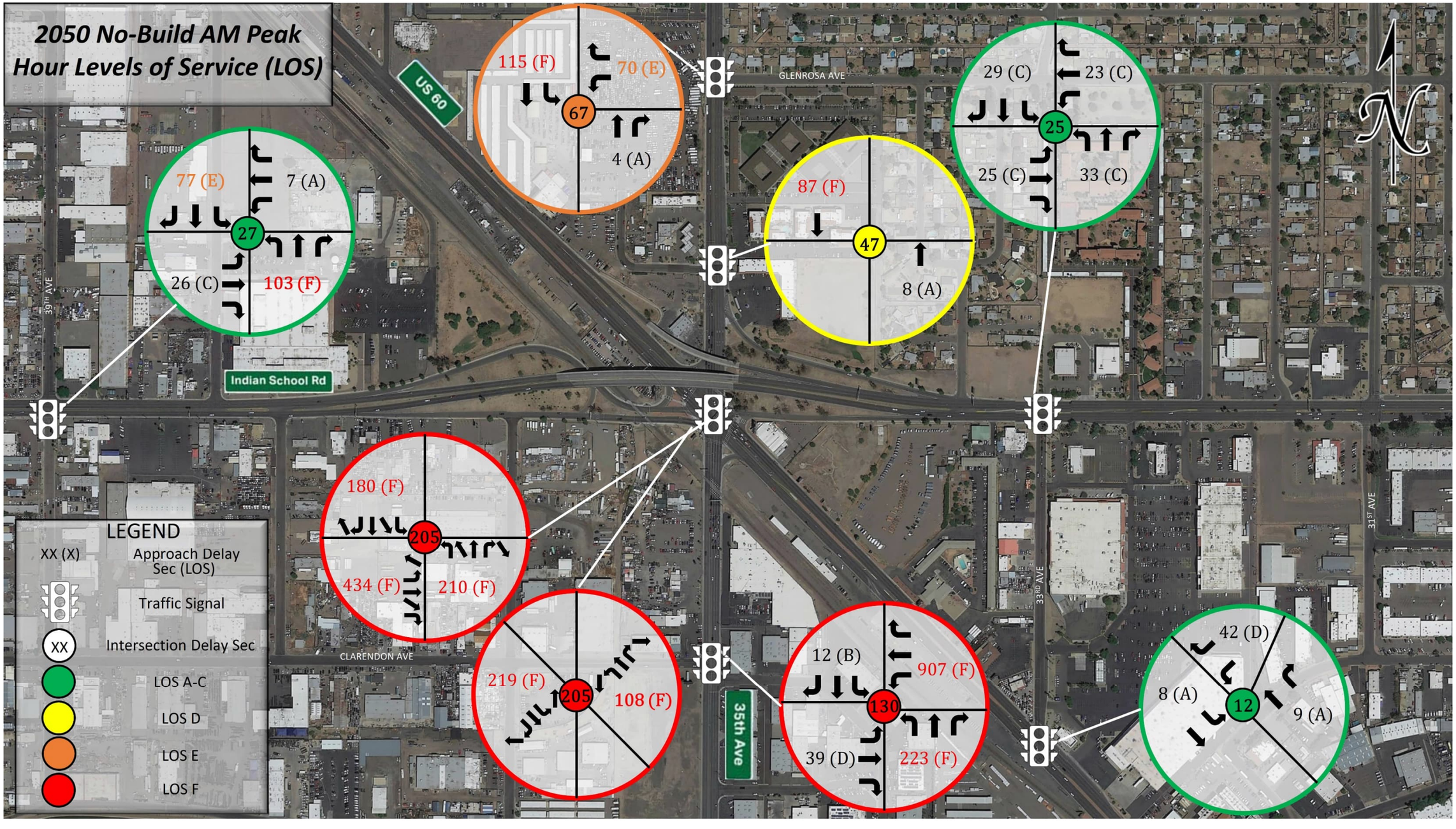
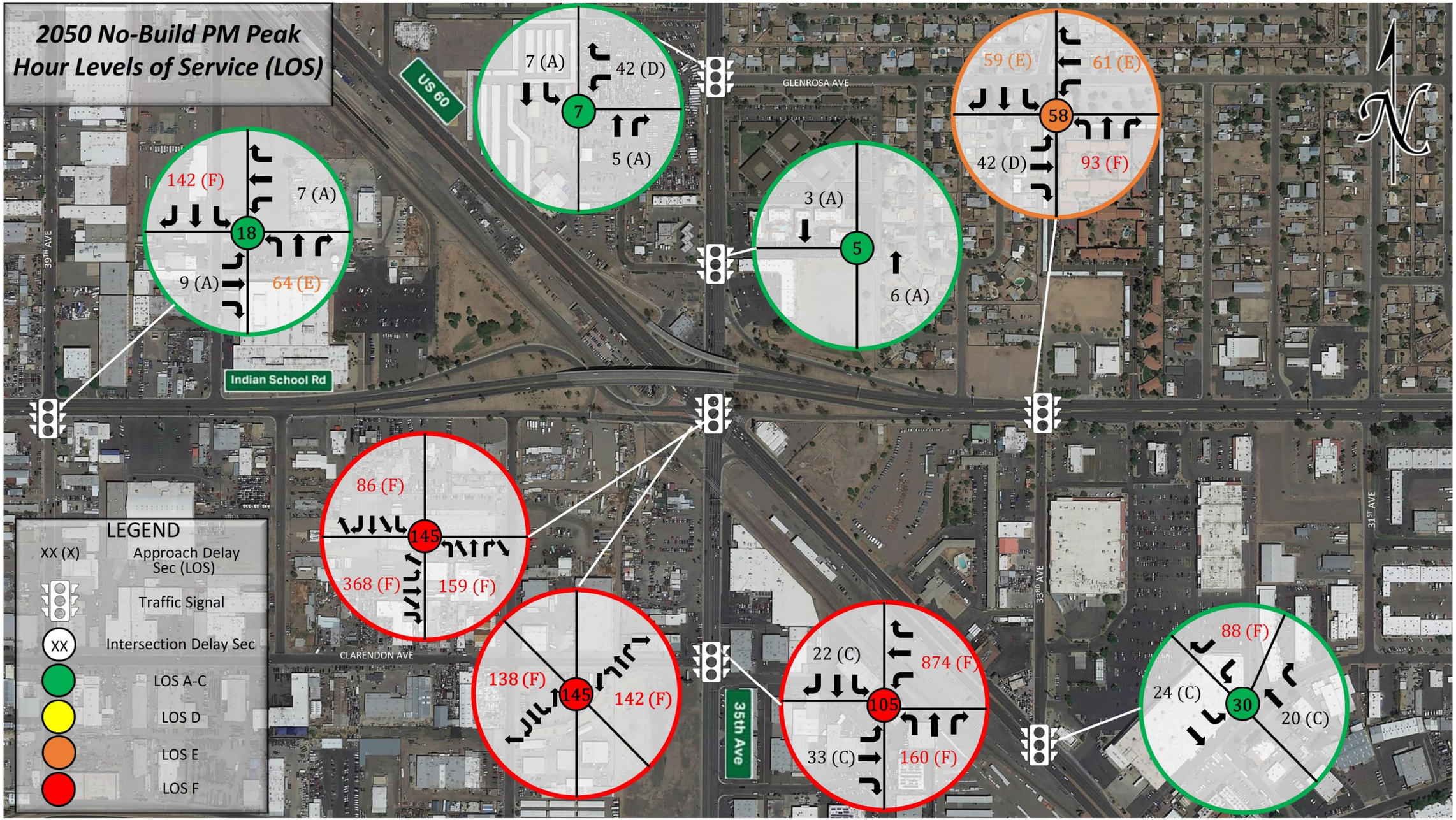


Figure 19 – 2050 No-Build Conditions PM Peak Hour Levels of Service



2.4.2.3 Build Alternative

As mentioned in Section 2.3.1, the Build Alternative would include BRT operating in exclusive lanes. For the purposes of the operational analysis, the exclusive lanes are assumed to be in the middle of 35th Avenue (center running) and the left-turn lanes would be located adjacent to the BRT lanes. Therefore, the northbound and southbound left-turn lanes along 35th Avenue were simulated with protected-only phasing. It was also assumed that the BRT buses would utilize the same signal phase as the northbound and southbound through traffic and no exclusive BRT phase was provided.

The 2050 A.M. and P.M. peak hour LOS analysis results for the Build Alternative are shown in **Figure 20** and **Figure 21**, respectively. **Table 12** presents the Build Alternative 2050 A.M. and P.M. peak hour delay and the corresponding level-of-service at the intersections within the project area.

The analysis results indicate that all intersections within the project area would operate at an overall intersection LOS 'D' or better during the A.M. and P.M. peak hours. Significant congestion (LOS 'E' or 'F') would be expected to occur on the following intersection approaches:

2050 PM Peak Hour:

- Indian School Rd/39th Avenue Southbound

Table 12 – 2050 Build Alternative Intersection Analysis Results (VISSIM)

Intersection Location	Intersection Approach	2050 Peak Hour	Delay (Sec/Veh)	Intersection Approach LOS	Delay (Sec/Veh)	Overall Intersection LOS
35th Ave/Clarendon (signalized)	Eastbound Clarendon Ave	A.M.	23	C	20	C
	Westbound Clarendon Ave		39	D		
	Northbound 35th Ave		17	B		
	Southbound 35th Ave		18	B		
	Eastbound Clarendon Ave	P.M.	47	D	27	C
	Westbound Clarendon Ave		41	D		
	Northbound 35th Ave		25	C		
	Southbound 35th Ave		18	B		
35th Ave/Indian School Rd (signalized)	Eastbound Indian School Rd	A.M.	19	B	22	C
	Westbound Indian School Rd		14	B		
	Northbound 35th Ave		38	D		
	Southbound 35th Ave		35	D		
	Eastbound Indian School Rd	P.M.	15	B	26	C
	Westbound Indian School Rd		33	C		
	Northbound 35th Ave		15	B		
	Southbound 35th Ave		30	C		
33rd Ave/Indian School Rd (signalized)	Eastbound Indian School Rd	A.M.	32	C	27	C
	Westbound Indian School Rd		12	B		
	Northbound 33rd Ave		33	C		
	Southbound 33rd Ave		39	D		
	Eastbound Indian School Rd	P.M.	42	D	43	D
	Westbound Indian School Rd		46	D		
	Northbound 33rd Ave		37	D		
	Southbound 33rd Ave		36	D		
US 60/'Eastbound Entrance Ramp (signalized)	Eastbound US 60	A.M.	1	A	1	A
	Westbound US 60		3	A		
	Eastbound US 60	P.M.	3	A	2	A
	Westbound US 60		2	A		
US 60/Glenrosa Ave (signalized)	Eastbound US 60	A.M,	6	A	10	A
	Westbound US 60		10	B		
	Southbound Glenrosa Ave		35	C		
	Eastbound US 60	P.M.	7	A	12	B
	Westbound US 60		11	B		
	Southbound 37th Ave		39	D		
US 60/33rd Ave (signalized)	Eastbound US 60	A.M,	20	B	21	C
	Westbound US 60		12	B		
	Southbound 33rd Ave		35	D		
	Eastbound US 60	P.M.	11	B	26	C
	Westbound US 60		29	C		
	Southbound 33rd Ave		41	D		
35th Ave/Glenrosa Ave (signalized)	Eastbound Glenrosa Ave	A.M.	21	C	15	B
	Westbound Glenrosa Ave		35	C		
	Northbound 35th Ave		23	C		
	Southbound 35th Ave		17	B		
	Eastbound Glenrosa Ave	P.M.	27	C	22	C
	Westbound Glenrosa Ave		35	C		
	Northbound 35th Ave		42	D		
	Southbound 35th Ave		33	C		

Note: Colored (red) LOS letters indicate intersections or approaches that would not meet the operational goals.

Figure 20 – 2050 Build Alternative AM Peak Hour Levels of Service

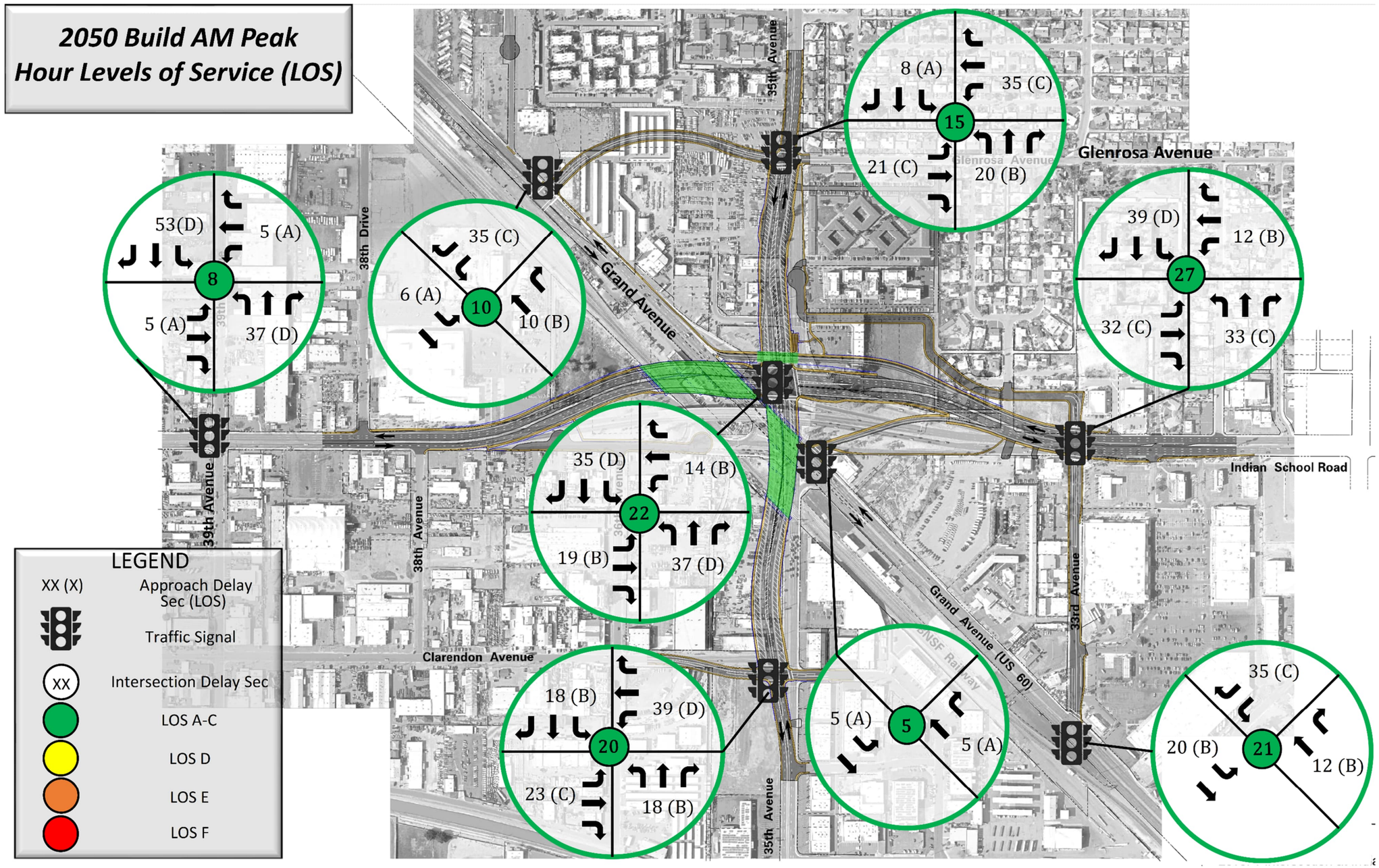
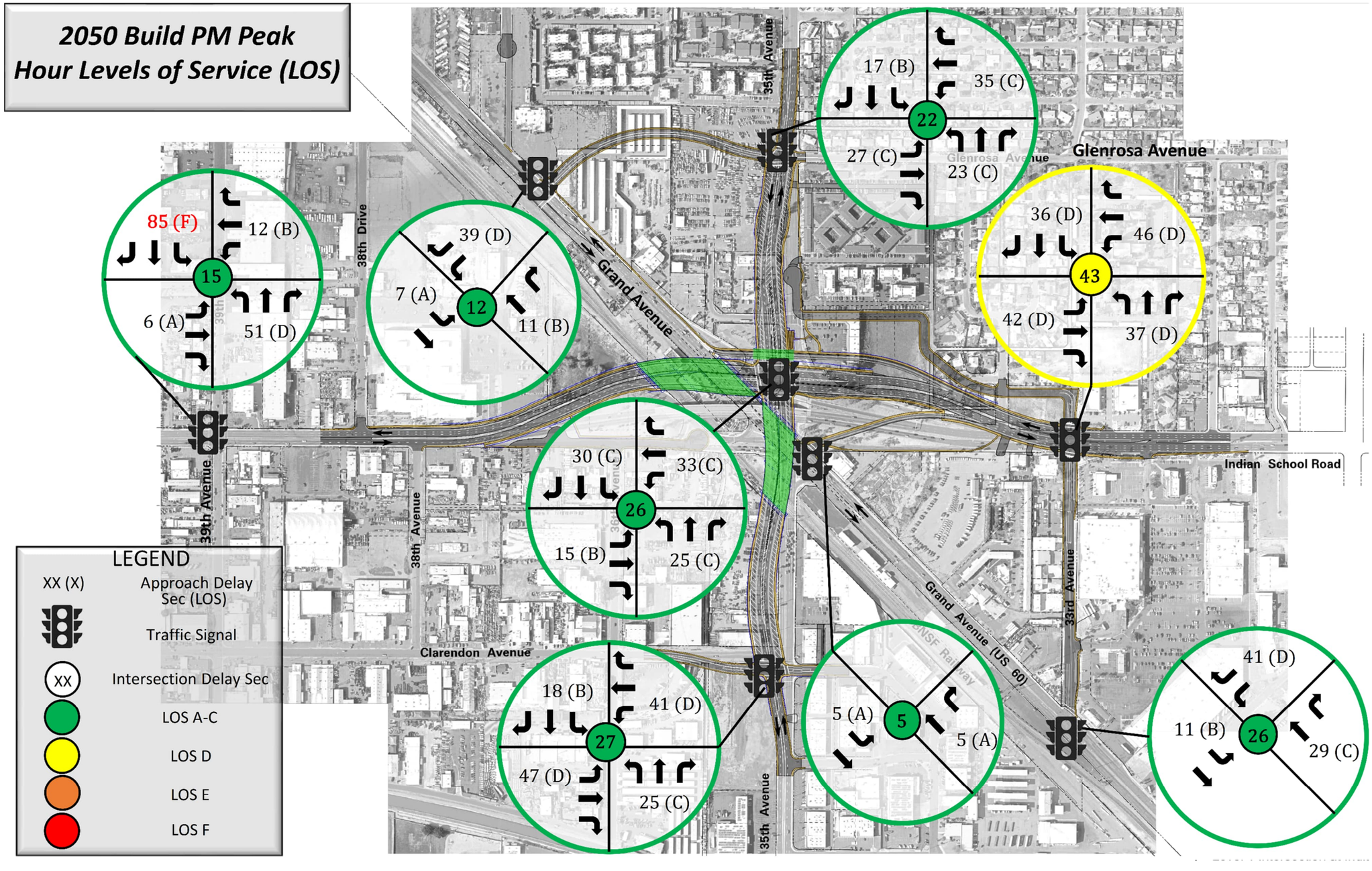


Figure 21 – 2050 Build Alternative PM Peak Hour Levels of Service



2.4.2.4 Summary of Operational Results

In order to understand how each alternative would function, numerous analyses were conducted including an evaluation of the operational characteristics of all of the intersections within the study area, the total travel time that would be experienced by travelers using two different high-volume travel routes through the study area, and the anticipated vehicle queue lengths at the key intersections.

Intersection Operations

The number of signalized intersections anticipated to operate with congestion (LOS 'E' or 'F') during the A.M. and P.M. peak hours is summarized in **Table 13**. The number of overall intersections and individual intersection approaches that would operate at LOS 'E' or 'F' is identified for each alternative.

Table 13 – Number of Signalized Intersections and Intersection Approaches With Congestion (LOS E or F)

Alternative	AM Peak Hour		PM Peak Hour		Total AM and PM Peak Hours	
	Total Intersections	Total Intersection Approaches	Total Intersections	Total Intersection Approaches	Total Intersections	Total Intersection Approaches
Existing (2020) Conditions	2	8	2	8	4	16
No-Build (2050)	3	12	3	13	6	25
Build Alternative (2050)	0	0	0	1	0	1

Vehicle Travel Time

The estimated future travel time was calculated for the high-volume vehicle trips within the study area. The travel time was estimated for six distinct vehicle trips that would occur during the A.M. and P.M. peak hours:

- Eastbound Indian School Road from 39th Avenue to 33rd Avenue
- Westbound Indian School Road from 33rd Avenue to 39th Avenue
- South/Eastbound US 60 from 37th Avenue to 33rd Avenue
- North/Westbound US 60 from 33rd Avenue to 37th Avenue
- Northbound 35th Avenue from Weldon Ave Avenue to Turney Avenue
- Southbound 35th Avenue from Turney Avenue to Weldon Avenue

Table 14 displays the total travel time calculated for each of these high-volume traffic movements during the A.M. and P.M. peak hours.

Table 14 – Travel Time for the High-Volume Trips

Alternative	AM Peak Hour			PM Peak Hour		
	Existing (2020)	2050 No-Build	2050 Build	Existing (2020)	2050 No-Build	2050 Build
EB Indian School Rd	151.1	232.3	191.0	146.6	241.8	164.3
WB Indian School Rd	99.6	103.5	110.6	158.8	240.2	252.9
SB/EB US 60	632.9	496.7	89.1	143.1	206.1	72.5
NB/WB US 60	148.1	145.4	71.6	463.5	236.4	73.2
NB 35th Ave	125.3	552.6	129.7	232.9	437.8	174.1
SB 35th Ave	231.7	568.3	99.7	141.3	173.9	107.5
Total	1,388.6	2,098.8	691.7	1,286.2	1,536.5	844.5

Note: Travel times shown in seconds

As shown in Table 14, the Build Alternative would provide a significant travel time savings for travelers passing through the study area when compared to the Existing Conditions and No-Build Alternative.

2.5 PREFERRED ALTERNATIVE TURN BAY LENGTHS

Table 15 provides the recommended left and right-turn lane storage lengths for the Preferred Alternative.

According to ADOT TGP 430, the gap length (opening) for a single left-turn or right-turn bay should be 60' for speeds less than 40 mph, and 90' for speeds between 40 to 50 mph. The gap length should be 120' and 180', respectively, for dual turn lanes. The Recommended Minimum Turn Bay Lengths shown in Table 15 include the braking distance, as described in Section 2.4.1.4.

Table 15 – Preferred Alternative Intersection Turn Bay Lengths

Intersection	Approach Movement	Recommended Minimum Turn Bay Length (ft) (1)
35th Ave/Indian School Rd	Eastbound LT	275
	Eastbound RT	150
	Westbound LT	250
	Westbound RT	300
	Northbound LT	250
	Northbound RT	350
	Southbound LT	250
	Southbound RT	250
33rd Ave/Indian School Rd	Eastbound LT	250
	Westbound LT	250
	Westbound RT	100
	Northbound LT	400
	Northbound RT	200
	Southbound LT	100
35th Ave/Clarendon Ave	Eastbound LT	150
	Westbound LT	150
	Northbound LT	350
	Southbound LT	250
35th Ave/Glenrosa Ave	Eastbound LT	250
	Eastbound RT	200
	Westbound LT	100
	Northbound LT	350
	Southbound LT	150
Grand Ave/Glenrosa Ave	South-eastbound LT	250
	Westbound LT	200
	Westbound RT	200
Grand Ave/Eastbound Ramp	South-eastbound LT	250

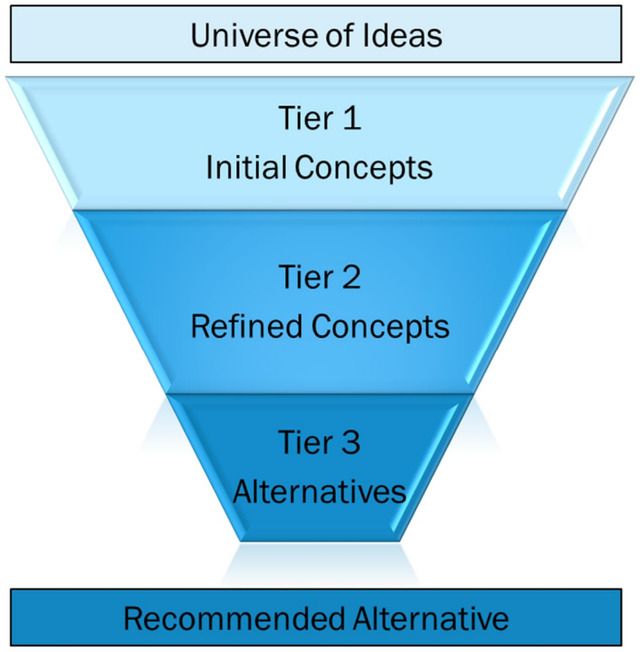
Note: (1) Turn bay lengths include storage and braking distance.

3.0 EVALUATION OF DESIGN ALTERNATIVES

3.1 INTRODUCTION

A multi-tiered evaluation process was used which started with a high-level evaluation of numerous concepts. This initial screening focused on the potential ability of a concept to achieve the overall project goals and eliminated high-level concepts that did not align with the project goals and identified concepts to be carried forward. The second tier of evaluation focused on the refined concepts from Tier 1 that would best attain the project goals and introduced technical evaluation criteria in order to identify a limited number of alternatives to carry forward for a more detailed evaluation in Tier 3. This process is depicted in **Figure 22.**

Figure 22 – Evaluation Process



The objective of this evaluation was to evaluate numerous concepts and identify which best attained the project goals while minimizing right-of-way and business access impacts, environmental impacts, project costs, and obtaining agency and public support.

Public agencies that have been involved in the alternatives development and evaluation process include ADOT, MAG, and the City of Phoenix.

3.2 TIER 1 EVALUATION

The intent of the Tier 1 evaluation process was to review high-level options and compare them to the project goals. Options that best align with the project goals would be carried forward for further evaluation. Options that do not seem to align with the project goals would be eliminated from further consideration as stand-alone options. The project goals include:

- Reduce traffic congestion - The traffic analysis shows congestion (LOS 'E' or 'F') in the existing AM and PM peak hours at the 35th Avenue/Grand Avenue/Indian School Road intersection which is expected to get worse by the year 2040 as traffic volumes grow.
- Enhance safety - The 2015 - 2019 crash data shows a majority of the crashes occur at the intersections with the 35th Avenue/Grand Avenue/Indian School Road intersection having the highest crash frequency within the study area.
- Reduce vehicle/train conflicts - In 2015, the Federal Railroad Administration identified the 35th Avenue railroad crossing as having the second highest frequency of incidents within the country (based on data from 2005-2015).
- Enhance multi-modal accommodations – Both 35th Avenue and Indian School Road have high transit ridership while Indian School Road also has a high frequency of bicycle boardings. The east leg of the 35th Avenue/Grand Avenue/Indian School Road intersection and three legs at the Indian School Road/33rd Avenue intersection show between 20 and 50 pedestrian crossings per hour in the PM peak hour.

The Tier 1 evaluation looked at the following high-level concepts and compared them to the project goals listed above:

1) Elevate BNSF Railway
2) Lower BNSF Railway
3) Elevate Street(s)
    a) Elevate 35th Ave
    b) Elevate US 60
4) Lower Street(s)
    a) Lower 35th Ave
    b) Lower US 60
5) Operational Improvements

<u>Concept 1 - Elevate BNSF Railway</u>

This concept would elevate the BNSF Railway over Indian School Road and 35th Avenue. This concept would impact the numerous spur tracks located both east and west of 35th Avenue and would affect the ability of BNSF to serve customers along this section of the rail line. Due to design criteria, the limits of railroad realignment would likely extend as far west as 42nd Avenue and the eastern limits of realignment would likely extend beyond 27th Avenue/Thomas Road. These extents would likely affect the at-grade crossings at Osborn Road, 31st Avenue, 27th Avenue, and Thomas Road. While these at-grade crossings would likely be removed, extending the limits to the east would also affect the construction cost and impacts to rail customers.

Elevating the BNSF Railway would align with the goal to reduce vehicle/train conflicts. However, raising the railroad would not have much effect on the typical intersection traffic operations, intersection safety, or multi-modal accommodations.

Concept 2 - Lower BNSF Railway

This concept would lower the BNSF Railway under Indian School Road and 35th Avenue. This concept would impact the numerous spur tracks located both east and west of 35th Avenue and would affect the ability of BNSF to serve customers along this section of the rail line. Due to design criteria, the limits of railroad realignment would likely extend as far west as 42nd Avenue and the eastern limits of realignment would likely extend beyond 27th Avenue/Thomas Road. These extents would likely affect the at-grade crossings at Osborn Road, 31st Avenue, 27th Avenue, and Thomas Road. While these at-grade crossings would likely be removed, extending the limits to the east would also affect the construction cost and impacts to rail customers.

Lowering the BNSF Railway would align with the goal to reduce vehicle/train conflicts. However, it would not have much effect on the typical intersection traffic operations, intersection safety, or multi-modal accommodations.

Concept 3A – Elevate 35th Avenue

This concept would elevate 35th Avenue to pass over the BNSF Railway and Grand Avenue and could include numerous options for connections to Indian school Road and/or Grand Avenue.

Elevating 35th Avenue would align with the goal to reduce vehicle/train conflicts and it would have the potential to align with the goals of improving intersection traffic operations, intersection safety, and multi-modal accommodations.

Concept 3B – Elevate Grand Avenue

This concept would elevate Grand Avenue to pass over Indian School Road and 35th Avenue and could include numerous options for connections between the three roadways.

Elevating Grand Avenue would not align with the goal to reduce vehicle/train conflicts but it would have the potential to align with the goals of improving intersection traffic operations, intersection safety, and multi-modal accommodations.

Concept 4A – Lower 35th Avenue

This concept would lower 35th Avenue to pass under the BNSF Railway and Grand Avenue and could include numerous options for connections to Indian school Road and/or Grand Avenue.

Lowering 35th Avenue would align with the goal to reduce vehicle/train conflicts and it would have the potential to align with the goals of improving intersection traffic operations, intersection safety, and multi-modal accommodations

Concept 4B – Lowering Grand Avenue

This concept would lower Grand Avenue to pass under Indian School Road and 35th Avenue and could include numerous options for connections between the three roadways.

Lowering Grand Avenue would not align with the goal to reduce vehicle/train conflicts but it would have the potential to align with the goals of improving intersection traffic operations, intersection safety, and multi-modal accommodations.

Concept 5 – Operational Improvements

This concept would leave 35th Avenue, Grand Avenue, and the BNSF Railway in their current locations and would include intersection improvements with the goal of enhancing intersection operations and reducing delay/congestion.

Operational/intersection improvements would not align with the goal to reduce vehicle/train conflicts, but it would have the potential to align with the goals of improving intersection traffic operations, intersection safety, and multi-modal accommodations.

Summary and Results

Table 16 shows the Tier 1 evaluation and following is a summary of the Tier 1 evaluation:

- Lowering or raising the BNSF Railway would align with the project goal to reduce vehicle/train conflicts but would have little effect on the traffic operations/congestion and the intersection safety.
- Lowering or raising Grand Avenue could align with the goals to reduce congestion and enhance safety but would not reduce vehicle/train conflicts.
- Implementing operational improvements could align with the goals to reduce congestion and enhance safety but would not reduce vehicle/train conflicts.
- Lowering or raising 35th Avenue could align with all of the project goals, as described above.
- All concepts would have varying degrees of potential impacts to the study area and the travelling public.

Therefore, Concept 3A (Elevate 35th Ave) and Concept 4A (Lower 35th Ave) were carried forward for further evaluation as these concepts are the most aligned with the project goals. The concepts to lower or raise 35th Avenue could include numerous options for connections to Grand Avenue and Indian School Road.

Table 16 – Tier 1 Evaluation Summary

Criteria	Tier 1 Concept						
	Concept 1 Elevate BNSF Railway	Concept 2 Lower BNSF Railway	Concept 3A Elevate 35th Avenue	Concept 3B Elevate Grand Avenue	Concept 4A Lower 35th Avenue	Concept 4B Lowering Grand Avenue	Concept 5 Operational Improvements
Reduce Congestion	🔴	🔴	🟡	🟡	🟡	🟡	🟡
Reduce vehicle/train conflicts	🟢	🟢	🟢	🔴	🟢	🔴	🔴
Enhance safety (intersection crashes)	🔴	🔴	🟡	🟡	🟡	🟡	🟡
Enhance Multi-modal	🔴	🔴	🟡	🟡	🟡	🟡	🟡
Potential Impacts	🟡	🟡	🟡	🟡	🟡	🟡	🟢
Recommendation	Do not carry forward	Do not carry forward	Carry forward	Do not carry forward	Carry forward	Do not carry forward	Do not carry forward

Description	Symbol
Does align with project goal / most benefit / least impact	🟢
Moderate alignment with project goal / moderate impact / moderate benefit	🟡
Does not align with project goal / least benefit / most impact	🔴

3.3 TIER 2 EVALUATION

The Tier 2 concepts were evaluated to determine which concepts should be carried forward for further evaluation in Tier 3. In order to evaluate each concept, a set of evaluation criteria were defined to determine how each concept would meet the purpose and need and project goals, and to assess the potential impacts.

The Tier 2 evaluation was conducted in two phases. The first phase (2A) investigated horizontal and vertical alignment changes to 35th Avenue and how the three primary roadways (Grand Avenue, 35th Avenue, Indian School Road) would intersect. Once concepts were identified to be carried forward from the first phase, the second phase (2B) investigated new roadway connections and ramps to restore the access to/from the three main roadways.

3.3.1 Tier 2A Evaluation Criteria

The evaluation criteria developed for the evaluation of the primary concepts included the following:

- Utility impacts
- Direct right-of-way impacts
- Property access impacts
- Constructability
- Environmental considerations
- Community impacts
- Cost
- Other issues/risks
- Intersection operations
- Safety
- Railroad crossings
- Multi-modal accommodations
- Local agency acceptance

Table 17 provides a description of the evaluation criteria and the evaluation methodology.

Table 17 – Tier 2A Evaluation Criteria

Metric	Description	Approach
Utility Impacts	Assessment of the potential impacts to utilities	Potential utility impacts with focus on 230kV, sewer, & irrigation
R/W Impacts	Assessment of the potential direct R/W impacts	Potential direct R/W impacts (total take versus partial) with focus on total takes
Property Access	Assessment of the potential impacts to access to the adjacent parcels	Potential impacts to property access (reconstruct or closure) with focus on total takes due to access closures
Constructability	Assessment of the potential issues/challenges during construction	Potential issues/challenges such as new roadways overlapping with existing roadways, proximity to existing bridge foundations, bridges for railroad, depressed or tall retaining walls
Environmental Considerations	Assessment of the potential environmental impacts	Potential environmental impacts to historic-age properties and visual impacts
Community Impacts	Assessment of the potential community impacts	Potential community impacts based on acquisition of buildings and relocation of residents
Cost	Assessment of the potential costs	Comparison of potential roadway and bridge costs (excluding utility or R/W costs)
Other Issues/Risks	Assessment of other issues/risks	Other potential issues/risks such as potential pump stations, relocation of residents, and opportunities for homeless encampments
Potential Intersection Operations	Assessment of the potential traffic operations at the primary intersection	Traffic volume (ADT) at the primary intersection
Safety	Assessment of the potential ability to enhance intersection safety	Eliminates or retains skewed intersection
Railroad crossings	Assessment of the potential ability to reduce or remove at-grade vehicle/train conflicts	All alternatives remove vehicle/train conflicts by eliminating both at-grade crossings
Multi-Modal Accommodations	Assessment of the potential ability to enhance accommodations for pedestrians, bicycles, and buses	Inhibits multi-modal accommodations by restricting typical section width in depressed sections due to existing bridge foundations, discouraging pedestrian/bicycle use due to raising roadway 2 levels, or inhibiting connectivity on 3-level concepts
Agency Input	Input received from primary stakeholder agencies (City of Phoenix and BNSF Railway)	Input received from primary stakeholder agencies (primarily City of Phoenix and BNSF Railway)

A comparative analysis was conducted using the criteria described above and one of the ratings shown (5-scale rating system) in **Table 18** was applied for each metric.

Table 18 – Tier 2A Ratings

Description	Symbol
Least impact/most benefit	●
Below average impact/above average benefit	◕
Moderate impact/moderate benefit	◑
Above average impact/below average benefit	◔
Most impact/least benefit	○

3.3.2 Tier 2A Primary Concepts

A total of 18 Tier 2 primary concepts were developed which included shifts in the 35th Avenue horizontal and vertical alignments, and different intersections for the three primary roadways (Grand Avenue, 35th Avenue, Indian School Road). Descriptions of these concepts are provided in **Table 19** and plan sheets are provided in **Appendix B**.

3.3.3 Tier 2A Concept Evaluation

The evaluation criteria described above was applied to the 18 primary concepts. A comparative analysis was conducted and the 5-scale rating systems was applied to each concept. A summary of the results is shown in **Table 20**.

Table 19 – Tier 2A Primary Concepts

Concept	35th Avenue	Existing Indian School Rd to remain	Reconstruct Indian School Rd at same elevation	Lower Indian School Rd	Existing Grand Ave to remain	Lower Grand Ave	Major intersection
A	Maintain horizontal & raise 1 level		X		X		35th Ave/Indian School Rd (elevated)
B	Maintain horizontal & raise 1 level			X	X		None - 3 levels
C	Maintain horizontal & raise 2 levels	X			X		None - 3 levels
D	Maintain horizontal & lower 1 level	X			X		None - 3 levels
E	Maintain horizontal & lower 1 level			X	X		35th Ave/Indian School Rd (depressed)
F	Maintain horizontal & lower 1 level		X			X	35th Ave/Grand Ave(depressed)
G	Shift west & raise 1 level		X		X		35th Ave/Indian School Rd (elevated)
H	Shift west & raise 1 level			X	X		None - 3 levels
I	Shift west & raise 2 levels	X			X		None - 3 levels
J	Shift west & lower 1 level	X			X		None - 3 levels
K	Shift west & lower 1 level			X	X		35th Ave/Indian School Rd (depressed)
L	Shift west & lower 1 level		X			X	35th Ave/Grand Ave (depressed)
M	Shift east & raise 1 level		X		X		35th Ave/Indian School Rd (elevated)
N	Shift east & raise 1 level			X	X		None - 3 levels
O	Shift east & raise 2 levels	X			X		None - 3 levels
P	Shift east & lower 1 level	X			X		None - 3 levels
Q	Shift east & lower 1 level			X	X		35th Ave/Indian School Rd (depressed)
R	Shift east & lower 1 level		X			X	35th Ave/Grand Ave (depressed)

Table 20 – Tier 2A Evaluation Summary

Characteristic\Criteria	CONCEPTS																	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
35th Avenue Horizontal Alignment	Maintain Existing Horizontal Location						Shift to West						Shift to East					
35th Avenue Vertical Alignment	Raise 1 level	Raise 1 level	Raise 2 levels	Lower 1 level	Lower 1 level	Lower 1 level	Raise 1 level	Raise 1 level	Raise 2 levels	Lower 1 level	Lower 1 level	Lower 1 level	Raise 1 level	Raise 1 level	Raise 2 levels	Lower 1 level	Lower 1 level	Lower 1 level
Major intersection (see legend below)	1	2	2	2	3	4	1	2	2	2	3	4	1	2	2	2	3	4
Utility Impacts	◑	◔	◑	◕	◑	○	◕	◕	●	●	○	○	◔	◔	●	●	◑	○
R/W Impacts	●	◕	●	●	◕	◑	◕	◑	●	◑	◑	○	◔	○	◔	◔	○	○
Property Access	○	○	○	◑	◔	○	◔	◑	◔	●	◑	◕	◕	●	◕	●	●	◑
Constructability	◑	◔	◑	◕	◔	○	◕	◕	●	●	◔	○	◑	◑	●	●	◔	○
Environmental Considerations	◕	◕	◑	●	●	◕	●	◑	○	●	◑	◑	◔	◔	○	◔	◔	◔
Community Impacts	◕	●	◕	●	●	◕	◕	◑	◔	●	◑	●	○	○	○	○	◔	◔
Cost	◑	◑	◕	●	◑	○	◑	◔	●	●	◔	○	◑	◔	◕	●	○	○
Other Issues/Risks	◕	◑	◑	◑	◔	◔	◕	◑	◕	◑	◔	◔	◑	◔	◑	◔	○	○
Potential Intersection Operations	◔	◕	◕	◕	◔	◔	◔	◕	◕	◕	◔	◔	◔	◕	◕	◕	◔	◔
Safety	◕	◕	◕	◕	◕	◔	◕	◕	◕	◕	◕	◔	◕	◕	◕	◕	◕	◔
Railroad Crossings	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑
Multi-Modal Accommodations	◕	○	○	○	◕	◕	◕	○	○	○	◕	◕	◕	○	○	○	◕	◕
Overall Technical Rating	◕	◑	◑	◕	◑	◔	◕	◑	◕	◕	◔	◔	◑	◔	◑	◕	◔	◔
Agency Input	◕	○	○	○	◑	○	◕	○	○	○	◔	○	◔	○	○	○	○	○

Legend:

Major Intersection Type:

1 – 35th Ave/Indian School Rd (elevated)
2 – None (3 levels)
3 – 35th Ave/Indian School Rd (depressed)
4 – 35th Ave/Grand Ave (depressed)

Least impact/most benefit	Below average impact/above average benefit	Moderate impact/moderate benefit	Above average impact /below average benefit	Most impact/least benefit
●	◕	◑	◔	○

Following the technical evaluation and consultation with City of Phoenix, MAG, and BNSF Railway, the following concepts were eliminated from further evaluation:

- *Concepts F, L, and R*
  These three concepts ranked very low in the technical evaluation primarily due to utility impacts, constructability, cost, and safety. Based on the input received at the Public Scoping meeting, these concepts would not be favored by the public as they retain the signalized intersection on US 60. Based on the agency input, a majority of the agencies would not support these concepts as they have multiple depressed roadways which would increase utility impacts, hinder constructability, potentially result in long-term operation and maintenance of a pump station, and would provide opportunities for homeless encampments. In addition, these concepts were not supported by a majority of the agencies as the concepts do not support regional mobility as they would retain the signalized intersection on US 60.
- *Concepts M, N, O and Q*
  These concepts ranked low in the technical evaluation primarily due to environmental considerations, potential community impacts, and right-of-way impacts. Based on the agency input, a majority of the agencies would not support these concepts due to the potential impacts to the local community. In addition, BNSF Railway indicated that shifting to the east would likely be more impactful to BNSF operations and potentially have additional bridge design and constructability challenges due to the numerous industrial spurs located immediately east of 35th Avenue.
- *Concept P*
  While this concept did rank well in the technical evaluation primarily due to cost, constructability, and property access, it would potentially result in extensive right-of-way impacts and community impacts. Based on the agency input, this concept was not supported due to the potential community impacts and because it would create a 3-level interchange which would inhibit connectivity between the roadways for bicycles and pedestrians. The City of Phoenix indicated that they would consider this lack of pedestrian and bicycle connectivity as a fatal flaw. In addition, BNSF Railway indicated that shifting to the east would likely be more impactful to BNSF operations and potentially have additional bridge design and constructability challenges due to the numerous industrial spurs located immediately east of 35th Avenue.
- *Concept B*
  Concept B ranked near the middle of the technical evaluation. Based on the agency input, this concept was not supported due to the cost and impacts associated with lowering Indian School Road, and the creation a 3-level interchange which would inhibit connectivity between the roadways for bicycles and pedestrians. The City of Phoenix indicated that they would consider this lack of pedestrian and bicycle connectivity as a fatal flaw. In addition, the agencies did not support lowering Indian School Road as it would hinder constructability, potentially result in long-term operation and maintenance of a pump station and would provide opportunities for homeless encampments.
- *Concept K*
  Concept K ranked low in the technical evaluation primarily due to utility impacts, constructability, and cost. Based on the agency input, a majority of the agencies would not support this concept as is has multiple depressed roadways which would increase utility impacts, hinder constructability, potentially result in long-term operation and maintenance of a pump station, and would provide opportunities for homeless encampments.
- *Concept H*
  This concept ranked near the middle of the technical evaluation. However, the agency input indicated that this concept would not be supported as it would create a 3-level interchange which would inhibit connectivity between the roadways for bicycles and pedestrians. The City of Phoenix indicated that they would consider this lack of pedestrian and bicycle connectivity as a fatal flaw. Agencies also expressed concern regarding the potential long-term operation and maintenance of a pump station, and that lowering roadways would provide opportunities for homeless encampments.
- *Concept C*
  This concept ranked near the middle of the technical evaluation due to utility impacts, constructability, and potential impacts to property access. Based on the agency input, agencies would not support this concept as it would create a 3-level interchange which would inhibit connections between the roadways for bicycles and, pedestrians. The City of Phoenix indicated that they would consider this lack of pedestrian and bicycle connectivity as a fatal flaw.
- *Concept E*
  This concept ranked near the middle of the technical evaluation. This concept would result in numerous utility impacts and would hinder constructability. Agencies also expressed concern regarding the potential long-term operation and maintenance of a pump station, and that lowering roadways would provide opportunities for homeless encampments.
- *Concepts D, I, and J*
  While these concepts ranked well in the technical evaluation, agencies would not support these concepts as they would create a 3-level interchange which would inhibit connectivity between the roadways for bicycles and pedestrians. The City of Phoenix indicated that they would consider this lack of pedestrian and bicycle connectivity as a fatal flaw.

Therefore, the concepts listed below were carried forward for further evaluation. Each of these concepts ranked well in the technical evaluation and were generally supported by the agency feedback.

- *Concept A* – Maintain existing 35th Avenue alignment and raise 35th Avenue to create an intersection with Indian School Road as shown in **Figure 23.**
- *Concept G* – Shift 35th Avenue to the west and raise 35th Avenue to create an intersection with Indian School Road as shown in **Figure 24**.

Figure 23 – Concept A

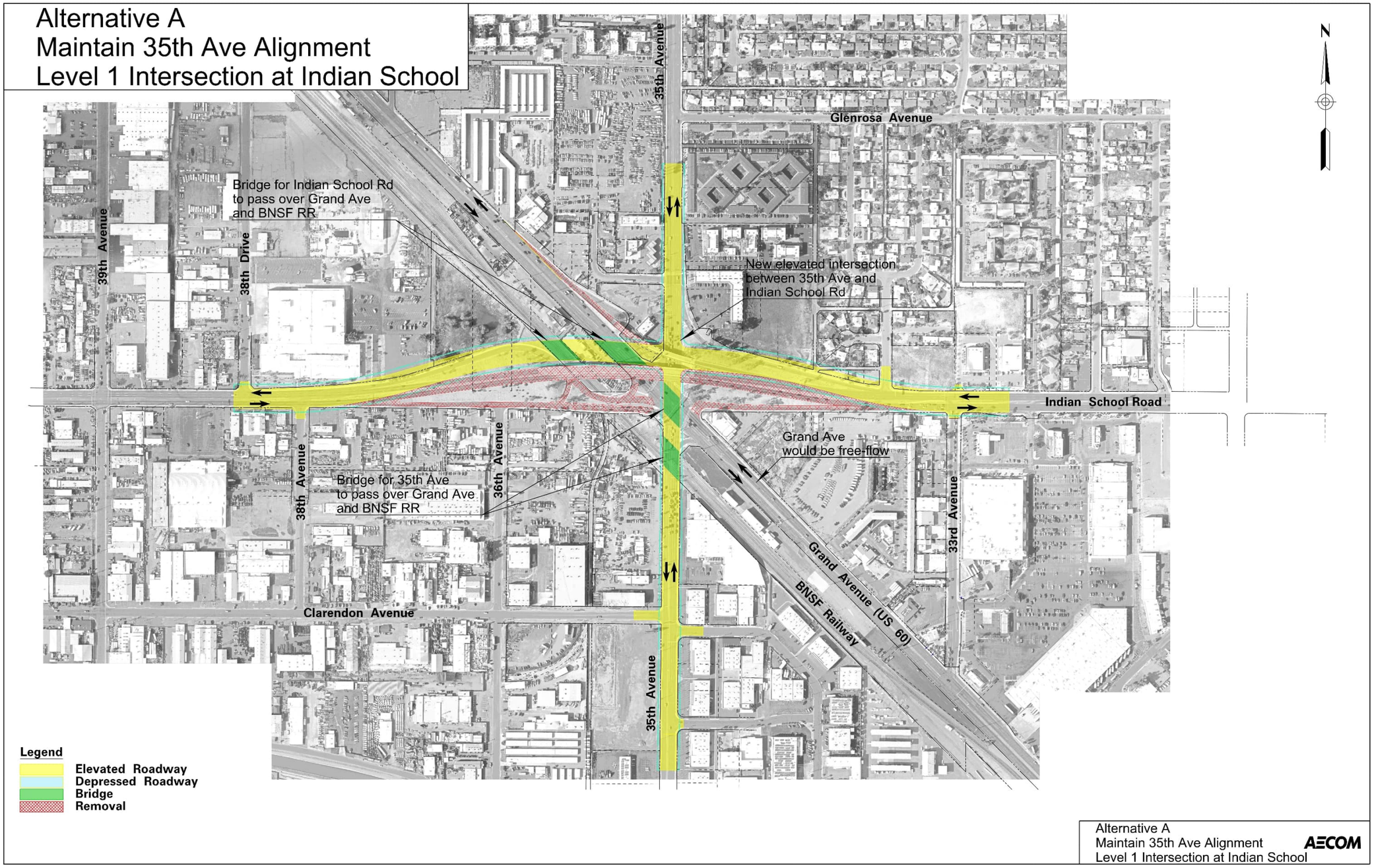
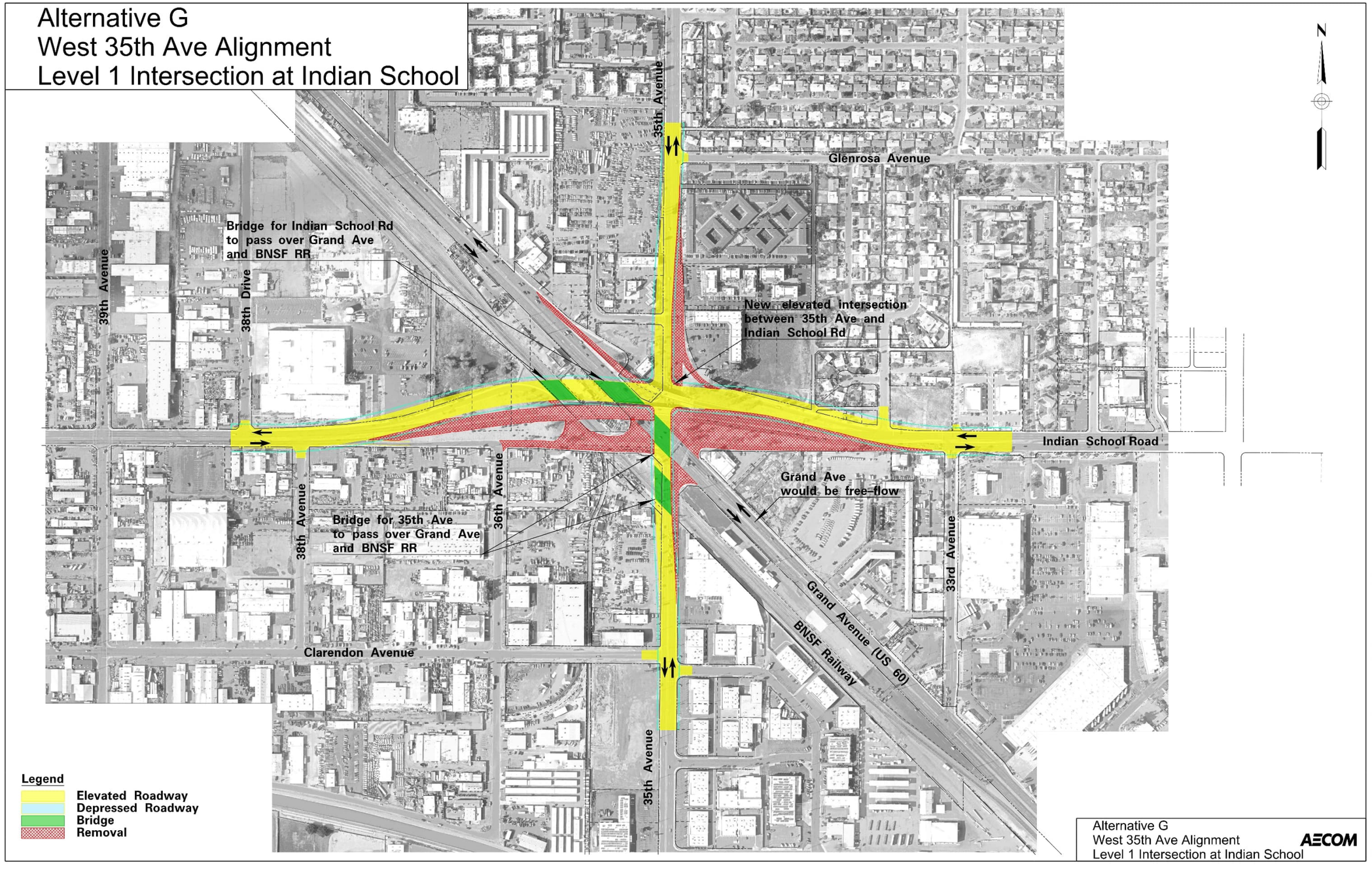


Figure 24 – Concept G



3.3.4 Tier 2B Connectivity Evaluation

As described above, Concepts A and G were advanced for further evaluation to assess potential concepts to restore connectivity between the three primary roadways. Both concepts (Concepts A and G) would create a new intersection between 35th Avenue and Indian School Road. Therefore, options were explored to provide connectivity between each of these roadways and US 60. These options include new connector roads and/or ramps to provide access/connectivity between 35th Avenue and US 60 and between Indian School Road and US 60. This review/evaluation builds upon the previous evaluation. Therefore, only new/additional benefits and/or impacts due to the inclusion of the connector roads/ramps were evaluated in this process. **Table 21** describes the evaluation criteria used to assess the connector options.

Table 21 – Tier 2B Evaluation Criteria

Metric	Description	Approach
R/W Impacts	Assessment of the potential direct R/W impacts	Potential direct R/W impacts
Potential Intersection Operations	Assessment of the potential traffic operations based on the intersection spacing	Qualitative assessment of intersection spacing and potential operational issues related to the spacing
Environmental Considerations	Assessment of the potential environmental impacts	Potential environmental impacts to historic-age properties and visual impacts
Railroad Crossings	Assessment of the potential impacts to BNSF operations and the likelihood of BNSF approval	Qualitative assessment of the potential impacts to BNSF operations due to the inclusion of an at-grade crossing
Design Criteria	Assessment of the ability to achieve design criteria	Qualitative assessment of skew angles, intersection grades, profiles, etc.
Property Access	Assessment of the potential ability to restore access to adjacent parcels	Qualitative assessment of the ability to restore access to adjacent parcels that would otherwise be acquired due to loss of access
Agency Input	Input received from primary stakeholder agencies (City of Phoenix and BNSF Railway)	Input received from primary stakeholder agencies (primarily City of Phoenix and BNSF Railway)

A comparative analysis was conducted using the criteria described above and one of the ratings (3-scale rating system) shown in **Table 22** was applied for each metric.

Table 22 – Tier 2B Ratings

Description	Symbol
Least impact/most benefit	●
Moderate impact/moderate benefit	◑
Most impact/least benefit	○

The connector road/ramp concepts to restore access to 35th Avenue are shown in **Figure 25** and a summary of the evaluation is shown in **Table 23**. The concepts to restore access to Indian School Road are shown in **Figure 26** and a summary of the evaluation is shown in **Table 24.**

Following the technical evaluation and consultation with City of Phoenix, MAG, and BNSF Railway, the following connectivity options were eliminated from further evaluation:

- *Indian School Rd Option 1*
  This option would construct a new connector road south of Grand Avenue, north of Indian School Road, and west of 35th Avenue to provide a connection from Indian School Road to Grand Avenue. This new connector road would cross the BNSF Railway at-grade and would cross numerous storage/siding tracks that are located west of 35th Avenue. Each time that BNSF moved cars along the tracks, the connector road would be closed to allow the train cars to move and their ability to store cars in this location would be restricted by the at-grade crossing. A portion of these storage/siding tracks would need to be reconstructed to facilitate a roadway crossing as the tracks are not at the same elevation. Due to the numerous issues associated with the at-grade crossing, and the desire by all stakeholders to not add new at-grade crossings, this option was eliminated.
- *Indian School Rd Option 2*
  This option would construct a new connector road in the southeast quadrant of the 35th Avenue/Indian School Road intersection to provide a connection from Indian School Road to Grand Avenue. This new connector road would create a signalized intersection between 35th Avenue and 33rd Avenue resulting in three signalized intersection within approximately 1,300 feet. In addition, the new connector road would be less than 500 feet long and would provide limited storage to queue vehicles. Due to the anticipated traffic operational issues, this option was eliminated.
- *Indian School Rd Option 4*
  This option would reconstruct the westbound entrance ramp and eastbound exit ramp to restore connectivity from Indian School Road (to/from the west) to Grand Avenue. This option would not remove the existing at-grade BNSF Railway crossing and therefore would not reduce the vehicle/train conflicts. This option would also result in a traffic signal at the ramp intersection along Grand Avenue. Due to the proposed realignment of Indian School Road, this option would also have substantial impacts to the existing drainage basin located north of Indian School Road. Due to these issues, this option was eliminated.
- *35th Ave Option 2*
  This option would construct a new connector road in the southeast quadrant of the 35th Avenue/Indian School Road intersection to provide a connection from 35th Avenue to Grand Avenue. This option would connect to Clarendon Avenue and cross the BNSF Railway at-grade and would cross numerous storage/siding tracks that are located east of 35th Avenue. Each time that BNSF moved cars along the tracks, the connector road would be closed to allow the train cars to move and their ability to store cars in this location would be restricted by the at-grade crossing. A portion of these storage/siding tracks would need to be reconstructed to facilitate a roadway crossing as the tracks are not at the same elevation. Due to the numerous issues associated with the at-grade crossing, and the desire by all stakeholders to not add new at-grade crossings, this option was eliminated.

Figure 25 – 35th Avenue Connector Options

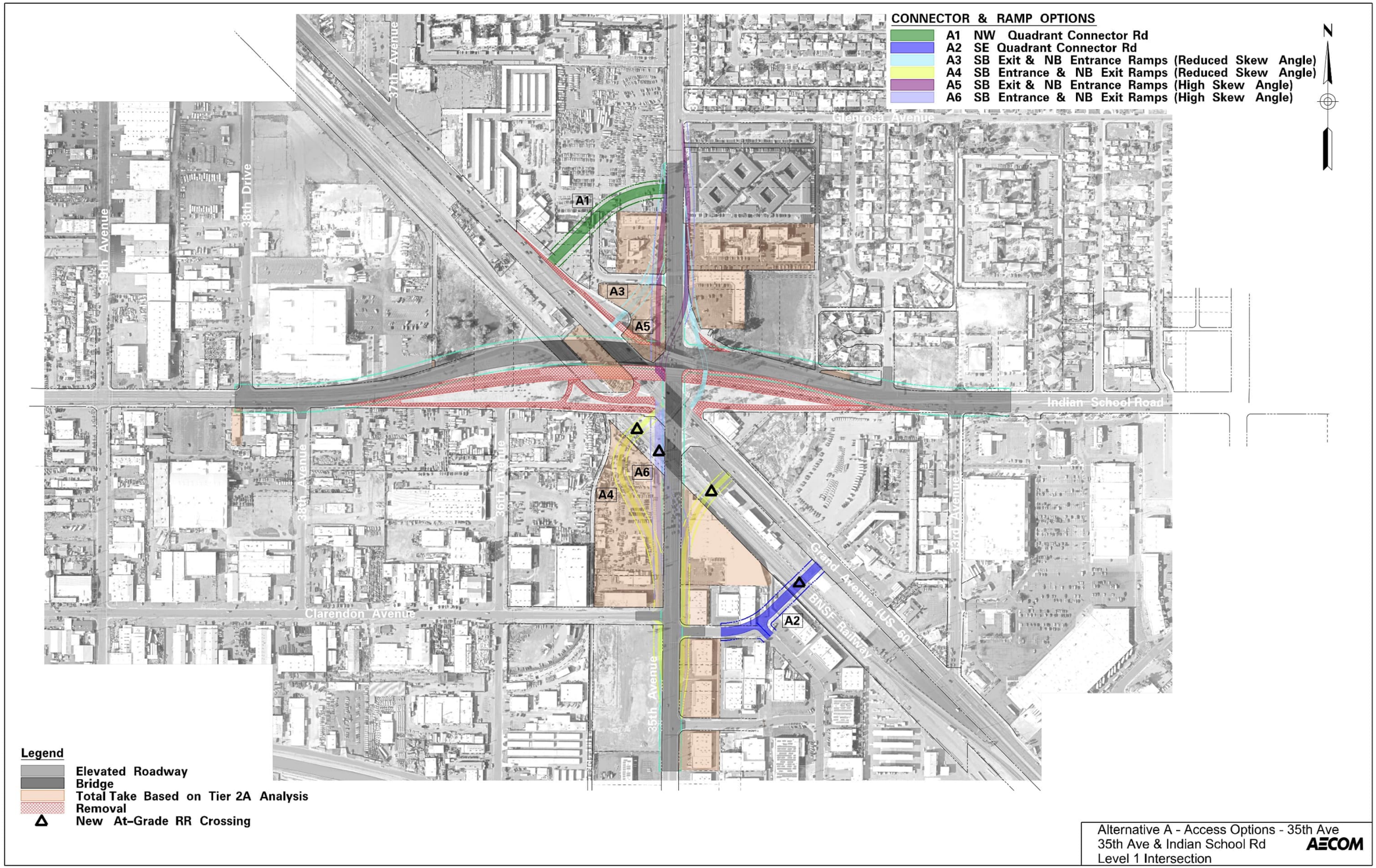


Table 23 – 35th Avenue Connector Evaluation

Criteria	35th Avenue Connector Concepts					
	1	2	3	4	5	6
Concept Description	NW Quadrant Connector Rd	SE Quadrant Connector Rd	SB exit & NB entrance ramps (reduced skew)	SB entrance & NB exit ramps (reduced skew)	SB exit & NB entrance ramps (high skew)	SB entrance & NB exit ramps (high skew)
R/W Impacts	○	○	●	●	○	●
Potential Intersection Operations	●	◑	○	○	●	●
Environmental Considerations	◑	◑	◑	●	○	●
Railroad Crossings	●	○	●	○	●	◑
Design Criteria	●	◑	◑	◑	◑	○
Property Access	◑	◑	○	◑	○	◑
Agency Input	◑	○	◑	○	◑	○

- *35th Ave Option 4*
  This option would construct new ramps to/from the south to provide connectivity between 35th Avenue and Grand Avenue. The ramps would introduce two closely spaced intersections along Grand Avenue and would cross the BNSF Railway at-grade and would create two new crossings of the railroad. The northbound exit ramp would cross numerous storage/siding tracks that are located east of 35th Avenue. Each time that BNSF moved cars along the tracks, the connector road would be closed to allow the train cars to move and their ability to store cars in this location would be restricted by the at-grade crossing. A portion of these storage/siding tracks would need to be reconstructed to facilitate a roadway crossing as the tracks are not at the same elevation. This option would cross Clarendon Avenue and would create operational and safety concerns at the Clarendon Avenue intersection. Due to the closely spaced intersections along Grand Avenue and the numerous issues associated with the at-grade crossing, and the desire by all stakeholders to not add new at-grade crossings, this option was eliminated.
- *35th Ave Option 6*
  This option would construct new ramps to/from the south to provide connectivity between 35th Avenue and Grand Avenue. The northbound exit ramp would turn to the west and cross 35th Avenue such that it would be located on the west side of 35th Avenue. The new ramps would cross the BNSF Railway at-grade. While this option eliminates some of the railroad crossing issues described for Option 4 above, it would still include a new at-grade crossing of the railroad tracks and would still introduce operational and safety concerns at the Clarendon Avenue intersection. This option was eliminated due to the desire by all stakeholders to not add new at-grade crossings, and the operational and safety issues at Clarendon Avenue.
- *35th Ave Options 3 and 5*
  Both of these options would construct new ramps to/from the north to provide connectivity between 35th Avenue and Grand Avenue. In order to provide full access between 35th Avenue and Grand Avenue, these options would need to be paired with Option 4 or Option 6 which were both eliminated as described above. Therefore, these options were eliminated as separate, stand-alone options.

Based on the evaluation, Indian School Road Option 3 is the best option to provide connectivity between Indian School Road and Grand Avenue and 35th Avenue Option 1 is the best option to provide connectivity between 35th Avenue and Grand Avenue. In addition, based on the traffic volumes, it will be highly advantageous to retain the westbound Indian School Road to north-westbound Grand Avenue ramp and eastbound entrance ramp (Indian School Road Option 5). Therefore, these options were advanced for further evaluation. **Appendix A** contains information regarding the re-routing of traffic and the connector road.

Figure 26 – Indian School Road Connector Options

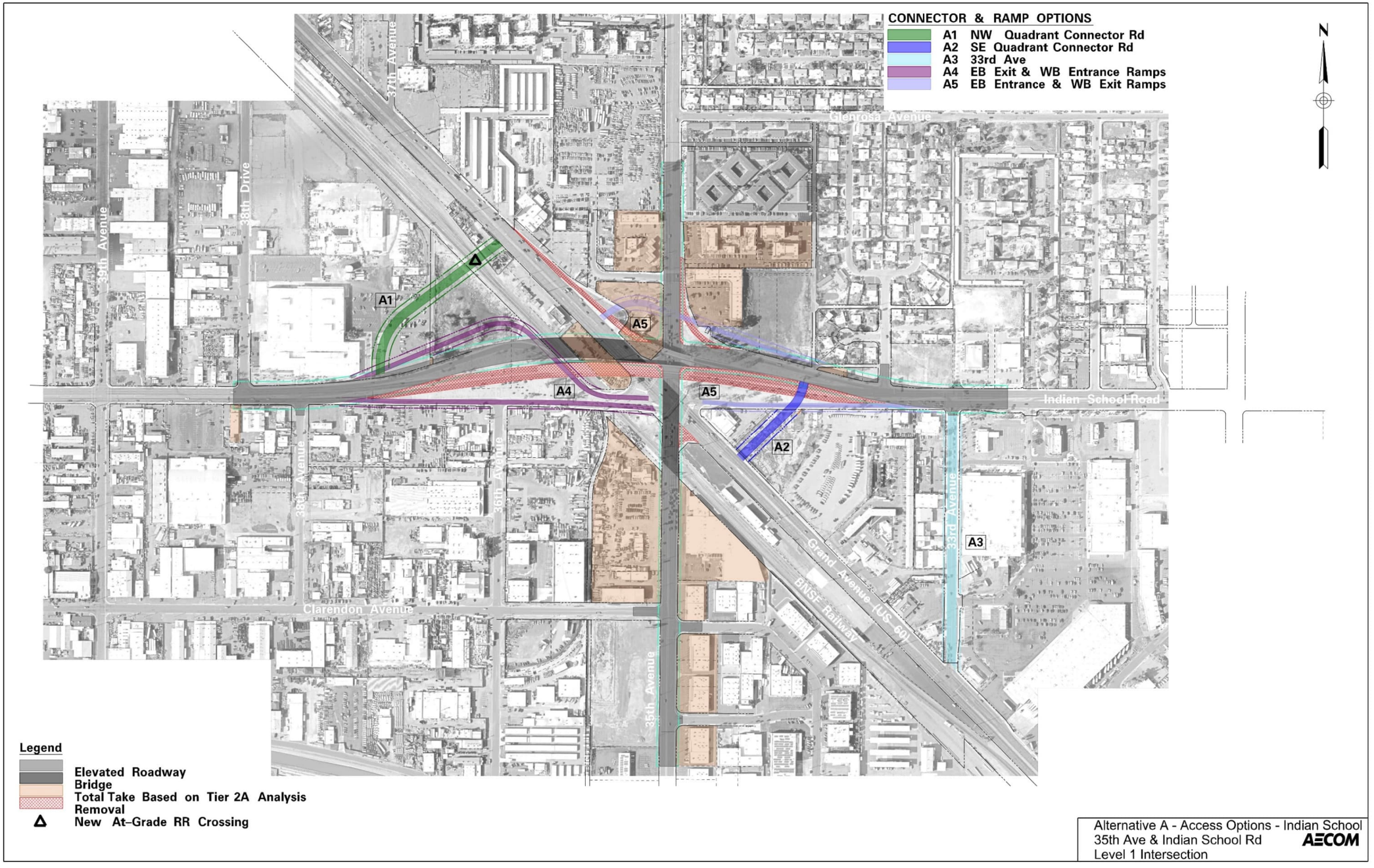


Table 24 – Indian School Road Connector Evaluation

Criteria	Indian School Road Connector Concepts				
	1	2	3	4	5
Concept Description	NW Quadrant Connector Rd	SE Quadrant Connector Rd	33rd Avenue	WB entrance & EB exit ramps	WB exit & EB entrance ramps
R/W Impacts	◑	●	●	◑	●
Potential Intersection Operations	●	○	●	◑	◑
Environmental Considerations	●	●	●	●	●
Railroad Crossings	○	●	●	◑	●
Design Criteria	◑	●	◑	◑	◑
Property Access	◑	◑	◑	◑	◑
Agency Input	○	○	●	◑	●

3.4 TIER 3 EVALUATION

Following the Tier 2 evaluation, two concepts were developed for further evaluation. Concepts A and G were revised to include the connector road concepts evaluated in Tier 2B and to address local circulation and access. The two resulting Build Alternatives are described below along with the No-Build Alternative.

3.4.1 Tier 3 Alternatives

No-Build Alternative
The No-Build Alternative would only include projects planned by other agencies and would not result in any other improvements at this location. The BRT project along 35th Avenue would be implemented and it is assumed that the BRT project would eliminate a northbound lane on **35th** Avenue and pedestrian improvements would be constructed as part of the BRT project.

Alternative 1
Alternative 1 (shown in **Figure 27**) would keep 35th Avenue on its existing horizontal alignment and it would be elevated to create a new intersection with Indian School Road. Indian School Road would be shifted to the north and would be elevated to create a new intersection with 35th Avenue. 35th Avenue would pass over Grand Avenue and the BNSF Railway and Indian School Road would pass over Grand Avenue and BNSF Railway.

A signalized intersection would be created between 35th Avenue and Indian School Road. Ramps would provide access from westbound Indian School Road to north-westbound US 60 and from US 60 to eastbound Indian School Road.

Two lanes would be provided in each direction of travel on 35th Avenue. 35th Avenue would include separate lanes for Bus Rapid Transit (BRT), buffers between the BRT lanes and the vehicle travel lanes, and a flush median between the BRT lanes.

Three lanes would be provided in each direction of travel on Indian School Road. Indian School Road would accommodate a potential, future high-capacity transit route.

Three lanes would be provided in each direction of travel on US 60 and US 60 would remain at-grade. Minor improvements would be included along US 60 to reconfigure the median and provide turn lanes at intersections.

Glenrosa Avenue would be extended to the west to create a new connector road that would restore connectivity between 35th Avenue and US 60. This new connector road would connect to 35th Avenue at Glenrosa Avenue and would connect to US 60 near 37th Avenue. This new connector road would provide two lanes in each direction of travel.

West of 35th Avenue, Clarendon Avenue would be realigned to connect to Clarendon Avenue east of 35th Avenue and eliminate the existing offset intersection at 35th Avenue.

33rd Avenue would be extended north of Indian School Road and a new east-west local road would extend from 33rd Avenue to 35th Avenue. 33rd Drive would connect to the new east-west local road.

Alternative 2
Alternative 2 (shown in **Figure 28**) would shift 35th Avenue to the west and it would be elevated to create a new intersection with Indian School Road. Indian School Road would be shifted to the north and would be elevated to create a new intersection with 35th Avenue. 35th Avenue would pass over Grand Avenue and the BNSF Railway and Indian School Road would pass over Grand Avenue and BNSF Railway.

A signalized intersection would be created between 35th Avenue and Indian School Road. Ramps would provide access from westbound Indian School Road to north-westbound US 60 and from US 60 to eastbound Indian School Road.

Two lanes would be provided in each direction of travel on 35th Avenue. 35th Avenue would include separate lanes for Bus Rapid Transit (BRT), buffers between the BRT lanes and the vehicle travel lanes, and a flush median between the BRT lanes.

Three lanes would be provided in each direction of travel on Indian School Road. Indian School Road would accommodate a potential, future high-capacity transit route.

Three lanes would be provided in each direction of travel on US 60 and US 60 would remain at-grade. Minor improvements would be included along US 60 to reconfigure the median and provide turn lanes at intersections.

Glenrosa Avenue would be extended to the west to create a new connector road that would restore connectivity between 35th Avenue and US 60. This new connector road would connect to 35th Avenue at Glenrosa Avenue and would connect to US 60 near 37th Avenue. This new connector road would provide two lanes in each direction of travel.

West of 35th Avenue, Clarendon Avenue would be realigned to connect to Clarendon Avenue east of 35th Avenue and eliminate the existing offset intersection at 35th Avenue.

33rd Avenue would be extended north of Indian School Road and a new east-west local road would extend from 33rd Avenue to 35th Avenue. 33rd Drive would connect to the new east-west local road.

3.4.2 Tier 3 Alternative Comparison

No-Build Alternative
The No-Build Alternative would only include projects planned by other agencies and would not result in any other improvements at this location. The congestion at the US60/35th Avenue/Indian School Road intersection would continue to worsen as the volume of traffic continues to grow in the future. The No-Build Alternative would not reduce the vehicle/train conflicts and would not provide a grade-separation of 35th Avenue at the BNSF Railway which would not support the regional transportation and transit planning goals of providing a safe and efficient transportation system for all modes of transportation. The at-grade railroad crossing would perpetuate the impacts the railroad has on response times for emergency service personnel. Therefore, the No-Build Alternative was eliminated from further consideration.

Alternative 1
Alternative 1 would eliminate all of the existing vehicle and pedestrian crossings of the railroad. It would enhance the traffic operation along Grand Avenue as the existing 6-legged intersection would be removed. It allows for future high-capacity transit on both 35th Avenue and Indian School Road. Alternative 1 would result in right-of-way impacts along both sides of 35th Avenue due to loss of access because 35th Avenue would be elevated up in the air. It provides limited opportunities to restore access to adjacent properties which could result in numerous right-of-way acquisitions on both sides of 35th Avenue. Keeping 35th Avenue on its existing alignment would likely require long-term closures of 35th Avenue during construction and it would impact numerous utilities within 35th Avenue. It is anticipated that Alternative 1 would have a slightly higher project cost than Alternative 2.

Alternative 1 has potential environmental impacts related to noise, visual, and historic properties, and has potential impacts to the railroad storage tracks east of 35th Avenue.

Alternative 2
Alternative 2 would eliminate all of the existing vehicle and pedestrian crossings of the railroad. It would enhance the traffic operation along Grand Avenue as the existing 6-legged intersection would be removed. It allows for future high-capacity transit on both 35th Avenue and Indian School Road. Alternative 2 would result in right-of-way impacts along both sides of 35th Avenue due to loss of access because 35th Avenue would be elevated up in the air. However, it reduces the impacts on the east side of 35th Avenue and provides more flexibility to restore access on the east side. Shifting 35th Avenue to the west would reduce some of the constructability challenges and would result in less disruption to traffic during construction. It would also reduce the utility impacts along 35th Avenue and it is anticipated that Alternative 2 would have a slightly lower project cost than Alternative 1.

Alternative 2 has potential environmental impacts related to noise, visual, and historic properties, but would have no impact to the railroad storage tracks east of 35th Avenue.

3.5 RECOMMENDATION

Based on the evaluation discussed above, the project team recommended Alternative 2 for implementation for the US60/35th Avenue/Indian School Road project. This recommendation stemmed from discussions with representatives of ADOT, City of Phoenix, MAG, and BNSF Railway. Alternative 2 was carried forward as the Preferred Alternative and was further refined as described in Section 4.

The selection of the Preferred Alternative was confirmed after publication of the Draft Environmental Assessment and through the Public Hearing.

Figure 27 – Alternative 1

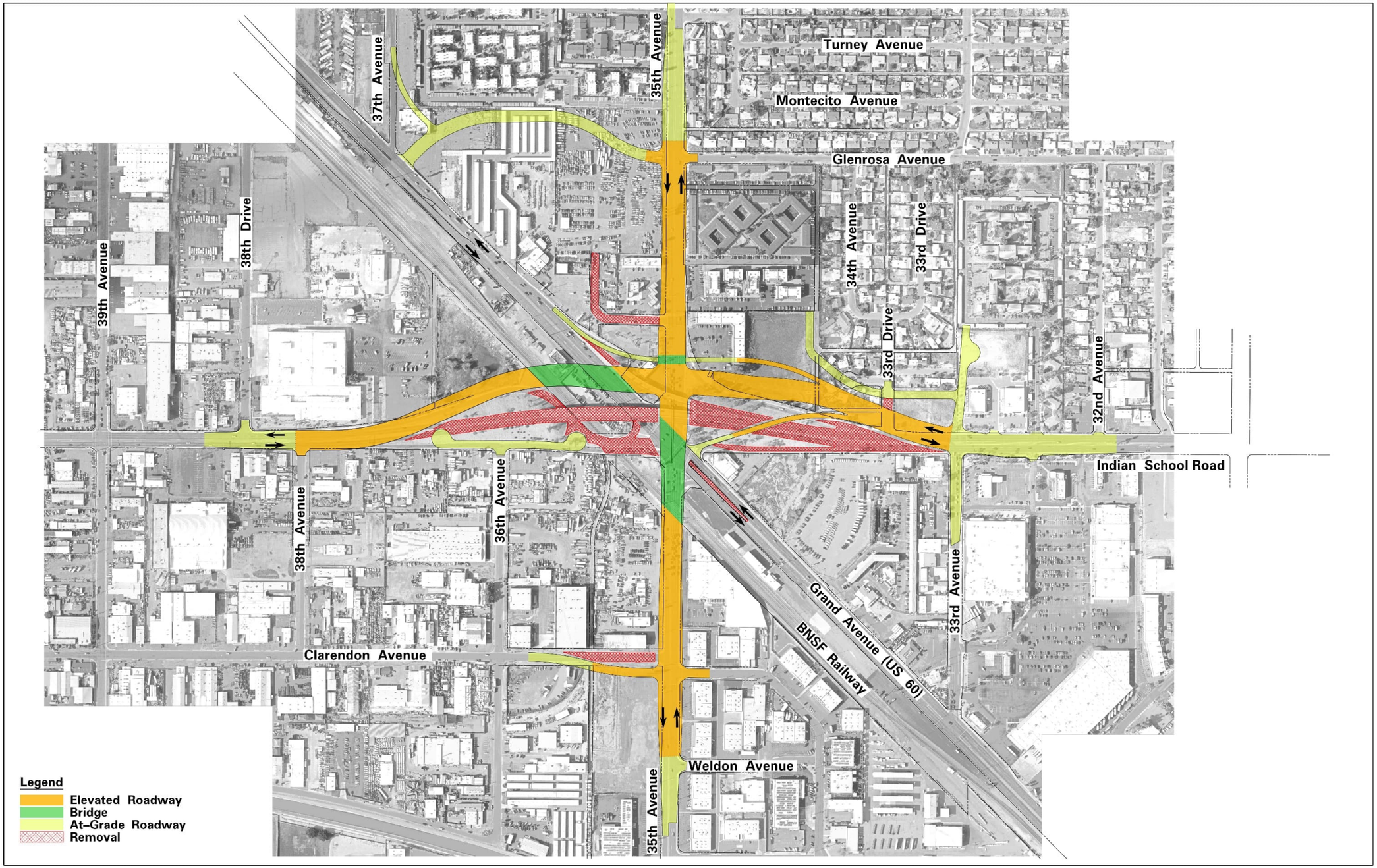
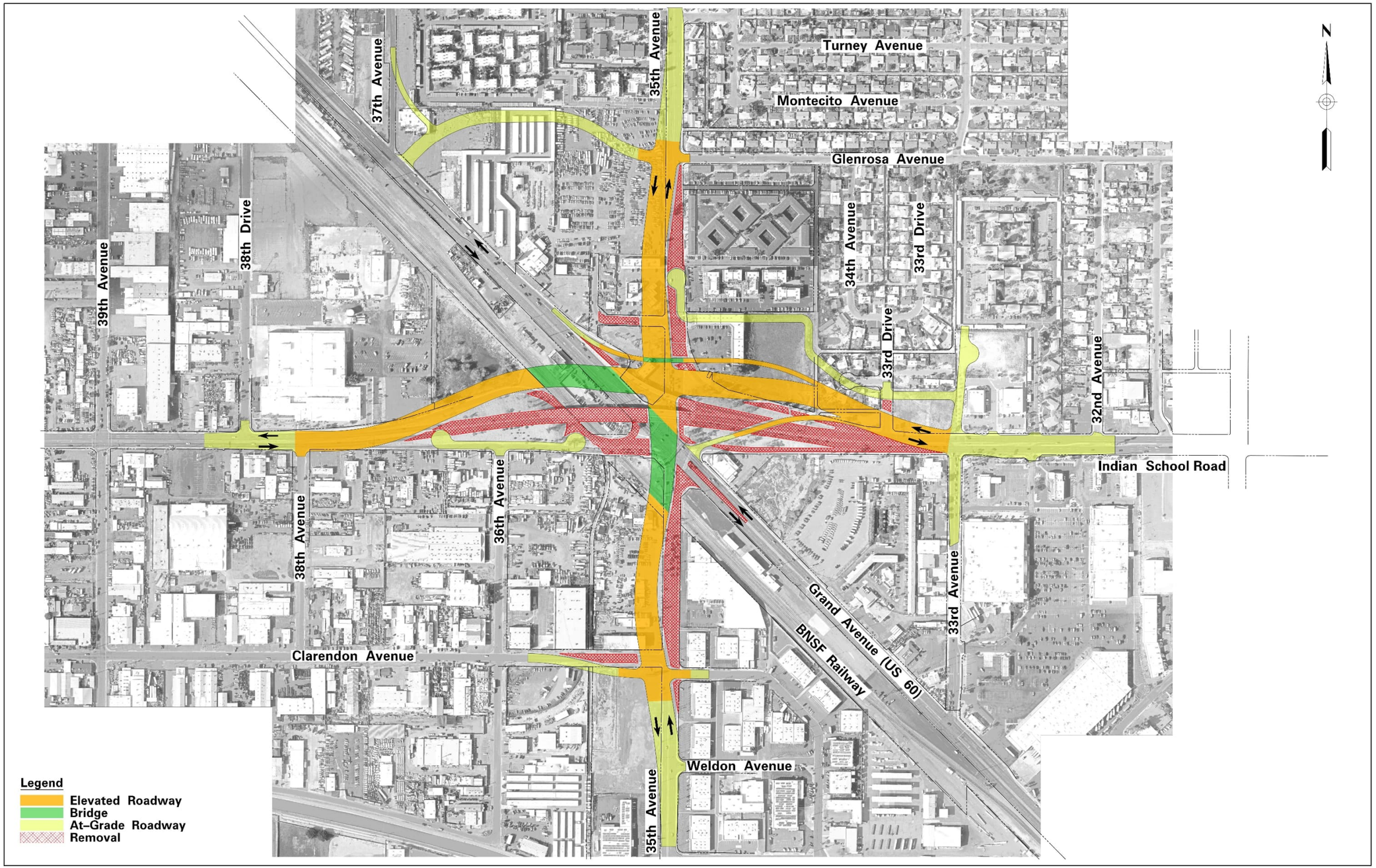


Figure 28 – Alternative 2



4.0 MAJOR DESIGN FEATURES OF THE PREFERRED ALTERNATIVE

This section describes the design controls and major design features for the Preferred Alternative.

4.1 DESIGN CONTROLS

The ADOT Roadway Design Guidelines (RDG)(current version) and ADOT Construction Standard Drawings will apply to US 60. The City of Phoenix Street Planning and Design Guidelines (2023) and the 2018 AASHTO "Green Book" and appropriate local agency requirements apply to 35th Avenue, Indian School Road, and the other local streets outside of the ADOT jurisdictional limits.

In October 2021, Phoenix City Council approved the initial Bus Rapid Transit (BRT) corridor of 35th Avenue and Van Buren Street. The BRT route will run along 35th Avenue from Cheryl Avenue to Van Buren Street and then along Van Buren Street from 35th Avenue to Central Avenue. In addition, Valley Metro is currently conducting the West Phoenix High-Capacity Transit Extension Study which is investigating east-west high-capacity transit corridors between Missouri Avenue and Osborn Avenue. Per direction from MAG, the Indian School Road concept needs to address a potential future LRT along Indian School Road and the Indian School Road bridges would also be constructed full width to accommodate a future High-Capacity Transit (HCT) corridor. In addition, 35th Avenue would be constructed to accommodate the planned BRT along 35th Avenue.

A summary of the design controls is provided in **Table 25**.

Table 25 – Design Controls

Description Of Criteria	US 60	Indian School Road	35th Avenue	Ramps
Design Year:	2050	2050	2050	2050
Design Speed:	Match existing (45 mph)	45 mph roadway; 35 mph LRT	45 mph	40 mph
Design Vehicle	WB-50	WB-50	WB-50	WB-50
Cross Slope:	0.020 ft./ft.	0.020 ft./ft.	0.020 ft./ft.	0.020 ft./ft.
Superelevation:	0.04 ft./ft. max.	0.04 ft./ft. max.	0.04 ft./ft. max.	0.04 ft./ft. max.
Median Width:	12 ft., 4 ft. at intersections	14 ft., 4 ft. at intersections	4 ft. (flush); 14' raised at BRT station	N/A
Lane Width:				
- Median Lane:	11 ft.	12 ft.	10 ft.	N/A
- Middle Lane:	11 ft.	11 ft.	N/A	12 ft.
- Outside Lane:	11 ft.	11 ft.	11 ft.	N/A
- BRT Lane:	N/A	N/A	12 ft.	N/A
BRT Buffer:	N/A	N/A	2 ft. min.	N/A.
Shoulder Width:				
- Median Lane:	2 ft	N/A	N/A	2 ft.
- Outside Lane:	5 ft.	6 ft.	6 ft.	8 ft.
Maximum Horizontal Curve:	8° 04'	8° 04' (711' radius)	8° 04' (711' radius)	10° 45' (533' radius)
Maximum Gradient:	Not applicable, match existing	4% desirable, 5% max.; 1% max. at LRT station	4% desirable, 5% max.; 1% max at BRT station	4% desirable, 6% max.
Taper Rate:	45:1	45:1	45:1	40:1
Slope Standards:				
- Cut slopes:	Varies, 3:1 maximum	Varies, 3:1 maximum	Varies, 3:1 maximum	Varies, 3:1 maximum
- Fill slopes:	Varies, 3:1 maximum	Varies, 3:1 maximum	Varies, 3:1 maximum	Varies, 3:1 maximum
Minimum Vertical Clearance:				
- Highway structure:	16.5 ft.	16.5 ft.	16.5 ft.	16.5 ft.
- Railroad overpass:	N/A	23.3 ft.	23.3 ft.	N/A.

4.2 ROADWAY CONFIGURATION

The Preferred Alternative includes shifting 35th Avenue to the west and 35th Avenue will be elevated to create a new intersection with Indian School Road. Indian School Road will be shifted to the north and will be elevated to create a new intersection with 35th Avenue. 35th Avenue will pass over US 60 and the BNSF Railway and Indian School Road will pass over US 60 and the BNSF Railway. **Figure 29** shows the Preferred Alternative. A signalized intersection will be created between 35th Avenue and Indian School Road. Ramps will provide access from westbound Indian School Road to north-westbound US 60 and from US 60 to eastbound Indian School Road.

35th Avenue will include two southbound lanes and three northbound lanes. 35th Avenue will include space for separate lanes for Bus Rapid Transit (BRT), buffers between the BRT lanes and the vehicle travel lanes, and a flush median between the BRT lanes. The BRT project will determine the lane configuration along 35th Avenue that will be implemented along with BRT.

Three lanes will be provided in each direction of travel on Indian School Road. The retaining walls along Indian School Road will be offset to account for a potential, future high-capacity transit (HCT) route along Indian School Road. The Indian School Road bridge over Grand Avenue and the BNSF Railway will be constructed to its full width to accommodate the potential, future HCT. The future project may need to widen/reconstruct portions of the Indian School Road approach roadways. Although the potential HCT mode has not been selected, the geometric requirements for a light-rail transit (LRT) station are more conservative than bus rapid transit and therefore were used to set the Indian School Road geometrics for a potential, future station located east of 35th Avenue.

Three lanes will be provided in each direction of travel on US 60 and US 60 will remain at-grade. Minor improvements will be included along US 60 to reconfigure the median and provide turn lanes at intersections.

Glenrosa Avenue will be extended to the west to create a new connector road that will restore connectivity between 35th Avenue and US 60. This new connector road will connect to 35th Avenue at Glenrosa Avenue and will connect to US 60 near 37th Avenue. This new connector road will provide one lane in each direction of travel.

West of 35th Avenue, Clarendon Avenue will be realigned to connect to Clarendon Avenue east of 35th Avenue and eliminate the existing offset intersection at 35th Avenue.

33rd Avenue will be extended north of Indian School Road and a new east-west local road will extend from 33rd Avenue to 35th Avenue. 33rd Drive will connect to the new east-west local road.

37th Avenue will be terminated north of US 60 with a cul-de-sac. The portion of 37th Avenue between the cul-de-sac and US 60 will be removed.

4.3 HORIZONTAL AND VERTICAL ALIGNMENTS

Plan and profile roll plots for the Preferred Alternative are provided in **Appendix C**. The plans include the horizontal and vertical alignments for US 60, Indian School Road, 35th Avenue, and the ramps and local streets.

4.4 STRUCTURES

4.4.1 Introduction

This section describes the features of the structural elements needed to support the Preferred Alternative. These elements include recommendations for the new bridge structures and retaining walls.

4.4.2 New Bridge Structures

In recent history, the design and construction of bridges for the Maricopa County Regional Freeway System has produced a knowledge base of economical and constructible bridge configurations for system interchange directional ramps and freeway overpass/underpass structures. Typical bridge types considered in this Design Concept Report include:

- Cast-in-place post-tensioned concrete box girders
- Precast, prestressed concrete AASHTO/Bulb-T girders
- Structural steel welded plate girders or welded steel box girders

Table 26 summarizes some of the representative characteristics and the advantages/ disadvantages of each of these structure types.

The use of concrete segmental and/or spliced girder bridges is not anticipated for this project at this stage of design development. Segmental construction requires special equipment and is not cost competitive for conditions on this project. Precast segmental construction becomes more cost competitive when large numbers of repetitive precast segments are required on a project. The use of spliced precast girders spanning directly over traffic in combination with a post-tensioned box girder bridge system or a post-tensioned box girder system utilizing hinges and drop-in precast girders has been successful on the Regional Freeway System and will be considered a viable option for longer spans.

Figure 29 – Preferred Alternative

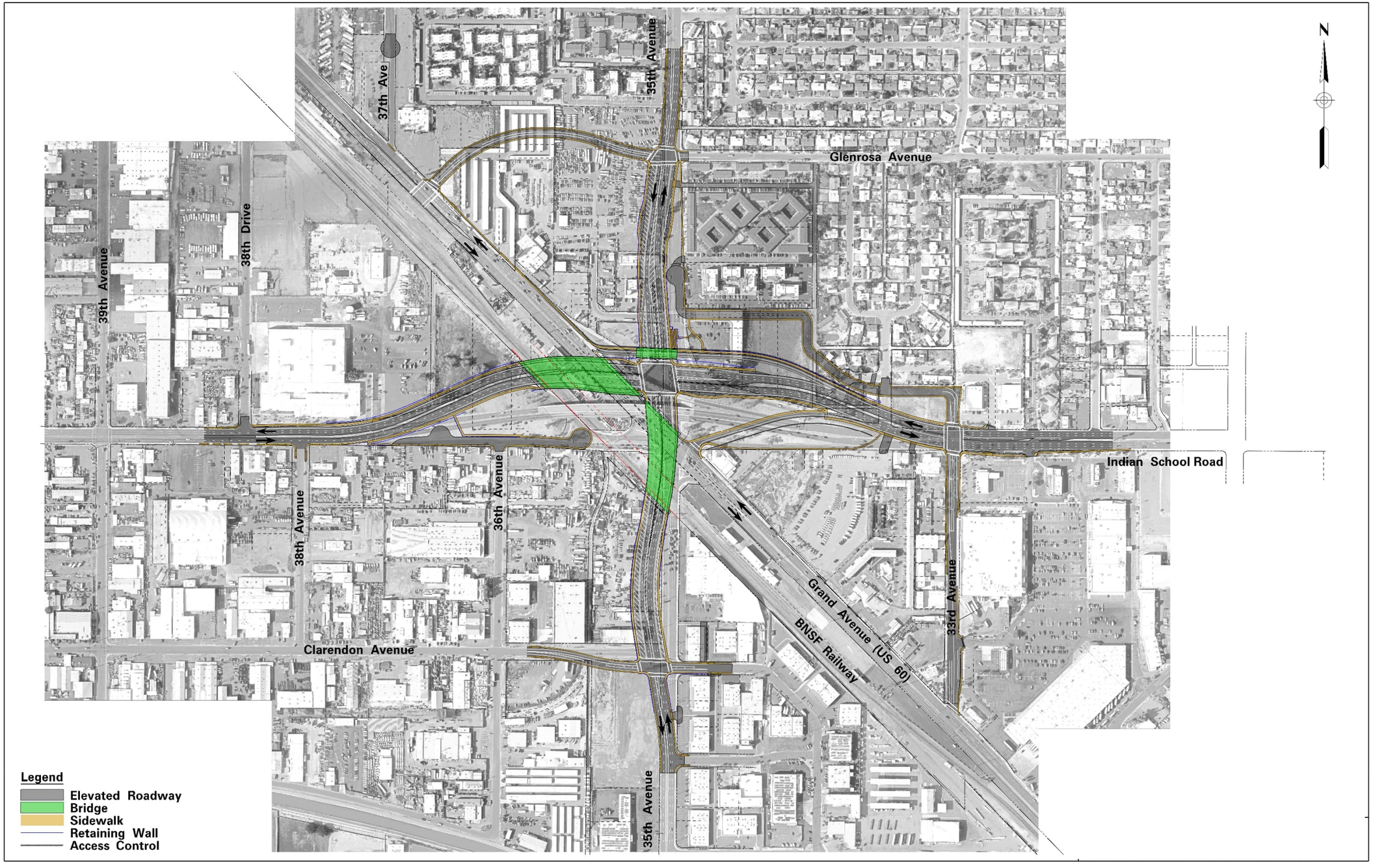


Table 26 – Bridge Structure Types

Features	Cast-In-Place (CIP) Post-Tensioned (PT) Concrete Box Girder	Precast, Prestressed Concrete AASHTO or Bulb-Tee (BT) Girders	Structural Steel Welded Girders / Steel Tubs
Practical Span Limit	250’	160’(+/-) for Bulb-Tee (BT) or AASHTO Super Type VI Girders	300’
Corresponding Structure Depth	10’	8.0’ (based on current BT sections available up to 82” – deeper sections up to 98” are feasible but not currently in use)	12’
Variable Depth	Haunches can be used as required	Commonly available precast girder types come in depth increments of 9” for AASHTO girders, and 8” for BT girders. They are uniform in section throughout the length of the girder	Haunches can be used as required
Horizontal Geometry	Cast-in-place concrete can readily conform to any straight or curvilinear geometry and has very high torsional rigidity	Line girders are cast straight and result in chorded spans with eccentric arc-to-chord variations on curvilinear alignments; Girders have moderate torsional rigidity	Welded girders can be fabricated straight or curvilinear; torsional factors become more critical for longer spans and/or smaller radius of curvature
Flares and Tapers, Gore Areas	Cast-in-place concrete can easily accommodate variable deck widths, ramp merge/diverge conditions, cross slope breaks, and superelevation transitions	Girder framing has limited flexibility in variable deck width, cross slope, and transitions	Girder framing has limited flexibility in variable deck width, cross slope, and transitions
Diaphragms and Pier Caps	Diaphragms and pier caps are internally integral with the superstructure	Diaphragms are integral with the superstructure. Pier caps are typically cast below the superstructure; however, they can be made integral by using recessed “dapped” girder ends supported on inverted-T pier caps	Diaphragms are integral with the superstructure; pier caps are typically cast below the superstructure but can also be made integral
Economy	Economical for both initial and life cycle cost	Very economical for both initial and life cycle cost	Historically, steel has been higher in initial cost due to lack of local suppliers and fabricators; inspection and maintenance needs also increase total life cycle costs
Aesthetics and Visual Compatibility	Generally considered to be the most aesthetically pleasing of these three alternatives	Typically considered to be less aesthetically pleasing than a CIP PT concrete box girder	Not currently used within the project limits; steel plate girders are typically considered to be the least desirable. When painted to match concrete structures, steel box girders are considered acceptable in appearance
Constructability	Requires falsework that temporarily reduces vertical clearance; when constructed over traffic, a “build high, then lower” technique could be used to achieve vertical clearance requirements for some elements. Longer construction duration than precast.	Can be erected quickly with minimum impacts to traffic; short term, off-peak closures are necessary during girder erection and deck/barrier concrete placement. Precast elements can be built concurrently with other construction, reducing overall construction duration.	Can be erected quickly with minimum impacts to traffic; short term off-peak closures are necessary during girder erection and deck/barrier concrete placement. Procurement and fabrication of steel can be a long lead item and increase the duration of construction.

Table 27 provides a summary of feasible new bridge structure configurations that may be constructed to support the Preferred Alternative.

Table 27 – New Bridge Structure Concepts

Bridge Description	Bridge Length (1)	Number of Spans	C_L-C_L Span Lengths (2)	Deck Width (3)	Maximum skew	Max. Superstructure Depth
Indian School Road over Grand Avenue and BNSF	421.05’	3	Varies (143.4’, 103.6’, and 150.9’ along cst C_L)	Varies from 141.1’ to 168.5’	48.75 deg	9’-2” (4)
35th Avenue over Grand Avenue and BNSF	388.44’	3	Varies (138.1’, 106.6’, and 151.4’ along cst C_L)	Varies from 123.4’ to 145.2’	48.87 deg	9’-2” (6)
Ramp 35 WB to Grand Avenue NW Underpass (5)	49’-6”	1	45’-0”	190’-0	Varies	26’-10 Total Box Depth

(1) Bridge length measured along construction centerline.
(2) These structures are on horizontal curves and tapers so the span lengths for individual girders will vary.
(3) Width measured perpendicular to construction line where centerline bearing intersects construction centerline.
(4) See “Special Design Considerations for Structures” for information pertaining to structure depths and preliminary vibration analysis for potential light rail usage.
(5) Structure is located underneath 35th Avenue.
(6) Maximum structure depth matches Indian School Road structure to reduce number of girder lines as well as match profiles for the intersection tie-in. Additional analyses are recommended to reduce structure depth and satisfy Indian School vibration, if feasible.

Vertical Clearances

All vehicular crossings require a minimum of 16’-6” of vertical clearance. For crossings over BNSF Railway, a minimum vertical clearance of 23’-6” is required.

Bus Rapid Transit and Potential/Future Light Rail Design Considerations

In October 2021, Phoenix City Council approved the initial Bus Rapid Transit (BRT) corridor of 35th Avenue and Van Buren Street. The BRT route will run along 35th Avenue from Cheryl Avenue to Van Buren Street and then along Van Buren Street from 35th Avenue to Central Avenue. In addition, Valley Metro is currently conducting the West Phoenix High-Capacity Transit Extension Study which is investigating east-west high-capacity transit corridors between Missouri Avenue and Osborn Avenue. Per direction from MAG, the Indian School Road structural concept needs to address a potential future LRT along Indian School Road and would also be constructed full width to accommodate a future High-Capacity Transit (HCT) corridor. In addition, 35th Avenue would be constructed to accommodate the BRT along 35th Avenue.

The potential for the inclusion of light rail along Indian School means that the Indian School structures will need to be evaluated for light rail vehicles per *AASHTO LRFD Guide Specifications for Bridges Carrying Light Rail Transit Loads, 2nd Edition* for both structural capacity and *Valley Metro Light Rail Transit Projects – LRT Design Criteria Manual*, to include (but not limited to) vibration requirements discussed in Section 5.11.4. In Section 5.11.4 of the *LRT Design Criteria Manual*, Valley Metro requires that “A special analysis shall be conducted for any bridge or superstructures having a first mode of vibration, which is less than 2.5 Hertz or for the condition when more than one span in a series of three consecutive spans has the first mode of vibration, which is less than 3.0 Hertz.” Since vibration criteria can sometimes be more stringent than

structural capacity and for the purpose of this design concept report, ACI 343.1r-12 *Guide for the Analysis and Design of Reinforced and Prestressed Concrete Guideway Structures* has been utilized as a simplified, preliminary analysis of candidate structures to ensure that sufficient stiffness for the proposed Indian School bridge structures is provided. However, more refined analyses (i.e., finite element analyses with suspension characteristics of the actual light rail vehicle) should be carried out for the Bridge Selection Report (during final design) to explore other structural alternatives as needed and to evaluate possibilities in reducing structural depths, if feasible.

BNSF Railway Requirements

On April 5, 2023, the project team met with BNSF to discuss permissible bridge placement along their railway. There is a 90'-0" wide opening located immediately to the southeast of the existing 35th Avenue at-grade crossing; BNSF has indicated that this 90'-0" wide corridor shall be preserved all the way through the proposed Indian School Road and 35th Avenue bridge improvements. Both Indian School Road and 35th Avenue bridge structures presented in Table 27 locate abutment and pier improvements to clear this opening assuming full-height abutments on a dual-row of drilled shafts and a pier supported by columns on drilled shafts. During final design and with further geotechnical investigation, optimizing abutment placements to minimize span lengths should be investigated, including evaluation of a "pier-type" abutment placed immediately adjacent to full-height MSE walls. BNSF will not allow the use of a cast-in-place post-tension box girder structure over the railroad.

Special Design Consideration for Structures

Table 27 presents a feasible span configuration and maximum superstructure depth for each bridge. Additional bridge alternatives, vertical profile refinements and/or the number of spans and span length configurations should be investigated further during the future Bridge Selection Report evaluation (during final design), while considering the constraints and issues presented in this section (including light rail design considerations) as well as additional geotechnical investigations and recommendations during that stage.

Specific design considerations and issues that should be considered for individual bridge crossings are provided in the following paragraphs. The structures are shown on the roll plots contained in Appendix C.

Indian School Road over Grand Avenue Underpass and BNSF

The Indian School Road over Grand Avenue structure will carry Indian School traffic over Grand Avenue and BNSF to and from the intersection of 35th Avenue and Indian School, located immediately to the east of the crossing. Per direction from MAG, the structure will be constructed full width for future HCT and the potential for a light rail corridor.

The structure exhibits unusual characteristics to address several concurrent constraints and issues:

1. The structure has a wide deck width, well more than 120 feet. Because of the width and the skew, an open joint is proposed near the mid-width to reduce the amount of transverse thermal movement in addition to the longitudinal thermal movement at the expansion joints. An open joint also allows two separate deck pours utilizing a deck-screeding machine which is normally limited to 120' maximum widths.
2. Since the structure may potentially be a light rail route in the future, the open joint's location must be placed to avoid conflict with light rail. The open joint has also been placed to facilitate more equal length girders, where feasible, and also placed within the interim raised median prior to future light rail placement.

Since the structure could potentially carry light rail in the future, a preliminary first modal analysis was conducted using equation 4.3.1.2b in ACI 343.1r-12 on the proposed bridge crossing to assess vibration requirements for light rail vehicles as required by Valley Metro. The preliminary analysis used closely spaced precast prestressed 98-inch deep bulb-tee concrete girders on a single span of approximately 150 feet. Based on the ACI evaluation, the frequency limit could be met on a single span frame. However, experience has shown that evaluation using a simplified ACI analysis tends to be conservative and does not account for the actual suspension characteristics of the light rail vehicle and its harmonic interaction with the bridge structure. During the next design stage, a finite element analysis using suspension characteristics of the Valley Metro vehicle should be conducted to assess if a shallower superstructure depth is feasible for this span as well as the remaining spans for the remaining 2 bridge spans.

The resulting spans for the 3-span structure measure approximately 143.4', 103.6' and 150.9', measured along the construction centerline; the span lengths actually vary since a portion of the northern edge of the structure is on a horizontal curve and the southern edge of the structure is partially on a taper. Full-height abutments (located adjacent to the east side of Grand Avenue and the west side of the BNSF railway corridor) supported by spread footings, a shaft cap and reinforced concrete drilled shafts, or an MSE wall with stub abutments on drilled shafts could be utilized with abutment faces located immediately adjacent to Grand Avenue. Adjacent lane closures along Grand Avenue may be required to facilitate abutment construction. The proposed piers could utilize either rectangular or bladed concrete columns on spread footings or shaft caps with reinforced concrete drilled shafts, pending a more detailed geotechnical analysis and foundation recommendations. The precast girder option is anticipated to be the recommended structural alternative, and Table 29 reflects the superstructure depth for this configuration along with approximate overall out-to-out deck widths, assuming precast prestressed 98-inch deep concrete bulb tee-girders are utilized as a maximum structure depth; the profile is controlled by the structure over BNSF.

A "dirt plug" was considered instead of the short center span, but an open space could be beneficial for utility relocation and also eliminate concern about differential settlement of the "dirt plug."

For the interim roadway condition, raised roadway curbs would be utilized and four inches of decomposed granite could be utilized between the roadway curbs and the raised sidewalks and standard SD-1.12/1.13 pedestrian parapets and fencing along the outside ultimate width of the structure. If light rail is included in the future, the superstructure could be modified by eliminating raised median to accommodate the rail lines via plinth blocks; the open joint would be located between directions of travel for light rail. The interim roadway curbs and granite could be removed and the bridge could be restriped in both directions to provide room for light rail in the middle of the structure.

Other superstructure alternatives could be explored including, but not limited to, steel structures (including steel tubs), precast concrete tub girders, etc., during the preparation of the Bridge Selection Report (during final design). Evaluations should consider costs, constructability, and light rail design criteria.

The utility conflicts are discussed further in Section 4.12.

35th Avenue over Grand Avenue and BNSF

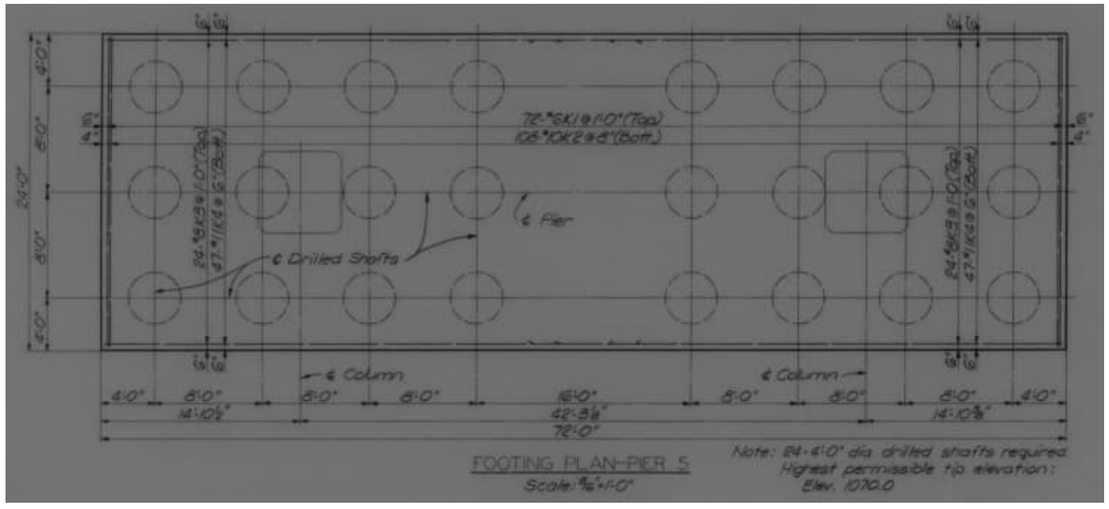
The 35th Avenue over Grand Avenue structure will carry 35th Avenue traffic over Grand Avenue and BNSF railway to and from the intersection of 35th Avenue and Indian School, located immediately to the north of the crossing. The structure will accommodate the BRT.

The resulting 3-span structure measures 138.1', 106.6', and 151.4' along the construction centerline. The span length varies because of a combination of partial horizontal curvature and roadway taper. The superstructure can feasibly be spanned using precast prestressed 98-inch deep concrete bulb tee-girders to

match the structure depth of Indian School Road and minimize the number of girder lines. The structure exhibits a significant skew and a deck width exceeding 120 feet so an open joint is proposed to be used along the construction centerline within the raised median on the structure. Optimizing the superstructure depth for the Indian School bridge may facilitate reducing the superstructure depth for this structure as well.

The northern abutment—located adjacent to Grand Avenue—is in conflict with an existing 72'-0" x 24'-0" x 7'-0" deep reinforced concrete pier footing drilled shaft cap with a total of 24 4'-0" diameter concrete drilled shafts (see **Figure 30**) at pier 5 of the existing Indian School Road overpass which is located in the existing "pork chop" island between 35th Avenue, Grand Avenue and a right-turn access from 35th Avenue to Grand Avenue.

Figure 30 – Existing Indian School Road Foundation at Pier 5



Locating the abutment further to the north to avoid the 24'-0" wide footing results in the abutment overlapping with the 4-way intersection (both directions of travel would be included on the structure and also precludes the use of precast concrete girders). Therefore, a full-height abutment is proposed on drilled shafts with a "deep pier"-type abutment bridging this existing cap. Alternatives may include placing a new large shaft centered in the 16'-0" spacing between two existing 4'-0" diameter concrete drilled shafts to help reduce drilled shaft demand. Another alternative that may be considered during the next design phase would be to explore the possibility of partially utilizing the existing shaft cap for support.

For the abutment adjacent to the BNSF property, a full-height abutment on spread footings, drilled shafts, or a stub abutment on drilled shafts placed with an MSE wall are possibilities to explore during the next design phase. The proposed piers could utilize either rectangular or bladed concrete columns on spread footings or shaft caps with reinforced concrete drilled shafts, pending a more detailed geotechnical analysis and foundation recommendations.

A "dirt plug" was considered instead of the short center span, but an open space could be beneficial for utility relocation and also eliminate concern about differential settlement of the "dirt plug."

Both sides of the superstructure would utilize standard SD-1.12/1.13 pedestrian parapets and fencing. Other superstructure alternatives could be explored including, but not limited to, steel structures (including steel tubs), precast concrete tub girders, etc., during the preparation of the Bridge Selection Report (during final design). Evaluations should consider costs, constructability, etc.

The utility conflicts are discussed further in Section 4.12.

Westbound Exit Ramp Underpass (WB Indian School Rd to NWB Grand Avenue)

The Preferred Alternative includes a ramp from westbound Indian School to northbound Grand Avenue. The proposed 35th Avenue would be elevated while the WB exit ramp would cross beneath 35th Avenue. A buried concrete structure with soil backfill is proposed to provide the grade separation. The interior clear span will be 45' to accommodate a 22' roadway, 8' sidewalk, and variable width offsets. The top of slab width will be 190' and have a skew that varies relative to the partially curved alignment of the exit ramp.

Two structure type alternatives are being considered: a three-sided rigid frame and a four-sided superbox. Both options have the same interior clearance, but the benefits vary.

The cost of the two options is largely dependent on the soil bearing capacity. When the bearing capacity is high (greater than 7.5ksf) the rigid frame footings are small, however if the bearing pressure is lower, then the footings will be large and the superbox will require less concrete. The rigid frame has the advantage of transmitting the live load into the soil instead of a bottom slab, but the superbox is unaffected by sliding and eccentricity. The rigid frame requires a thicker top slab so the fill height is less.

The decision on whether to proceed with a three-sided rigid frame or a four-sided superbox will be largely influenced by the geotechnical investigation and the preference of the design team.

4.4.3 Retaining Walls

Retaining walls will be required along Indian School Road and 35th Avenue within the elevated portion of the roadways. For the DCR cost estimate, the presumed wall system is Mechanically Stabilized Earth (MSE). A detailed wall evaluation and Wall Selection Report shall be performed during final design. The evaluation criteria should include, but not be limited to: right-of-way constraints, construction access availability, the ability to maintain traffic during construction, geotechnical considerations and estimated construction costs. The evaluation will also address the BNSF requirements for retaining walls as shown in the BNSF Guidelines for Railroad Grade Separation Projects.

Table 28 summarizes the walls required to support the Preferred Alternative.

Table 28 – New Retaining Wall Summary

Roadway	Wall No.	Description	Approximate Station Limits	Approx. Wall Length (ft)	Average Wall Height/ Maximum Wall Height	Wall Type
35th Ave	35-1	Along west side of 35th Ave, north of Indian School	Sta. 52+80 to Sta. 60+85	829	16'/29'	MSE
	35-2	Along east side of 35th Ave, north of Indian School	Sta. 56+42 to Sta. 59+88	340	22'/27'	MSE
	35-3	Along east side of 35th Ave, north EB Indian School on ramp	Sta. 63+50 to Sta. 64+77	128	34'/35'	MSE
	35-4	Along west side of 35th Ave, north of W Clarendon Ave	Sta. 67+66 to Sta. 75+39	813	23'/35'	MSE
	35-5	Along east side of 35th Ave, north of W Clarendon Ave	Sta. 68+54 to Sta. 72+20	357	29'/34'	MSE
Indian School Rd	IS-1	Along north side of Indian School Rd	Sta. 39+82 to Sta. 45+52	542	11'/20'	MSE
	IS-2	Along north side of Indian School Rd	Sta. 45+66 to Sta. 49+52	401	28'/34'	MSE
	IS-3	Along south side of Indian School Rd	Sta. 40+58 to Sta. 45+89	555	12'/22'	MSE
	IS-4	Along south side of Indian School Rd	Sta. 45+99 to Sta. 46+48	49	22'/24'	MSE
	IS-5	Along south side of Indian School Rd	Sta. 49+87 to Sta. 50+57	65	39'/35'	MSE
	IS-6	Along north side of Indian School Rd	Sta. 53+40 to Sta. 54+87	147	33'/34'	MSE
	IS-7	Along south side of Indian School Rd	Sta. 55+21 to Sta. 55+35	19	31'/32'	MSE
	IS-8	Along north side of Indian School Rd	Sta. 56+77 to Sta. 59+99	330	32'/38'	MSE
WB Exit Ramp	WB-1	Along north side of WB exit ramp to Indian School Rd	Sta. 207+95 to Sta. 216+55	871	19'/33'	MSE
West Frontage Rd	WFR-1	Along sidewalk north of frontage road	Sta. 51+07 to Sta. 52+09	101	10'/13'	MSE
	WFR-2	Along north side of frontage road	Sta. 52+09 to Sta. 53+59	257	6'/13'	MSE

4.5 DRAINAGE

Pavement Drainage/Storm Drains
For this initial drainage analysis, the US 60 (Grand Avenue) roadway inlets are all assumed to be curb opening inlets (ADOT C-15.20), and infield areas will use ADOT area inlets (ADOT C-15.80). All the other roadways will have City of Phoenix standard P-1569 curb opening inlets.

The storm drains are initially sized based on the cumulative 10-year peak onsite flows anticipated within the project limits. The storm drains range in diameter from 18-inches to 30-inches for the Preferred Alternative. Therefore, the MAG standard manhole and riser (520 & 522) for small diameter storm drains shall be used.

The storm drains will either discharge into new/existing detention basins, connect to existing City of Phoenix storm drains (along 35th Avenue or Indian School Road), or into ADOT storm drains located along Grand Avenue. Several locations will have new catch basins where curb is being shifted and the catch basins will be installed onto existing lateral pipes that will be extended.

Existing storm drains that are expected to be kept in service will be evaluated for load capacity in locations where new roadway embankment is to be constructed. If higher grade pipe is warranted, those sections of pipe will be replaced.

New storm drains that must pass through a new retaining wall will have a special detail that uses a vertical "stovepipe" configuration that will pass under or through a blocked-out section of the new wall foundation.

Detention Basins
The two existing detention basins (previously deemed West Basin and East Basin) will be partially affected by new roadway fill for the realigned roadways. The basins will be regraded to mitigate as much as possible any lost storage volume due to roadway embankment intrusion. These two basins have been renumbered: West Basin is now DB-1, and East Basin is now DB-2. Side slopes will be a maximum of 3:1 and depths for all of the new basins will be limited to 3-feet. The two existing basins (DB-1 and DB-2) are much deeper and will require access control fencing (same as existing condition).

Six other detention basins (DB-3 through DB-8) are recommended to mitigate lost volume in DB-1 and DB-2, as shown in **Figure 31**. The new basins will capture the increased onsite runoff in other locations within the project as much as practical. **Table 29** shows the volume data for each of the detention basins. The basins also function as water treatment prior to release into the City or ADOT storm drain network.

The collector pipes that discharge into the detention basins will be protected with standard flared end sections and dumped riprap outlet aprons to control local scour.

Each new detention basin will have a bleed-off structure that is assumed to be a modified version of a MAG 535 area inlet, but with the grate raised above the detention basin bottom, and a sized bleed-off orifice in the front wall (facing into the detention basin). Minor flows will collect in the detention basin and will be metered out through the orifice. Higher flows will fill the basin above the level of the grate and detained flows will flow through the grate and into the primary outlet pipe for the basin. The combined dewatering time for each basin will be less than the maximum allowable 36-hour dewatering time. During final design, the type of bleed-off will be reviewed based on the required dewatering time. The outlet structures for DB-1 and DB-2 may require larger flow capacity such as the beehive style structure that are presently used in those basins.

Table 29 – Proposed Detention Basin Summary

Detention Basin No.	Existing Onsite & Offsite 100yr/2hr Detained Volume (Ac Ft)	Offsite 100yr/2hr Volume Required (Ac Ft)	Proposed 100yr/2hr Onsite Volume Required (Ac Ft)	Total Detention Volume Required (Ac Ft)	Proposed Volume Provided (Ac Ft)	Q10 Inflow (cfs)
DB-1	5.08	3.38	1.00	4.38	10.78	18.4
DB-2	5.85	4.29	0.42	4.71	10.40	7.8
DB-3	n/a	n/a	0.02	0.02	0.50	0.3
DB-4	n/a	n/a	0.34	0.34	2.49	6.2
DB-5	n/a	n/a	0.48	0.48	0.87	7.7
DB-6	n/a	n/a	0.83	0.83	1.00	15.2
DB-7	n/a	n/a	0.43	0.43	0.68	7.9

Detention Basin 1 (DB-1, formerly West Basin)
The new roadway embankment will encroach into the south half of the existing triangular shaped detention basin. There won't be any available room for expansion of the remaining part of the basin, so any lost capacity will be made up elsewhere in the project.

This basin has three inlet pipes that drain roadways west of the proposed intersection. Approximately 400 feet of the existing storm drain along the westbound Indian School Road lanes will be realigned northward to follow the new retaining wall but will still discharge into DB-1. The DB-1 outlet pipe is a replacement of the existing storm drain outlet pipe. The new pipes will be designed for the high fill loads anticipated under the new roadway. That outlet pipe connects to the existing storm drain that parallels the railroad, on the south side (same as existing condition).

Detention Basin 2 (DB-2, formerly East Basin)
The new roadway embankment will encroach into the south half of the existing rectangular shaped detention basin. The parcel located immediately west of the existing basin will be re-graded to mitigate lost volume elsewhere in the detention basin.

This basin has four inlet pipes that drain roadways east of the proposed intersection, the ramp from westbound Indian School Road to north-westbound Grand Ave, and the new roadway from 33rd Avenue to 33rd Drive. The outlet pipe and bleed-off structure will be located on the west side of the re-graded detention basin and will connect to the existing storm drain trunk line along 35th Avenue.

Detention Basin 3 (DB-3)
This new trapezoidal detention basin is located north of Grand Avenue, just west of 35th Avenue. The basin has two collector drains that collect runoff from the new westbound Indian School Road to north-westbound Grand Ave ramp. A new outlet pipe and bleed-off structure will connect to an existing lateral pipe on Grand Avenue (after the existing catch basin is relocated).

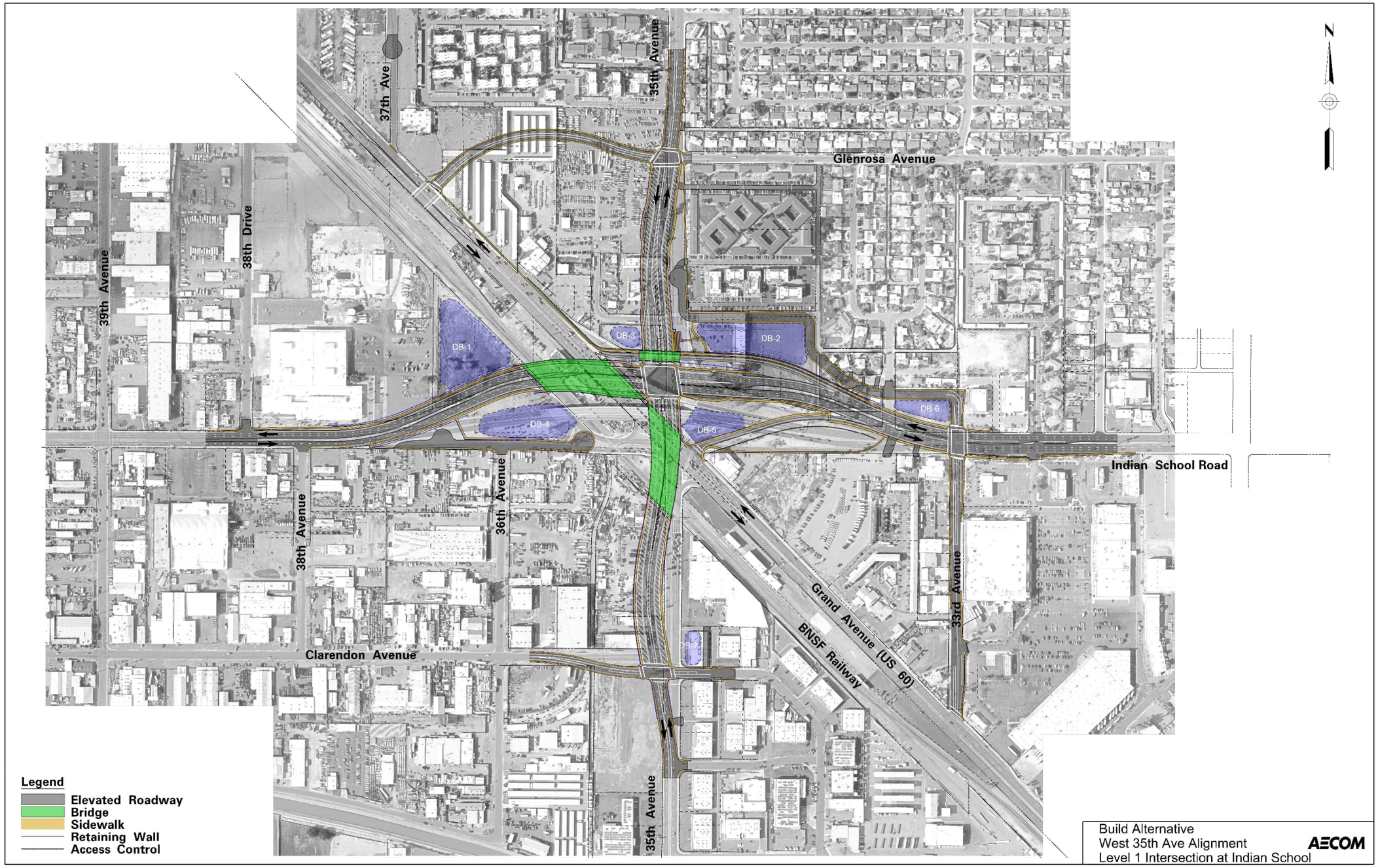
Detention Basin 4 (DB-4)
This new triangular detention basin will be located south of the new Indian School Road, west of the new intersection. Three inlet pipes carry runoff from eastbound Indian School Road, and from the reconstructed frontage road along the south side of Indian School Road. The outlet pipe and bleed-off structure discharges into the existing storm drain along the frontage road.

Detention Basin 5 (DB-5)
This new basin is located at the southeast quadrant of the interchange and will receive runoff from eastbound Indian School Road, and the new ramp from Grand Avenue to eastbound Indian School Road. There will be two inflow pipes into the basin. The outlet and bleed-off structure will be located at the west end of the new basin. The short outlet pipe will connect to the existing 35th Avenue storm drain that drains southward.

Detention Basin 6 (DB-6)
This new detention basin will be located at the northwest corner of Indian School Road and 33rd Avenue. There will be three inlet pipes that collect runoff from the 33rd Avenue/Indian School Road intersection and the new connector road from 33rd Avenue to 33rd Drive. The outlet pipe and bleed-off structure will connect to the existing storm drain along Indian School Road.

Detention Basin 7 (DB-7)
This new detention basin will be located in the northeast corner of 35th Avenue and Clarendon Avenue intersection. There is one inlet pipe that is a new storm drain that collects runoff from the new west leg of the Clarendon Avenue intersection. The outlet pipe and bleed-off structure will connect to the existing 35th Avenue storm drain.

Figure 31 – Proposed Drainage System



4.6 RIGHT-OF-WAY

Approximately 23 acres of new right-of-way will be required for the Preferred Alternative.

Temporary Construction Easements (TCE's) will be required for the construction of the Preferred Alternative. The TCE locations and limits will be determined during final design.

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4.7 JURISDICTIONAL AND MAINTENANCE LIMITS

ADOT and the City of Phoenix will execute a Joint Project Agreement (JPA) during final design that will outline specific maintenance responsibilities.

At the completion of construction, ADOT will assume jurisdiction and maintenance responsibility for US 60.

The City of Phoenix will assume jurisdiction and maintenance responsibility for the full limits of 35th Avenue, Indian School Road, and all local roads.

4.8 ACCESS CONTROL

ADOT owns access rights at approximately 4 parcels along US 60 within the project limits. In other locations, access is currently controlled along US 60, 35th Avenue, and Indian School Road through permits as ADOT nor City of Phoenix currently own access rights. Within the project limits, both 35th Avenue and Indian School Road will be elevated which will generally preclude direct access. A raised median will be provided along Indian School Road to help control access and minor changes will be implemented to restrict outbound left-turn movements onto Indian School Road. The purchase of access control is anticipated along the westbound Indian School Road exit ramp and the eastbound Indian School Road entrance ramp. Access control requirements will be further coordinated with ADOT and City of Phoenix.

4.9 EARTHWORK

The earthwork required for the project will include approximately 78,000 cubic yards of excavation and 566,000 cubic yards of embankment. Based on the anticipated construction sequencing, a portion of the excavation could be used in the embankment. A 10% shrink factor was applied to the portion of the excavation that could be used for embankment resulting in an estimated 535,000 cubic yards of borrow for the project.

4.10 TRAFFIC DESIGN

4.10.1 Signing and Pavement Marking

The roadway roll plots in Appendix C include a guide sign concept. Signing and marking plans shall be prepared in more detail during the final design phase of project development. The goal of the signing concept is to provide clear advance guide signing along US 60 for travelers destined for Indian School Road or 35th Avenue. The final sign locations will be determined during the development of the final design plans and must consider the existing and new locations of utilities, bridge structure, drainage features, lighting standards and other appurtenances. The retroreflective sheeting on the signs will be Type IX or Type XI. Current ADOT design standards do not require sign lighting for this type of sheeting.

The pavement marking concept shown on the plan sheets in Appendix C was developed to incorporate the new lane configurations for the Preferred Alternative. The preliminary pavement marking concept has been developed in accordance with the current edition of the ADOT Signing and Marking Standard Drawings that reference the requirements for lane lines, edge lines, and gore striping.

4.10.2 Traffic Signals

New traffic signals will be installed for the new 35th Avenue/Indian School Road, 35th Avenue/Glenrosa Avenue, and 35th Avenue/Clarendon Avenue intersections. New traffic signals will also be installed at the 33rd Avenue/Indian School Road intersection. These signal installations will be designed in accordance with City of Phoenix standards and will be interconnected to the adjacent traffic signals. The City of Phoenix will operate and maintain these traffic signals after construction is completed.

Traffic signals will be installed at the US60/Glenrosa Avenue and US60/Eastbound Entrance Ramp intersection. These new traffic signals shall be designed in accordance with ADOT standards. The City of Phoenix will operate and maintain these traffic signals after construction is completed.

4.10.3 Lighting

The existing street lighting systems along 35th Avenue and Indian School Road will require modifications within the project limits. Per City of Phoenix criteria, spacing will be approximately 200 to 250 feet (on each side of street) using 2,700 kelvin LED lighting. The lighting will be offset to result in spacing of 100 to 150 feet between opposite sides of the street.

A lighting evaluation will be conducted to verify the proposed street lighting is in conformance with the criteria established in the American National Standard Practice for Roadway Lighting, ANSI/IES RP-8-21, published in 2021. This document identifies nationally recognized design criteria for roadway lighting that has been accepted by ADOT. The criteria for the lighting analysis will be coordinated with ADOT and the City of Phoenix.

The City of Phoenix will operate and maintain the street lighting along US 60, and all other roadways. During final design, the appropriate design and construction standards will be utilized based upon the responsible jurisdiction.

4.10.4 Intelligent Transportation Systems (ITS)

Three traffic signals on US 60 will be controlled and maintained by the City of Phoenix within the study area. The signal timings for the traffic signals on US 60 are coordinated and use a 180 second cycle length during the AM and PM peak hours. The three signalized intersections on US 60 include the following locations:

- US 60/33rd Avenue
- US 60/Eastbound Entrance Ramp
- US 60/Glenrosa Avenue

Along 35th Avenue, three traffic signals will be controlled and maintained by the City of Phoenix including:

- 35th Avenue/Glenrosa Avenue
- 35th Avenue/Indian School Road
- 35th Avenue/Clarendon Avenue

Along Indian School Road, two traffic signals will be controlled and maintained by the City of Phoenix including:

- Indian School Road/33rd Avenue
- Indian School Road/35th Avenue

The City of Phoenix is currently installing fiber optic cable on Indian School Road and an upcoming project on 35th Avenue will install fiber optic cable on 35th Avenue. The final designer shall coordinate with the City of Phoenix regarding the installation of the fiber optic cable.

4.11 CONSTRUCTION PHASING AND TRAFFIC CONTROL

Traffic will be managed by detailed traffic control plans and by procedures and guidelines specified in Part VI of the current version of the *Manual on Uniform Traffic Control Devices* (MUTCD), and by the current edition of the Arizona Supplement to Part VI of the MUTCD. The final construction phasing and traffic control plans will be developed during final design. A conceptual construction phasing plan is included in **Appendix D**.

Temporary lane reductions and restrictions may be considered along with night construction operations. Due to the location of the 35th Avenue bridge, 35th Avenue will require a full closure at US 60. Lane restrictions and closures on US 60 should be minimized to the extent possible. Short-term closures will be needed along US 60 to remove the existing bridge and to construct elements of the new bridges.

All grading, drainage, embankment construction, pavement widening, bridge and retaining wall construction, and other major project features shall be protected by temporary traffic control devices.

Access to existing properties will be maintained at all times. Coordination will be required with ADOT and the City of Phoenix to determine the project phasing restrictions that will be used for this project.

Coordination will also be required with the BNSF Railway to develop a phasing plan for removal of the existing Indian School Road bridge and for the construction of the new 35th Avenue and Indian School Road bridges.

4.12 UTILITIES

During final design, each city and utility agency will receive and review the preliminary design plans for this project. Utility conflicts will be identified and resolved with the assistance and cooperation from the affected agencies. Construction plans for the relocations or adjustments of the utilities will be developed by the responsible party.

In the planning and scheduling of high voltage power line relocations, it is important to allow sufficient schedule lead time for the fabrication and delivery of the new poles. Power line relocations that would require transmission line de-energizing and re-energizing may be restricted to the cooler months of the year (between October and April) when power consumption is lower.

Preliminary discussions regarding relocations have occurred with a few of the utility agencies and are described below. Coordination with the utility agencies will continue through final design.

SRP Irrigation - Existing facilities along 35th Avenue are in conflict with proposed bridge structures, retaining walls and earthen fills for the realignment of 35th Avenue. SRP will require the pipe material to be upgraded to current standards and a re-alignment will be required to avoid the proposed improvements. SRP has developed plans to relocate their irrigation line to the west side of 35th Avenue.

SRP Power - Existing overhead facilities along 35th Avenue will need to be relocated and raised to go over the new Indian School Road improvements. Any facilities currently located on the west side of 35th Avenue will need to be relocated to the east side of the road. Additional conflicts with retaining walls, and structures, will need to be mitigated.

APS - Existing 230 kV overhead facilities along Grand Avenue will be impacted by the proposed improvements. Due to the size of the facilities, APS will need to perform an outage study to determine if the project area can sustain an outage for the relocation (study takes about 3 months). Any loss of revenue during the relocation may be a potential cost to the project. APS has indicated that they plan to construct new (taller) poles adjacent to the existing poles.

Southwest Gas - Existing gas facilities along 35th Avenue, Indian School Road and Grand Avenue will be impacted by the proposed improvements. Some facilities may require horizontal and vertical relocations, while others may require evaluation of existing conditions and possible impacts due to earthen fills (additional loads).

City of Phoenix (Sewer) - Existing facilities along 35th Avenue, Indian School Road and Grand Avenue will be impacted by the proposed improvements. Horizontal relocation of the sewer facilities will be required in some areas to avoid retaining walls and/or bridge structures. An evaluation of the existing pipe conditions will be required and upgrades to the existing pipes may be required in order to provide adequate capacity due to the new earthen fill.

City of Phoenix (Water) - Existing facilities along 35th Avenue, Indian School Road and Grand Avenue will be impacted by the proposed improvements. Horizontal relocation of the water facilities will be required in some areas to avoid retaining walls and/or bridge structures. An evaluation of the existing pipe conditions will be required and upgrades to the existing pipes may be required in order to provide adequate capacity due to the new earthen fill.

A listing of the utility company and agency representatives is shown in **Table 30**.

Table 30 – Utilities and Agency Contacts

Agency	Utility Type	Name	Phone	E-mail
AT&T	Coaxial, Fiber Optics, Telephone	Joseph Forkert	(714) 963-7964	joef@forkertengineering.com
APS	Electric	Bobby Garza	(602) 371-7989	baldemar.garza@aps.com
BNSF Railway	Communication, Fiber Optics, Electric		(800) 533-2891	
City of Phoenix	Sewer	Jami Erickson	(602) 261-8229	jami.erickson@phoenix.gov
	Storm Drain	Rubben Lolly	(602) 495-7945	rubben.lolly@phoenix.gov
	Traffic Signals, Street Lights & ITS	Simon Ramos	(520) 500-4190	simon.ramos@phoenix.gov
	Transit - Electric	Bernard Venegas	(480) 435-2431	bernard.venegas@phoenix.gov
	Water	Jami Erickson	(602) 261-8229	jami.erickson@phoenix.gov
Cox Communications	CATV, Fiber Optics	Melanese Denson	-	natlconsttrafficmgmtteam@cox.com
CenturyLink (Qwest - Mountain Bell)	Coaxial, Fiber Optics	Mark Grabowski	(623) 312-6665	maps@centurylink.com AZReview@CenturyLink.com azreview@terratechllc.net
MCI - (Verizon Business)	Fiber Optics	Jesus Arrieta	(909) 421-3316	jesus.arrieta@verizon.com
SRP	Electric, Fiber Optics	Jason Hughes	-	jason.hughes@srpnet.com
SRP	Irrigation	Victor Lucero	(602) 326-2156	victor.lucero@srpnet.com
Southwest Gas	Gas	Yvonne Aguirre	(602) 484-5338	Yvonne.aguirre@swgas.com
Sprint	Telephone	David Jeter	(602) 430-3615	david.jeter@t-mobile.com
Zayo Group FKA AGL	Fiber Optics	Matt Burke	(480) 257-7714	matt.burke@zayo.com

4.13 GEOTECHNICAL AND PAVEMENT DESIGN

The majority of the project alignment is underlain by relatively good quality subgrade soils. It appears likely that all site soils can be re-used as embankment fill. Testing will be required to verify whether some or all of it would qualify for structure backfill. The geotechnical field investigation and testing will be conducted during final design.

4.13.1 New Bridge Structures

Spread footings founded at shallow depths (less than 10 feet) should provide adequate support for moderately loaded bridge foundation elements. Drilled shafts founded at depth within the firm to hard soils would provide good to excellent support for moderate to high foundation loads. Drilled shafts may be preferred where ground disturbance must be minimized. Settlements with either foundation system or a combination of both could likely be kept within tolerable settlement limits for foundations.

4.13.2 Retaining Walls

No retaining walls are currently present at the site. Proposed retaining walls for this project may be utilized to provide grade separation from the adjacent roadways, railroad right of way or adjacent properties. The new walls will likely be constructed as mechanically stabilized earth (MSE) walls, or possibly as cast-in-place spread footings at relatively low to moderate allowable soil bearing pressures. Variations of the actual wall types selected will likely be based upon cost, and constructability around existing and new structures rather than soil conditions. The existing site soils are well suited for the support of the various wall types. Standard wall footings are anticipated since the new walls are located a sufficient distance from existing features. However, the use of non-standard walls may be necessary to accommodate the fairly tall wall heights. The use of drilled shaft foundations may be preferred in some locations, depending on proximity to existing structures, for constructability purposes, and in isolated areas as dictated by subgrade conditions.

4.13.3 Recommended Pavement Structural Sections

It is anticipated the existing pavement will be removed as part of a full reconstruction. The proposed preliminary pavement section was deemed adequate based on an assumed R-value of 25 (i.e. resilient modulus of 14,900 pounds per square inch) and seasonal variation factor of 1.0 for Phoenix. The projected 2050 daily traffic volumes of 58,000 vehicles per day (vpd) for Grand Avenue, 63,000 vpd for Indian School Road, and 29,000 vpd for 35th Avenue were used for the preliminary pavement design. It is assumed truck traffic is 8 percent based on Grand Avenue data. The proposed pavement sections are shown in **Table 31**.

Table 31 – Preliminary Recommended Pavement Structural Sections

Location	AC (in)	AB (in)	Select Material (in)
US 60 (Grand Avenue) – Flexible	9	12	-
Indian School Road - Flexible	9	12	-
35th Avenue - Flexible	7	9	-

4.13.4 Temporary Earth Retaining Structures

The construction phasing concept may require the use of temporary embankment slopes while a portion of the elevated roadway is under construction. During final design, options will be considered for the temporary embankment slope, if needed, including mechanically stabilized earth (MSE) retaining walls, reinforced soil slopes with shotcrete facing, and geotextile fabric with “pillow-type” facing retaining systems. Foundations for lighting, sign structures, and other features may be required within the Indian School Road median. These foundations could be in conflict with straps, fabric, or other items left underground with the temporary retaining systems.

MSE walls would require metal straps to be placed in lifts and connected to concrete wall panels. The straps could be in conflict with foundations that would be drilled into the MSE retained section of the elevated roadway. In addition, removing the concrete panels (during the subsequent construction phase) could result in failure of the embankment. If the concrete panels are left in-place, future differential settlement issues could occur at the embankment interface after project completion. Other options that would include panel and strap systems could result in similar issues.

Reinforced soil slope options with geogrid would likely result in flatter slopes. The slope face could be stabilized with light weight gunite (shotcrete) or concrete. However, this could also result in conflicts with lighting and sign structure foundations.

"Pillow-Type" geo-fabric wall systems have successfully been used on previous ADOT projects. This retaining system would include geo-fabric wrapped around the exposed face of the embankment slope and embedded underneath the elevated roadway. These systems are typically constructed in maximum 2' lifts for the entire height of the embankment. Since the height of the temporary slope could vary up to approximately 30', lift thicknesses less than 2' may be required.

4.14 BNSF RAILWAY

The construction of the Preferred Alternative will require extensive coordination, design approvals and a railroad agreement with the BNSF Railway. BNSF Railway coordination shall be conducted through ADOT's Utility and Railroad Engineering Section.

An early action item during the final design phase will be to conduct an on-site diagnostic meeting with representatives from ADOT U&RR, BNSF and the ACC. This meeting will outline the requirements for the final crossing design, the process to be followed to obtain design reviews from BNSF, permitting and fee requirements, and the approval process. Because of the length of time required for the design and approval process, the design of the bridges over the BNSF Railway will need to be accelerated to the 95% design level early in the final design process.

4.15 LANDSCAPING AND AESTHETICS

The landscaping and aesthetic concept will be developed in coordination with ADOT Roadside Development Section, ADOT Central District, and City of Phoenix. City of Phoenix Street Department staff have indicated the city does not anticipate requesting enhancements to the standard ADOT approach.

4.16 TRANSIT FACILITIES

The City of Phoenix is currently planning the implementation of Bus Rapid Transit (BRT) along 35th Avenue from Cheryl Avenue to Van Buren Street. This project has assumed that the future BRT would operate in the middle of 35th Avenue (center running). 35th Avenue will accommodate future, separate lanes for Bus Rapid Transit (BRT), buffers between the BRT lanes and the vehicle travel lanes, and a flush median between the BRT lanes. A BRT station will be located on 35th Avenue immediately north of Indian School Road. Based on center running operation, 35th Avenue will include a raised median for the BRT station platform, separate BRT lanes, buffers between the BRT lanes and the vehicle travel lanes, and single left-turn lanes on each side of the station. Coordination with the on-going City of Phoenix BRT project will be required during final design to revise the design to match the BRT project and to coordinate construction phasing, timing, and traffic control.

The retaining walls along Indian School Road will be offset to account for a potential, future high-capacity transit (HCT) route along Indian School Road. The Indian School Road bridge over Grand Avenue and the BNSF Railway will be constructed to its full width to accommodate the potential, future HCT. The future project may need to widen/reconstruct portions of the Indian School Road approach roadways. Although the potential HCT mode has not been selected, the geometric requirements for a light-rail transit (LRT) station are more conservative than bus rapid transit and therefore were used to set the Indian School Road geometrics for a potential, future station located east of 35th Avenue.

Local bus routes 35 and 41 will continue to operate and bus stops/pull-outs will be constructed in each direction of travel on 35th Avenue and on Indian School Road.

4.17 BICYCLE AND PEDESTRIAN FACILITIES

The Preferred Alternative will include 6' outside shoulders on both 35th Avenue and Indian School Road which will be marked for exclusive bicycle use per City of Phoenix criteria. These shoulders/bike lanes will be carried through the project limits and will transition back to match existing conditions which do not contain shoulders/bike lanes.

The Preferred Alternative will include 8' sidewalks generally along both sides of 35th Avenue and Indian School Road. A 6' sidewalk will be provided along the north side of Grand Avenue. Sidewalk/pedestrian connectivity will be provided from both Indian School Road and 35th Avenue to Grand Avenue. Two high-intensity activated crosswalk (HAWK) beacons will be included; one along the eastbound entrance ramp and one along the westbound exit ramp. The sidewalks for the Preferred Alternative are shown on the roll plots in Appendix C.

4.18 ON-GOING PROJECTS

The City of Phoenix has two on-going projects that overlap with this project: a safety project on 35th Avenue from I-10 to Camelback Road that is in the design phase, and a BRT project on 35th Avenue from Cheryl Avenue to Van Buren Street that is in the planning/pre-design phase. Coordination will be required with both projects during the final design phase. See section 4.16 for more information about the BRT project. The City of Phoenix safety project will generally exclude the portion of 35th Avenue from Clarendon Avenue to Glenrosa Avenue. As part of the safety project, the City of Phoenix will install a HAWK at the 35th Avenue/Glenrosa Avenue intersection. The signal equipment can be repurposed by ADOT.

5.0 ITEMIZED ESTIMATE OF PROBABLE COSTS

5.1 ORDER-OF-MAGNITUDE PROJECT COST ESTIMATE

The order-of-magnitude estimate of project cost for the Preferred Alternative is shown in **Table 32**. The ADOT Five-Year Transportation Facilities Construction Program (2024-2028) includes $90,766,575 for right-of-way acquisition, and $106,355,570 for construction in Fiscal Year 2025.

The estimated unit costs are based on unit prices obtained from recent ADOT bid results. The following is a list of assumptions that are reflected in the cost estimate for the Preferred Alternative:

- The estimated costs for right-of-way were provided by ADOT's Right-of-Way Group.
- $1.0 million for BNSF Railway costs.
- Indirect Cost Allocation (ICAP) of 10.7%.
- Percentages for erosion control, maintenance and protect of traffic, construction engineering, etc. are as shown in the estimate.
- Utility relocation concepts have not been developed by the utility companies and therefore a utility relocation cost has not been developed. An assumed cost of $20 million is included in the estimate.
- The earthwork factor applied to the project excavation is estimated to be 10% shrink. The assumed shrink factor was applied to the excavation material that is anticipated to be used for embankment. No additional earthwork quantities were included in anticipation of hazardous materials or unsuitable material sites.
- Environmental mitigation costs are not included in this cost estimate.

Table 32 – Order of Magnitude Estimate for the Preferred Alternative

Item	Description	Unit	Quantity	Unit Price	Amount
2020020	REMOVAL OF CONCRETE CURB	L.FT.	9,300	$8.00	$74,400
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	21,430	$10.00	$214,300
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS AND SLABS	SQ.FT.	114,151	$5.00	$570,755
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	2,137	$35.00	$74,795
2020029	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	78,680	$6.00	$472,080
2020041	REMOVAL OF PIPE	L.FT.	2,944	$30.00	$88,320
2020054	REMOVE (CATCH BASINS)	EACH	52	$500.00	$26,000
2020153	REMOVE (INDIAN SCHOOL ROAD STRUCTURE)	L.SUM	1	$900,000.00	$900,000
2020154	REMOVE (INDIAN SCHOOL ROAD WB TO GRAND AVE STRUCT)	L.SUM	1	$250,000.00	$250,000
2020201	SAWCUT	L.FT.	8,677	$2.00	$17,354
2030301	ROADWAY EXCAVATION	CU.YD.	18,264	$15.00	$273,960
2030401	DRAINAGE EXCAVATION	CU.YD.	60,833	$12.00	$729,996
2030901	ROADWAY EMBANKMENT (BORROW)	CU.YD.	489,100	$17.00	$8,314,700
3030022	AGGREGRATE BASE, CLASS 2	CU.YD.	28,696	$150.00	$4,304,400
4040111	TACK COAT	TON	48	$800.00	$38,400
4040116	APPLY TACK COAT	HOUR	88	$300.00	$26,400
4040230	ASPHALT BINDER (PG-XX)	TON	2,220	$900.00	$1,998,000
4160004	ASPHALTIC CONCRETE	TON	44,381	$75.00	$3,328,575
4160031	MINERAL ADMIXTURE	TON	418	$90.00	$37,620
5012518	STORM DRAIN PIPE 18"	L.FT.	5,359	$100.00	$535,900
5012524	STORM DRAIN PIPE 24"	L.FT.	3,780	$130.00	$491,400
5012530	STORM DRAIN PIPE 30"	L.FT.	439	$170.00	$74,630
5014118	FLARED END SECTION, 18" (C-13.20)	EACH	15	$2,000.00	$30,000
5014124	FLARED END SECTION, 24" (C-13.20)	EACH	5	$2,500.00	$12,500
5014130	FLARED END SECTION, 30" (C-13.20)	EACH	5	$3,000.00	$15,000
5030001	CONCRETE CATCH BASIN (C-15.10) SINGLE, H=8' OR LESS	EACH	2	$8,000.00	$16,000
5030023	CONCRETE CATCH BASIN (C-15.20) ONE 7.5' WING H<8'	EACH	3	$10,000.00	$30,000
5030272	CATCH BASIN,TYPE M-1 (L=6') (PHOENIX DET. P-1569)	EACH	107	$8,500.00	$909,500
5030605	CONCRETE CATCH BASIN (C-15.80)	EACH	2	$9,000.00	$18,000
5030607	CONCRETE CATCH BASIN (Detail DO - Bleedoff Structure)	EACH	7	$9,000.00	$63,000
5050065	MANHOLE (MAG DET. 520 & 522)	EACH	40	$10,000.00	$400,000
6016091	HEADWALL (24IN DROP INLET HDWL)(C-15.75)	EACH	1	$40,000.00	$40,000
703X100	SIGNING	L.SUM	1	$178,000.00	$178,000
704X100	PAVEMENT MARKINGS	L.SUM	1	$221,500.00	$221,500
733X001	TRAFFIC SIGNALS	L.SUM	1	$1,160,000.00	$1,160,000
736X007	ROADWAY LIGHTING	L.SUM	1	$1,282,000.00	$1,282,000
80300XX	LANDSCAPING (SIDEWALK STRIP)	SQ.YD.	4,210	$32.00	$134,720
80300XX	LANDSCAPING (MISC)	SQ.YD.	39,700	$36.00	$1,429,200
9080101	CONRETE CURB AND GUTTER (MAG DETAIL 220, TYPE A)	L.FT.	29,003	$30.00	$870,090
9080085	CONCRETE CURB AND GUTTER (C-05.10) (TYPE D)	L.FT.	3,202	$30.00	$96,060
9080108	CONCRETE CURB (MAG DETAIL 222, TYPE A)	L.FT.	7,918	$25.00	$197,950
9080109	CONCRETE CURB (C-05.10) (Type A)	L.FT.	3,781	$25.00	$94,525
9080242	CONCRETE SIDEWALK (COP STD DTL P1230)	SQ.FT.	163,109	$10.00	$1,631,090
9080243	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	8,459	$10.00	$84,590
9080286	CONCRETE SIDEWALK RAMP (DUAL)	EACH	16	$6,000.00	$96,000
9080287	CONCRETE SIDEWALK RAMP (SINGLE)	EACH	21	$4,000.00	$84,000
9080288	CONCRETE SIDEWALK RAMP (LONG)	EACH	3	$6,000.00	$18,000
9080301	CONCRETE DRIVEWAY ENTRANCE (COP STD DTL P1255)	SQ.FT.	5,693	$15.00	$85,395
9080304	DRIVEWAY (ASPHALT)	SQ.FT.	18,191	$9.00	$163,719
9100001	CONCRETE BARRIER	L.FT.	8,318	$150.00	$1,247,700
9140153	RETAINING WALL	SQ.FT.	145,529	$100.00	$14,552,900
9170001	EMBANKMENT SPILLWAY (C-4.10)	L.FT.	27	$400.00	$10,800
9170021	INLET (C-4.10) (SINGLE)	EACH	1	$7,500.00	$7,500
9210011	MEDIAN PAVING	SQ.YD.	6,158	$150.00	$923,700
9999910	STRUCTURES (INDIAN SCHOOL OVER GRAND AVE AND BNSF)	L.SUM	1	$24,648,000.00	$24,648,000
9999910	STRUCTURES (35TH AVENUE OVER GRAND AVE AND BNSF)	L.SUM	1	$19,813,125.00	$19,813,125
9999910	STRUCTURES (WB EXIT UNDER 35TH AVENUE)	L.SUM	1	$2,918,400.00	$2,918,400
				SUBTOTAL A (ITEM TOTAL)	**$96,325,000**

	PROJECT WIDE				
	Maintenance and Protection of Traffic (7%)	COST			$6,743,000
	Dust and Water Palliative (0.75%)	COST			$722,000
	Quality Control (1.0%)	COST			$963,000
	Construction Surveying (1.5%)	COST			$1,445,000
	Erosion Control (1.0%)	COST			$963,000
	Mobilization (8% of all construction items)	COST			$12,438,000
	Unidentified Items (30% of Item Total and Project Wide Subtotal)	COST			$35,880,000
				SUBTOTAL B	**$155,479,000**
	BELOW THE LINE				
	Post Design Services (1%)	COST			$1,555,000
	Construction Engineering (8%)	COST			$12,438,000
	Construction Contingencies (5%)	COST			$7,774,000
	Indirect Cost Allocation (10.7%)	COST			$18,965,000
				SUBTOTAL BASE YEAR CONSTRUCTION COST	$196,211,000
	Labor and Material Inflation to Fiscal year 2025				$28,254,100
				TOTAL ESTIMATED CONSTRUCTION COST	**$224,465,400**
	DESIGN				
	Engineering Design (8% of all items)	COST			$15,697,000
	Indirect Cost Allocation (10.7%)	COST			$1,680,000
				TOTAL ESTIMATED DESIGN COST	**$17,377,000**
	UTILITY				
	Prior Rights Utility Relocation	COST			$20,000,000
	BNSF Coordination	COST			$1,000,000
	Indirect Cost Allocation (10.7%)	COST			$2,247,000
				TOTAL ESTIMATED UTILITY RELOCATION COST	**$23,247,000**
	RIGHT-OF-WAY				
	Right-of-Way	COST			$95,915,500
	Indirect Cost Allocation (10.7%)	COST			$10,263,000
				TOTAL ESTIMATED R/W COST	**$106,175,500**
				TOTAL ESTIMATED CONSTRUCTION COST	**$224,465,400**
				TOTAL ESTIMATED DESIGN COST	**$17,377,000**
				TOTAL ESTIMATED UTILITY RELOCATION COST	**$23,247,000**
				TOTAL ESTIMATED R/W COST	**$106,175,500**
				TOTAL ESTIMATED PROJECT COST	**$371,264,900**

6.0 AASHTO CONTROLLING DESIGN CRITERIA

American Association of State Highway and Transportation Officials (AASHTO) Controlling Design Criteria have been reviewed for the existing roadways and documented in the AASHTO Controlling Criteria Report included in Appendix G. Existing features that do not meet current AASHTO (2018 Green Book) recommended guidelines are indicated below.

The Arizona Department of Transportation (ADOT) Design Criteria has also been reviewed for US 60 (Grand Avenue). Existing and proposed features that do not meet current *ADOT Roadway Design Guidelines* are also indicated below.

6.1 AASHTO NON-CONFORMING DESIGN ELEMENTS

The non-conforming AASHTO design elements that have been identified would be removed with the project.

6.2 AASHTO DESIGN EXCEPTIONS

No AASHTO design exceptions are anticipated.

6.3 ADOT RDG NON-CONFORMING DESIGN ELEMENTS

Non-conforming ADOT design elements that would not be upgraded as part of this project are listed below.

The following existing lane widths to do meet current ADOT requirements:

- US 60, travel lane, 11 feet < 12 feet

6.4 ADOT DESIGN EXCEPTIONS & VARIANCES

An ADOT design variance request will be requested for the non-conforming design elements listed above in section 6.3.

6.5 CITY OF PHOENIX NON-CONFORMING DESIGN ELEMENTS

Non-conforming City of Phoenix design elements that would not be upgraded as part of this project are listed below.

The following minimum vertical grades do not meet current City of Phoenix requirements:

- Glenrosa Avenue, 0.20% < 0.40%
- Glenrosa Avenue, 0.38% < 0.40%
- East Frontage Road, 0.21% < 0.40%
- East Frontage Road, 0.15% < 0.40%

The following tangent lengths approaching an intersection do not meet current City of Phoenix requirements:

- 35th Avenue approaching Glenrosa Avenue, 0 feet < 150 feet
- 35th Avenue approaching Clarendon Avenue, 90 feet < 150 feet
- Indian School Road approaching 33rd Avenue, 0 feet < 250 feet

The following design speeds do not meet current City of Phoenix requirements:

- 35th Avenue, 45 mph < 50 mph
- Indian School Road, 45 mph < 50 mph

6.6 CITY OF PHOENIX DESIGN EXCEPTIONS & VARIANCES

Approval will be requested from the City of Phoenix for the non-conforming design elements listed above in section 6.5.

7.0 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONCERNS

7.1 ENVIRONMENTAL DOCUMENTATION

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Arizona Department of Transportation (ADOT) pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated April 16, 2019, and executed by the Federal Highway Administration (FHWA) and ADOT.

An Environmental Assessment (EA) was prepared for this project. The Final EA and a Finding of No Significant Impact were approved by ADOT on June 1, 2024. With the completion of the Final EA and the issuance of a Finding of No Significant Impacts by ADOT, the NEPA requirements for this project have been met.

7.2 MITIGATION MEASURES

Environmental mitigation measures are intended to avoid, minimize, or mitigate impacts on environmental resources. The following mitigation measures are not subject to change without prior written approval from ADOT Environmental Planning.

Arizona Department of Transportation Design Responsibility

- The Arizona Department of Transportation will continue to facilitate opportunities for public engagement in accordance with the attached *Grand-35 Project Mitigation Plan* (Appendix D of the Final Environmental Assessment).
- The Arizona Department of Transportation in coordination with the contractor will develop and implement a Business Assistance Program during construction that will support businesses within the project vicinity, provide assistance with messaging and marketing for businesses, and evaluate traffic control measures on a routine basis.
- During final design, the Arizona Department of Transportation will develop traffic control specifications that will outline traffic control measures and construction sequencing. Before the traffic control specifications are finalized, the Arizona Department of Transportation will share the details with the public and provide an opportunity for input.
- As part of final design and construction phases, the Arizona Department of Transportation will implement and follow the requirements outlined in the *Grand-35 Project Mitigation Plan* (Appendix D of the Final Environmental Assessment).
- During final design the Arizona Department of Transportation will continue coordination with BNSF Railway Company and the Arizona Corporation Commission regarding final crossing design requirements, permitting, and approval processes.
- The Maricopa County Floodplain Manager will be provided an opportunity to review and comment on the design plans.
- The Department project manager will contact the Arizona Department of Transportation, Environmental Planning, Hazardous Materials Coordinator (602.920.3882 or 602.712.7767) during final design to determine the need for additional site assessment or asbestos sampling.

Arizona Department of Transportation Central District Responsibilities

- During final design, the Arizona Department of Transportation will develop traffic control specifications that will outline traffic control measures and construction sequencing. Before the traffic control specifications are finalized, the Arizona Department of Transportation will share the details with the public and provide an opportunity for input.
- The Arizona Department of Transportation will coordinate with the City of Phoenix to keep transit stops open and accessible during construction.

Arizona Department of Transportation Right-of-Way Responsibilities

- As part of final design and construction phases, the Arizona Department of Transportation will implement and follow the requirements outlined in the *Grand-35 Project Mitigation Plan* (Appendix D of the Final Environmental Assessment)

Contractor Responsibilities

- With the exception of temporary, short-term closures (less than 3 hours), the contractor shall maintain driveway access to all businesses and residences throughout the construction. If a property has multiple driveways, at least one shall remain open at all times.
- The contractor shall provide the Arizona Department of Transportation resident engineer and Arizona Department of Transportation Communications with advance notification of roadway restrictions and closures. The advance notification shall be provided with adequate time for the Arizona Department of Transportation to approve the contractor's traffic control plans and for ADOT to coordinate notification to the public prior to the roadway restrictions and closures. Public notification methods may include, but are not limited to, email alerts, media alerts, social media, direct mailings and canvassing to area businesses and residents, and newspaper notices.
- The contractor shall be responsible for placing variable message signs to provide advance driver notification of restrictions and closures/detours, and providing construction notices to affected properties in advance of any driveway restrictions/closures, or other construction activities within an easement across their property or that will affect their property access or utility service.
- The contractor shall be responsible for implementing a Construction Advisory Board to evaluate traffic control measures, signage, and advance notifications on a routine basis, in accordance with the requirements outlined in the *Grand-35 Project Mitigation Plan* (Final Environmental Assessment Appendix D).
- The contractor shall follow the traffic control specifications provided by the Arizona Department of Transportation, and will communicate any changes to the public prior to construction.
- The contractor, in coordination with the Arizona Department of Transportation, will work to implement and oversee a Business Assistance Program during construction.

APPENDIX A– Traffic Re-Routing Memorandum

Memorandum

Date: April 14, 2023

To: Project File

From: Rodney Bragg, P.E.

Subject: Design Concept Report and Environmental Study
US 60 (Grand Ave)\35th Ave\Indian School Rd
F0272 01L
Traffic Re-Routing

1.0 INTRODUCTION

Background

The 35th Avenue/Indian School Road/Grand Avenue Design Concept Report is investigating concepts to improve safety and traffic operations at the subject intersection. Numerous concepts were investigated that would include reconfiguring the existing 6-legged intersection to create a new intersection between 35th Avenue and Indian School Road. The proposed new intersection would be elevated above the existing Grand Avenue and direct access between 35th Avenue and Grand Avenue would be removed. Access between Indian School Road and Grand Avenue would be provided via 33rd Avenue and two ramps: (1) westbound Indian School Road to north-westbound Grand Avenue; and (2) Grand Avenue to eastbound Indian School Road. **Figure 1** shows the overall design concept.

Purpose of Memorandum

This memorandum will investigate the re-routing of trips to mitigate the lost connectivity and the operational effects of the re-routing. This memorandum is not intended to document all traffic analysis of the Build Alternative or the final re-routing of traffic volumes. It is prepared to investigate the need for additional mitigation (additional connector roads) to replace access between the three primary roadways.

2.0 TRAFFIC VOLUMES

Figure 2 and **Table 1** show the projected 2050 peak hour traffic volumes that would need to be re-routed due to the lost connectivity. As shown in Table 1, approximately 1,200 trips in both the AM and PM peak hours would need to be re-routed. This re-routing does not account for any changes in traffic volumes due to right-of-way acquisitions or business relocations. The 2050 No-Build volumes were simply re-routed through the network to assess the need for additional mitigation to replace access between the three primary roadways.

The peak hour traffic volumes shown in Table 1 were re-routed from the 35th Avenue/Grand Avenue intersection to 33rd Avenue to restore connectivity. As part of this re-routing, trips would utilize the 33rd Avenue/Indian School Road, 33rd Avenue/Grand Avenue, and 35th Avenue/Indian School Road intersections, as needed, to provide connectivity between 35th Avenue and Grand Avenue. Examples of the re-routing are shown in **Figure 3**.

Figure 1 – Overall Design Concept

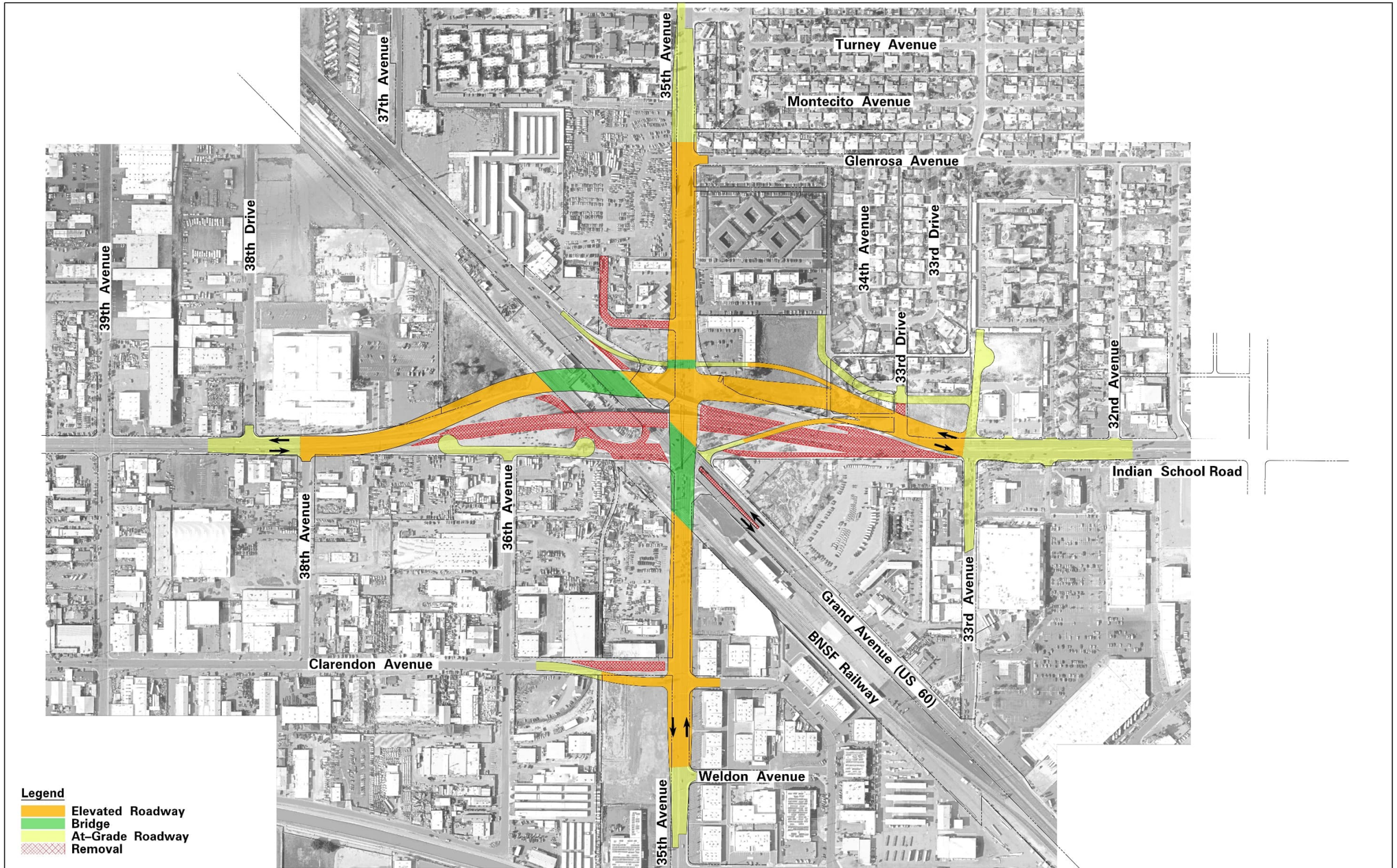


Figure 2 - 2050 Peak Hour Volumes

Figure 3 – Example Re-Routing

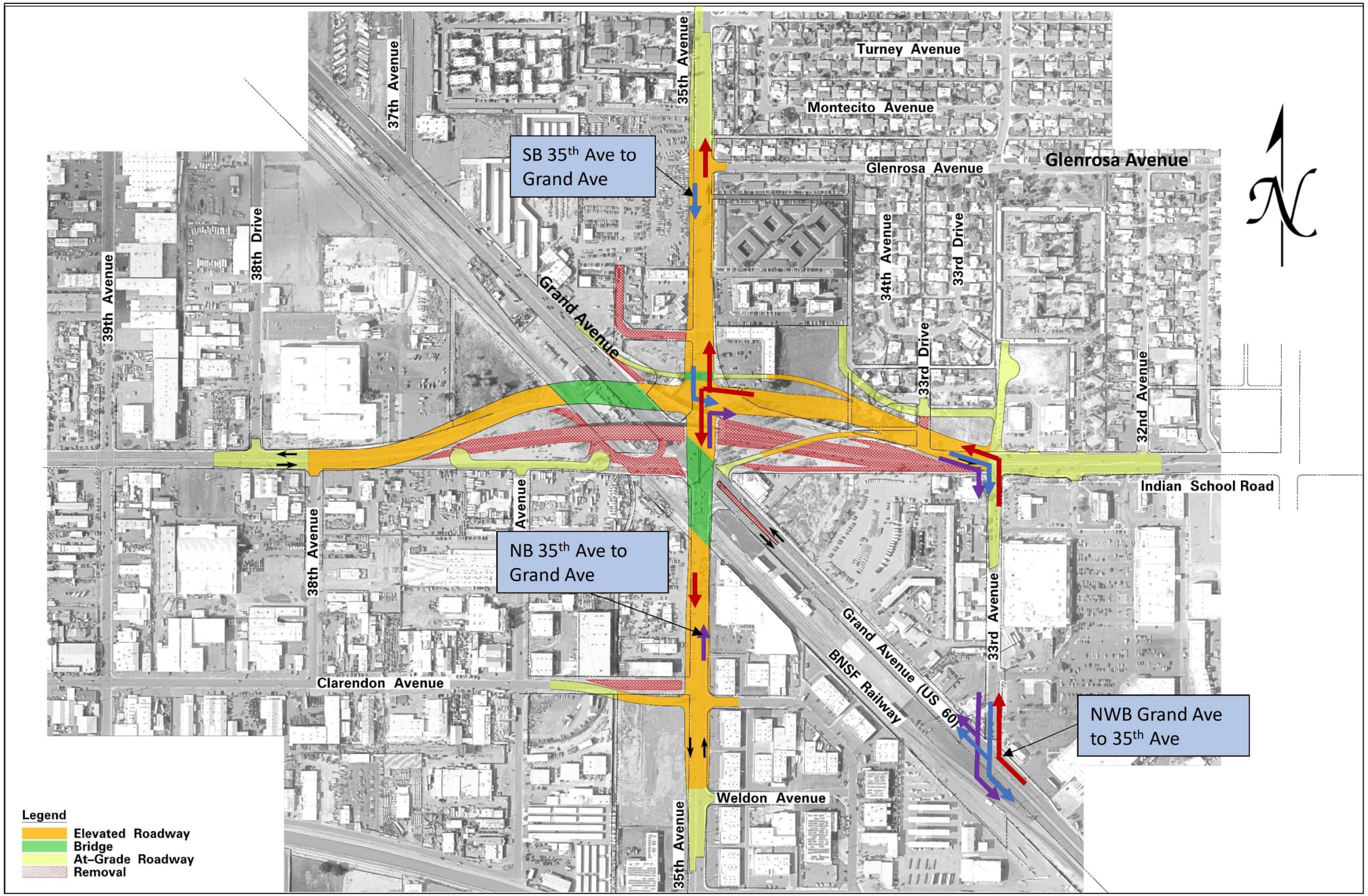


Table 1 – 2050 Peak Hour Re-Routing

Movement			2050	
			AM	PM
EB Indian School	to	NWB Grand Ave	5	30
		SEB Grand Ave	360	100
SB 35th Ave	to	NWB Grand Ave	10	20
		SEB Grand Ave	280	70
NB 35th Ave	to	NWB Grand Ave	140	250
		SEB Grand Ave	70	90
SEB Grand Ave	to	NB 35th Ave	5	10
		SB 35th Ave	140	170
		WB Indian School	40	80
NWB Grand Ave	to	NB 35th Ave	50	120
		SB 35th Ave	30	60
		WB Indian School	90	180
		Total	1,220	1,180

3.0 OPERATIONAL ANALYSIS

Following the re-routing, the 33rd Avenue/Indian School Road and 33rd Avenue/Grand Avenue intersections were analyzed in Synchro 11 using the following input assumptions:

- Peak hour factor: 0.92
- Vehicle travel speed: 40 mph
- Intersection spacing based on roadway geometrics
- Percentage of heavy vehicles: 2%
- Lane widths: 12'
- Base saturation flow rate: 1,900 vphpl for all movements
- Pedestrian movements were not included in signal timings
- Right-turn-on-red movements: These traffic movements were included in the analysis and modeled in the software
- Cycle length: Based on existing signal timings

Table 2 shows the control delays and corresponding levels-of-service established in the Highway Capacity Manual (HCM) for signalized intersections.

Table 2 – Intersection Delay and Corresponding Levels-of-Service

Level-of-Service	Control Delay (sec/veh)
A	< 10
B	10 – 20
C	20 – 35
D	35 – 55
E	55 – 80
F	> 80

Source: HCM 2010, Volume 3: pg. 18-6

Table 3 shows the resulting 2050 level-of-service (LOS) and approach delays for the 33rd Avenue/Indian School Road and 33rd Avenue/Grand Avenue intersections.

Table 3 – 2050 LOS Results

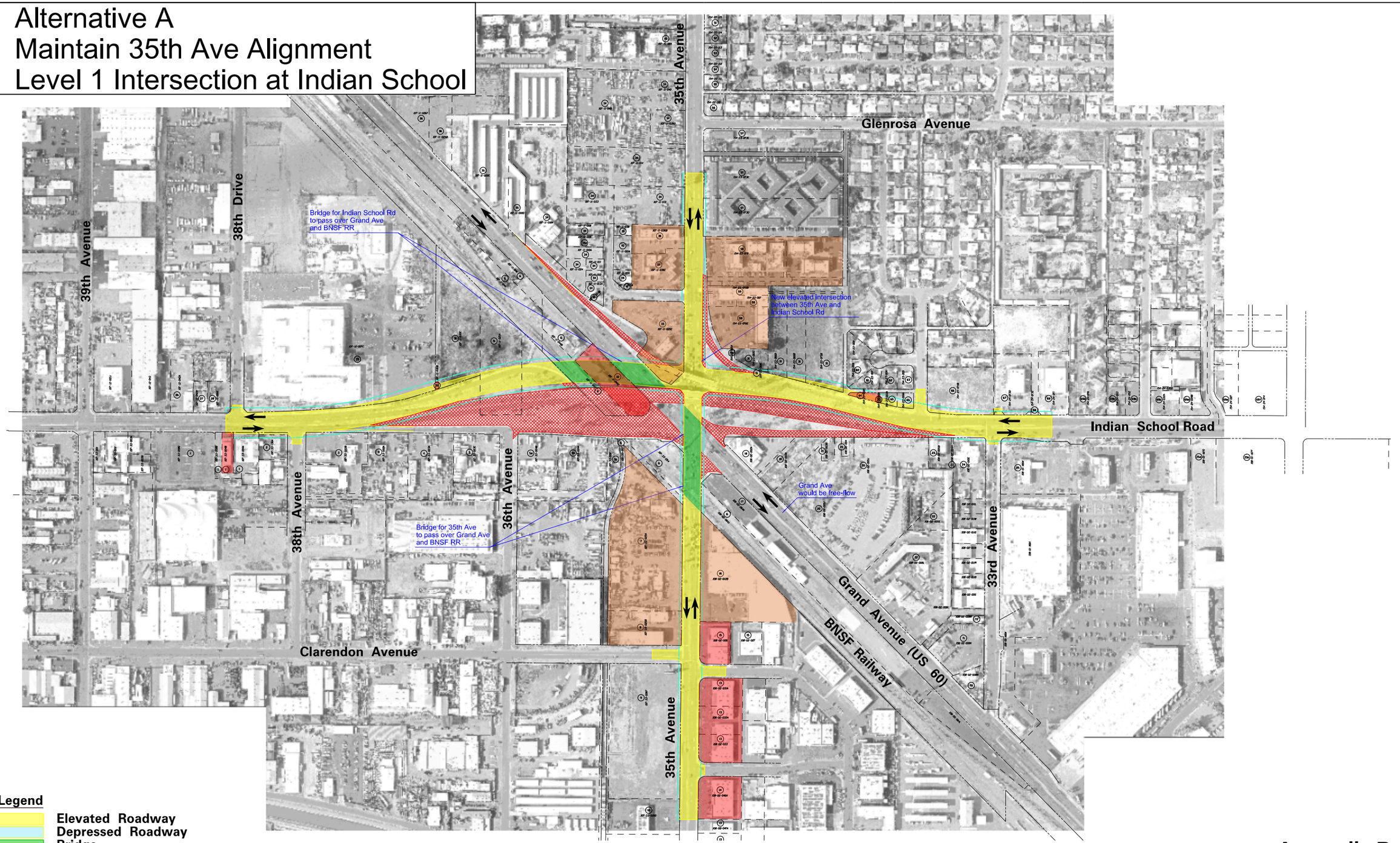
Intersection	Approach	2050 AM Peak Hr	2050 PM Peak Hr
33rd Ave & Indian School Rd	EB	354.3 (F)	159.1 (F)
	WB	87.0 (F)	391.4 (F)
	NB	36.1 (D)	929.7 (F)
	SB	58.7 (E)	508.2 (F)
	Total	**252.7 (F)**	**431.4 (F)**
33rd Ave & Grand Ave	SEB	55.9 (E)	113.9 (F)
	NWB	15.2 (B)	11.8 (B)
	SB	65.5 (E)	457.5 (F)
	Total	**53.0 (D)**	**133.5 (F)**

As shown in Table 3, one of the intersections is anticipated to operate at LOS F in the AM Peak Hour, and both intersections are anticipated to operate at LOS F in the PM Peak Hour. A total of five intersection approaches in the AM Peak Hour and six intersection approaches in the PM Peak Hour are expected to operate at LOS E or F.

Therefore, is it recommended that the project team investigate other alternatives to restore connectivity between 35th Avenue and Grand Avenue.

APPENDIX B – Tier 2A Concept Drawings

Alternative A
Maintain 35th Ave Alignment
Level 1 Intersection at Indian School



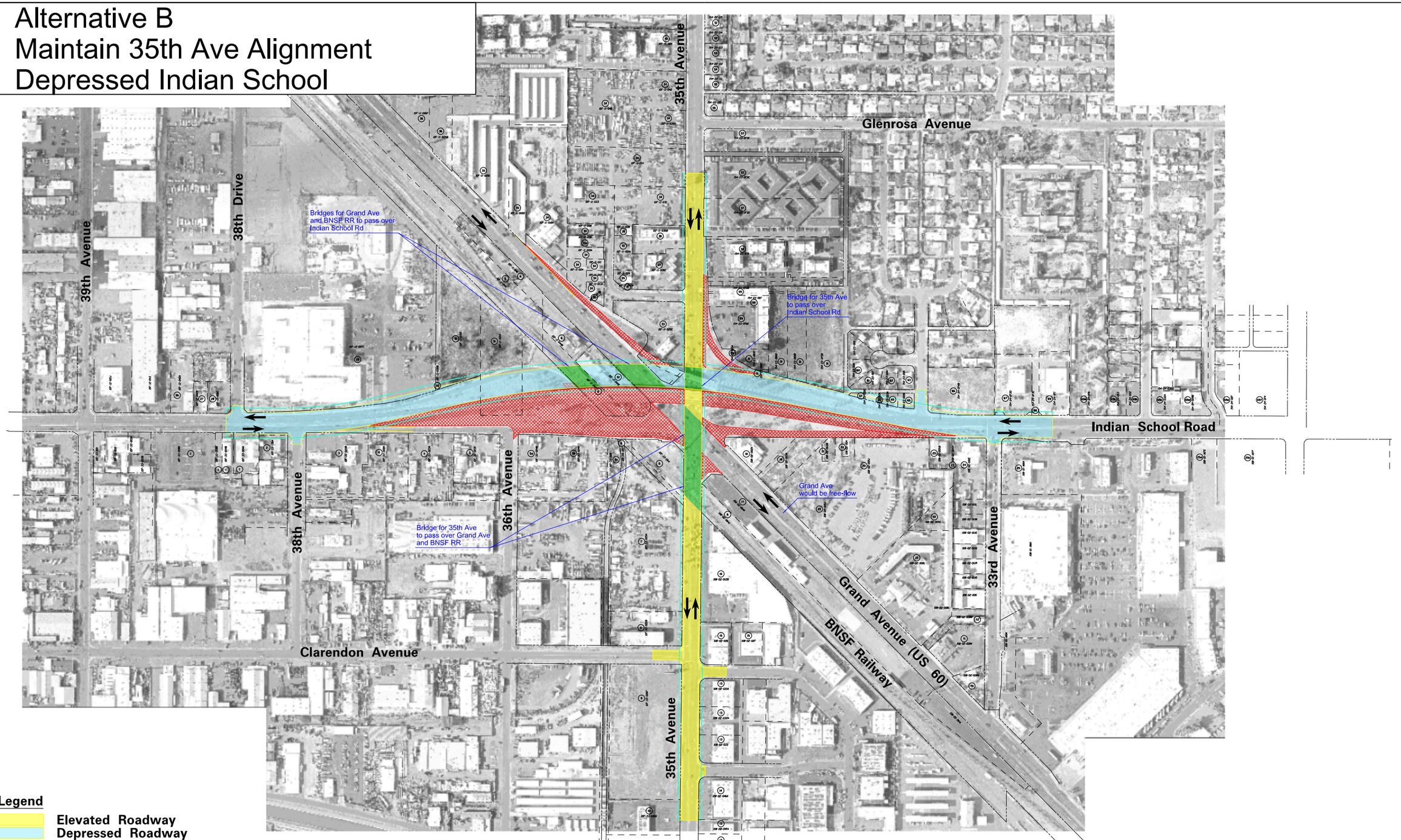
Appendix B

Alternative A
Maintain 35th Ave Alignment
Level 1 Intersection at Indian School

AECOM

5/26/2021

Alternative B
Maintain 35th Ave Alignment
Depressed Indian School



Legend

- Elevated Roadway
- Depressed Roadway
- Bridge
- Removal

Appendix B

Alternative B
Maintain 35th Ave Alignment
Depressed Indian School

AECOM

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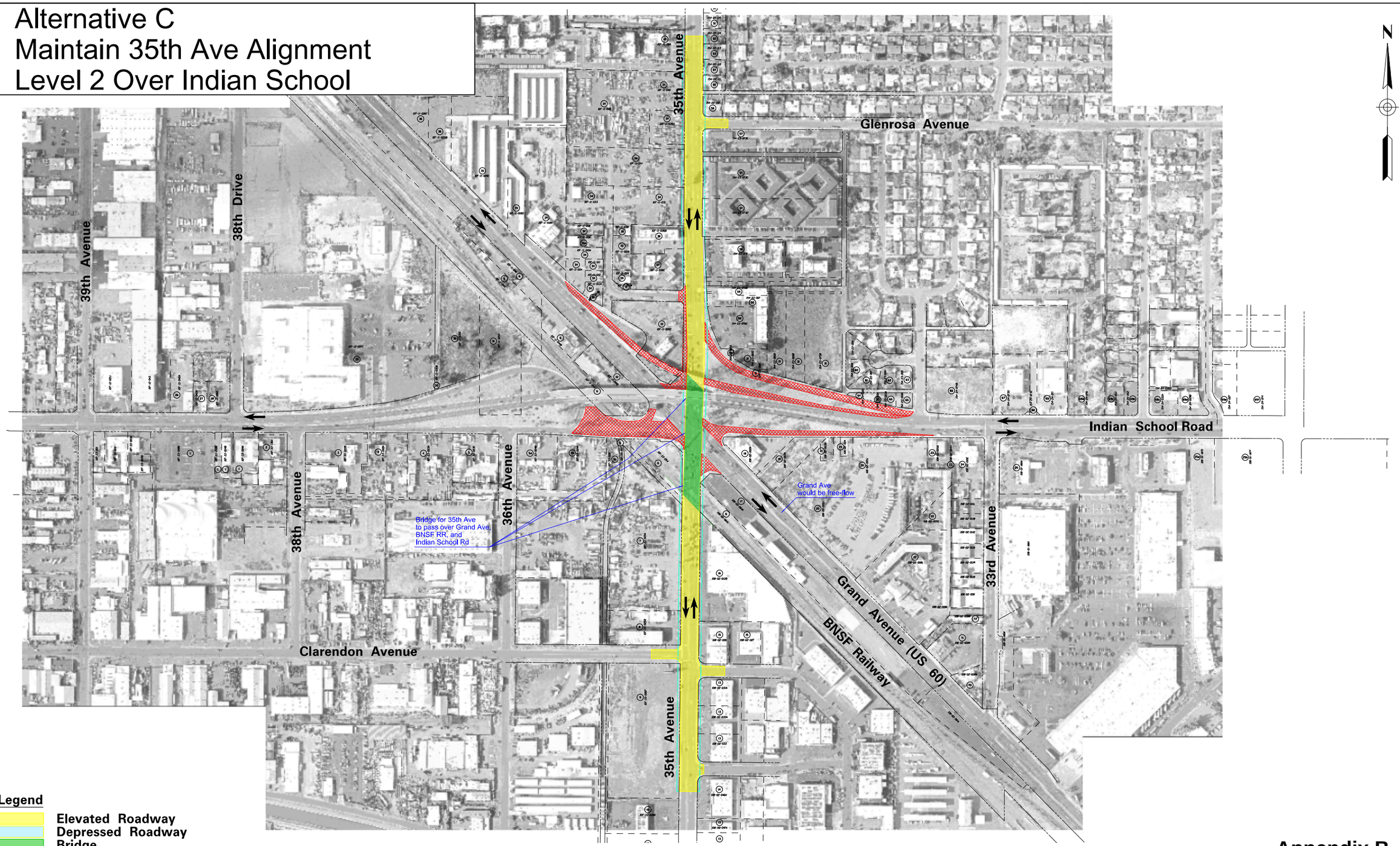
5/26/2021

Alternative C
Maintain 35th Ave Alignment
Level 2 Over Indian School



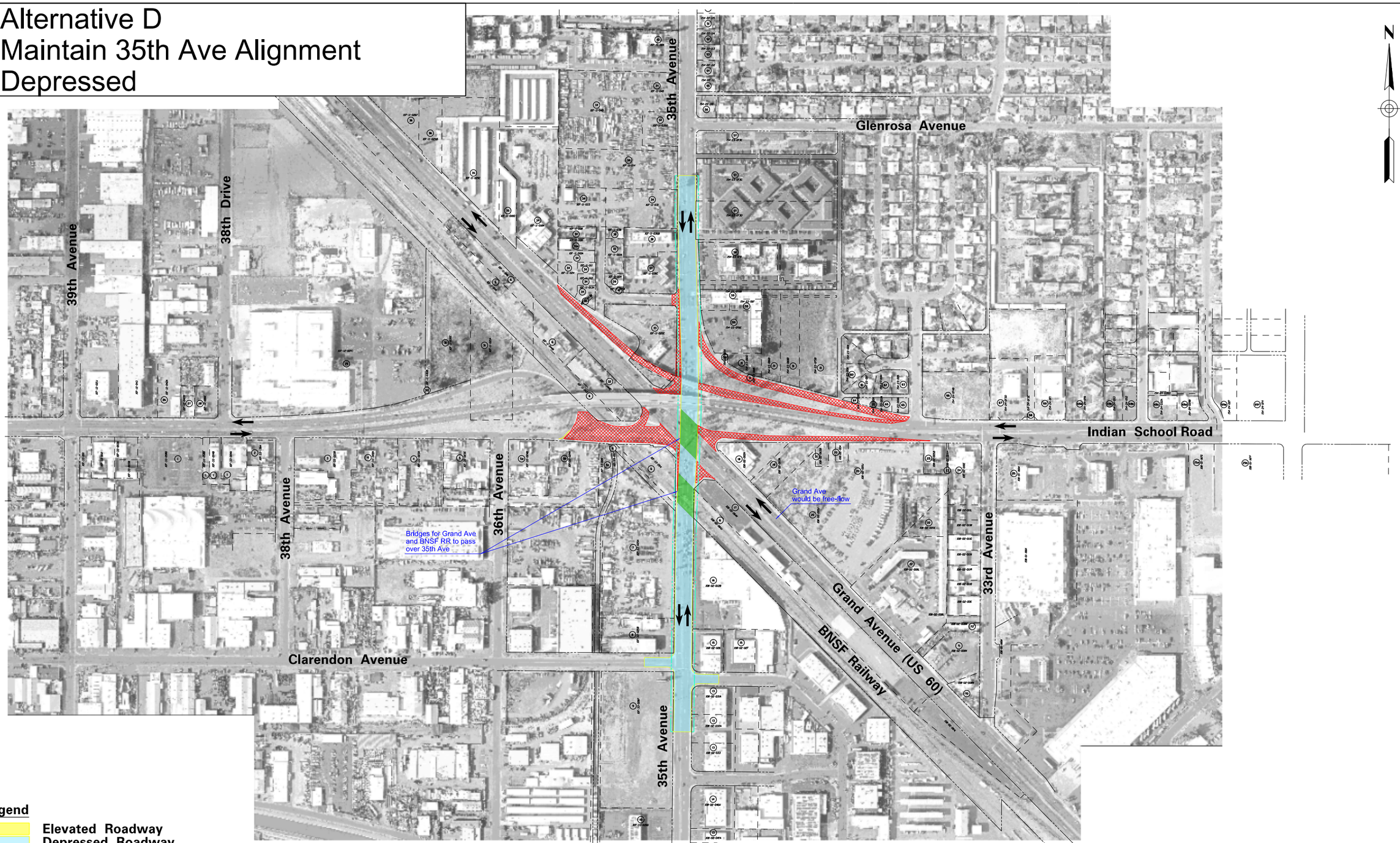
Appendix B

Alternative C
Maintain 35th Ave Alignment
Level 2 Over Indian School

AECOM

5/26/2021

Alternative D
Maintain 35th Ave Alignment
Depressed



Legend

- Elevated Roadway
- Depressed Roadway
- Bridge
- Removal

Appendix B

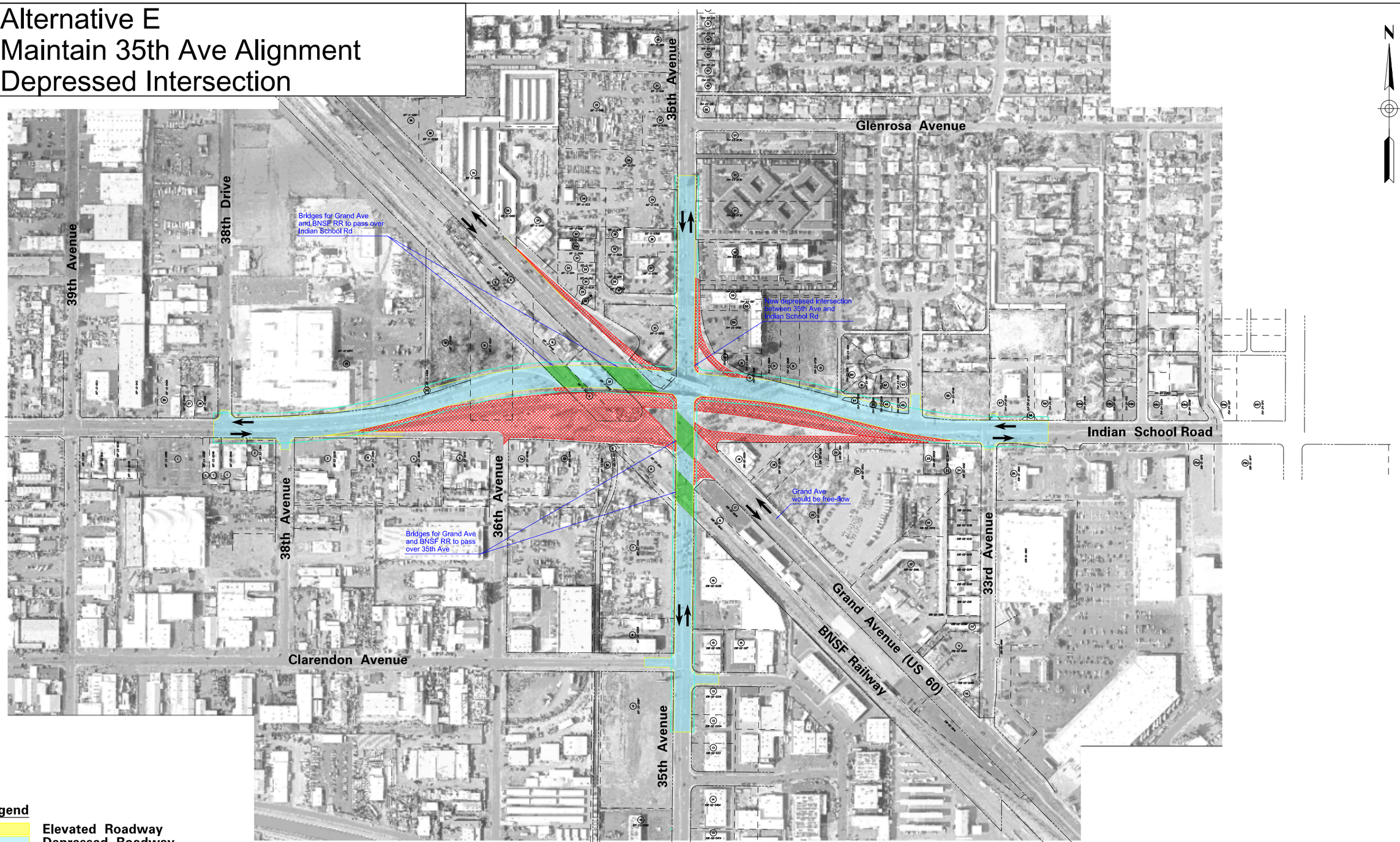
Alternative D
Maintain 35th Ave Alignment
Depressed

AECOM

c:\pwworking\aecom_ds19_na\joe.gillis\aecom.com\dms\249\Alt-D.dgn

5/26/2021

Alternative E
Maintain 35th Ave Alignment
Depressed Intersection



Legend

- Elevated Roadway
- Depressed Roadway
- Bridge
- Removal

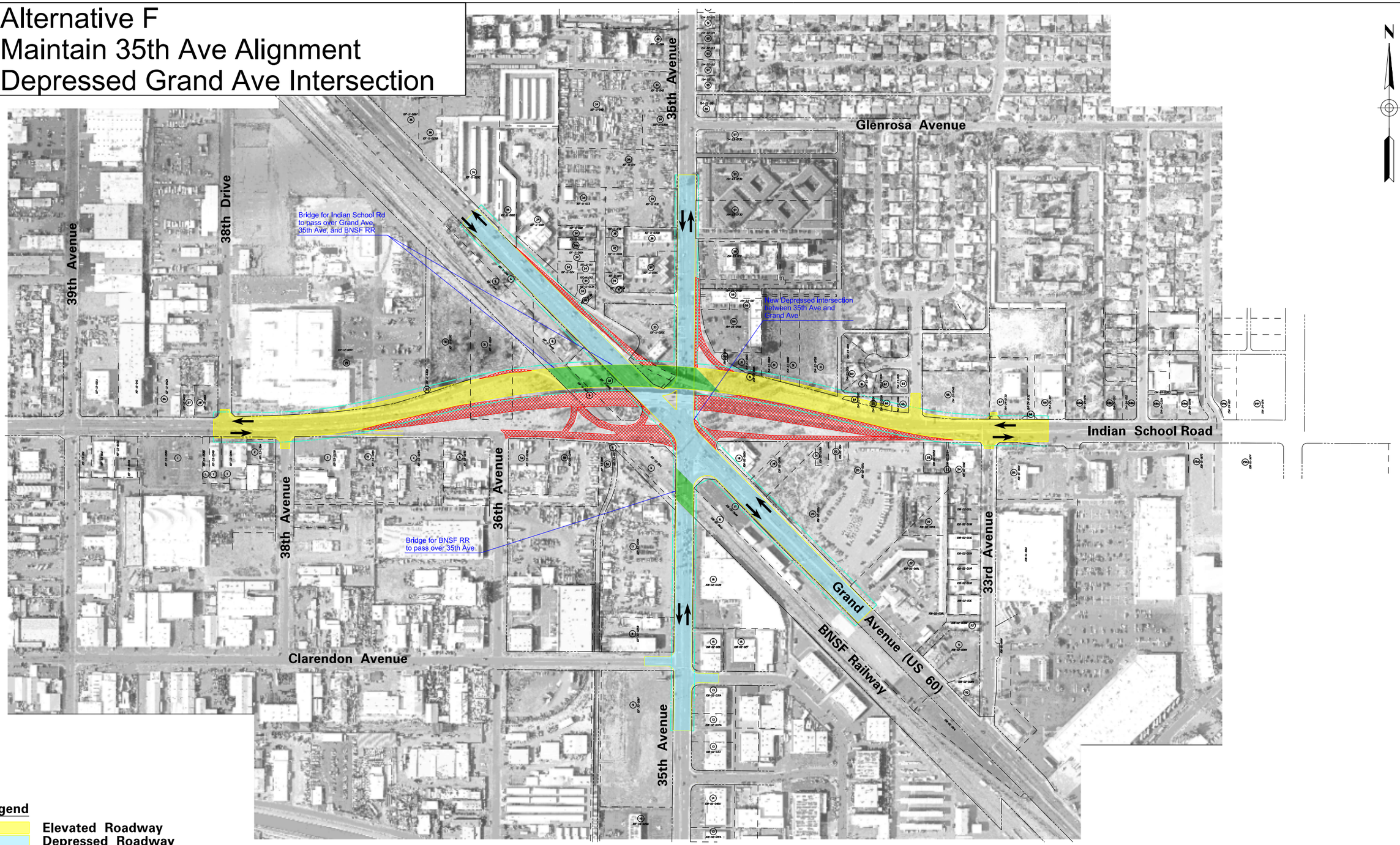
Appendix B

Alternative E
Maintain 35th Ave Alignment
Depressed Intersection

AECOM

5/26/2021

Alternative F
Maintain 35th Ave Alignment
Depressed Grand Ave Intersection



Legend

- Elevated Roadway
- Depressed Roadway
- Bridge
- Removal

Appendix B

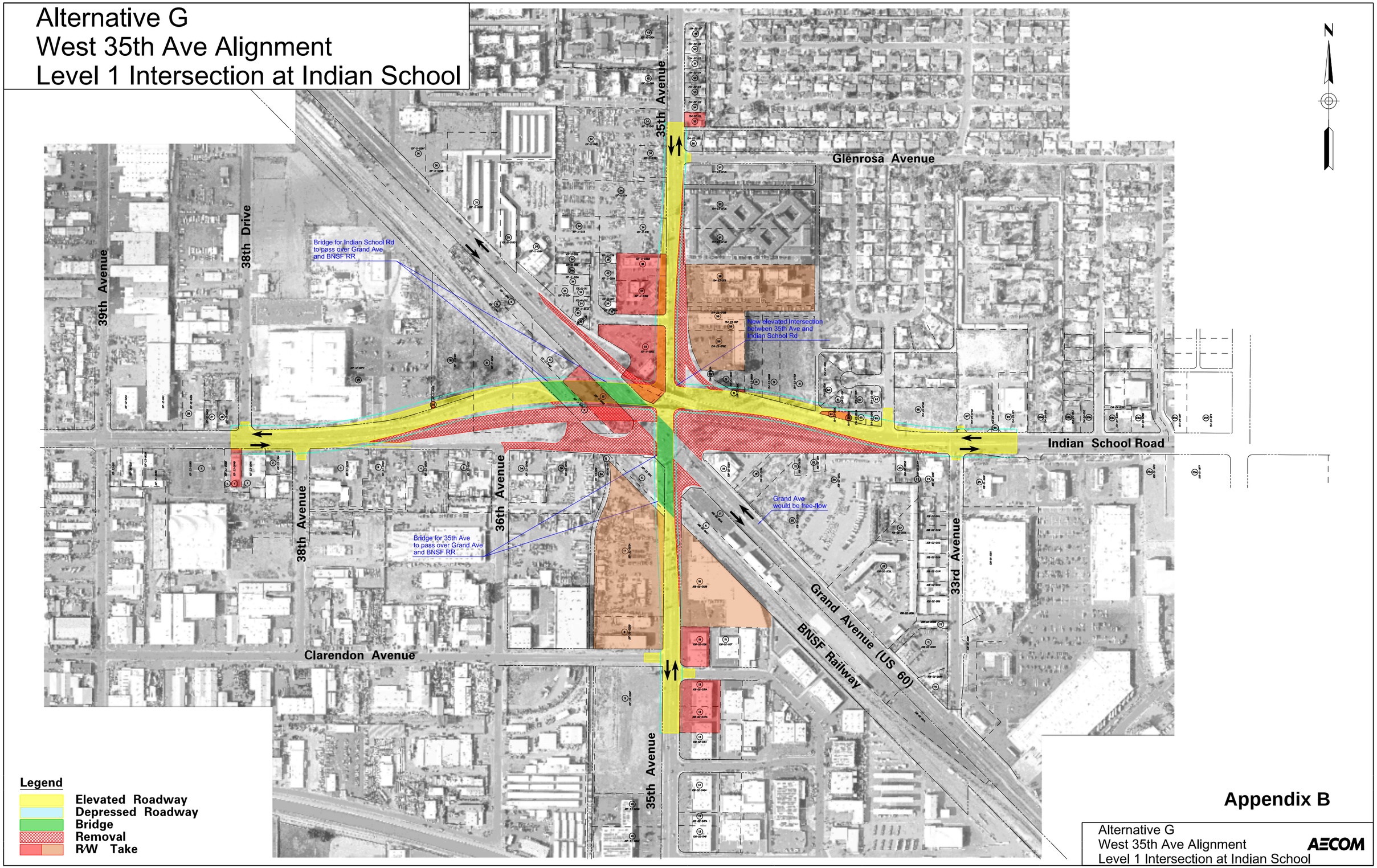
Alternative F
Maintain 35th Ave Alignment
Depressed Grand Ave Intersection

AECOM

c:\pwworking\aecom_ds19_nd\joe.gillis@aecom.com\dms12491\Alt-F.dgn

5/26/2021

Alternative G
West 35th Ave Alignment
Level 1 Intersection at Indian School



Appendix B

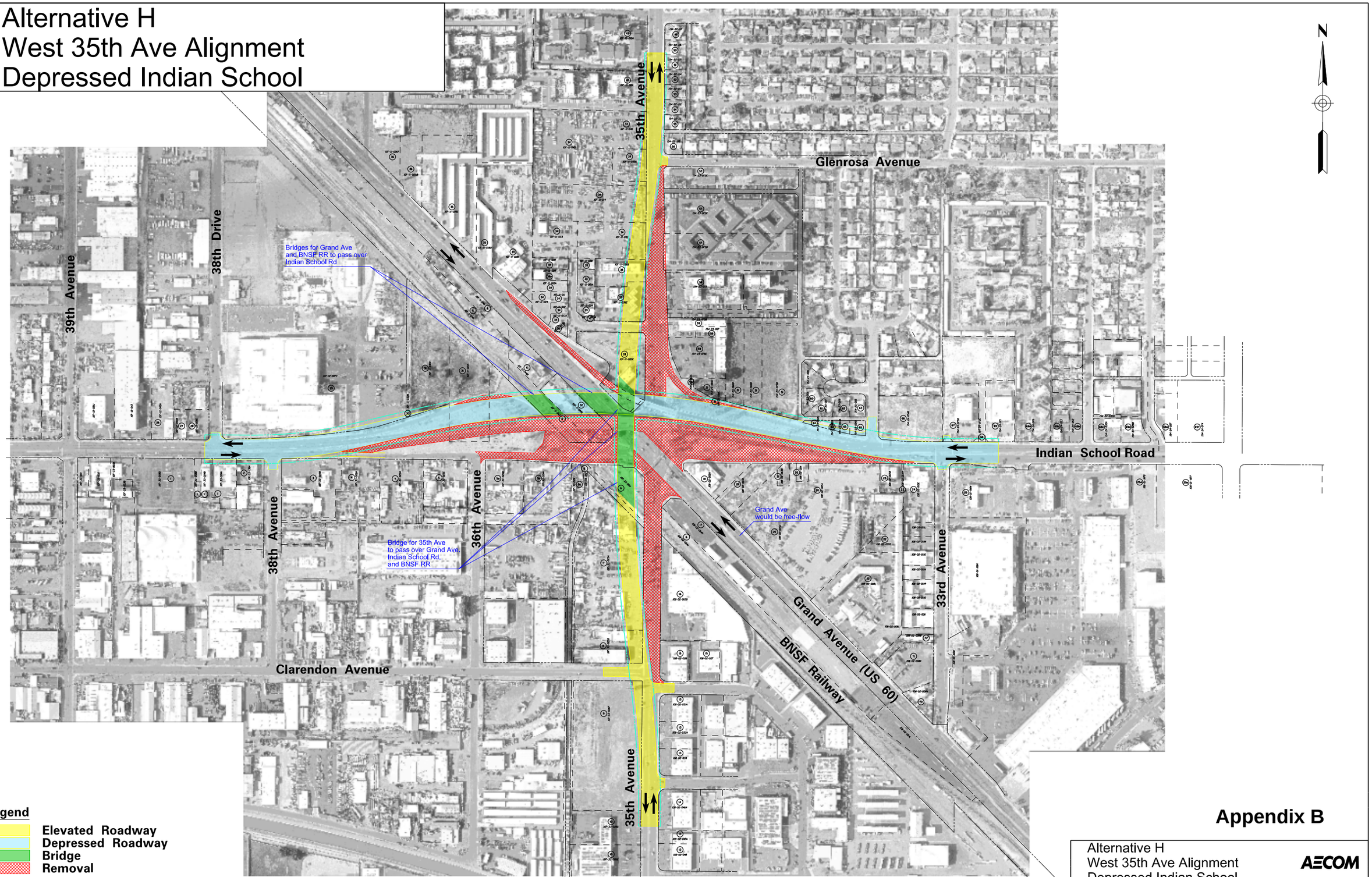
Alternative G
West 35th Ave Alignment
Level 1 Intersection at Indian School

AECOM

c:\pwworking\aecom_ds19_na\joe.gillis\aecom.com\dms12491\Alt-G.dgn

5/26/2021

Alternative H
West 35th Ave Alignment
Depressed Indian School



Legend

- Elevated Roadway
- Depressed Roadway
- Bridge
- Removal

Appendix B

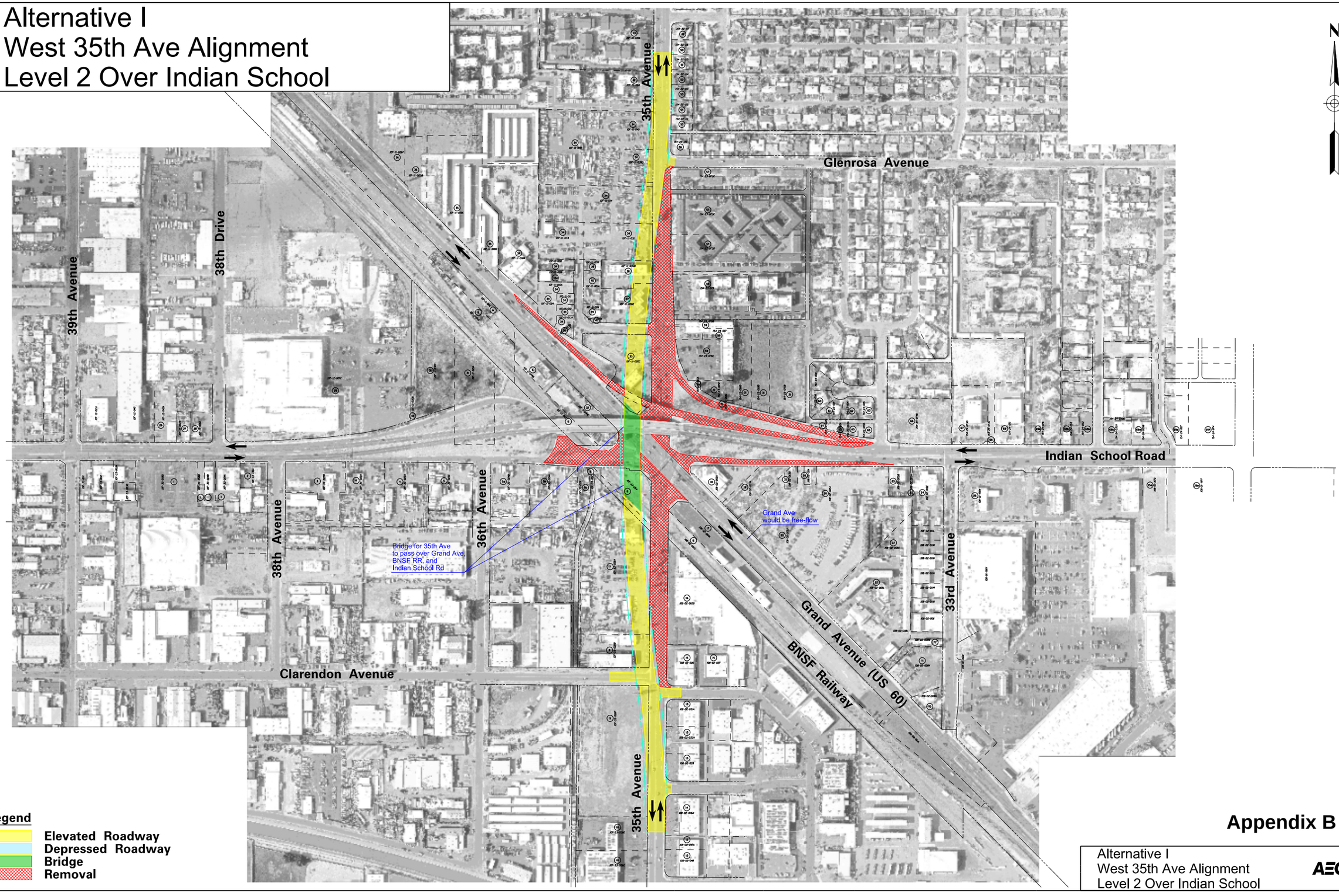
Alternative H
West 35th Ave Alignment
Depressed Indian School

AECOM

c:\pwworking\aecom_ds19_na\joe.gillis@aecom.com\dms12491\Alt-H.dgn

5/26/2021

Alternative I
West 35th Ave Alignment
Level 2 Over Indian School



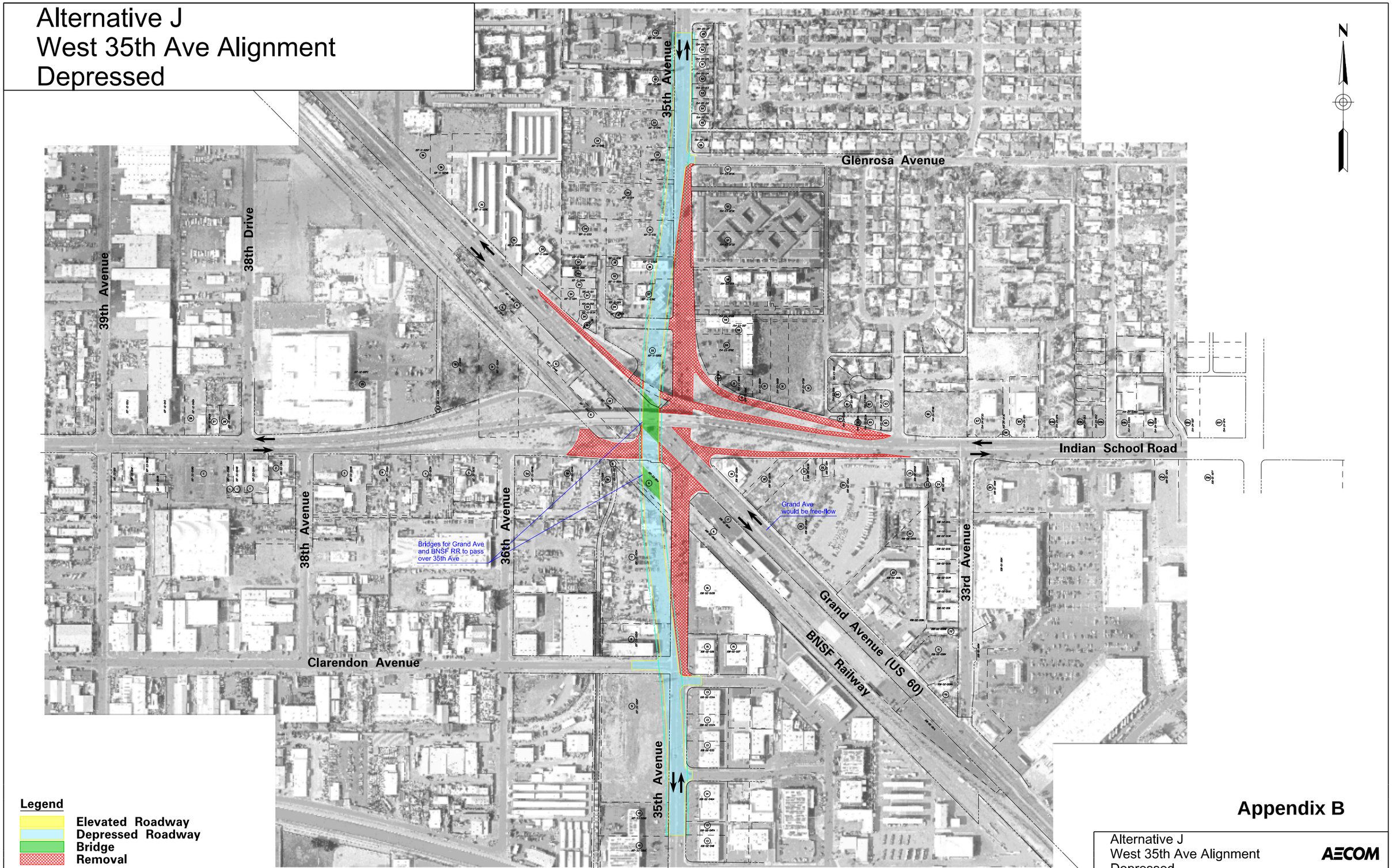
Appendix B

Alternative I
West 35th Ave Alignment
Level 2 Over Indian School

AECOM

5/26/2021

Alternative J
West 35th Ave Alignment
Depressed



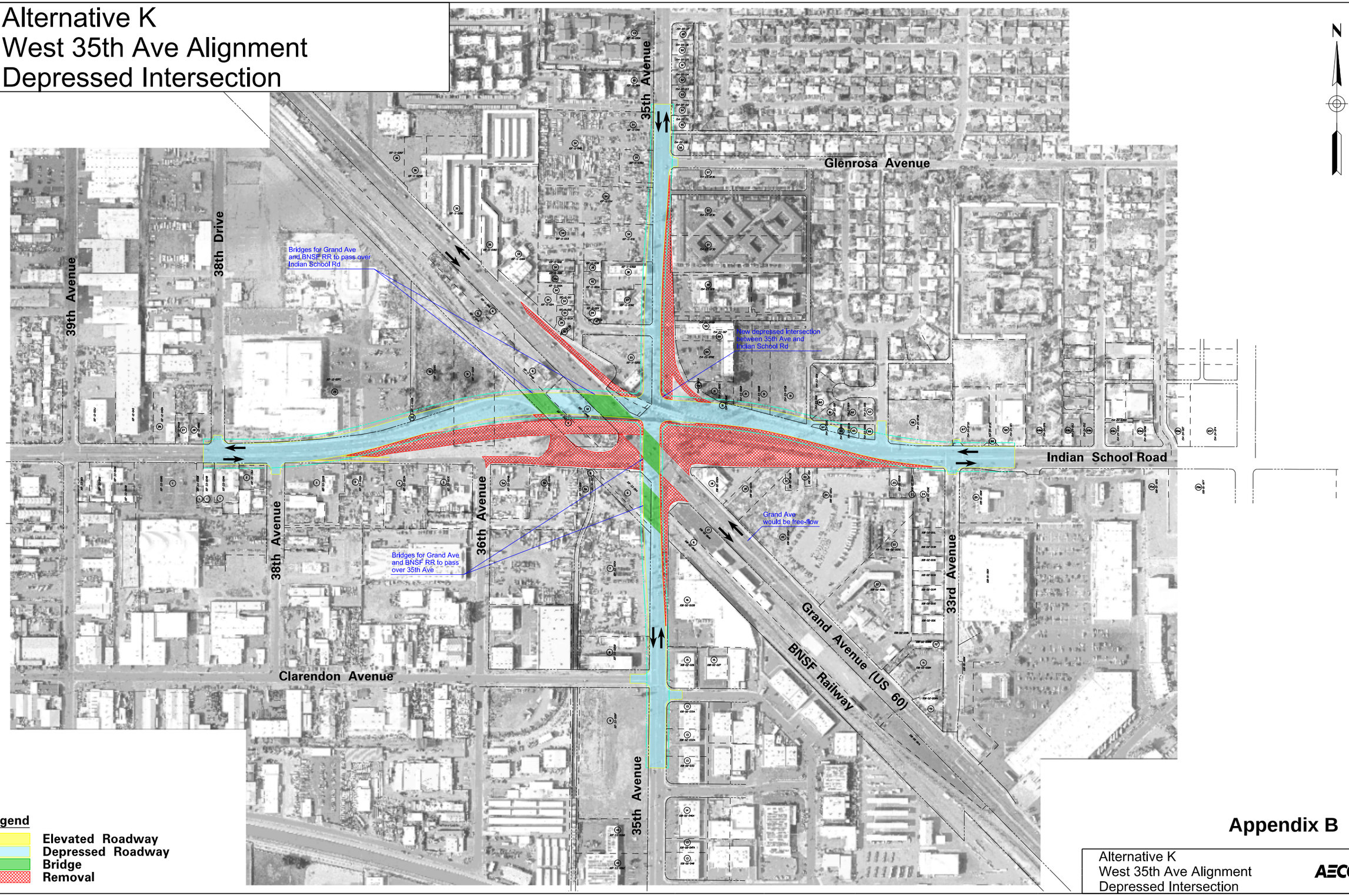
Appendix B

Alternative J
West 35th Ave Alignment
Depressed

AECOM

5/26/2021

Alternative K
West 35th Ave Alignment
Depressed Intersection



Appendix B

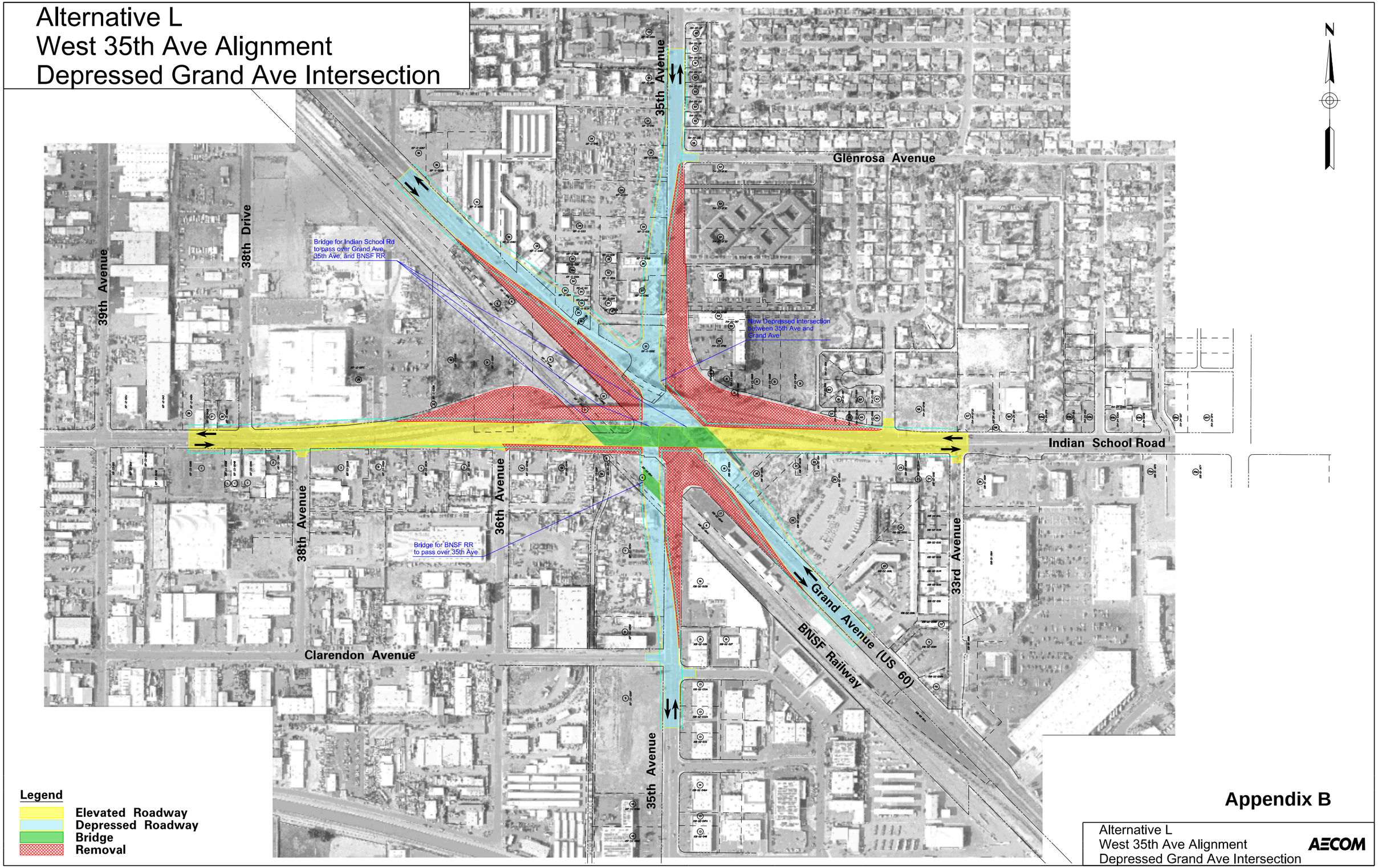
Alternative K
West 35th Ave Alignment
Depressed Intersection

AECOM

c:\pwworking\aecom_ds19_na\joe.gillis\aecom.com\dms12491\Alt-K.dgn

5/26/2021

Alternative L
West 35th Ave Alignment
Depressed Grand Ave Intersection



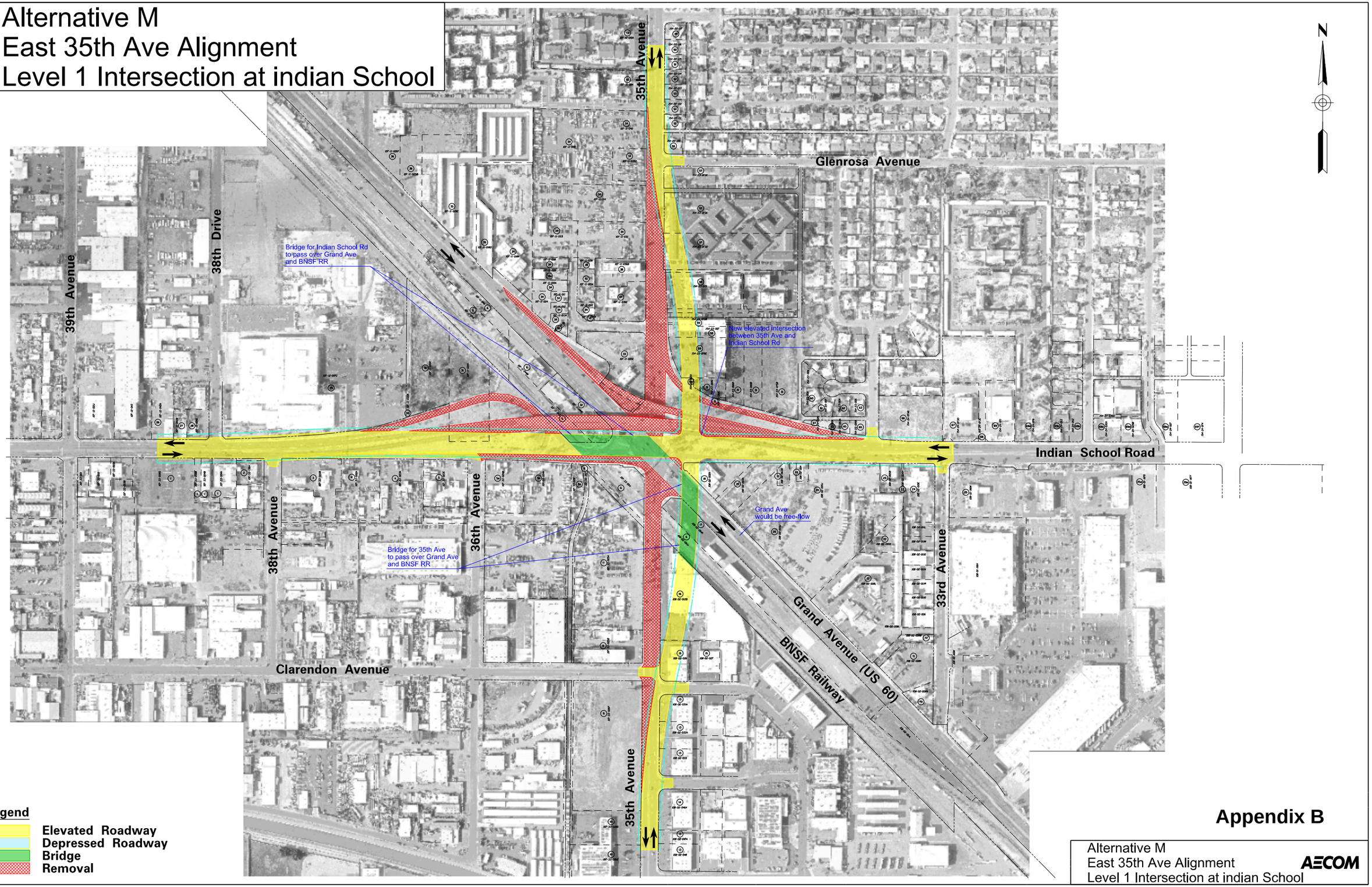
Appendix B

Alternative L
West 35th Ave Alignment
Depressed Grand Ave Intersection

AECOM

5/26/2021

Alternative M
East 35th Ave Alignment
Level 1 Intersection at indian School



Legend

- Elevated Roadway
- Depressed Roadway
- Bridge
- Removal

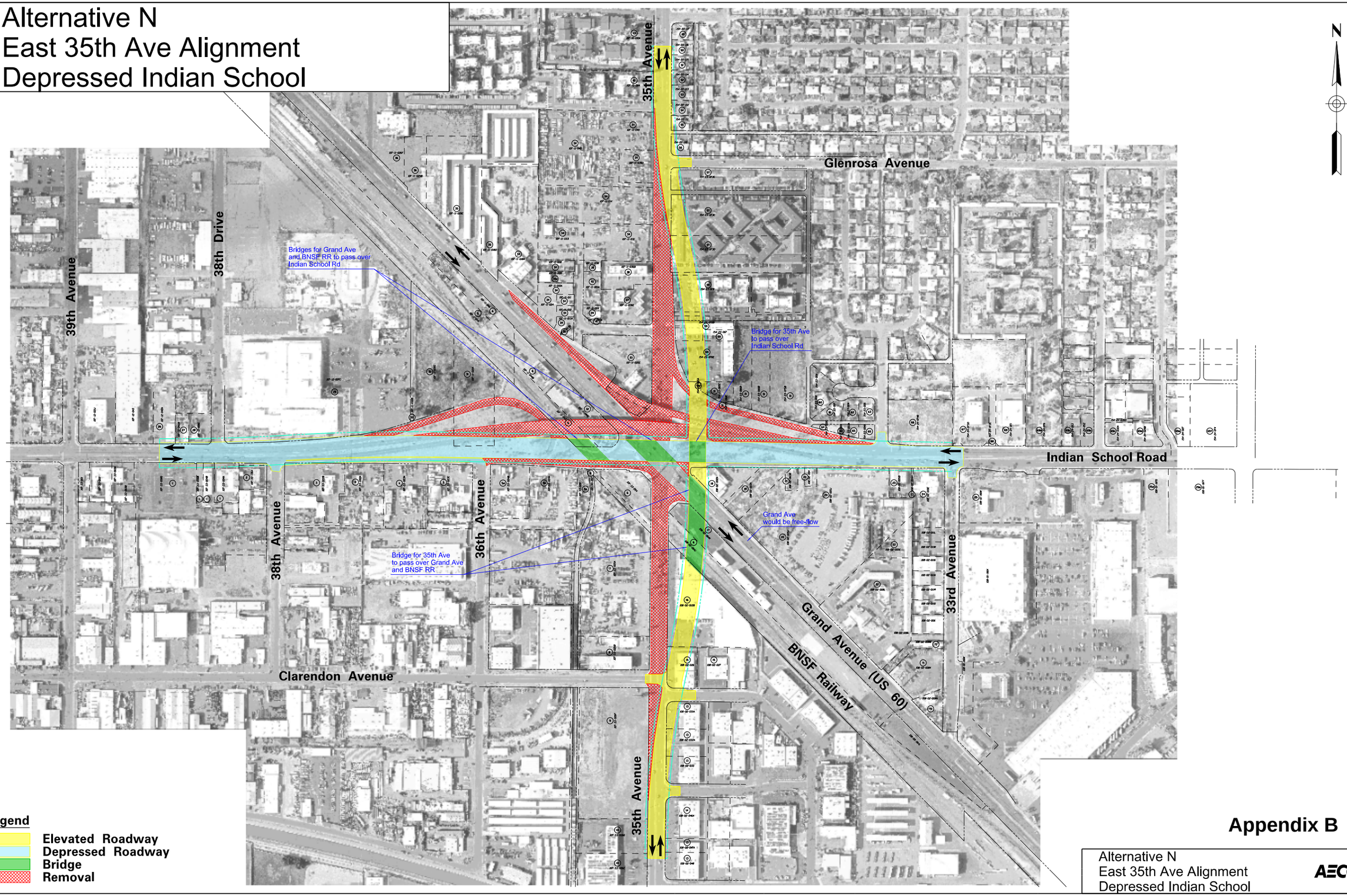
Appendix B

Alternative M
East 35th Ave Alignment
Level 1 Intersection at indian School

AECOM

5/26/2021

Alternative N
East 35th Ave Alignment
Depressed Indian School



Appendix B

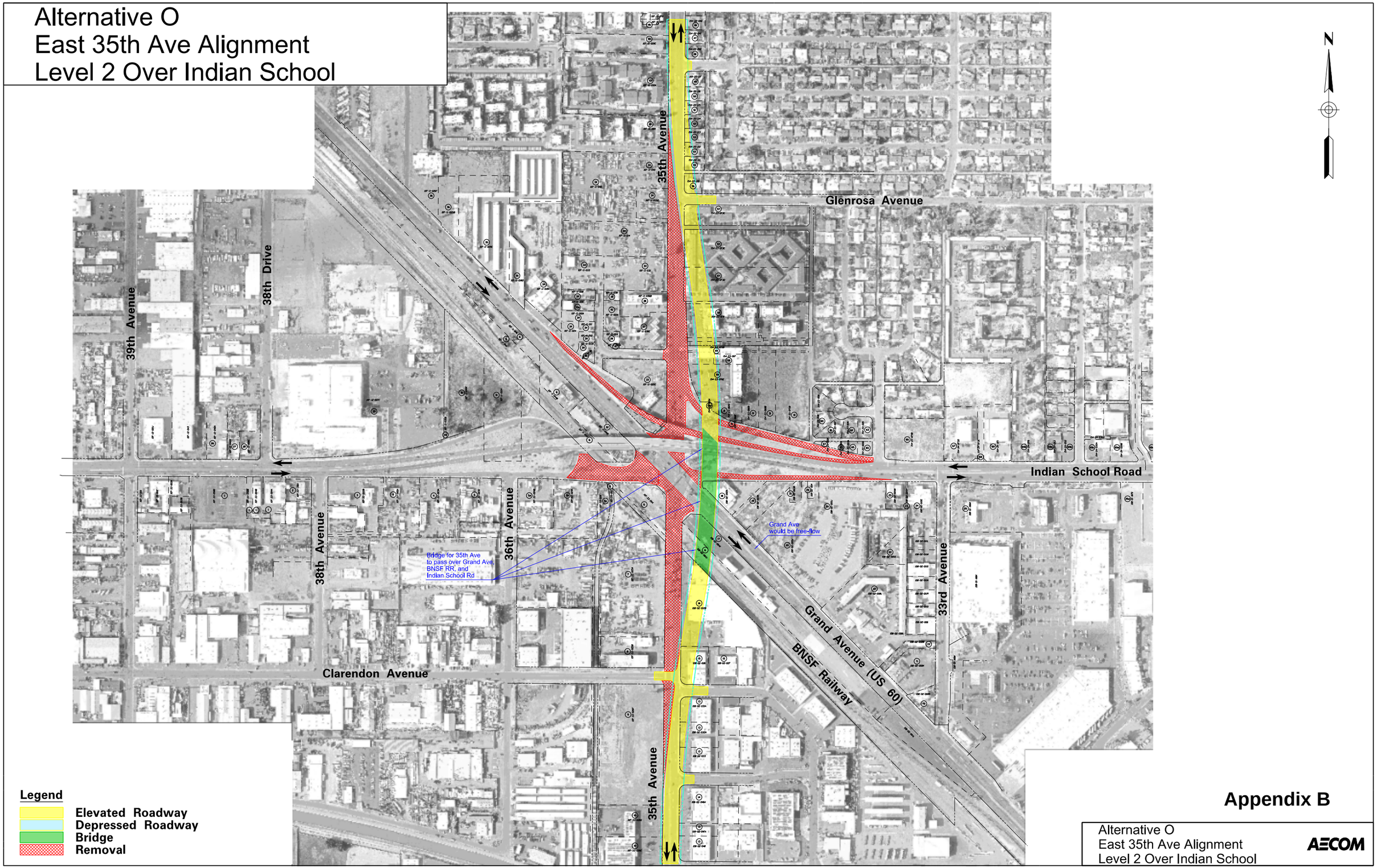
Alternative N
East 35th Ave Alignment
Depressed Indian School

AECOM

c:\pwworking\aecom_ds19_na\joe.gillis\aecom.com\dms\249\Alt-N.dgn

5/26/2021

Alternative O
East 35th Ave Alignment
Level 2 Over Indian School



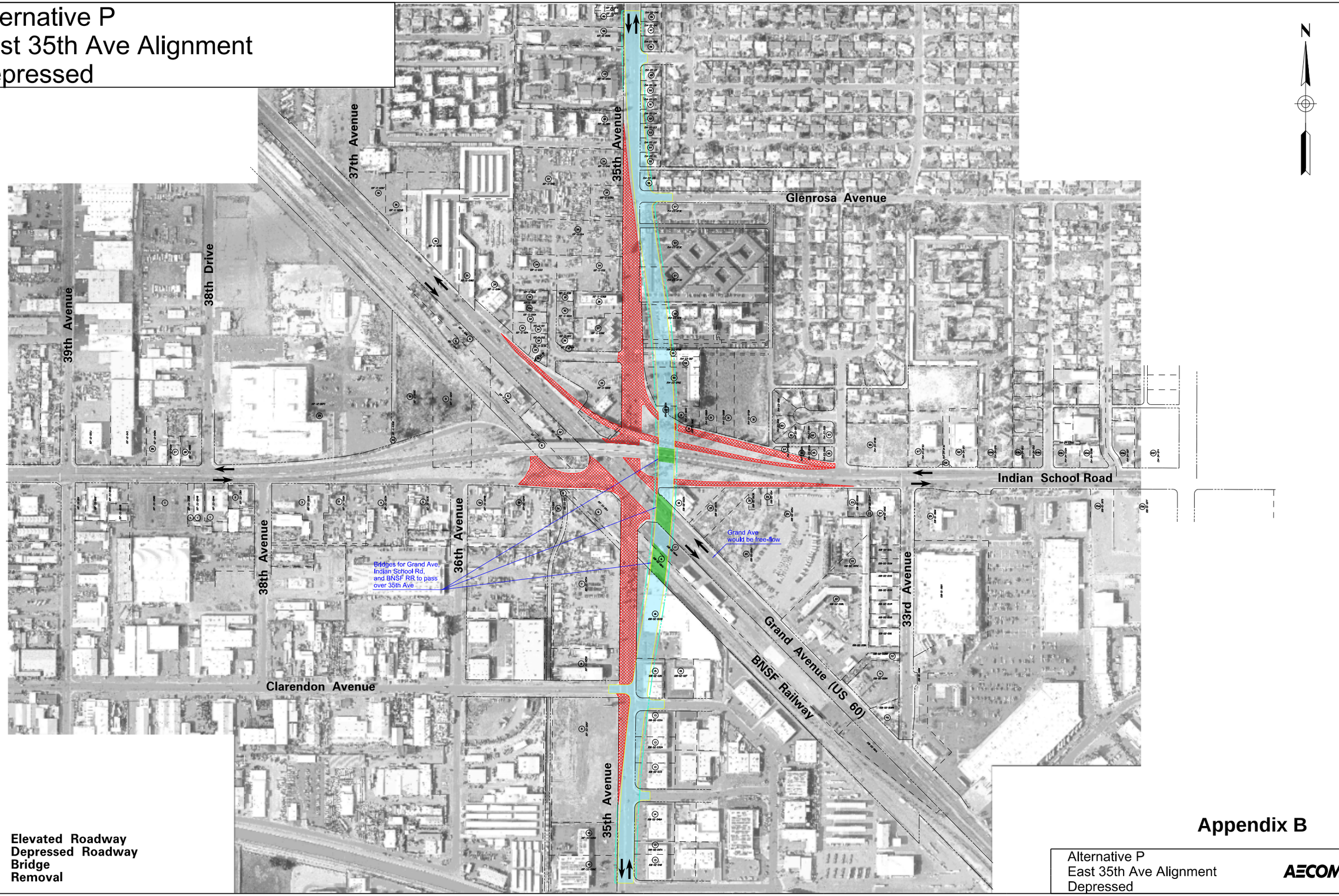
Appendix B

Alternative O
East 35th Ave Alignment
Level 2 Over Indian School

AECOM

5/26/2021

Alternative P
East 35th Ave Alignment
Depressed



Appendix B

Alternative P
East 35th Ave Alignment
Depressed

AECOM

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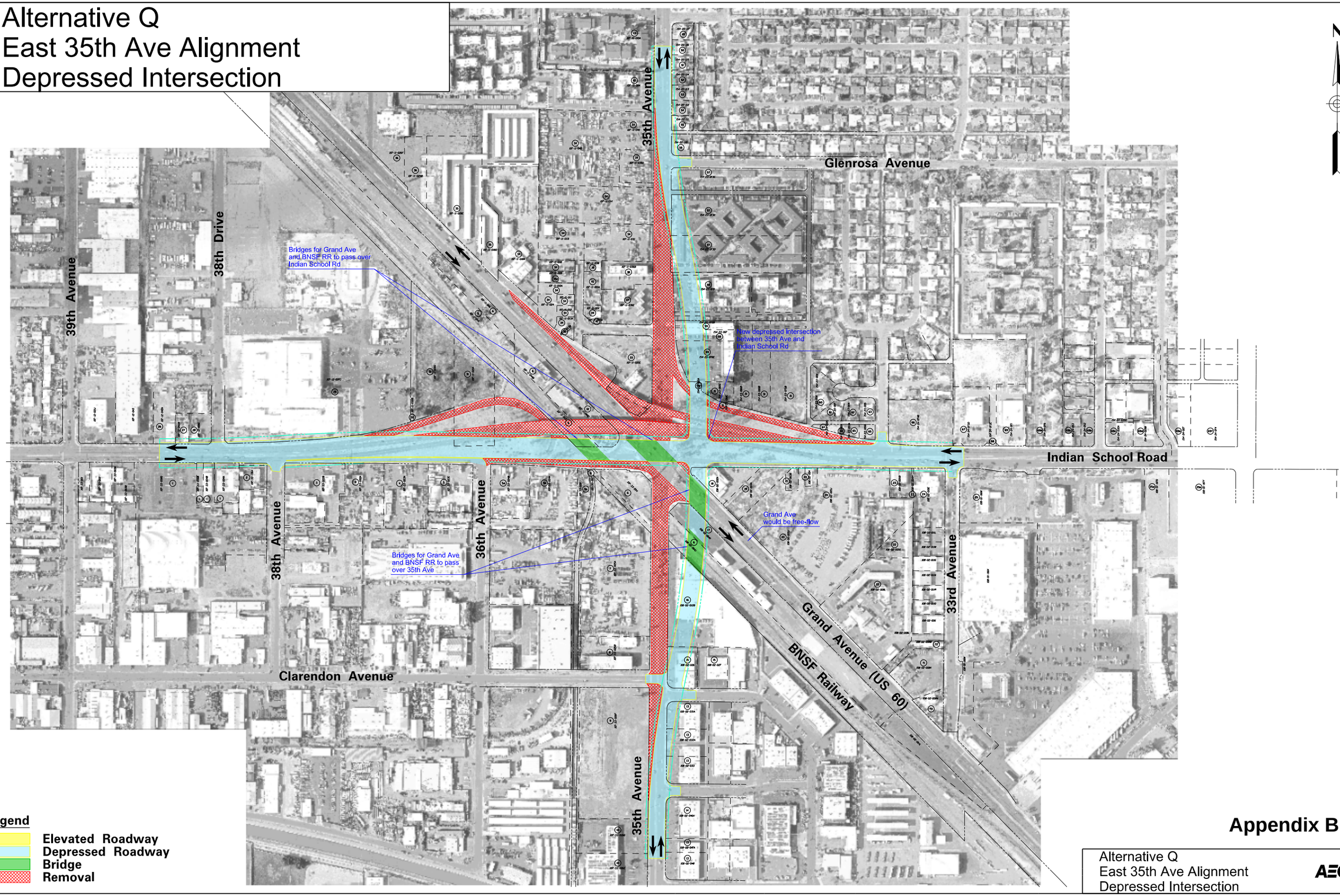
5/26/2021

Alternative Q
East 35th Ave Alignment
Depressed Intersection



Legend

- Elevated Roadway
- Depressed Roadway
- Bridge
- Removal

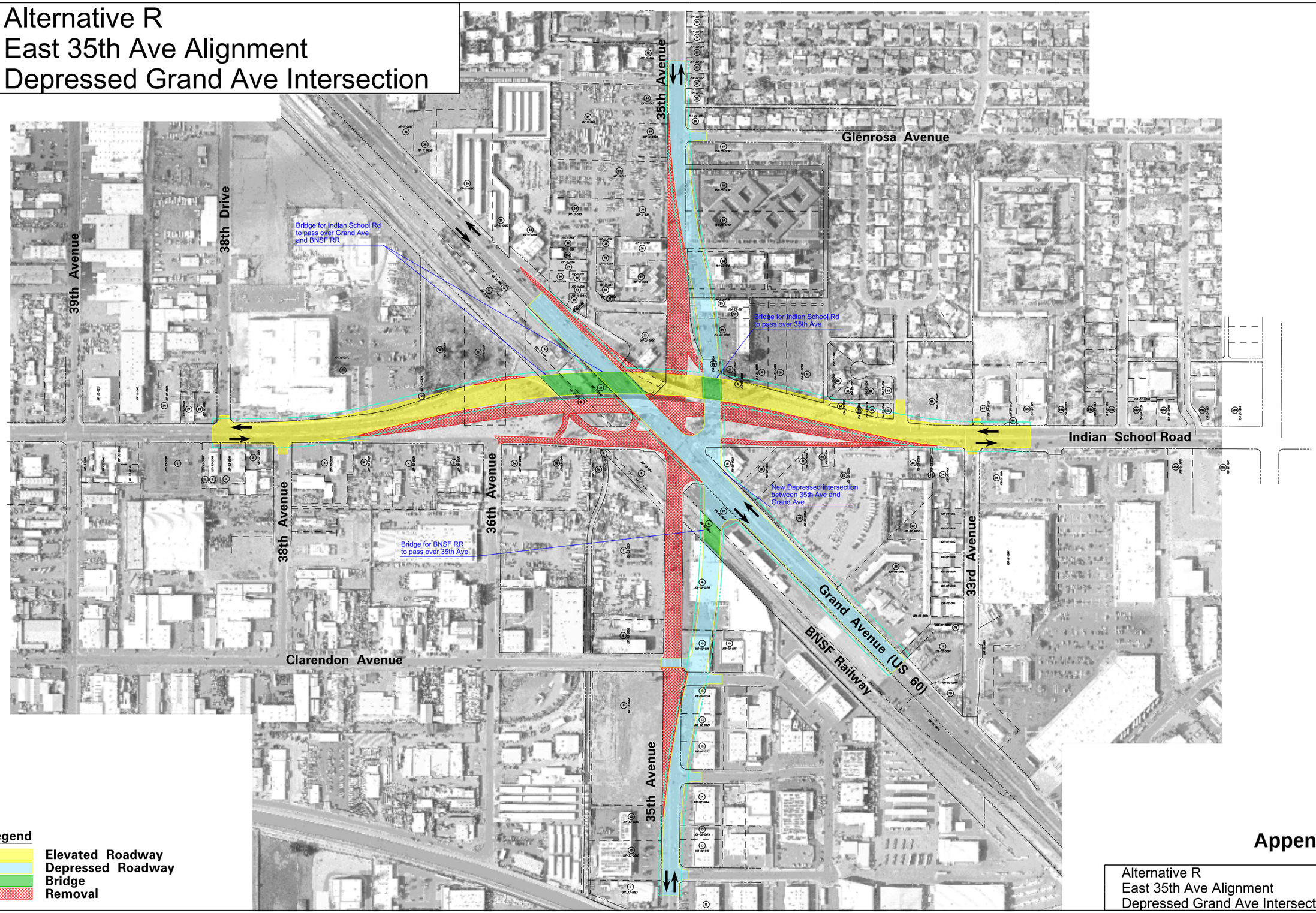
Appendix B

Alternative Q
East 35th Ave Alignment
Depressed Intersection

AECOM

5/26/2021

Alternative R
East 35th Ave Alignment
Depressed Grand Ave Intersection



Appendix B

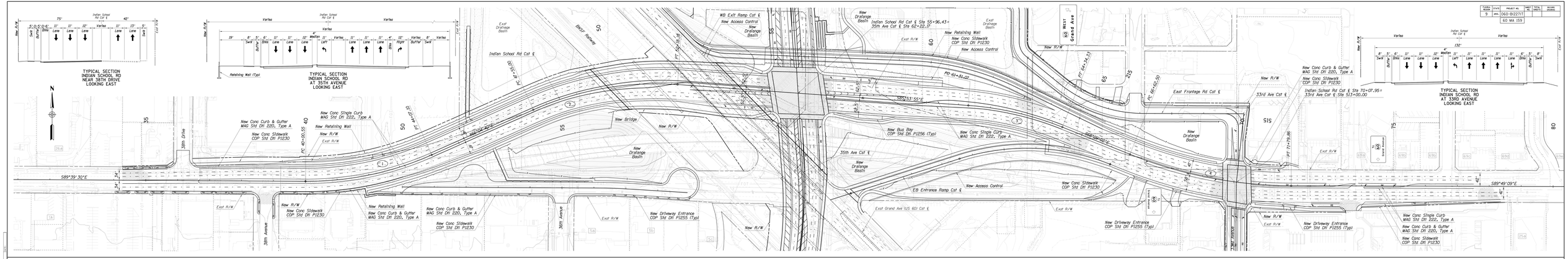
Alternative R
East 35th Ave Alignment
Depressed Grand Ave Intersection

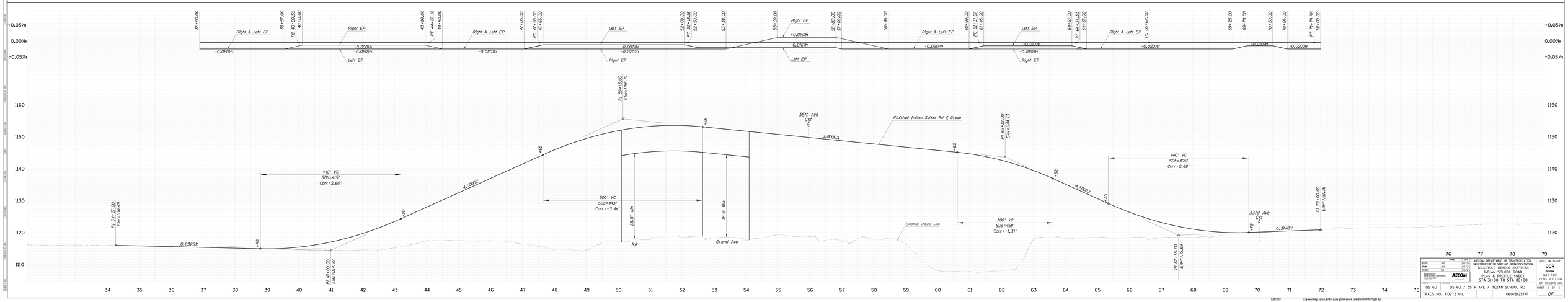
AECOM

c:\pwworking\aecom_ds19_na\joe.gillis\aecom.com\dms1249\Alt-R.dgn

5/26/2021

APPENDIX C - Alternative 2 Roll Plots (Preferred Alternative)





F.A.P. / ACCESS	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	REVISED DATE
9	ARIZ.	060-B(227)T			
		60 MA 159			

	76	77	78	79	
DESIGN	JPS	09/04	ARIZONA DEPARTMENT OF TRANSPORTATION		PRELIMINARY
DRAWN	JPS	09/04	INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION		DCR
CHECKED	TB	09/04	ROADWAY DESIGN SERVICES		Review
QUANTITY CHECK			INDIAN SCHOOL ROAD		NOT FOR
QUALITY ASSURANCE	ASCOM		PLAN & PROFILE SHEET		CONSTRUCTION
CONSTRUCTION			STA 33+00 TO STA 80+00		OR RECORDING
US 60	US 60 / 35TH AVE / INDIAN SCHOOL RD				SHEET 7 OF 9
TRACS NO. F027Z 01L			060-B(227)T		

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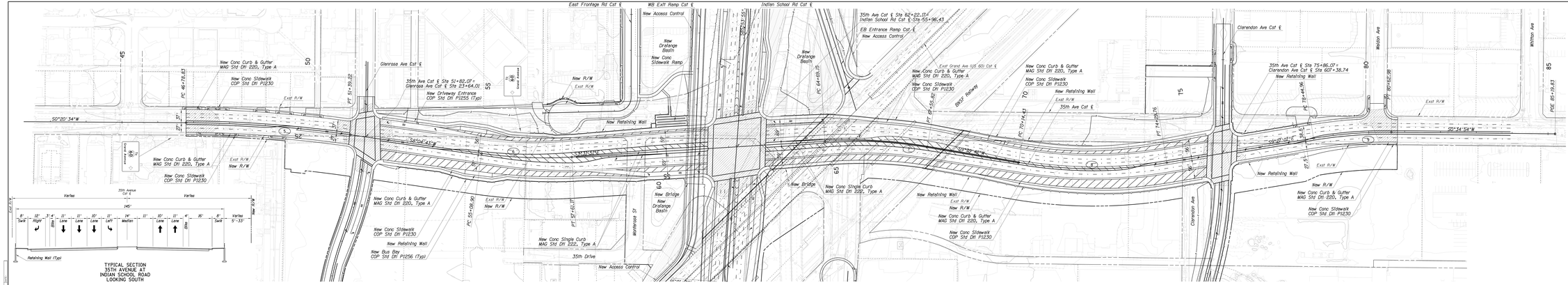

FUNCL. ROUTE	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	REVISED DRAWING
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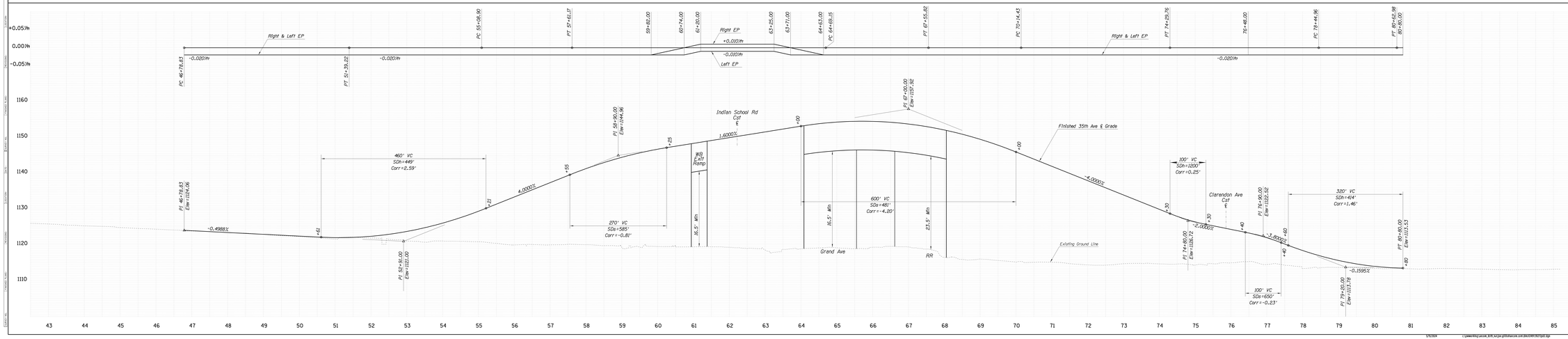
		60 MA 159			



	NAME	DATE
DESIGN	JPS	09/24
DRAWN	JPS	09/24
CHECKED	TB	09/24

ASCOM

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONAL DESIGN
ROADWAY DESIGN SERVICES

35TH AVENUE
PLAN & PROFILE SHEET
STA 43+00 TO STA 85+00

PRELIMINARY
DCR
Review
NOT FOR
CONSTRUCTION
OR RECORDING

US 60	US 60 / 35TH AVE / INDIAN SCHOOL RD	SHEET 1 OF 4
TRACS NO. F027Z 01L	060-B(227)T	OF

5/15/2024

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FUNC. ROUTE	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	REVISED DRAWING
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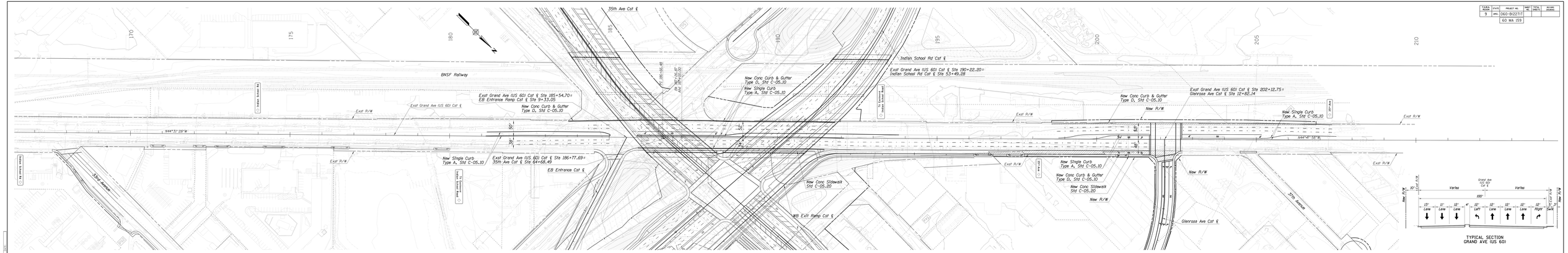
		60 MA 159			



ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADWAY DESIGN SERVICES
GRAND AVENUE (US 60)
PLAN & PROFILE SHEET
STA 187+00 TO STA 214+00

PRELIMINARY
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

US 60 | US 60 / 35TH AVE / INDIAN SCHOOL RD | SHEET ___ OF 16 ___

TRACS NO. F027201L | 060-B(227)T | ___ OF ___

5/10/2024

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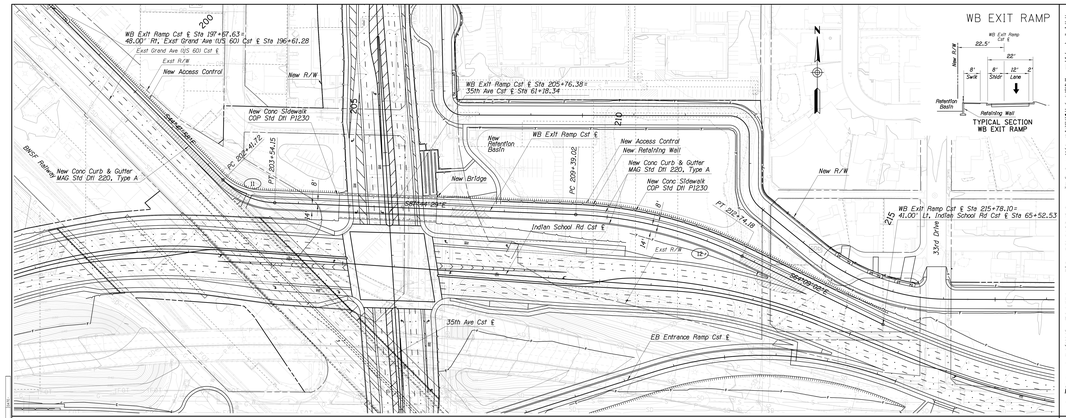

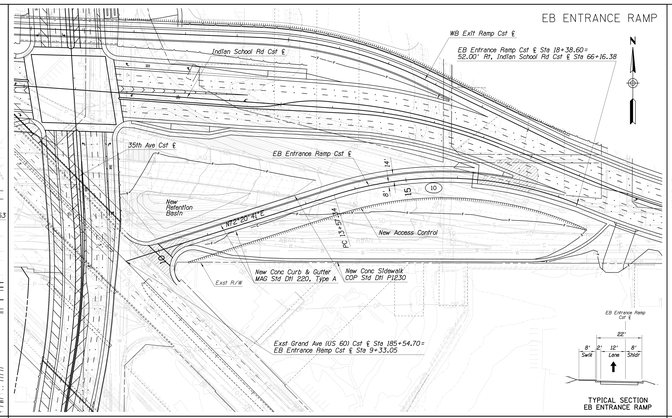

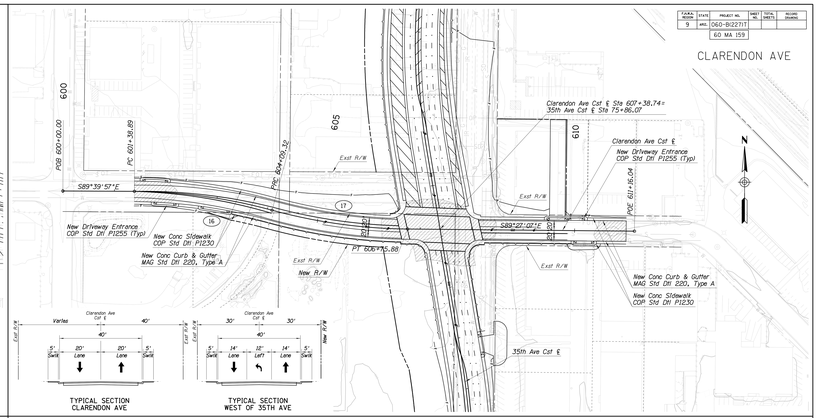

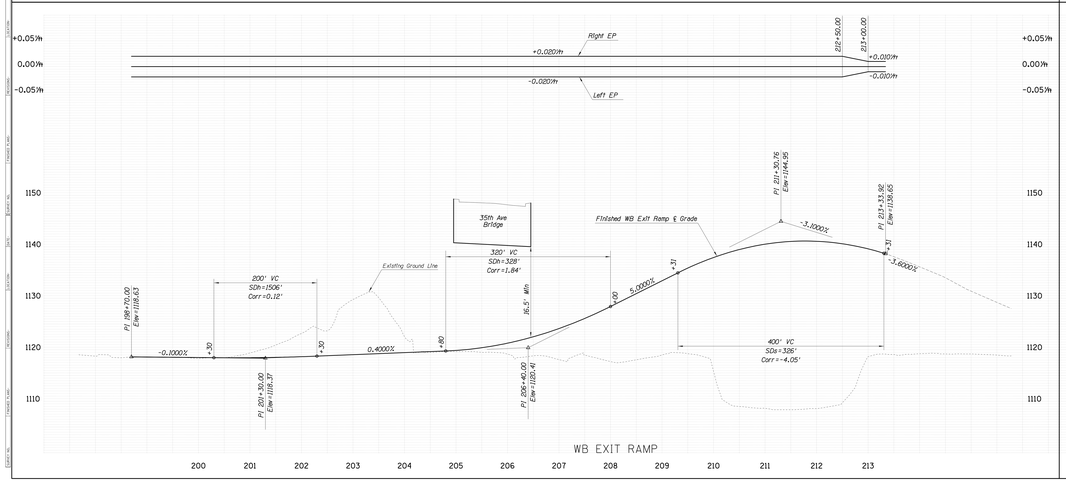

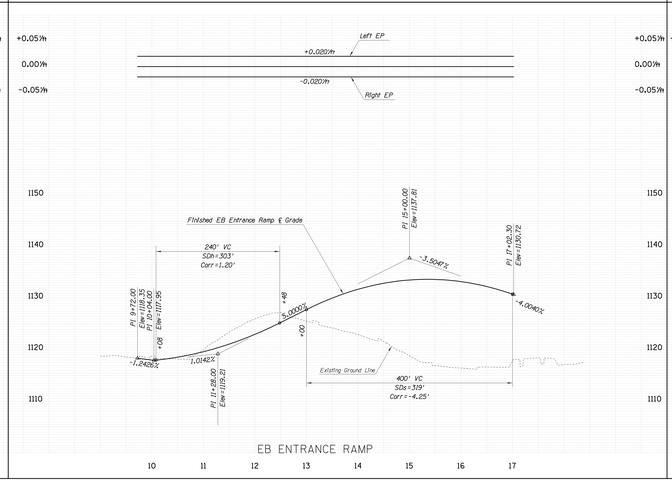

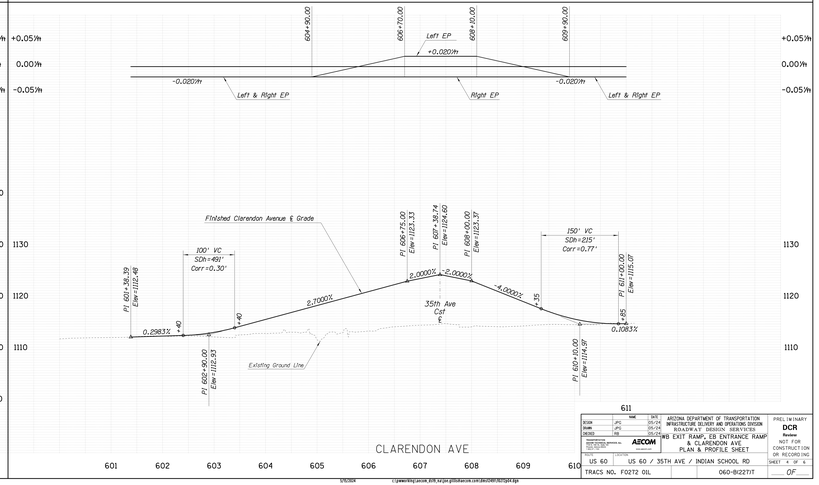

FUNCL. ROUTE	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	REVISED
9	ARI.	060-B(227)T			
		60 MA 159			

611

	NAME	DATE
DESIGN	JPS	05/24
DRAWN	JPS	05/24
CHECKED	TB	05/24

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONAL DESIGN GROUP
ROADWAY DESIGN SERVICES

ASCOM

WB EXIT RAMP, EB ENTRANCE RAMP & CLARENDON AVE
PLAN & PROFILE SHEET

PRELIMINARY
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

US 60	US 60 / 35TH AVE / INDIAN SCHOOL RD	
TRACS NO. F027Z 01L		060-B(227)T

SHEET # OF #
__ OF __

5/15/2024

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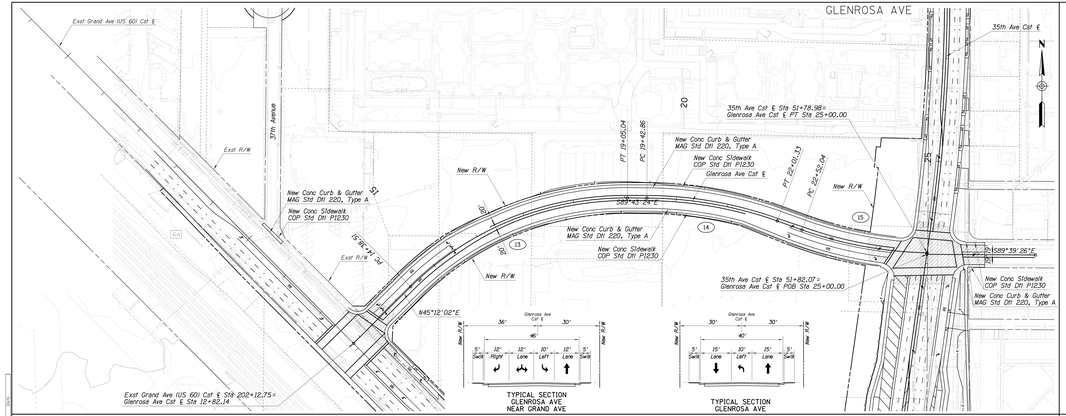

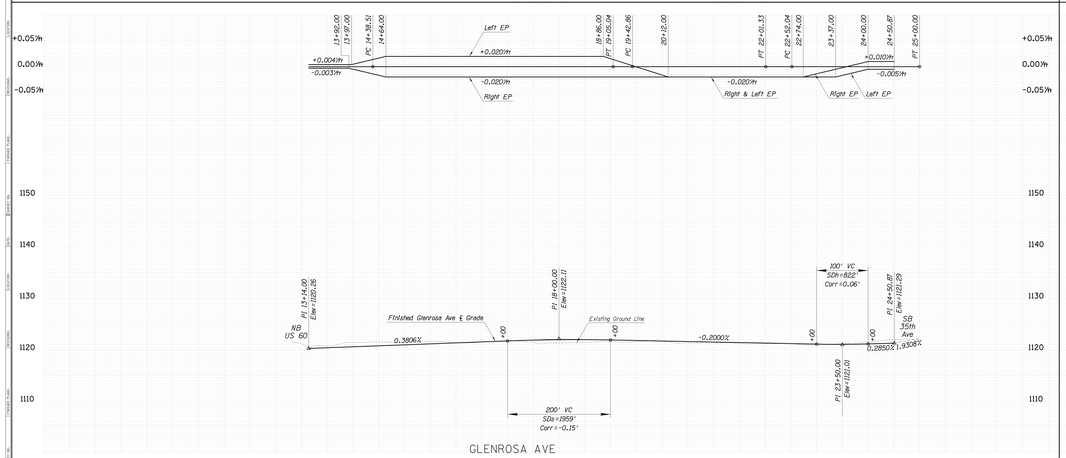

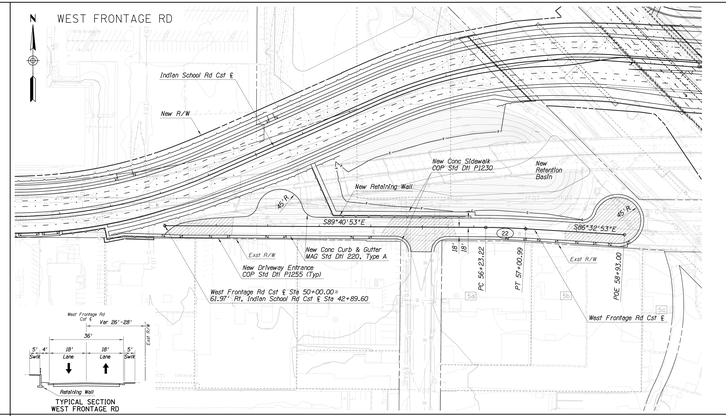

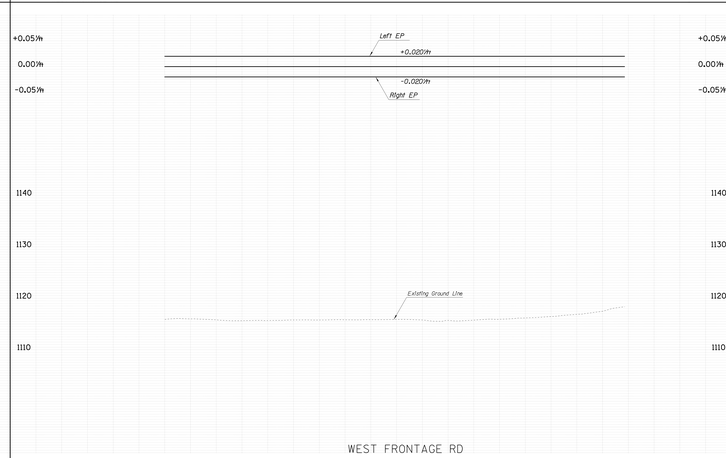

FUNCT. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RELEASED FOR BIDDING
9	ARIZ.	060-B(227)T			
		60 MA 159			

	NAME	DATE
DESIGN	JPS	09/24
DRAWN	JPS	09/24
CHECKED	TB	09/24

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONAL DIVISION
ROADWAY DESIGN SERVICES

GLENROSA AVE, 37TH AVE
& WEST FRONTAGE RD
PLAN & PROFILE SHEET

PRELIMINARY
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

US 60	US 60 / 35TH AVE / INDIAN SCHOOL RD	SHEET 5 OF 6
TRACS NO. F027Z 01L	060-B(227)T	OF

5/6/2024

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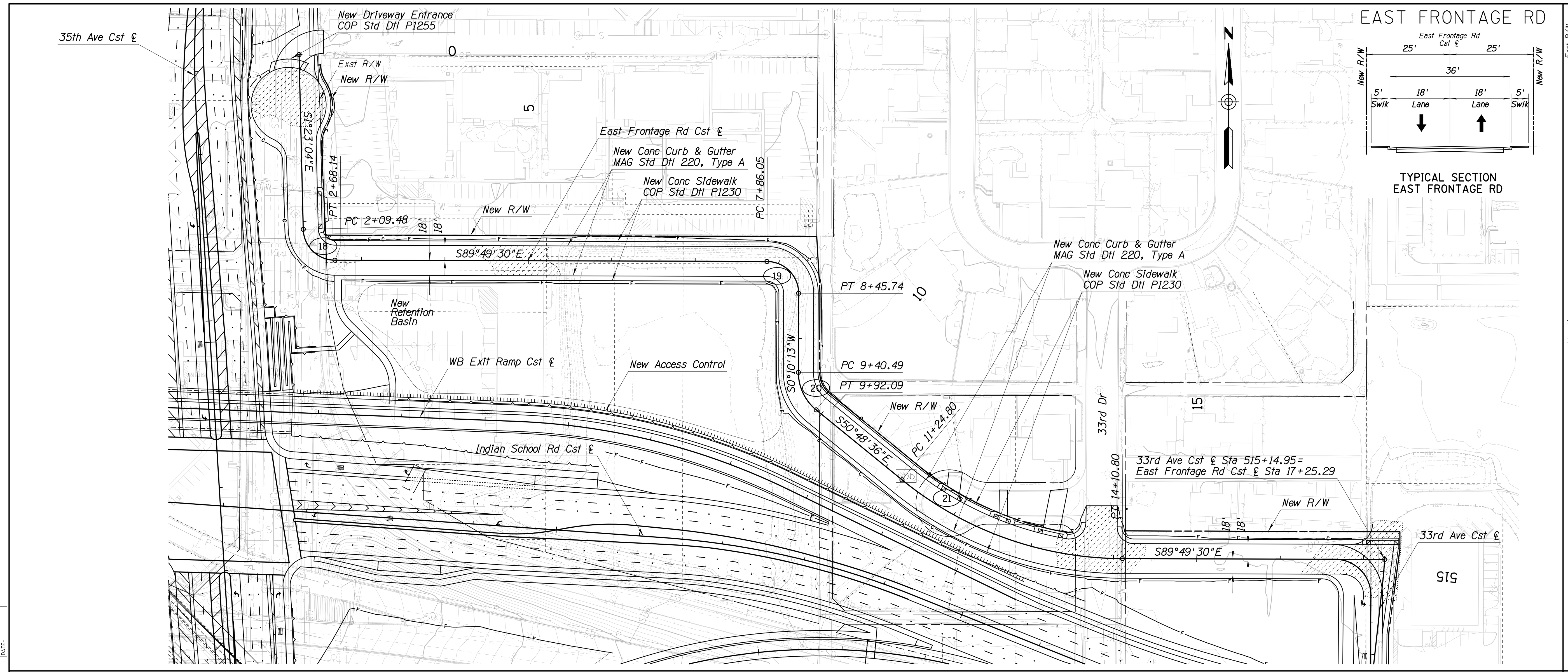
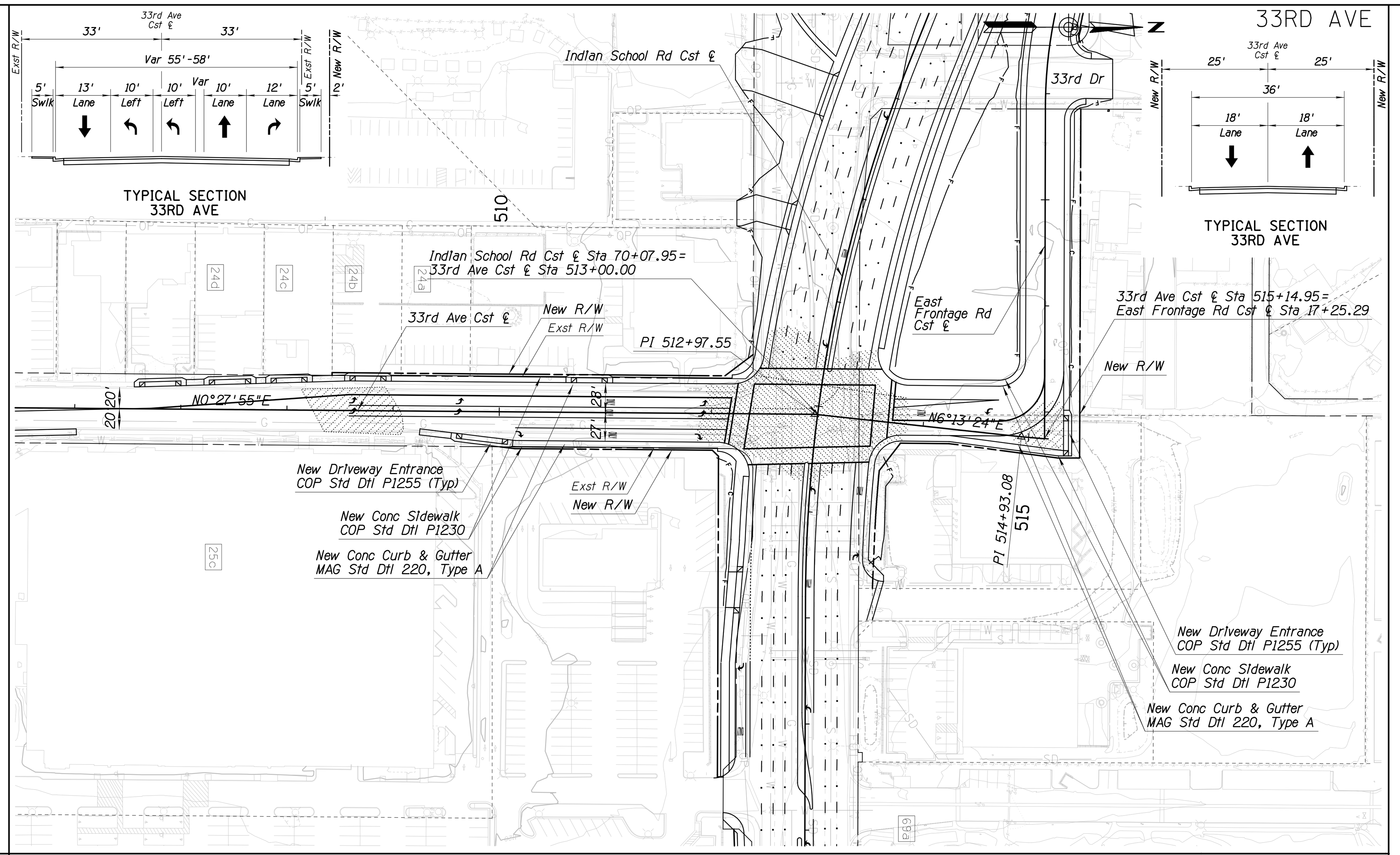
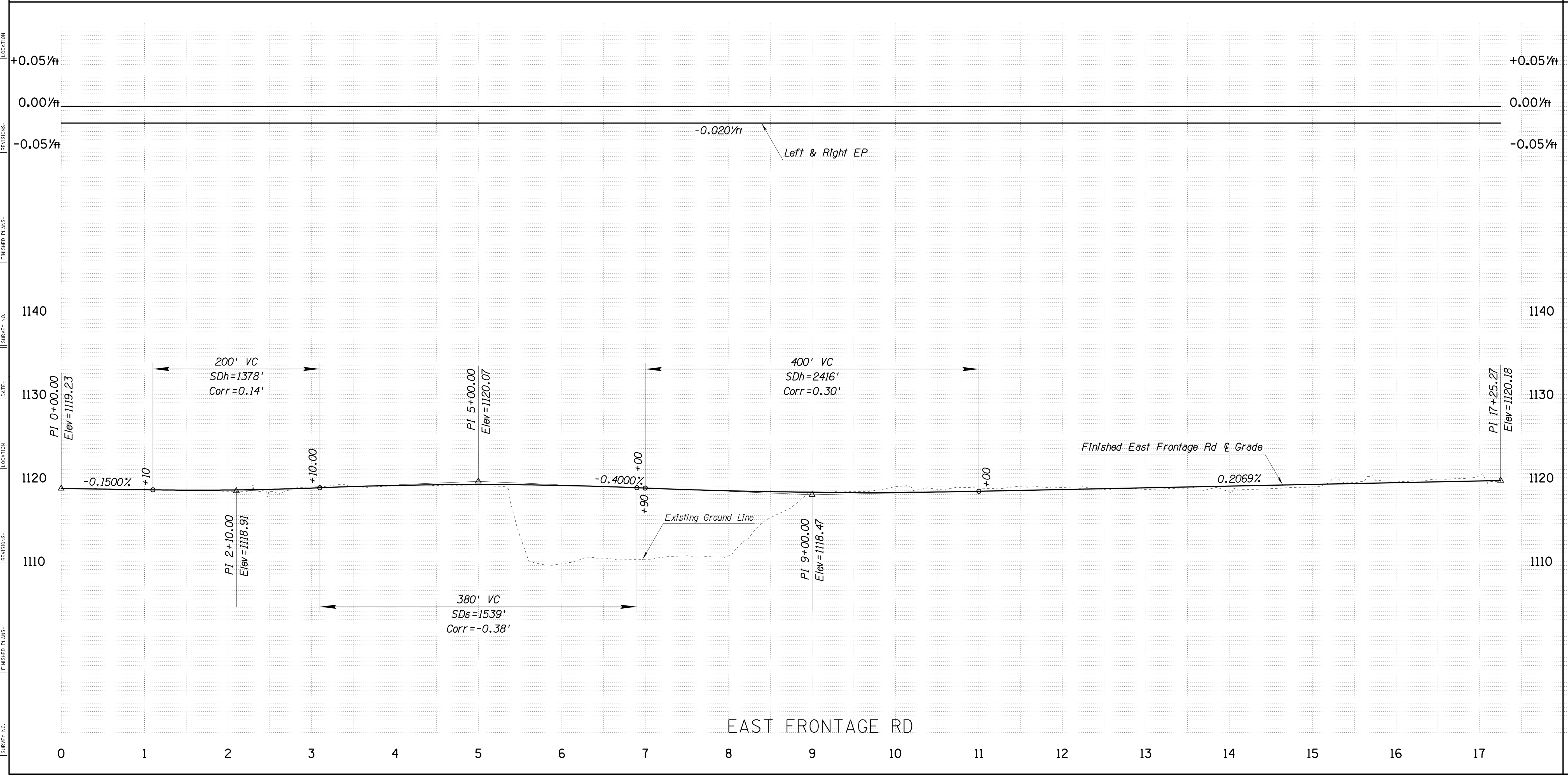
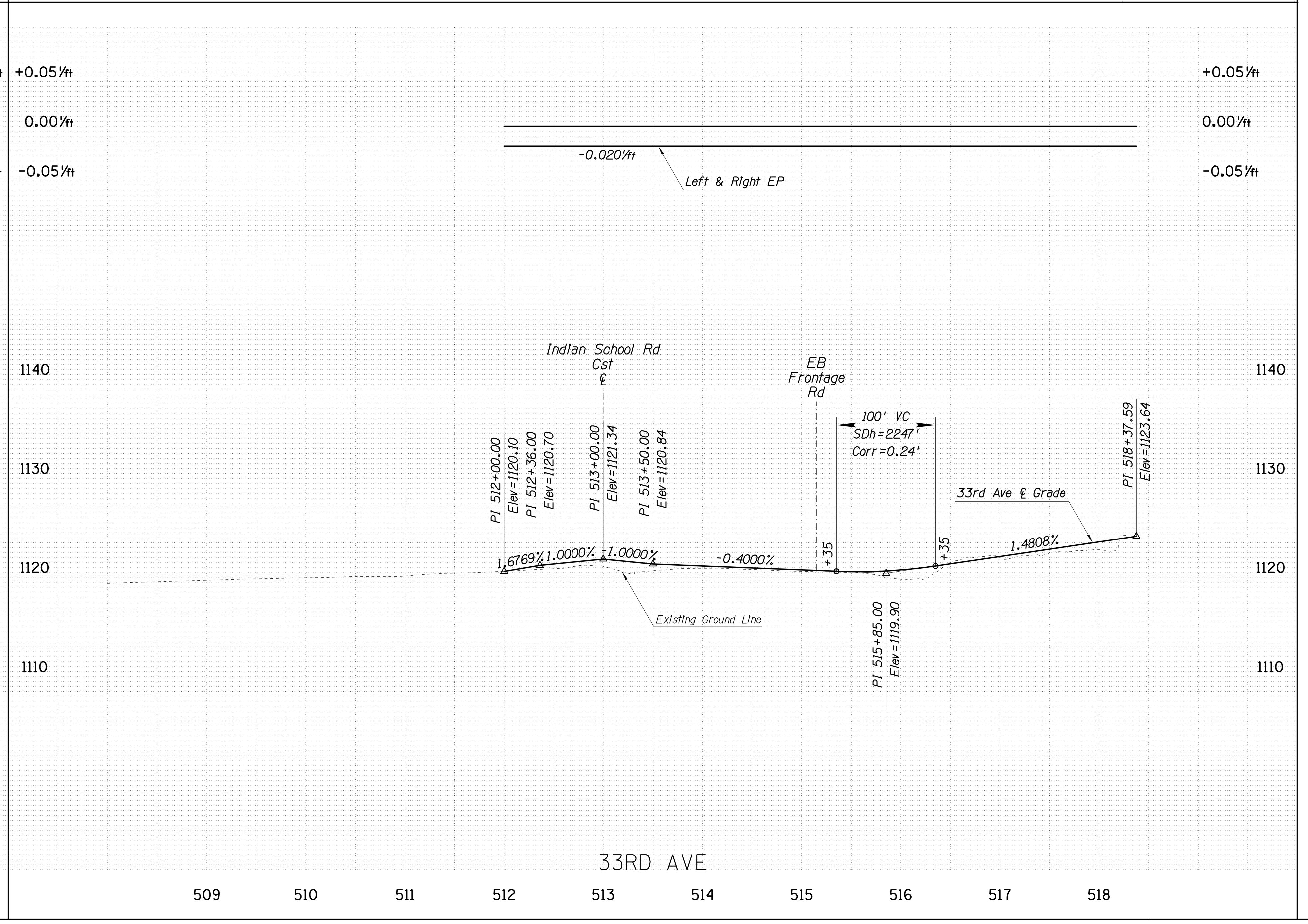








PLAN REF NO.	LOCATION	P.I./P.O.T. STATION	COORDINATES		All Coordinates Are Ground Coordinates And All Bearings Are Grid Bearings							G.A.F. = 1.00023215			
	Existing Grand Avenue Construction ℄														
	Existing Grand Avenue Cst ℄ POB	156+15.65	N= 905685.934	E= 635872.633											
	Existing Grand Avenue Cst ℄ PI	186+66.48	N= 907861.031	E= 633733.353											
	Existing Grand Avenue Cst ℄ POE	227+10.71	N= 910749.796	E= 630864.748											
	Indian School Road Construction ℄														
	Indian School Road Cst ℄ POB	29+51.78	N= 907845.692	E= 631119.499											
	Indian School Road Cst ℄ PC	40+00.55	N= 907839.436	E= 632168.251											
1	Indian School Road Cst ℄ PI	42+06.92	N= 907838.206	E= 632374.614	SIMPLE	Δ=24°15'50"	R= 960.00 D_C=5°58'06"	T= 206.37	L= 406.55	Ext= 21.93	e= -.008%	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	Indian School Road Cst ℄ PT	44+07.10	N= 907921.886	E= 632563.253											
	Indian School Road Cst ℄ PC	47+55.00	N= 908062.959	E= 632881.270											
2	Indian School Road Cst ℄ PI	49+91.32	N= 908158.786	E= 633097.290	SIMPLE	Δ=28°01'25"	R= 947.00 D_C=6°03'01"	T= 236.32	L= 463.18	Ext= 29.04	e= -.007'/ft	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	Indian School Road Cst ℄ PT	52+18.18	N= 908141.884	E= 633333.005											
	Indian School Road Cst ℄ PC	61+31.07	N= 908076.592	E= 634243.559											
3	Indian School Road Cst ℄ PI	62+83.93	N= 908065.660	E= 634396.021	SIMPLE	Δ=17°44'53"	R=979.00 D_C=5°51'09"	T= 152.85	L= 303.26	Ext= 11.86	e= -.010'/ft	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	Indian School Road Cst ℄ PT	64+34.33	N= 908008.772	E= 634537.894											
	Indian School Road Cst ℄ PC	66+62.50	N= 907923.856	E= 634749.668											
4	Indian School Road Cst ℄ PI	69+24.31	N= 907826.418	E= 634992.672	SIMPLE	Δ=21°40'08"	R= 1368.00 D_C =4°11'18"	T= 261.81	L= 517.37	Ext= 24.83	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	Indian School Road Cst ℄ PT	71+79.86	N= 907825.592	E= 635254.481											
	Indian School Road Cst ℄ POE	83+18.54	N= 907822.000	E= 636393.157											
	35th Avenue Construction ℄														
	35th Avenue Cst ℄ POB	40+00.00	N= 910330.223	E= 633781.678											
	35th Avenue Cst ℄ PC	46+78.83	N= 909651.409	E= 633777.616											
5	35th Avenue Cst ℄ PI	49+09.38	N= 909420.863	E= 633776.237	SIMPLE	Δ=7°44'06"	R= 3410.00 D_C=1°40'49"	T= 230.55	L= 460.40	Ext = 7.78	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	35th Avenue Cst ℄ PT	51+39.22	N= 909192.601	E= 633743.838											
	35th Avenue Cst ℄ PC	55+08.90	N= 908826.593	E= 633691.887											
6	35th Avenue Cst ℄ PI	56+35.47	N= 908701.283	E= 633674.100	SIMPLE	Δ=11°36'34"	R= 1245.00 D_C=4°36'07"	T= 126.57	L= 252.27	Ext= 6.42	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	35th Avenue Cst ℄ PT	57+61.17	N= 908574.957	E= 633681.895											
	35th Avenue Cst ℄ PC	64+69.15	N= 907868.319	E= 633725.498											
7	35th Avenue Cst ℄ PI	66+13.12	N= 907724.622	E= 633734.365	SIMPLE	Δ=13°11'34"	R= 1245.00 D_C=4°36'07"	T= 143.97	L= 286.67	Ext= 8.30	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	35th Avenue Cst ℄ PT	67+55.82	N= 907582.693	E= 633710.202											
	35th Avenue Cst ℄ PC	70+14.43	N= 907327.751	E= 633666.799											
8	35th Avenue Cst ℄ PI	72+24.04	N= 907121.113	E= 633631.619	SIMPLE	Δ=19°06'49"	R= 1245.00 D_C=4°36'07"	T= 209.61	L= 415.33	Ext= 17.52	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	35th Avenue Cst ℄ PT	74+29.76	N= 906914.347	E= 633666.042											
	35th Avenue Cst ℄ PC	78+44.96	N= 906504.780	E= 633734.226											
9	35th Avenue Cst ℄ PI	79+54.25	N= 906396.974	E= 633752.174	SIMPLE	Δ=10°02'01"	R= 1245.00 D_C=4°36'07"	T= 109.29	L= 109.29	Ext= 4.79	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	35th Avenue Cst ℄ PT	80+62.98	N= 906287.690	E= 633751.065											
	35th Avenue Cst ℄ POE	85+19.83	N= 905830.861	E= 633746.428											
	Eastbound Indian School Entrance Construction ℄														
	EB Indian School Entrance Cst ℄ POB	9+33.05	N= 907781.335	E= 633811.736											
	EB Indian School Entrance Cst ℄ PC	13+57.34	N= 907910.018	E= 634216.041											
10	EB Indian School Entrance Cst ℄ PI	16+07.98	N= 907986.036	E= 634454.876	SIMPLE	Δ=39°30'08"	R= 698.00 D_C=8°12'31"	T= 250.64	L= 481.26	Ext= 43.64	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	EB Indian School Entrance Cst ℄ PT	18+38.60	N= 907892.754	E= 634687.513											
	Westbound Indian School Exit Construction ℄														
	WB Indian School Exit Cst ℄ POB	197+67.63	N= 908619.808	E= 633047.517											
	WB Indian School Exit Cst ℄ PC	202+41.72	N= 908283.401	E= 633381.575											
11	WB Indian School Exit Cst ℄ PI	203+00.72	N= 908241.537	E= 633423.147	SIMPLE	Δ=42°56'31"	R= 150.00 D_C=38°11'50"	T= 59.00	L= 112.42	Ext= 11.19	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	WB Indian School Exit Cst ℄ PT	203+54.15	N= 908239.212	E= 633482.101											
	WB Indian School Exit Cst ℄ PC	209+39.02	N= 908216.163	E= 634066.520											
12	WB Indian School Exit Cst ℄ PI	211+09.01	N= 908209.464	E= 634236.375	SIMPLE	Δ=23°35'27"	R= 814.00 D_C=7°02'20"	T= 169.99	L= 335.16	Ext= 17.56	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	WB Indian School Exit Cst ℄ PT	212+74.18	N= 908135.348	E= 634389.353											
	WB Indian School Exit Cst ℄ POE	215+78.10	N= 908002.836	E= 634662.863											
	Glenrosa Avenue Construction ℄														
	Glenrosa Avenue West Cst ℄ POB	12+82.14	N= 908977.295	E= 632624.878											
	Glenrosa Avenue West Cst ℄ PC	14+38.51	N= 909087.477	E= 632735.834											
13	Glenrosa Avenue West Cst ℄ PI	16+84.60	N= 909260.878	E= 632910.454	SIMPLE	Δ=45°04'33"	R= 593.00 D_C=9°39'43"	T= 246.09	L= 466.53	Ext= 49.03	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	Glenrosa Avenue West Cst ℄ PT	19+05.04	N= 909259.690	E= 633156.540											
	Glenrosa Avenue West Cst ℄ PC	19+42.86	N= 909259.508	E= 633194.359											
14	Glenrosa Avenue West Cst ℄ PI	20+73.35	N= 909258.878	E= 633324.850	SIMPLE	Δ=19°26'07"	R= 762.00 D_C=7°31'09"	T= 130.49	L= 258.48	Ext= 11.09	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	Glenrosa Avenue West Cst ℄ PT	22+01.33	N= 909214.864	E= 633447.696											
	Glenrosa Avenue West Cst ℄ PC	22+52.04	N= 909197.760	E= 633495.435											
15	Glenrosa Avenue West Cst ℄ PI	23+77.13	N= 909155.570	E= 633613.189	SIMPLE	Δ=18°38'39"	R= 762.00 D_C=7°31'09"	T= 125.08	L= 247.96	Ext= 10.20	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	Glenrosa Avenue West Cst ℄ PT	25+00.00	N= 909153.240	E= 633738.251											
	Glenrosa Avenue East Cst ℄ POB	25+00.00	N= 909150.185	E= 633767.817											
	Glenrosa Avenue East Cst ℄ POE	27+10.99	N= 909148.922	E= 633948.801											
	Clarendon Avenue Construction ℄														
	Clarendon Avenue Cst ℄ POB	600+00.00	N= 906834.649	E= 632959.485											
	Clarendon Avenue Cst ℄ PC	601+38.89	N= 906833.839	E= 633098.369											
16	Clarendon Avenue Cst ℄ PI	602+74.87	N= 906833.046	E= 633234.353	SIMPLE	Δ=14°54'48"	R= 1039.00 D_C=5°30'52"	T= 135.99	L= 270.44	Ext= 8.86	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	Clarendon Avenue Cst ℄ PT	604+09.32	N= 906797.283	E= 633365.553											
	Clarendon Avenue Cst ℄ PC	604+09.32	N= 906797.283	E= 633365.553											
17	Clarendon Avenue Cst ℄ PI	605+43.34	N= 906762.038	E= 633494.850	SIMPLE	Δ=14°41'58"	R= 1039.00 D_C=5°30'52"	T= 134.02	L= 266.56	Ext= 8.61	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	Clarendon Avenue Cst ℄ PT	606+75.88	N= 906760.756	E= 633628.859											
	Clarendon Avenue Cst ℄ POE	611+16.04	N= 906756.546	E= 634069.000											
	33rd Avenue Construction ℄														
	33rd Avenue Cst ℄ PI	499+63.04	N= 906500.014	E= 635071.958											
	33rd Avenue Cst ℄ PI	512+97.55	N= 907834.488	E= 635082.796											
	33rd Avenue Cst ℄ PI	514+93.08	N= 908028.857	E= 635103.991											
	33rd Avenue Cst ℄ PI	515+14.95	N= 908050.658	E= 635105.819											
	East Frontage Road Construction ℄														
	East Frontage Road Cst ℄ POB	0+00.00	N= 908656.030	E= 633804.569											
	East Frontage Road Cst ℄ PC	2+09.48	N= 908446.608	E= 633809.630											
18	East Frontage Road Cst ℄ PI	2+46.46	N= 908409.639	E= 633810.523	SIMPLE	Δ=88°26'26"	R= 38.00 D_C=150°46'42"	T= 36.98	L= 58.66	Ext= 15.02	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	East Frontage Road Cst ℄ PT	2+68.14	N= 908409.526	E= 633847.503											
	East Frontage Road Cst ℄ PC	7+86.05	N= 908407.943	E= 634365.410											
19	East Frontage Road Cst ℄ PI	8+24.05	N= 908407.827	E= 634403.407	SIMPLE	Δ=89°59'42"	R= 38.00 D_C=150°46'42"	T= 38.00	L= 59.69	Ext= 15.74	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	East Frontage Road Cst ℄ PT	8+45.74	N= 908369.831	E= 634403.294											
	East Frontage Road Cst ℄ PC	9+40.49	N= 908275.080	E= 634403.013											
20	East Frontage Road Cst ℄ PI	9+68.14	N= 908247.428	E= 634402.930	SIMPLE	Δ=50°58'48"	R= 58.00 D_C=98°47'09"	T= 27.65	L= 51.61	Ext= 6.25	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	East Frontage Road Cst ℄ PT	9+92.09	N= 908229.955	E= 634424.362											
	East Frontage Road Cst ℄ PC	11+24.80	N= 908146.095	E= 634527.220											
21	East Frontage Road Cst ℄ PI	12+73.60	N= 908052.074	E= 634642.542	SIMPLE	Δ=39°00'54"	R= 420.00 D_C=13°38'51"	T= 148.79	L= 285.99	Ext= 25.58	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	East Frontage Road Cst ℄ PT	14+10.80	N= 908051.620	E= 634791.333											
	East Frontage Road Cst ℄ POE	17+25.29	N= 908050.658	E= 635105.819											
	West Frontage Road Construction ℄														
	West Frontage Road Cst ℄ POB	50+00.00	N= 907821.638	E= 632471.231											
	West Frontage Road Cst ℄ PC	56+23.22	N= 907818.174	E= 633094.441											
22	West Frontage Road Cst ℄ PI	56+62.11	N= 907817.958	E= 633133.333	SIMPLE	Δ=3°08'00"	R= 1422.00 D_C=4°01'45"	T= 38.89	L= 77.77	Ext= 0.53	e= NC	BFS=N/A	EFS=N/A	L_S = N/A	L_C= N/A
	West Frontage Road Cst ℄ PT	57+00.99	N= 907815.616	E= 633172.155											
	West Frontage Road Cst ℄ POE	58+93.00	N= 907804.055	E= 633363.822											

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	060-B(227)T			

60 MA 159

	NAME	DATE
DESIGN	JPG	05/24
DRAWN	JPG	05/24
CHECKED	RB	05/24

TRANSPORTATION
AECOM TECHNICAL SERVICES, Inc.
AECOM

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

33RD AVE
& EAST FRONTAGE RD
PLAN & PROFILE SHEET

PRELIMINARY
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

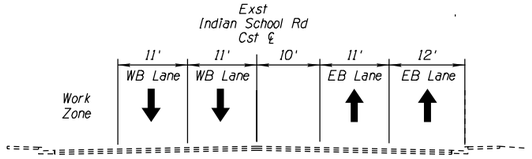
ROUTE: US 60
LOCATION: US 60 / 35TH AVE / INDIAN SCHOOL RD
SHEET 6 OF 6

TRACS NO. F0272 01L
060-B(227)T
____ OF ____

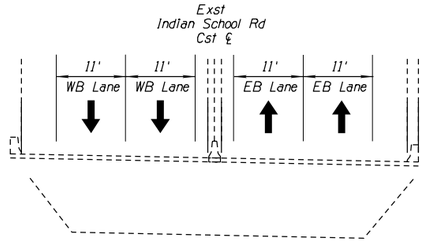
5/15/2024 c:\pwworking\aecom_ds19_na\joe.gillis@aecom.com\dms12491\f0272p06.dgn

APPENDIX D – Conceptual Construction Phasing Plan

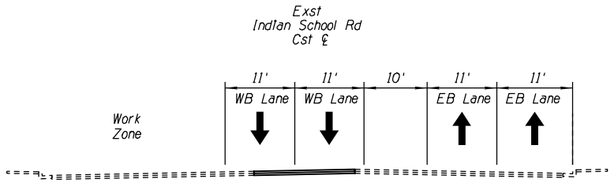
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	060-B(227)T			
		60 MA 159			



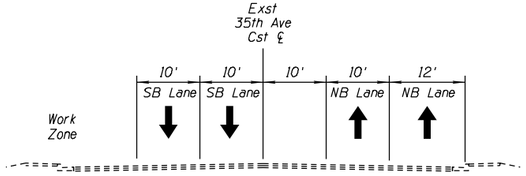
TYPICAL SECTION - INDIAN SCHOOL RD
West of 35th Avenue



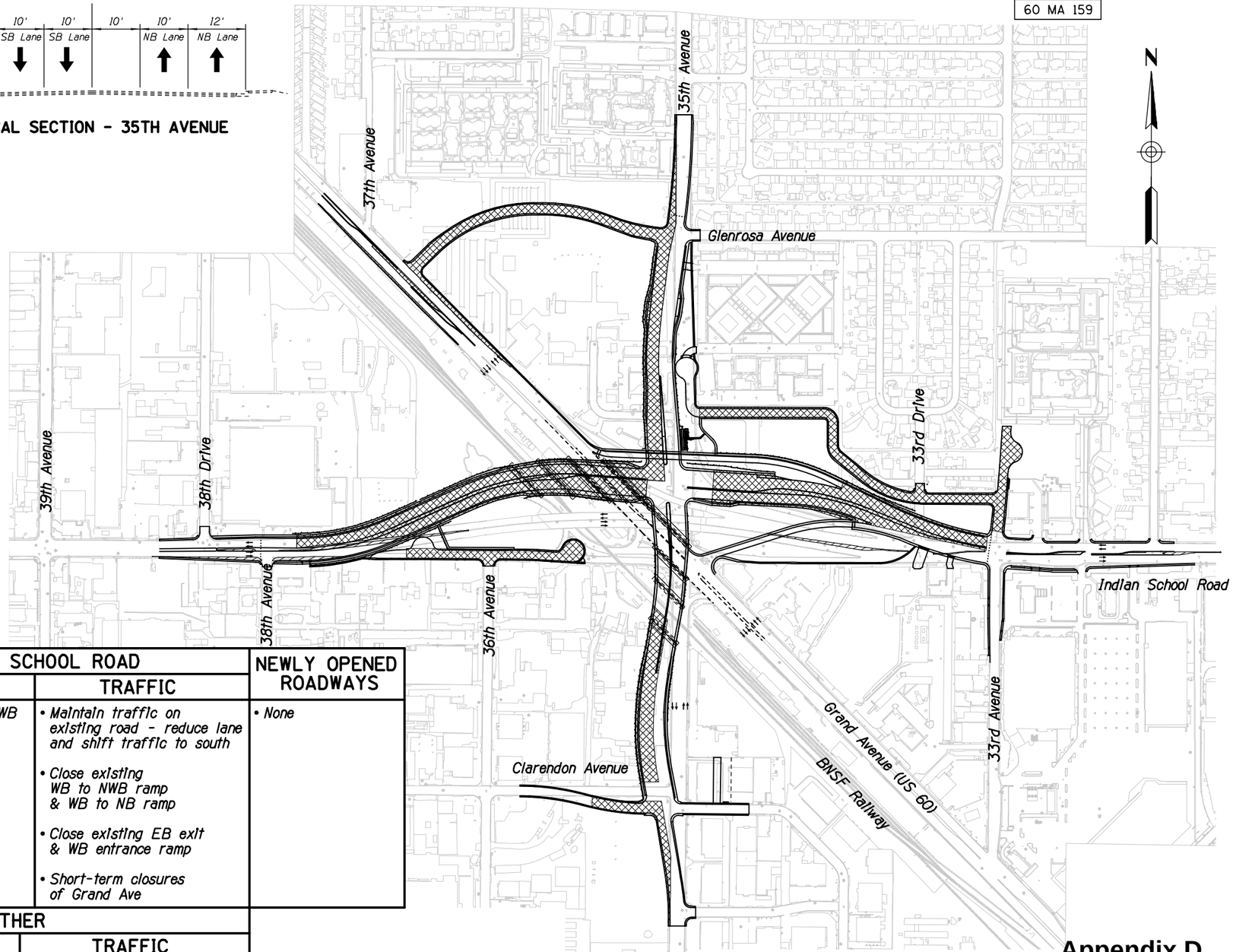
TYPICAL SECTION - INDIAN SCHOOL RD
On Structure



TYPICAL SECTION - INDIAN SCHOOL RD
East of 35th Avenue



TYPICAL SECTION - 35TH AVENUE



35TH AVENUE		INDIAN SCHOOL ROAD		NEWLY OPENED ROADWAYS
ACTIVITY	TRAFFIC	ACTIVITY	TRAFFIC	
• Construct portion of SB roadway & retaining walls	• Maintain traffic on existing road - reduce lanes and shift traffic to east	• Construct portion of WB & EB roadway & retaining walls • Construct bridge over Grand Ave & BNSF	• Maintain traffic on existing road - reduce lane and shift traffic to south • Close existing WB to NWB ramp & WB to NB ramp • Close existing EB exit & WB entrance ramp • Short-term closures of Grand Ave	• None

US 60		OTHER	
ACTIVITY	TRAFFIC	ACTIVITY	TRAFFIC
• Construct new Glenrosa Ave intersection • Construct Indian School Rd bridge	• Maintain traffic on existing road • Short-term closures	• Construct Glenrosa Ave west of 35th Ave • Construct portion of Clarendon Ave west of 35th Ave • Construct East Frontage Rd & north 33rd Ave • Construct West Frontage Rd	• N/A (new road) • Maintain traffic on existing road • Maintain access via 33rd Dr

LEGEND:
- Work Zone
- Temporary Pavement

Appendix D

	NAME	DATE
DESIGN	JPG	04/23
DRAWN	JPG	04/23
CHECKED	RB	04/23

TRANSPORTATION
AECOM TECHNICAL SERVICES, Inc.
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AECOM
www.aecom.com

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

CONSTRUCTION SEQUENCING PLAN SHEET
PHASE 1

PRELIMINARY
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	SHEET	OF
US 60	US 60 / 35TH AVE / INDIAN SCHOOL RD		
TRACS NO. F0272 01L		060-B(227)T	___ OF ___

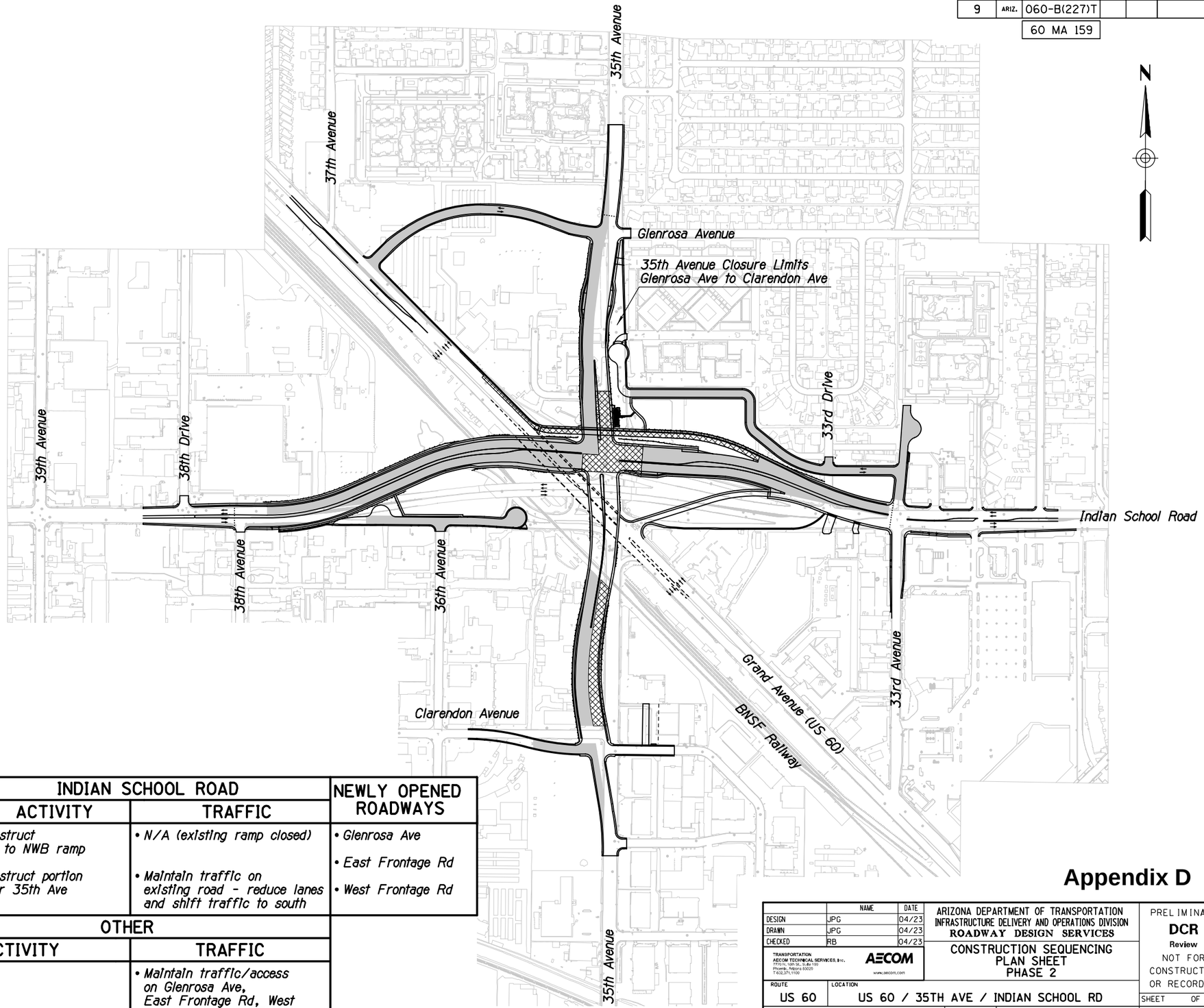
4/12/2023 c:\pwworking\aecom_ds19_na\greg.jacoby@aecom.com\dms1249l\Phase1_Sequence.dgn

DATE- | LOCATION- | REVISIONS- | FINISHED PLANS- | SURVEY NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	060-B(227)T			
		60 MA 159			

LEGEND:

- Work Zone
- Completed Portion of Project



35TH AVENUE		INDIAN SCHOOL ROAD		NEWLY OPENED ROADWAYS
ACTIVITY	TRAFFIC	ACTIVITY	TRAFFIC	
• Construct portion near Indian School Rd	• Close portion of 35th Ave (Glenrosa Ave to Clarendon Ave)	• Construct WB to NWB ramp • Construct portion near 35th Ave	• N/A (existing ramp closed) • Maintain traffic on existing road - reduce lanes and shift traffic to south	• Glenrosa Ave • East Frontage Rd • West Frontage Rd

US 60		OTHER	
ACTIVITY	TRAFFIC	ACTIVITY	TRAFFIC
	• Maintain traffic on existing road		• Maintain traffic/access on Glenrosa Ave, East Frontage Rd, West Frontage Rd, & 33rd Ave

Appendix D

	NAME	DATE
DESIGN	JPG	04/23
DRAWN	JPG	04/23
CHECKED	RB	04/23

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AECOM
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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

CONSTRUCTION SEQUENCING PLAN SHEET
PHASE 2

ROUTE	LOCATION
US 60	US 60 / 35TH AVE / INDIAN SCHOOL RD

PRELIMINARY
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Review
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SHEET OF

TRACS NO.		
F0272 01L		060-B(227)T

SHEET OF ___

4/12/2023 c:\pwworking\aecom_ds19_na\greg.jacoby@aecom.com\dms1249l\Phase2_Sequence.dgn

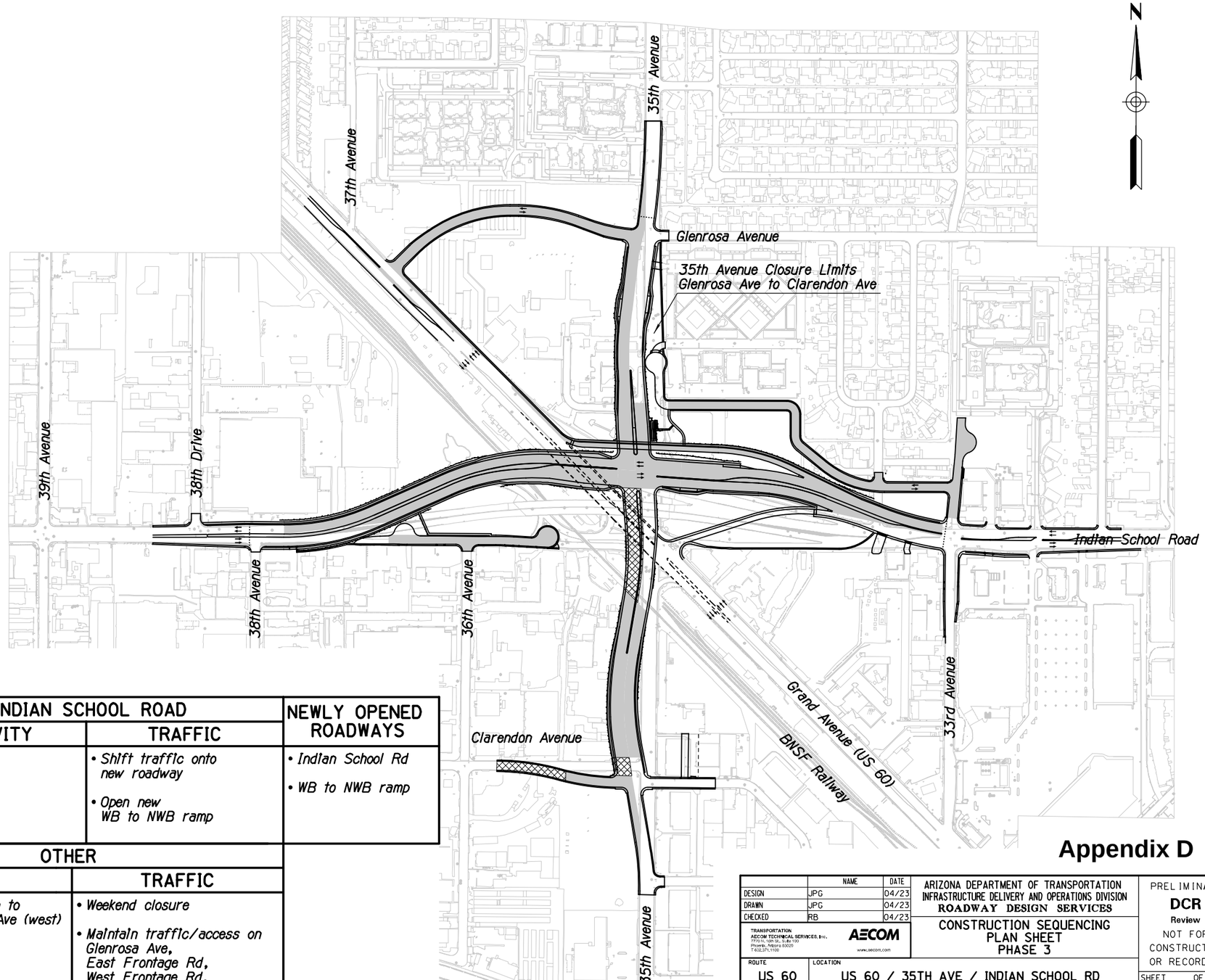
DATE- LOCATION- REVISIONS- FINISHED PLANS- SURVEY NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	060-B(227)T			
		60 MA 159			

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

LEGEND:

- Work Zone
- Completed Portion of Project



35TH AVENUE		INDIAN SCHOOL ROAD		NEWLY OPENED ROADWAYS
ACTIVITY	TRAFFIC	ACTIVITY	TRAFFIC	
• Construct bridge over Grand Ave & BNSF	• Short-term closures of Grand Ave • Close portion of 35th Ave (Glenrosa Ave to Clarendon Ave)		• Shift traffic onto new roadway • Open new WB to NWB ramp	• Indian School Rd • WB to NWB ramp

US 60		OTHER	
ACTIVITY	TRAFFIC	ACTIVITY	TRAFFIC
• Construct 35th Ave bridge	• Short-term closures • Maintain traffic on existing road	• Construct connection to existing Clarendon Ave (west)	• Weekend closure • Maintain traffic/access on Glenrosa Ave, East Frontage Rd, West Frontage Rd, & 33rd Ave

Appendix D

	NAME	DATE
DESIGN	JPG	04/23
DRAWN	JPG	04/23
CHECKED	RB	04/23

TRANSPORTATION
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7720 N. 16th St., Suite 100
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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

CONSTRUCTION SEQUENCING PLAN SHEET
PHASE 3

ROUTE	LOCATION
US 60	US 60 / 35TH AVE / INDIAN SCHOOL RD

PRELIMINARY
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

SHEET OF

TRACS NO.		
F0272 01L		060-B(227)T

___ OF ___

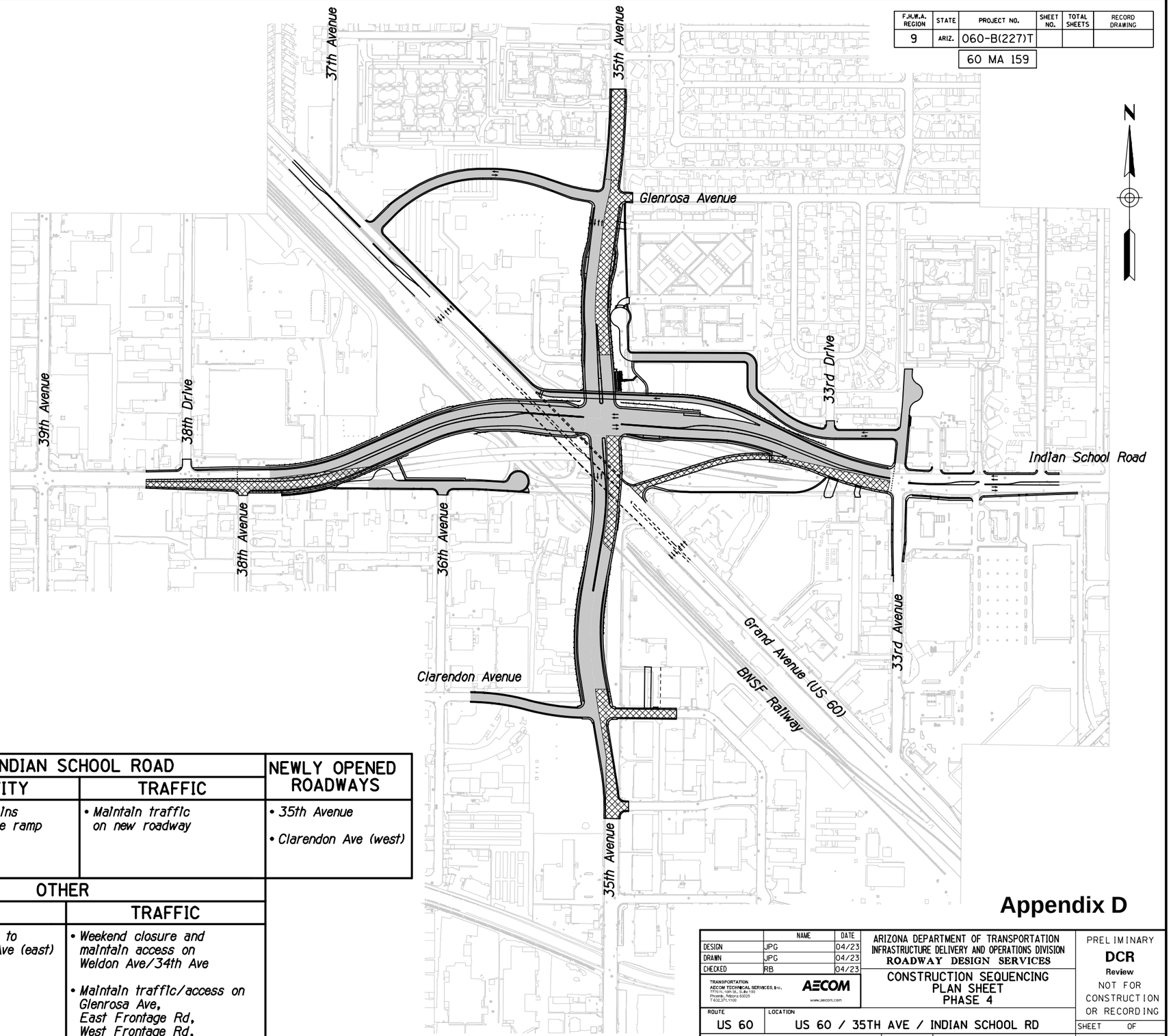
4/12/2023 c:\pwworking\aecom_dsl9_na\greg.jacoby@aecom.com\dms12491\Phase3_ Sequence.dgn

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.	060-B(227)T			
		60 MA 159			

LEGEND:

Work Zone

Completed Portion of Project



35TH AVENUE		INDIAN SCHOOL ROAD		NEWLY OPENED ROADWAYS
ACTIVITY	TRAFFIC	ACTIVITY	TRAFFIC	
• Construct NB roadway • Construct bridge over Grand Ave & BNSF	• Shift traffic onto new roadway • Short-term closures of Grand Ave	• Construct tie-ins & EB entrance ramp	• Maintain traffic on new roadway	• 35th Avenue • Clarendon Ave (west)

US 60		OTHER	
ACTIVITY	TRAFFIC	ACTIVITY	TRAFFIC
• Construct 35th Ave bridge	• Short-term closures • Maintain traffic on existing road	• Construct connection to existing Clarendon Ave (east)	• Weekend closure and maintain access on Weldon Ave/34th Ave • Maintain traffic/access on Glenrosa Ave, East Frontage Rd, West Frontage Rd, & 33rd Ave

Appendix D

	NAME	DATE
DESIGN	JPG	04/23
DRAWN	JPG	04/23
CHECKED	RB	04/23

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ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
ROADWAY DESIGN SERVICES

CONSTRUCTION SEQUENCING PLAN SHEET PHASE 4

PRELIMINARY
DCR
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE	LOCATION	SHEET	OF
US 60	US 60 / 35TH AVE / INDIAN SCHOOL RD		

TRACS NO.			
F0272 01L		060-B(227)T	___ OF ___

4/12/2023 c:\pwworking\aecom_ds19_na\greg.jacoby@aecom.com\dms1249l\Phase4_ Sequence.dgn

DATE- | LOCATION- | REVISIONS- | FINISHED PLANS- | SURVEY NO.

APPENDIX E – Summary of Comments

US 60, Grand Avenue
35th Avenue / Indian School Road Traffic Interchange
Project No. F0272 01L
Initial Design Concept Report Review Comments

#	Reviewer	Page	Section	Comment	Disposition	Response
1	N/A	N/A	N/A	Comment must have been deleted because there isn't one labeled as #1	D	No action taken
2	Jennifer Acuna (FHWA)	3	1.2	Can be noted here or in Section 1.3 - both US60 and Indian School Rd. are on the NHS	A	Will revise text
3	Henry Miranda (ADOT)	cover sheet		No comment from ADOT URR at this time.	D	No action taken
4	Kenneth Richmond (ADOT)	cover sheet		No comment	D	No action taken
5	Bruce Littleton (COP)	8	1.3.5	City of Phoenix has a fiber line running along Indian School Road. Going from west to east, the fiber is on the south side of Indian School Road, proceeds along the south side of the exit ramp and under BNSF along the exit ramp. At the SW corner of 35th Ave and Grand, the fiber crosses over Grand Avenue to the NE corner utilizing the signal staple. It proceeds east long the entrance ramp for Indian School Road and continues east on the south side of Indian School Road.	A	Will add information to Table 2
6	Bruce Littleton (COP)	11	1.3.10	ADOT does not maintain the traffic signal at 35th Ave & Grand. The signals are operated and maintained by the City of Phoenix. The signal timing plans are available from the City.	A	Will revise text
7	Bruce Littleton (COP)	59	4.10.2	Why ADOT? The City operates and maintains all remaining signals (six) on US 60/Grand into the City. It would make sense for the City to maintain signal progression for the all eight of the signals within the City on USD 60/Grand	A	Will revise text to indicate that the City will maintain
8	Bruce Littleton (COP)	59	4.10.3	Current City of Phoenix lighting standards are for LED street lights zt 2700 degrees K at approximately 200 foot spacings	A	Will revise text
9	Bruce Littleton (COP)	60	4.10.3	The existing streetlights along Grand Avenue are maintained by the City of Phoenix. We have no objection to ADOT taking over the streetlights, however, to not have a gap, the project limits t 43rd and Camelback for lighting purposes and have a well-defined southern limit say the signal at 33rd Ave.	A	Will revise text to indicate that the City will maintain
10	Bruce Littleton (COP)	60	4.10.4	Why? See previous signal comments. If ADOT wants the signals, we have no objection, but they should take over responsibilities for all the signals to the Encanto Blvd. and Grand Ave	A	Will revise text to indicate that the City will maintain
11	Dennis Haley (ADOT)	47	3.5	I thought that the project team has decided to proceed with the recommended alternative shown on DCR page 52 (Figure 29).	A	Yes, correct. Alternative 2 is generally the same. Text will be added to clarify revisions were made to Alt 2 to develop the Recommended Alternative
12	William Downes (ADOt)	55	4.4.2	For single span bridges GRS abutments may be a better, quicker less expensive and lower long term options then stub-abutments on drilled shafts with MSE walls. This applies to several single span bridges in the report.	D	No action taken. This option can be explored during the final design phase as an alternative. Coordination with BNSF may require revising the bridge configuration(s) as well. Additionally, geotechnical investigations and recommendations may also influence evaluation of alternatives.
13	HirenKumar Shah (ADOT)	3	1.2	Can we have more recent data (from 2011 to 2021)	D	This is the most recent, published information. Will revise text to clarify this information was from an FRA publication.
14	HirenKumar Shah (ADOT)	17	2.2	Do we have 2022 field count data just like Indian School Road and 35th Ave	A	Will include 2022 data
15	HirenKumar Shah (ADOT)	18	2.4.1.2	All lanes are 12' wide? Certain lanes are 11' or less on US 60, Indian School Road and 35th Ave	D	No action taken. This is an assumption for the Synchro analysis which is used to help develop the signal timings; changing to 11' lanes would have a negligible effect on the analysis as HCM 6th Edition states that lane widths would need to be < 10' to effect the predicted saturation flow rate
16	HirenKumar Shah (ADOT)	23	2.4.2.2	Should be LOS F	A	Will revise table
17	Quinn Farol (ADOT)	13	2.1	Would recommend that these dates also be updated as part of the final DCR. Data is 4 years old.	D	Crash data was collected at start of project (in 2020) as part of the existing conditions analysis which is needed at the onset of the project. In addition, the data timeframe overlaps with the City of Phoenix collision studies which provide a basis for the comparison of crash rates. The crash data also reflects the general time period of the traffic count data. While there is newer data available, we are recommending to keep all of the existing data as-is.
18	Quinn Farol (ADOT)	13	2.2	Unless the intent is to avoid the traffic disruptions associated with COVID, these dates could also be brought up to be more current.	A	Will review newer data and revise text as necessary
19	Quinn Farol (ADOT)	23	2.4.1.4	Please change to "TGP" (now Traffic Guidelines and Processes")	A	Will revise text
20	Quinn Farol (ADOT)	31	2.5	Please change to "TGP" (now Traffic Guidelines and Processes")	A	Will revise text

A - Will Comply
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21	Quinn Farol (ADOT)	59	4.10.1	Type XI only for permanent signs.	A	Will revise text
22	Quinn Farol (ADOT)	59	4.10.1	Recommend simply saying "...current edition of the ADOT Signing and Marking Standard Drawings..." and omitting any years ("2014" isn't useful information as related to our Standard Drawings).	A	Will revise text
23	Quinn Farol (ADOT)	60	4.11	"...the current edition of the Arizona..."	A	Will revise text
24	Sara Kotecki (COP)	5	1.3.3	Page 5 under Transit Facilities and Routes: The Route 571 now uses Loop 101 and I-10 in both directions and no longer operates in this area effective April 24, 2023 so the reference to the Route 571 can probably be deleted	A	Will revise text
25	Sara Kotecki (COP)	62	4.16	Page 62 under Transit Facilities: This references a raised median for the BRT station platform but may want to clarify this is for center running. Should this paragraph be revised to describe how it would work with side running? Or is center the default since it is the widest ROW? Might want to list both since the BRT cross-section has not been finalized.	A	Will revise text to refer to center running and will add text to clarify that the BRT design is underway
26	HirenKumar Shah (ADOT)	44	3.3.4	Where is the brief description @ 35th ave Option 1	D	No action taken. This text is describing the options that were eliminated & Option 1 was not eliminated from consideration. Option 1 is shown in Figure 25 and the evaluation is shown in Table 23.
27	HirenKumar Shah (ADOT)	59	4.5	Where is the DB6, Show on the map on page 62	A	Will revise text, tables, and graphic to re-number basins as DB-6 does not exist
28	HirenKumar Shah (ADOT)	65	6.4	Lane width does not meet RDG requirement. Please include RDG exception for lane width	A	Will revise text to state that US 60 travel lanes are < 12' which do not meet RDG
29	HirenKumar Shah (ADOT)	50	4.1	35th will have 2 lanes or 3 lanes in each direction? As per lane width it appears to have 3 lane in each direction	A	35th Ave will have 2 lanes in each direction; will revise table
30	Md Ahsan Habib (ADOT)	12	1.3.12	Revise the table (table 3) to include all the major pavement construction activities since they were first built. Otherwise, the table does not represent existing structural sections.	A	It would be difficult to identify all major pavement improvements which is beyond the scope of the DCR. Text and table will be revised to state the informaiton reflects the as-builts from the years shown in the table and additonal improvements may have occured since then.
31	Md Ahsan Habib (ADOT)	61	4.13.3 (Table 31)	Please verify and revise the structural sections, which seem to be under designed. On US 60 for example, 9" AC over 12" AB was used reasonably in the vicinity of the project (may see H5137 project). In the select material column, differentiating new and existing appears to be confusing and may lead to an increased number of structural sections unnecessarily. Try to minimize/optimize number of structural sections if feasible.	A	Will revise Table 31 to show 9 AC over 12 AB for US 60 and Indian School Rd. With this change, we will remove the column that refers to Select Material. To clarify, the information shown in the DCR was based on previous projects as we have not conducted any geotechnical investigation - the geotech field data will be conducted during final design.
32	Md Ahsan Habib (ADOT)	63	5.1	This item of estimate is obsolete. Please include items for 416 AC, binder PG 76-22 PM, mineral aggregates, tack, and friction course items to reflect representative cost of pavement materials	D	This will be addressed during the design phase.
33	Henry Miranda (ADOT)	38	3.3.3	A,C and E are the best for least utility impact I and J are best for the least utility impact O and P are the best the least utility impact	D	No action taken. This evaluation was presented in 2021 and the rankings were based on the existing data available at that time and a comparison of all 18 concepts.
34	Henry Miranda (ADOT)	60	4.12	Need to keep open communication with all utility companies to keep project on track to avoid delays in schedule in design and construction	A	Coordination with utility companies is on-going
35	Anissa Gerard (ADOT)	page 6/6	Appendix A	With failing LOS at 33rd Ave, did you analyze adding extra lanes on the side streets to optimize the signal timing to provide better LOS	D	Yes, additional lanes were tested. This memo is intended to investigate the re-routing of all movements from the 35th Ave/Grand Ave intersection to 33rd Avenue which includes over 1,000 trip per peak hour. Based on the analysis in the memo, it was determined that additional mitigation would be needed.
36	Anissa Gerard (ADOT)	31	N/A	are all intersections modeled as protected left turns? Is this by design or were protected permissive left turns analyzed? Were there sight distance issues?	A	Will add text to section 2.4.2.3 to clarify. Protected left-turns were modeled along 35th Avenue to account for center-running BRT. Other single lane left-turns were modeled as protected-permissive while the dual left-turn lanes were modeled as protected.
37	John Hucko (ADOT)	62	4.15	Please expand Title and language to include aesthetics as well.	A	Will revise text
38	Paul Njiraini (COP)	Sheet 5/6	Appendix C	City of Phoenix will install a HAWK at 35th Ave and Glenrosa. Equipment can be repurposed by ADOT	A	Will add section 4.18 to discuss on-going projects and include this information

A - Will Comply
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US 60, Grand Avenue
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Initial Design Concept Report Review Comments

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39	Guled Ahmed (ADOT)	54	4.4.2	Will there be a bridge selection or wall selection report to evaluate different foundations for this project?	A	Yes, this report will be prepared during final design. Text has been added at several locations where the future report is mentioned to clarify it will be prepared during final design
40	Guled Ahmed (ADOT)	56	4.4.3	Would there be Wall selection report to evaluate different wall system and their cost?	A	Yes, added text to mention this report will be prepared during final design
41	Guled Ahmed (ADOT)	57	4.5	This will require infiltration test or study to evaluate percolation rate of the soil.	A	Text will be added to section 4.13 to mention future geotech investigation & testing plan during final design
42	Guled Ahmed (ADOT)	59	4.9	What are the earthwork factors (swell and shrinkage) used to determine earthwork quantities required for embankment and excavation?	A	As noted on page 63, we used a 10% shrink applied to the excavation but only a specific portion of the excavation that could be used for embankment during construction, based on the anticipated project phasing. We will add information to pages 59 and 63 to clarify.
43	Brad Williams (MAG)	3	1.2	2nd paragraph - City of Litchfield Park should be Goodyear	A	Revise text to say "Goodyear"
44	Brad Williams (MAG)	5	1.3.3	2nd paragraph - confirm route 41 runs only 1-way and is not a two-way route	A	Revised text as current transit schedule show running in both directions
45	Brad Williams (MAG)	5	1.3.3	3rd paragraph - is there a stop where route 35 and route 41 both stop to allow transfers	A	Revise text to describe the relative locations and transfer opportunities
46	Brad Williams (MAG)	5	1.3.3	last paragraph - change "future HCT" to "preferred future HCT"	A	Revised text as requested
47	Brad Williams (MAG)	13	2.1	table 6 and associated text - explain why us60/35th Ave/IS intersection has a lower-than average rate but a higher-than average frequency. Also explain why 33rd/ISR has a higher than average rate but a lower thana average frequency.	A	Revised text to mention difference in traffic volumes and # of crashes
48	Brad Williams (MAG)	13	2.2	It is confusing trying to understand what time period represents existing conditions. Information is cited representing 2007-2017, 2019, and 2022 but no specific count data (such as dates, locations, etc.) Data for some streets seem to be from different years from other streets. A lot happened between 2019 and 2022 and it is likely there has been some shifting in traffic characteristics during that time. Has there been any comparisons between the count data and the MAG model to see if the MAG model might be a more reliable source of data, or to provide insight to how to combine 2019 and 2022 data into a single whole?	A	Revised to text to include more information about the different counts. 2019 count data was primary source to estimate 2020 volumes. 2020 and 2021 count data was used as supplement to fill in some holes. This approach was discussed at a meetings on 7/15/20, 9/20/20, and 1/5/21, and in a memo that was distributed in July 2020. MAG model was not used for existing volumes. See comment # 54 below.
49	Brad Williams (MAG)	17	2.3.1	Would the No-Build BRT have a station at Indian School Rd?	A	Added text to section 2.3.1 to state that the ADOT No-Build project is assumed to include a BRT station at Indian School. The BRT project has not developed a recommended design concept. Based on coordination with the BRT team, we are assuming that our No-Build project would include a BRT station at or near Indian School Rd.
50	Brad Williams (MAG)	17	2.3.1	Would the BRT service include reductions in through-lanes along 35th Avenue & Van Buren Street?	D	No action taken. The text in section 2.3.1 mentions the assumption that the BRT would remove a lane on 35th Avenue. The BRT project has not developed a recommended design concept. Based on coordination with the BRT team, it is assumed that the BRT project would remove 1 NB lane on 35th Ave. Van Buren St is 3 miles south of Indian School Rd and is not within the study area for this project. The MAG model that we received did not extend to Van Buren St so the projected network conditions are unknown. As it is 3 miles away, it would likely have minimal effect on the travel demand along Indian School Rd.
51	Brad Williams (MAG)	17	2.3.1	This is a reduction of one through lane in the northbound direction on 35th Ave	A	Revised text to state that 1 NB is removed. Based on coordination with the BRT project, it is assumed the BRT project would remove 1 NB lane, as also stated in the description of the No-Build Alternative. Therefore, that has been implemented as part of this project. However, the BRT project has not developed a recommended design concept, so this is an assumption.

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US 60, Grand Avenue
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52	Brad Williams (MAG)	18	2.4.1.2	Given the cross sections of Grand Avenue, 35th Ave, and Indian School Rd, an 11' lane width assumption might be considered	D	No action taken. This is an assumption for the Synchro analysis which is used to help develop the signal timings; changing to 11' lanes would have a negligible effect on the analysis as HCM 6th Edition states that lane widths would need to be < 10' to effect the predicted saturation flow rate
53	Brad Williams (MAG)	18	2.4.1.2	Is 1900 vphpl the recommended assumption in the HCM for left and right turn?	A	Text revised to remove "all movements" from bullet point. HCM 6th Edition shows 1,900 as the base saturation flow rate for all movements which is then adjusted for each "lane group" based on several factors including lane width, heavy vehicles, lane utilization, and specific adjustments for left and right turn lanes
54	Brad Williams (MAG)	24	Figure 16	In the upper left corner, the title says the existing year is 2020. Is this a typo?	A	The graphics and text revised to show 2020 as the existing baseline and the text will be updated to reflect the methodology. The 2019 count data was used to estimate 2020 without the effect of the COVID-19 pandemic. This approach was discussed at a meetings on 7/15/20, 9/20/20, and 1/5/21, and in a memo that was distributed in July 2020.
55	Brad Williams (MAG)	28	2.4.2.3	Did you include BRT service on 35th Ave in the simulations? Also have you investigated what LOS might be provided if and when HCT service is put on Indian School Rd? It would be a shame if we complete this project only to discover a few years later that the bridges need to be widened to avoid unacceptable delays. This is unlikely, given the high quality of service shown in the simulations, but it would be good to confirm that with an actual model run. The HCT may have a larger impact on other intersections as well, such as 33rd Ave/Indian School Rd	D	The BRT project has not developed a recommended design concept. Based on coordination with the BRT team, it is assumed that the BRT buses would operate in exclusive lanes and would utilize the north-south signal green phase for 35th Ave traffic and would not have a separate signal phase so we did not include BRT service in the simulations. HCT has not been included along Indian School Rd. A MAG travel demand model was not ran with HCT along Indian School Rd as construction is not funded. Adding HCT to the travel demand model along Indian School Rd would likely reduce the vehicular traffic. The footprint for Indian School Rd can accommodate 3 lanes in each direction of travel plus HCT.
56	Brad Williams (MAG)	28	2.4.2.3	Achieving an average delay of 47 seconds while simultaneously having an approach delay of 178 seconds does not seem to be a successful result. The objective should be more than just minimizing total intersection delay. This inequitable solution might be remedied with a simple change to timing or intersection geometry. It would be helpful to understand what can be done for Clarendon Ave.	A	Revisions to the signal timing have improved the operations - tables & figures have been updated
57	Brad Williams (MAG)	Page 1/6	Appendix A	How was this re-routing done? Did you utilize the MAG model as a resource in determining how trips should be re-routed? Did you do any select-link analysis, for example, to get a sense of how any trips would be diverted by the network changes? How much of the shifting is due to re-establishing access to parcels due to loss of their prior access? How did you determine the volumes to be diverted, and to which paths? How much of the re-routing was to reflect the creation of new network connections and the loss of others that might affect a broader group of vehicles? How did you balance turning movements at intersections with all of these changes?	A	The memo has been updated to more clearly state the purpose of the memo and analysis, and re-routing approach. The memo is focused on re-routing all related movements from the existing 35th Ave/US 60/Indian School Rd intersection to 33rd Ave to determine the operational effects of the re-routing on 33rd Ave.The memo provides graphics and a table to describe which movements were re-routed and where they were re-routed to.

A - Will Comply
B - Consultant to Evaluate
C - ADOT Team to evaluate
D - Design team recommends no further action taken

US 60, Grand Avenue
35th Avenue / Indian School Road Traffic Interchange
Project No. F0272 01L
Draft Final Design Concept Report Review Comments

#	Reviewer	Page	Section	Comment	Disposition	Response
1	John Hucko (ADOT)	Cover sheet	N/A	Roadside Development Has no comments.	D	No action taken
2	Haldun Guvenen (ADOT)	Cover sheet	N/A	ADOT Roadway Drainage Design Section has no more drainage related comments,	D	No action taken
3	William Downes (ADOT)	iii	N/A	I have no further comments.	D	No action taken
4	Brad Williams (MAG)	5	1.3.3	Please change to: the Regional Strategic Transportation Infrastructure Investment Plan (RSTIIP).	A	Will revise text
5	Brad Williams (MAG)	5	1.3.3	Consider: A West Phoenix HCT route has been studied for several years. Recently the City of Phoenix established a preferred alignment for this service that runs along Indian School Road and passes through the Grand Avenue/35th Avenue/Indian School Road intersection. The West Phoenix HCT extension has also been included in the 2050 RTP and the RSTIIP, but the mode for this service and, potentially, the alignment itself have not yet been finalized.	A	Will revise text
6	Quinn Farol (ADOT)	12	1.3.9	"Traffic Guidelines and Processes"	A	Will revise text
7	Brad Williams (MAG)	14	2.1	Is Clarendon Avenue an arterial or a collector street?	A	Clarendon is a collector street; will revise text to clarify
8	Quinn Farol (ADOT)	14	2.1	"Traffic Safety Section"	A	Will revise text
9	Brad Williams (MAG)	14	2.2	You indicate that 2020 traffic volumes were lower than 2019 volumes due to COVID, but then apply a small growth factor to the 2019 data. Is this factor more than 1.0 or less than 1.0? Do the adjusted numbers represent the lower traffic in 2020, or something that is increased over the 2019 volumes? If it is the latter, then the existing conditions would represent a modification to the actual 2020 volumes.	A	Will update the text to include reference to 2% growth factor that was applied to the 2019 volumes to represent a conservative estimate of the 2020 volumes as if COVID did not occur as we began this project in early 2020 right at the on-set of COVID impacts.
10	Quinn Farol (ADOT)	14	2.2	I agree that this should be clarified.	A	See comment #9 above
11	Brad Williams (MAG)	18	2.2	This comment is an observation and does not imply a need to revise the report. But a casual reader might be confused. The difference in K factors on US60 between the observations and the MPD data are significant. A 9% factor is 50% higher than a 6% factor. Is this difference related to the way the data were collected (e.g. across a whole year vs on a particular day, or at a different location)? How did the daily volumes compare? Do the MPD data imply a higher peak hour volume or a lower daily total volume?	D	Added a sentence to clarify that the published ADOT K & D factors are based on the 30th highest hourly volume of the year.
12	Brad Williams (MAG)	18	2.3.1	at the elevated intersection	A	Will revise text
13	Quinn Farol (ADOT)	19	2.4.1.3	Good job in verifying model calibration.	D	No action taken
14	HirenKumar Shah (ADOT)	19	2.4.1.3	VISSIM model used 50MPH free flow speed for US60 where table 28 (4.1 design controls) has design speed 45MPH. Please clarify		Will revise text to reflect that US 60 was modeled at 45 mph.
15	Quinn Farol (ADOT)	24	2.4.1.4	"Traffic Guidelines and Processes (TGP)"	A	Will revise text
16	Quinn Farol (ADOT)	24	2.4.1.4	Change to "TGP"as PGP is old (typical).	A	Will revise text
17	Quinn Farol (ADOT)	51	4.1	Is the intent to use the 2009 version or would it be better to use the 2023 version? Please verify.	A	Will revise text
18	HirenKumar Shah (ADOT)	51	4.1	mention RDG 2021 with 2022 update or current version	A	Will revise text
19	Kelly Murray (COP)	51	4.1	Cheryl Ave to Van Buren Street	A	Will revise text
20	Kelly Murray (COP)	54	4.4.2	Cheryl Ave to Van Buren Street	A	Will revise text
21	Kelly Murray (COP)	63	4.16	Cheryl	A	Will revise text
22	Kelly Murray (COP)	63	4.18	Cheryl	A	Will revise text
23	Md Ahsan Habib (ADOT)	64	5.1	Include bid item for Aggregate Base Class 2.	A	Will revise
24	Md Ahsan Habib (ADOT)	64	5.1	This bid item does not exist. Please include bid items 4160004, 4160031 and 4040230 for AC, mineral aggregate (MA) and binder respectively, all in the units of TON. For calculation, consider AC unit wt to be 150lb/Cu Yd..Use 1 % of AC as MA and 5% of AC as binder.	A	Will revise
25	Dena Whitaker (ADOT)	67	7.1	May 31, 2024	A	Will revise text

A - Will Comply
B - Consultant to Evaluate
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D - Design team recommends no further action taken

Version Dated 2017-09-22

No Comment / All Items CLOSED* ☐

Submittal Essentials in RED **

MPP Review Items; KC Structures Review Items

BNSF Engineering Services-Structures Review Comments

Grade Separation (OH Design) Review Comments Sheet

Check for compliance with current AREMA and Union Pacific - BNSF Guidelines for Railroad Grade Separation Projects

Project Name:	US 60, GRAND AVENUE, 35th Avenue/Indian School Road Traffic Interchange	BNSF Point of Contact:	Rafer Nichols
Submittal Name:	Draft-Final Design Concept Report	Project CM Contact:	
Plan File Name:	F0272 Draft Final DCR.pdf	Asset MP Name:	**188.1XX**
Plan File Date:	May 2024	Plan %:	Draft Concept

Horizontal Clearance
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Clearance for Future Track(s) (Input from Cap Planning; Left / Right?)
☐No Exceptions Taken ☐ Comments Below ☐ N/A

BNSF MP & Direction of Increasing MP on Plan View
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Track Geometry (Curves, run off, grades, track spacing, etc.)
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Vertical Clearance
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Fence / Barrier Rail (Shoulder width, height, limits w/ respect to tracks)
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Temporary Horizontal Clearance (Includes Falsework)
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Temporary Vertical Clearance (Includes Falsework)
☐No Exceptions Taken ☐ Comments Below ☐ N/A

TOR Elevations at All Tracks
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Clearance for Access Road (Input from Division on Need)
☐No Exceptions Taken ☐ Comments Below ☐ N/A

RR Track Profile (1000' Either direction on all Existing and Future Tracks)
☐No Exceptions Taken ☐ Comments Below ☐ N/A

ROW Limits Shown (all piers should be off of BNSF ROW if possible)
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Drainage – Diverted away from BNSF ROW & Drain Locations
☐No Exceptions Taken ☐ Comments Below ☐ N/A

2:1 Slopes w/ Type / limits of Paving
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Depth of Foundations from TOT Dimensioned
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Ditches Shown and Drainage Path Indicated
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Impacts to signal, telecom, etc.
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Width of Superstructure & Depth Dimensioned on Section View
☐No Exceptions Taken ☐ Comments Below ☐ N/A

Piers on BNSF ROW (Check Pier Protection Requirements)
☐ > 25' to CL ☐ ≤ 25' to CL ☐ ≤ 12' to CL

Splice Locations Shown w/ respect to tracks
☐No Exceptions Taken ☐ Comments Below ☐ N/A

MSE Walls
☐None Proposed ☐ Off BNSF ROW ☐ Crash-Protected

Item No.	Sheet No.	Reviewer Comment Date: 7/16/2024	Initial	Designer's Response Date:	Reviewer's Comment Date:	Initial	Designer's Response Date:	Reviewer's Comment Date:	Initial	Designer's Response Date:	Reviewer's Comment Date:	Initial	Status (Open or Closed
1.	General	Note that these comments may not be all-inclusive and are based on the amount of information that is furnished at the time of the review.	JRH										OPEN
2.	8	Include BNSF Signal and Fiber Information	JRH	Will revise table to include comm located along west side of ROW and note that signals (and associated comms and power) are also present									OPEN
3.	9	Provide zoomed in graphic of Figure 6	JRH	We can provide a PDF for your use									OPEN
4.	10	Update UPRR to BNSF	JRH	Will revise text									OPEN

*BNSF has reviewed these submittals and no exceptions are taken with regard to BNSF's ability to use or accommodate the project as intended. BNSF has not reviewed the design details or calculations for structural integrity or engineering accuracy. BNSF accepts no responsibility for errors or omissions in the design or execution of the project.

** Check Submittal Essentials prior to transmittal to Structures Review. If not included, Project Engineer to reject and request resubmittal.

Version Dated 2017-09-22

No Comment / All Items CLOSED* ☐

Submittal Essentials in RED **

MPP Review Items; KC Structures Review Items

BNSF Engineering Services-Structures Review Comments

Grade Separation (OH Design) Review Comments Sheet

Check for compliance with current AREMA and Union Pacific - BNSF Guidelines for Railroad Grade Separation Projects

Project Name:	US 60, GRAND AVENUE, 35th Avenue/Indian School Road Traffic Interchange	BNSF Point of Contact:	Rafer Nichols
Submittal Name:	Draft-Final Design Concept Report	Project CM Contact:	
Plan File Name:	F0272 Draft Final DCR.pdf	Asset MP Name:	**188.1XX**
Plan File Date:	May 2024	Plan %:	Draft Concept

5.	11	Statement: "Current BNSF Railway policy prohibits the construction of structures within their right-of-way during the fourth quarter (October 1 through December 31) of each calendar year. This moratorium applies to the entire BNSF Railway system due to the higher demands during the holiday season." is misleading. Work is allowed on ROW however track closure is not allowed and work could be limited due to train movement.	JRH	Will revise text to say: Current BNSF Railway policy prohibits track closures during the fourth quarter (October 1 through December 31) of each calendar year. In addition, work within the right-of-way may be restricted due to train movements. This moratorium applies to the entire BNSF Railway system due to the higher demands during the holiday season									OPEN
6.	53	Verify ROW line is accurate and confirm roundabout is off BNSF ROW.	JRH	For the study, ROW line is based on county assessor information. ROW line will be developed by ADOT ROW for use in final design. Cul-de-sac is currently located west of BNSF ROW and will be adjusted, if needed, during final design to stay west of RR ROW.									OPEN
7.	54	23' 6" Clearance required for BNSF	JRH	Will revise text									OPEN
8.	54	Cast in Place not allowed over BNSF tracks.	JRH	Table 26 is shown to describe predominate structure types used in AZ and does not include recommendations for this project. The text can be revised to note that a CIP Post-tension box girder structure would not be allowed. The only CIP elements would be the CIP deck on the pre-cast girders which can use stay-in-place forms for the interior bays and only the exterior bays would need to be formed using the exterior girders for support.									OPEN
9.	57	Refer to BNSF Guidelines for use of MSE walls.	JRH	Will add text to refer to BNSF guidelines									OPEN
10.	62	Include BNSF Signal and Fiber Information	JRH	Will add to table									OPEN

*BNSF has reviewed these submittals and no exceptions are taken with regard to BNSF's ability to use or accommodate the project as intended. BNSF has not reviewed the design details or calculations for structural integrity or engineering accuracy. BNSF accepts no responsibility for errors or omissions in the design or execution of the project.

** Check Submittal Essentials prior to transmittal to Structures Review. If not included, Project Engineer to reject and request resubmittal.

Version Dated 2017-09-22

No Comment / All Items CLOSED* ☐

Submittal Essentials in RED **

MPP Review Items; KC Structures Review Items

BNSF Engineering Services-Structures Review Comments

Grade Separation (OH Design) Review Comments Sheet

Check for compliance with current AREMA and Union Pacific - BNSF Guidelines for Railroad Grade Separation Projects

Project Name:	US 60, GRAND AVENUE, 35th Avenue/Indian School Road Traffic Interchange	BNSF Point of Contact:	Rafer Nichols
Submittal Name:	Draft-Final Design Concept Report	Project CM Contact:	
Plan File Name:	F0272 Draft Final DCR.pdf	Asset MP Name:	**188.1XX**
Plan File Date:	May 2024	Plan %:	Draft Concept

11.	Appendix C: Sheet 1 of 6	Clarify "New R/W" callouts on BNSF ROW	JRH	The labels are intended to identify areas where new ROW and/or easements are required. ADOT ROW will work with BNSF to develop and execute easement agreement(s).									OPEN
12.	Appendix C: Sheet 1 of 6	Verify ROW lines and confirm roundabout is off BNSF ROW.	JRH	For the study, ROW line is based on county assessor information. ROW line will be developed by ADOT ROW for use in final design. Cul-de-sac is currently located west of BNSF ROW and will be adjusted, if needed, during final design to stay west of RR ROW.									OPEN
13.	Appendix C: Sheet 1 of 6	Verify vertical clearance is measured at 9' from CL of Future tracks.	JRH	Yes, this will be the approach during final design									OPEN
14.	Appendix C: Sheet 2 of 6	Verify vertical clearance is measured at 9' from CL of Future tracks.	JRH	Yes, this will be the approach during final design									OPEN
15.	General	Provide details for BNSF access to property.	JRH	Access details will be worked out in final design. Current concept would be to provide access from US 60 (Grand Ave) and/or from cul-de-sac shown on Sheet 1 in Appendix C									OPEN

Add Row

*BNSF has reviewed these submittals and no exceptions are taken with regard to BNSF's ability to use or accommodate the project as intended. BNSF has not reviewed the design details or calculations for structural integrity or engineering accuracy. BNSF accepts no responsibility for errors or omissions in the design or execution of the project.

** Check Submittal Essentials prior to transmittal to Structures Review. If not included, Project Engineer to reject and request resubmittal.

APPENDIX F – Draft ADA Compliance and Feasibility Report

PROJECT NO. F0272 01L
FEDERAL PROJECT NO. 060-B(227)T
US 60 (Grand Ave) 35th Avenue and
Indian School Road Intersection

DRAFT ADA COMPLIANCE AND FEASIBILITY REPORT

January 2024

PREPARED BY

AECOM

January 2024

ROADWAY PREDESIGN SECTION

ROADWAY ENGINEERING GROUP

ADOT

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1.0 INTRODUCTION

Project F0272 01L – US 60 (Grand Ave) 35th Avenue and Indian School Road Intersection is located at the intersection of Grand Avenue,35th Avenue and Indian School Road. The proposed project limits along Grand Avenue begin at Milepost (MP) XX (37th Ave.) and end at MP XX (33rd Ave.). The proposed project limits along 35th Avenue begin just north of Glenrosa Avenue and end at Weldon Avenue. The proposed project limits along Indian School Road begin at 38th Drive and end at 32nd Avenue.

For the purpose of this report the limits noted above were evaluated for compliance with the 2010 ADA Standards for Accessible Design (2010 Standards). The ADOT Features Inventory System (FIS) indicates that there are 48 ADA features located within the project limits. Of the 48 ADA features identified in the ADOT FIS, 15 are labeled as non-compliant. A summary of the features included in the ADOT FIS system for the limits is provided in Table 1.

Table 1 – ADOT FIS Summary of Features

Feature Type	Compliant	Non-Compliant	Total
Sidewalk	1	0	1
Curb Ramps	21	1	22
Handrail	0	0	0
Pedestrian Activated Signals	4	1	5
Obstructions or Needs	0	4	4
Driveways	2	9	11
Traffic Island Pedestrian Crossings	5	0	5
Railroad Crossings	0	0	0
Total	**33**	**15**	**48**

As part of the evaluation process for this report, AECOM performed field reviews of the project limits to verify data from the ADOT FIS. From these field reviews it was found that some ADOT FIS measurements did not match those of the AECOM field review measurements. The project limits extend along Grand Avenue (US 60), 35th Avenue, and Indian School Road. The ADOT FIS is focused on the ADOT R/W along US 60. Many of the features contained within this report are within City of Phoenix R/W and are not contained within the ADOT FIS. The project improvements and future maintenance will be covered in an IGA between ADOT and the City of Phoenix.

Based on evaluation of both the ADOT FIS and AECOM field reviews it is determined that 373 ADA features are located within the project limits. Of the 373 ADA features, it is determined that 137 are non-compliant per the 2010 Standards. A summary of the

features located within the project limits per evaluation of both the ADOT FIS and AECOM field reviews is provided in Table 2.

Table 2 – Summary of Features (ADOT FIS and AECOM Field Review)

Feature Type	Compliant	Non-Compliant	Total
Sidewalk	134	15	149
Curb Ramps	55	17	72
Handrail	0	1	1
Pedestrian Activated Signals	16	4	20
Obstructions or Needs	0	4	4
Driveways	26	92	118
Traffic Island Pedestrian Crossings	5	0	5
Railroad Crossings	0	4	4
Total	**236**	**137**	**373**

Included in the subsequent sections of this report are summaries of the compliant and non-compliant features within the project limits (including but not limited to type, location, proposed mitigation action, etc.). Summaries include evaluation of features as per both the ADOT FIS and AECOM field reviews. Also included in an Appendix are Non-Compliant Feature Location Maps and Non-Compliant Feature Photo Logs (both currently in the ADOT FIS and missing from the ADOT FIS).

2.0 SIDEWALK

There are a total of 149 sidewalk locations totaling approximately 14,554 feet of sidewalk within the evaluated project limits. Of the 149 sidewalk locations, 15 are non-compliant per 2010 Standards. Of the 149 sidewalk locations, 133 compliant locations and 15 non-compliant locations are currently not listed in the ADOT FIS.

Table 3 provides a summary of the compliant sidewalk locations. Table 4 provides a detailed summary of the non-compliant sidewalk locations. Locations that currently are not listed in the ADOT FIS are included at the end of both Tables 3 and 4. Identification numbers were assigned from the AECOM field review for reference purposes.

Asset IDs designated with (**) are features that were not verified in the field. The information was gathered using street view on Google Maps.

Table 3 – Compliant Sidewalk

Asset ID	Location	Appr. Length (LF)
1021412(1)	NB 35th Ave to EB US60 Median	36.30
301(2)	WB Indian School Rd West of 38th Dr	21.00
302(2)	EB Indian School Rd West of 35th Ave	46.00
303(2)	EB Indian School Rd West of 35th Ave	58.60
304(2)	EB Indian School Rd West of 35th Ave	16.80
305(2)	EB Indian School Rd West of 35th Ave	22.30
306(2)	EB Indian School Rd West of 35th Ave	39.50
307(2)	EB Indian School Rd West of 35th Ave	24.20
308(2)	EB Indian School Rd West of 35th Ave	18.90
309(2)	EB Indian School Rd West of 35th Ave	14.40
310(2)	EB Indian School Rd West of 35th Ave	60.60
311(2)	EB Indian School Rd West of 35th Ave	16.50
313(2)	EB Indian School Rd West of 35th Ave	28.20
314(2)	EB Indian School Rd West of 35th Ave	52.70
315(2)	EB Indian School Rd West of 35th Ave	91.50
316(2)	EB Indian School Rd West of 35th Ave	80.00
317(2)	EB Indian School Rd West of 35th Ave	45.20
318(2)	EB Indian School Rd West of 35th Ave	59.40
319(2)	EB Indian School Rd West of 35th Ave	54.40
320(2)	36th Ave S, of Indian School Rd	75.30
321(2)	36th Ave S, of Indian School Rd	18.50
322(2)	EB Indian School Rd West of 35th Ave	119.80
324(2)	EB Indian School Rd West of 35th Ave	44.40
325(2)	EB Indian School Rd West of 35th Ave	34.00

Table 3 – Compliant Sidewalk (cont.)

Asset ID	Location	Appr. Length (LF)
326(2)	EB Indian School Rd West of 35th Ave	135.40
327(2)	EB Indian School Rd West of 35th Ave	169.90
328(2)	SB 35th Ave South of Indian School Rd	43.30
329(2)	SB 35th Ave South of Indian School Rd	67.90
330(2)	SB 35th Ave South of Indian School Rd	39.60
331(2)	SB 35th Ave South of Indian School Rd	35.10
332(2)	SB 35th Ave South of Indian School Rd	270.10
333(2)	SB 35th Ave South of Indian School Rd	156.40
334(2)	SB 35th Ave South of Indian School Rd	73.50
335(2)	SB 35th Ave South of Indian School Rd	12.80
336(2)	SB 35th Ave South of Indian School Rd	171.40
337(2)	SB 35th Ave South of Indian School Rd	122.00
338(2)	SB 35th Ave South of Indian School Rd	106.90
339(2)	SB 35th Ave South of Indian School Rd	21.50
340(2)	NB 35th Ave South of Indian School Rd	14.20
341(2)	NB 35th Ave South of Indian School Rd	144.40
342(2)	NB 35th Ave South of Indian School Rd	170.60
343(2)	NB 35th Ave South of Indian School Rd	32.30
344(2)	NB 35th Ave South of Indian School Rd	13.40
345(2)	NB 35th Ave South of Indian School Rd	144.00
346(2)	NB 35th Ave South of Indian School Rd	27.10
347(2)	NB 35th Ave South of Indian School Rd	47.20
348(2)	NB 35th Ave South of Indian School Rd	296.70
349(2)	NB 35th Ave South of Indian School Rd	66.90

Table 3 – Compliant Sidewalk (cont.)

Asset ID	Location	Appr. Length (LF)
351(2)	WB Grand Ave, South of Indian School Rd	70.50
352(2)	WB Grand Ave, South of Indian School Rd	14.60
355(2)	WB Grand Ave, South of Indian School Rd	48.50
359(2)	WB Grand Ave, South of Indian School Rd	267.30
360(2)	NB 35th Ave, South of Indian School Rd	107.80
362(2)	WB Grand Ave, South of Indian School Rd	197.50
363(2)	WB Grand Ave, South of Indian School Rd	18.00
365(2)	EB Indian School Rd East of Grand Ave	116.50
366(2)	EB Indian School Rd East of Grand Ave	65.20
367(2)	EB Indian School Rd East of Grand Ave	49.20
368(2)	EB Indian School Rd East of Grand Ave	22.80
371(2)	EB Indian School Rd East of Grand Ave	85.60
371-1(2)	EB Indian School Rd East of Grand Ave	80.50
372(2)	EB Indian School Rd East of Grand Ave	37.20
373(2)	EB Indian School Rd East of Grand Ave	93.90
375(2)	33rd Avenue, South of Indian School Rd	134.80
376(2)	EB Indian School Rd East of Grand Ave	111.20
377(2)	WB Indian School Rd East of Grand Ave	87.90
378(2)	WB Indian School Rd East of Grand Ave	39.40
379(2)	WB Indian School Rd East of Grand Ave	254.10
380(2)	WB Indian School Rd East of Grand Ave	10.80
381(2)	WB Indian School Rd East of Grand Ave	14.10
382(2)	WB Indian School Rd East of Grand Ave	916.00
383(2)	NB 35th Ave, North of Indian School Rd	126.00

Table 3 – Compliant Sidewalk (cont.)

Asset ID	Location	Appr. Length (LF)
384(2)	NB 35th Ave, North of Indian School Rd	60.70
385(2)	NB 35th Ave, North of Indian School Rd	24.70
386(2)	NB 35th Ave, North of Indian School Rd	170.80
387(2)	NB 35th Ave, North of Indian School Rd	315.80
388(2)	NB 35th Ave, North of Indian School Rd	88.10
389(2)	NB 35th Ave, North of Indian School Rd	20.00
390(2)	NB 35th Ave, North of Indian School Rd	97.40
391(2)	NB 35th Ave, North of Indian School Rd	54.10
392(2)	NB 35th Ave, North of Indian School Rd	38.20
393(2)	NB 35th Ave, North of Indian School Rd	80.50
394(2)	NB 35th Ave, North of Indian School Rd	10.20
395(2)	NB 35th Ave, North of Indian School Rd	20.50
396(2)	NB 35th Ave, North of Indian School Rd	10.50
398(2)	SB 35th Ave, North of Indian School Rd	40.10
399(2)	SB 35th Ave, North of Indian School Rd	11.60
400(2)	SB 35th Ave, North of Indian School Rd	95.20
401(2)	SB 35th Ave, North of Indian School Rd	112.20
402(2)	SB 35th Ave, North of Indian School Rd	38.80
403(2)	SB 35th Ave, North of Indian School Rd	147.10
405(2)	SB 35th Ave, North of Indian School Rd	184.60
406(2)	SB 35th Ave, North of Indian School Rd	154.20
407(2)	SB 35th Ave, North of Indian School Rd	59.70
408(2)	SB 35th Ave, North of Indian School Rd	59.70
409(2)	SB 35th Ave, North of Indian School Rd	12.20

Table 3 – Compliant Sidewalk (cont.)

Asset ID	Location	Appr. Length (LF)
410(2)	SB 35th Ave, North of Indian School Rd	60.90
411(2)	NB 35th Ave, North of Indian School Rd	219.70
413(2)	WB Grand Ave, North of Indian School Rd	121.40
414(2)	WB Grand Ave, North of Indian School Rd	700.00
415(2)	WB Grand Ave, North of Indian School Rd	54.80
416(2)	WB Grand Ave, North of Indian School Rd	307.80
417(2)	WB Grand Ave, North of Indian School Rd	31.00
418(2)	WB Grand Ave, North of Indian School Rd	37.40
419(2)	WB Grand Ave, South of Indian School Rd	152.00
420(2)	WB Grand Ave, South of Indian School Rd	120.00
421(2)	WB Indian School Rd West of Grand Ave	102.00
422(2)	WB Indian School Rd West of 35th Ave	320.00
423(2)	WB Indian School Rd West of 35th Ave	423.30
424(2)	WB Indian School Rd West of 35th Ave	41.00
425(2)	WB Indian School Rd West of 35th Ave	235.60
426(2)	WB Indian School Rd West of 35th Ave	558.70
427(2)	WB Indian School Rd West of 35th Ave	22.70
428(2)	WB Indian School Rd West of 35th Ave	6.60
429(2)	WB Grand Ave, North of Indian School Rd	251.00
**430(2)	WB Indian School Rd West of 38th Dr	25.50
** 431(2)	WB Indian School Rd West of 38th Dr	17.50
** 432(2)	WB Indian School Rd West of 38th Dr	15.60
** 433(2)	EB Indian School Rd West of 38th Ave	29.40
** 434(2)	EB Indian School Rd West of 38th Ave	35.50

Table 3 – Compliant Sidewalk (cont.)

Asset ID	Location	Appr. Length (LF)
** 435(2)	NB 33rd Ave, North of Grand Ave	217.00
** 436(2)	NB 33rd Ave, North of Grand Ave	594.00
** 437(2)	NB 33rd Ave, North of Grand Ave	276.10
** 438(2)	EB Indian School Rd East of 33rd Ave	151.80
** 439(2)	EB Indian School Rd East of 33rd Ave	176.50
** 440(2)	EB Indian School Rd East of 33rd Ave	221.50
** 441(2)	WB Indian School Rd East of 33rd Ave	113.40
** 442(2)	WB Indian School Rd East of 33rd Ave	153.50
** 443(2)	WB Indian School Rd East of 33rd Ave	139.50
** 444(2)	WB Indian School Rd East of 33rd Ave	68.50
** 445(2)	WB Indian School Rd East of 33rd Ave	39.50
** 446(2)	WB Grand Ave, North of Indian School Rd	97.30
** 447(2)	WB Grand Ave, North of Indian School Rd	26.40
** 448(2)	WB Grand Ave, North of Indian School Rd	51.70

** - Feature was not verified in the field.
(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

Table 4 – Non-Compliant Sidewalk

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
312(2)	EB Indian School Rd- Between 38th Ave and 36th Ave	•Sidewalk not flush Damaged	This Feature will be Reconstructed with this project.		
323(2)	EB Indian School Rd- Between 36th Ave and 35th Ave	•Sidewalk not flush With Obstruction	This Feature will be Reconstructed with this project.		
350(1)	WB Grand Ave - South of 33rd Ave	• Damaged Sidewalk With Obstruction	This Feature will be Reconstructed with this project.		
353(1)	WB Grand Ave - North of 33rd Ave	•<36" wide sidewalk at power pole	This Feature will be Reconstructed with this project.		
354(1)	WB Grand Ave - South of Indian School Rd	•Cross Slope › 2%	This Feature will be Reconstructed with this project.		
356(1)	WB Grand Ave - South of Indian School Rd	•Cross Slope › 2%	This Feature will be Reconstructed with this project.		
357(1)	WB Grand Ave - South of Indian School Rd	•Cross Slope › 2%	This Feature will be Reconstructed with this project.		
358(1)	WB Grand Ave - South of Indian School Rd	•Cross Slope › 2%	This Feature will be Reconstructed with this project.		
364(2)	EB Indian School Rd- Between Grand Ave and 33rd Ave	•Broken Sidewalk	This Feature will be Reconstructed with this project.		
369(2)	EB Indian School Rd- Between Grand Ave and 33rd Ave	• Damaged Sidewalk With Obstruction	This Feature will be Reconstructed with this project.		
370(2)	EB Indian School Rd- Between Grand Ave and 33rd Ave	• Damaged Sidewalk With Obstruction	This Feature will be Reconstructed with this project.		
374(2)	EB Indian School Rd- Between Grand Ave and 33rd Ave	•Sidewalk not flush With Obstruction	This Feature will be Removed with this project.		
404(2)	SB 35th Ave – North of Indian School Rd	• Damaged Sidewalk With Obstruction	This Feature will be Removed with this project.		
412(1)	WB Grand Ave- North of Indian School Rd	•Cross Slope › 2%	This Feature will be Removed with this project.		
449(1)	WB Grand Ave - North of 33rd Ave	•<36" wide sidewalk at power pole	This Feature will be Reconstructed with this project.		

** - Feature was not verified in the field.
(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

3.0 CURB RAMPS

There are a total of 72 curb ramps within the evaluated project limits. Of the 72 curb ramps, 17 are non-compliant per 2010 Standards. Of the 72 curb ramps, 34 compliant curb ramps and 16 non-compliant curb ramps are currently not listed in the ADOT FIS.

Table 5 provides a summary of the compliant curb ramps. Table 6 provides a detailed summary of the non-compliant curb ramps. Curb ramps that currently are not listed in the ADOT FIS are included at the end of both Table 5 and 6. Identification numbers were assigned from the AECOM field review for reference purposes.

Asset IDs designated with (**) are features that were not verified in the field. The information was gathered using street view on Google Maps.

Table 5 – Compliant Curb Ramps

Asset ID	Location
1381770(1)	WB Grand Ave SE Corner of 37th Ave
1381771(1)	WB Grand Ave NW Corner of 37th Ave
1381777(1)	Median Island- NB 35th Ave to EB Grand Ave
1381778(1)	WB Grand Ave SE Corner of 37th Ave
1381780(1)	SB 35th Ave SW Corner of Indian School Rd
1381783(1)	EB Indian School Rd SW Corner of 35th Ave
1381785(1)	Median Island- EB Grand Ave to WB Indian School Rd
1381786(1)	Median Island- EB Grand Ave to WB Indian School Rd
1381787(1)	Median Island- EB Grand Ave to WB Indian School Rd
1381789(1)	WB Indian School Rd- NW Corner Grand Ave
1381816(1)	WB Grand Ave NE Corner 33rd Ave
1381818(1)	WB Grand Ave NW Corner 33rd Ave
1381822(1)	EB Indian School Rd- SE Corner Grand Ave
1381823(1)	Median Island- WB Grand Ave to EB Indian School Rd
1381824(1)	Median Island- WB Grand Ave to EB Indian School Rd
1381825(1)	Median Island- WB Grand Ave to EB Indian School Rd

Asset ID	Location
1381827(1)	EB Indian School Rd SE Corner Grand Ave
1381828(1)	NB 35th Ave NE Corner EB Indian School Rd
1381831(1)	Median Island- SB 35th Ave to WB Grand Ave
1381832(1)	Median Island- SB 35th Ave to WB Grand Ave
1381833(1)	Median Island- SB 35th Ave to WB Grand Ave
6(2)	EB Indian School Rd West of RR Crossing
7(2)	EB Indian School Rd East of RR Crossing
10(2)	SB 35th Ave North of RR Crossing
11(2)	SB 35th Ave South of RR Crossing
12(2)	SB 35th Ave NW Corner of Clarendon Ave
13(2)	SB 35th Ave SW Corner of Clarendon Ave
14(2)	NB 35th Ave SE Corner of Weldon Ave
15(2)	NB 35th Ave NE Corner of Weldon Ave
16(2)	NB 35th Ave SE Corner of Clarendon Ave
17(2)	NB 35th Ave NE Corner of Clarendon Ave
18(2)	NB 35th Ave NE Corner of Clarendon Ave

Table 5 – Compliant Curb Ramps (cont.)

Asset ID	Location
19(2)	NB 35th Ave South of RR Crossing
20(2)	NB 35th Ave North of RR Crossing
21(2)	NB 35th Ave Island to EB Grand Ave
27(2)	EB Indian School Rd SW Corner of 33rd Ave
28(2)	EB Indian School Rd SW Corner of 33rd Ave
29(2)	EB Indian School Rd SE Corner of 33rd Ave
33(2)	WB Indian School Rd NE Corner of 33rd Dr
34(2)	WB Indian School Rd NW Corner of 33rd Dr
35(2)	NB 35th Ave North of Indian School Rd
36(2)	NB 35th Ave North of Indian School Rd
37(2)	NB 35th Ave WB crossing at Monterosa St
38(2)	NB 35th Ave SE Corner of Glenrosa Ave
39(2)	NB 35th Ave NE Corner of Glenrosa Ave
41(2)	SB 35th Ave NW Corner of Monterosa St
42(2)	SB 35th Ave NW Corner of Monterosa St
43(2)	SB 35th Ave SW Corner of Monterosa St
48(2)	WB Indian School Rd East of RR Crossing
49(2)	WB Indian School Rd West of RR Crossing
504(2)	Indian School Rd Median West of Grand Ave
505(2)	Indian School Rd Median West of Grand Ave
506(2)	Median Island- NB 35th Ave to EB Grand Ave
** 52(2)	WB Indian School Rd Between 33rd Ave and 32nd Ave
** 53(2)	WB Indian School Rd Between 33rd Ave and 32nd Ave

** - Feature was not verified in the field.
(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

Table 6 – Non-Compliant Curb Ramps

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
1381836(1)	SB 35th Ave to WB Grand Ave Return	•No Detectable Warnings •Running Slope › 12:1 •Ramp Landing › 2%	This Feature will be Removed with this project.		
1(2)	WB Indian School Rd NW Corner of 38th Dr	• No Detectable Warnings •Cross Slope › 2% •No Landing	This Feature will be Reconstructed with this project.		
2(2)	EB Indian School Rd SW Corner of 38th Ave	• No Detectable Warnings •Cross Slope › 2% •No Landing	This Feature will be Reconstructed with this project.		
3(2)	EB Indian School Rd SE Corner of 38th Ave	• No Detectable Warnings •Cross Slope › 2% •No Landing	This Feature will be Reconstructed with this project.		
4(2)	EB Indian School Rd SW Corner of 36th Ave	• No Detectable Warnings •Cross Slope › 2% •No Landing	This Feature will be Reconstructed with this project.		
5(2)	EB Indian School Rd SE Corner of 36th Ave	• No Detectable Warnings •Cross Slope › 2% •No Landing	This Feature will be Reconstructed with this project.		
30(2)	WB Indian School Rd At 33rd Ave Intersection	• No Detectable Warnings	This Feature will be Reconstructed with this project.		
31(2)	WB Indian School Rd At 33rd Ave Intersection	• No Detectable Warnings	This Feature will be Reconstructed with this project.		
32(2)	WB Indian School Rd At 33rd Ave Intersection	• No Detectable Warnings	This Feature will be Reconstructed with this project.		
50(2)	WB Indian School Rd NE Corner of 38th Dr	•Running Slope › 12:1 • No Detectable Warnings •No Landing	This Feature will be Reconstructed with this project.		

Table 6 – Non-Compliant Curb Ramps (cont.)

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
51(2)	SB 35th Ave East Crossing to Glenrosa Ave	•Running Slope › 12:1 • No Detectable Warnings •No Landing	This Feature will be Removed with this project.		
** 54(2)	EB Indian School Rd East of 33rd Ave	• No Detectable Warnings	This Feature will be Reconstructed with this project.		
** 55(2)	EB Indian School Rd East of 33rd Ave	• No Detectable Warnings	This Feature will be Reconstructed with this project.		
** 56(2)	WB Indian School Rd NW Corner 32nd Ave	• No Detectable Warnings	This Feature will be Reconstructed with this project.		
** 57(2)	WB Indian School Rd NE Corner 32nd Ave	• No Detectable Warnings	This Feature will be Reconstructed with this project.		
** 58(2)	NB 33rd Ave North of Grand Ave	• No Detectable Warnings	This Feature will be Reconstructed with this project.		
** 59(2)	NB 33rd Ave North of Grand Ave	• No Detectable Warnings	This Feature will be Reconstructed with this project.		

** - Feature was not verified in the field.
(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

4.0 PEDESTRIAN ACTIVATED SIGNALS

There are a total of 20 pedestrian activated signals within the evaluated project limits. Of the 20 pedestrian activated signals, 4 are non-compliant per 2010 Standards. Of the 20 pedestrian activated signals, 12 compliant pedestrian activated signals and 3 non-compliant pedestrian activated signals are currently not listed in the ADOT FIS.

Table 7 provides a summary of the compliant pedestrian activated signals. Table 8 provides a detailed summary of the non-compliant pedestrian activated signals. Pedestrian activated signals that currently are not listed in the ADOT FIS are included at the end of both Tables 7 and 8. Identification numbers were assigned from the AECOM field review for reference purposes.

Table 7 – Compliant Pedestrian Activated Signals

Asset ID	Location
1381781(1)	SB 35th Ave SW Corner of Indian School Rd
1381782(1)	EB Indian School Rd SW Corner of 35th Ave
1381817(1)	WB Grand Ave NE Corner of 33rd Ave
1381830(1)	EB Indian School Rd NE Corner of Grand Ave
603(2)	NB 35th Ave – West crossing south of Indian School Road
604(2)	EB 35th Ave – East crossing south of Indian School Rd
607(2)	WB Grand Ave NW Corner of 33rd Ave
609(2)	EB Indian School Rd SW Corner of 33rd Ave
610(2)	WB Indian School Rd NW Corner of 33rd Ave
611(2)	WB Grand Ave - Median Island, West Crossing
612(2)	EB Indian School Rd - Median Island, North Crossing
615(2)	NB 35th Ave – West Crossing at Monterosa St
616(2)	SB 35th Ave NW Corner of Monterosa St
617(2)	Median Island – SB 35th Ave to WB Grand Ave
619(2)	Median Island – EB Grand Ave to WB Indian School Rd
620(2)	Median Island – EB Grand Ave to WB Indian School Rd

(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

Table 8 – Non-Compliant Pedestrian Activated Signals

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
1381829(1)	NB 35th Ave NE Corner of Indian School EB	•Push Button › 10" Away from Edge of Accessible Route	This Feature will be Removed with this project.		
605(2)	SB 35th Ave SW Corner of Clarendon Ave	•Push Button is at 49.5" above the sidewalk	This Feature will be Removed with this project.		
606(2)	NB 35th Ave NE Corner of Clarendon Ave	•Push Button alignment is not perpendicular to crossing	This Feature will be Removed with this project.		
618(1)	Traffic Island located between SB 35th Ave and WB Grand Ave.	•Missing signage for push button	This Feature will be Removed with this project.		

(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

5.0 HANDRAIL

There is a total of 1 location with existing railing within the evaluated project limits. The existing railing at the 1 location functions as safety rail (not handrail). However, each existing rail location was evaluated for compliance of its edge treatment. Of the 1 existing rail location, 1 is non-compliant as handrail per the 2010 Standards. Of the existing rail location, 1 non-compliant handrail location is currently not listed in the ADOT FIS.

Table 9 provides a summary of the non-compliant handrail locations.

See Section 2.0 SIDEWALK for additional locations that may require safety rail or handrail.

Table 9 – Non-Compliant Handrail

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
901(2)	NB 35th Ave Located at WB crossing at Monterosa St	Bottom Rail is 14" above the sidewalk surface	This Feature will be Removed with this project.		

(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

6.0 OBSTRUCTIONS OR NEEDS

There are a total of 4 locations with existing obstructions or needs that are non-compliant per 2010 Standards within the evaluated project limits. Of the 4 locations with existing obstructions or needs, 0 are currently not listed in the ADOT FIS.

Table 10 provides a detailed summary of the non-compliant obstructions or needs.

Table 10 – Non-Compliant Obstructions or Needs

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
1381791(1)	Grand Ave EB to Indian School WB, Median Island	•Curb and Pavement Issues, not flush	This Feature will be Reconstructed with this project.		
1381834(1)	35th Ave SB to Grand Ave WB, Median Island	•Curb and Pavement not flush	This Feature will be Reconstructed with this project.		
1381835(1)	Grand Ave WB, North of Indian School Rd	•Curb and Pavement not flush	This Feature will be Reconstructed with this project.		
1381840(1)	Grand Ave WB, North of Indian School Rd	•Broken Concrete Sidewalk, bad patchwork	This Feature will be Reconstructed with this project.		

(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

7.0 DRIVEWAYS

There are a total of 118 driveways within the evaluated project limits. Of the 118 driveways, 92 are non-compliant per 2010 Standards. Of the 118 driveways, 24 compliant driveway and 83 non-compliant driveways are currently not listed in the ADOT FIS.

Table 11 provides a summary of the compliant driveways. Table 12 provides a detailed summary of the non-compliant driveways. Driveways that currently are not listed in the ADOT FIS are included at the end of both Tables 11 and 12. Identification numbers were assigned from the AECOM field review for reference purposes.

Asset IDs designated with (**) are features that were not verified in the field. The information was gathered using street view on Google Maps.

Table 11 – Compliant Driveways

Asset ID	Location
1382050(1)	WB Grand Ave – First driveway south of Indian School Rd
1382054(1)	WB Grand Ave – Third driveway south of 37th Ave
118(2)	SB 36th Ave – First driveway south of Indian School Rd
124(2)	SB 35th Ave – First driveway south of Indian School Rd
125(2)	SB 35th Ave – Second driveway south of Indian School Rd
139(2)	NB 35th Ave – First driveway south of Indian School Rd
140(2)	EB Grand Ave – Between 35th Ave and 33rd Ave
141(2)	EB Grand Ave – Between 35th Ave and 33rd Ave
142(2)	EB Grand Ave – Between 35th Ave and 33rd Ave
149(2)	WB Grand Ave – First driveway south of Indian School Rd
182(2)	SB 35th Ave – Kings Mini Mart Driveway
189(2)	WB Grand Ave – Second driveway south of 37th Ave
190(2)	WB Grand Ave – First driveway south of 37th Ave
** 205(2)	WB Indian School Rd – East of 33rd Ave
** 206(2)	NB 33rd Ave – North of Grand Ave

Table 11 – Compliant Driveways (cont.)

Asset ID	Location
** 207(2)	WB Grand Ave – South of 37th Ave
** 208(2)	WB Grand Ave – North of 37th Ave
** 209(2)	WB Grand Ave – North of 37th Ave
** 212(2)	WB Clarendon Ave – East of 35th Ave
** 213(2)	EB Clarendon Ave – East of 35th Ave
** 214(2)	WB Clarendon Ave – West of 35th Ave
** 215(2)	WB Clarendon Ave – West of 35th Ave
** 216(2)	EB Clarendon Ave – West of 35th Ave
** 217(2)	EB Clarendon Ave – West of 35th Ave
** 218(2)	WB Grand Ave – North of 37th Ave
** 219(2)	EB Clarendon Ave – East of 35th Ave

** - Feature was not verified in the field.
(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

Table 12 – Non-Compliant Driveways

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
1382044(1)	WB Grand Ave First Driveway north of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
1382045(1)	WB Grand Ave Second Driveway north of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
1382046(1)	WB Grand Ave Third Driveway north of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
1382047(1)	WB Grand Ave Fourth Driveway north of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2% •Damaged Sidewalk	This Feature will be Reconstructed with this project.		
1382048(1)	WB Grand Ave Fifth Driveway north of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
1382049(1)	WB Grand Ave Sixth Driveway north of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
1382051(1)	WB Grand Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
1382052(1)	WB Grand Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
1382053(1)	WB Grand Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
101(2)	WB Indian School Rd West of 38th Dr	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
102(2)	EB Indian School Rd West of 38th Dr	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
103(2)	EB Indian School Rd West of 38th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
104(2)	EB Indian School Rd West of 38th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
105(2)	EB Indian School Rd West of 38th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
106(2)	EB Indian School Rd West of 38th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		

Table 12 – Non-Compliant Driveways (cont.)

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
107(2)	38th Ave South of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
108(2)	38th Ave South of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
109(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
110(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
110-A(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
111(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
112(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
113(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
114(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
115(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
116(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
117(2)	EB Indian School Rd Between 38th Ave and 36th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
120(2)	EB Indian School Rd Between 36th Ave and 35th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
121(2)	EB Indian School Rd Between 36th Ave and 35th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		

Table 12 – Non-Compliant Driveways (cont.)

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
122(2)	EB Indian School Rd Between 36th Ave and 35th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
123(2)	EB Indian School Rd Between 36th Ave and 35th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
126(2)	SB 35th Ave Between Indian School Rd and Clarendon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2% •Damaged Sidewalk	This Feature will be Removed with this project.		
127(2)	SB 35th Ave Between Indian School Rd and Clarendon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
128(2)	SB 35th Ave Between Indian School Rd and Clarendon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
129(2)	SB 35th Ave Between Clarendon Ave and Weldon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2% •Damaged Sidewalk	This Feature will be Removed with this project.		
130(2)	SB 35th Ave Between Clarendon Ave and Weldon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
131(2)	SB 35th Ave Between Clarendon Ave and Weldon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
132(2)	EB Weldon Ave East of 35th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
133(2)	WB Weldon Ave East of 35th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
134(2)	NB 35th Ave Between Clarendon Ave and Weldon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
135(2)	EB Clarendon Ave East of 35th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
135-A(2)	WB Clarendon Ave East of 35th Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
136(2)	NB 35th Ave Between Grand Ave and Clarendon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		

Table 12 – Non-Compliant Driveways (cont.)

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
137(2)	NB 35th Ave Between Grand Ave and Clarendon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
138(2)	NB 35th Ave Between Grand Ave and Clarendon Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
150(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
151(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
152(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
153(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
154(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2% •Damaged Sidewalk	This Feature will be Removed with this project.		
155(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2% •Damaged Sidewalk	This Feature will be Removed with this project.		
156(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
157(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
158(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
159(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
161(2)	EB Indian School Rd Between Grand Ave and 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
162(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		

Table 12 – Non-Compliant Driveways (cont.)

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
163(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
164(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
165(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
166(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
167(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
168(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
169(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
170(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
171(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
172(2)	NB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
175(2)	SB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
176(2)	SB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
177(2)	SB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
179(2)	SB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
180(2)	SB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		

Table 12 – Non-Compliant Driveways (cont.)

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
181(2)	SB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
183(2)	SB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
198(1)	EB Grand Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2% •Running Slope > 5% along Sidewalk	This Feature will be Removed with this project.		
199(2)	WB Indian School Rd Between 38th Dr and Grand Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
200(2)	WB Indian School Rd Between 38th Dr and Grand Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
201(2)	WB Indian School Rd Between 38th Dr and Grand Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
202(2)	WB Indian School Rd Between 38th Dr and Grand Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
203(2)	SB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Removed with this project.		
204(2)	SB 35th Ave North of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2% •Running Slope > 5% along Sidewalk	This Feature will be Removed with this project.		
** 220(2)	WB Indian School Rd West of 38th Dr	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
** 221(2)	WB Indian School Rd West of 38th Dr	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
** 222(2)	EB Indian School Rd West of 38th Dr	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
** 223(2)	EB Indian School Rd West of 38th Dr	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
** 224(2)	WB Indian School Rd East of 33rd Ave	•Damaged Pavement/Obstruction	This Feature will be Reconstructed with this project.		

Table 12 – Non-Compliant Driveways (cont.)

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
** 225(2)	WB Indian School Rd East of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
** 226(2)	WB Indian School Rd East of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
** 227(2)	EB Indian School Rd East of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
** 228(2)	EB Indian School Rd East of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
** 229(2)	EB Indian School Rd East of 33rd Ave	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		
** 230(2)	NB 33rd Ave South of Indian School Rd	•Attached Sidewalk, •Driveway Cross Slope > 2%	This Feature will be Reconstructed with this project.		

** - Feature was not verified in the field.
(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

8.0 RAILROAD CROSSING

There are a total of 4 railroad crossing within the evaluated project limits. Of the 4 traffic islands, 4 are non-compliant per 2010 Standards. The 4 crossings are currently not listed in the ADOT FIS.

Table 13 provides a detailed summary of the non-compliant railroad crossings. Identification numbers were assigned from the AECOM field review for reference purposes.

Table 13 – Non-Compliant Railroad Crossings

Asset ID	Location	Reason for Non-Compliance	DCR Proposed Action	Final Design Proposed Action	Construction Action
701(1)	Railroad Crossing, EB Indian School Road, West of 35th Ave	•3" horizontal gap at track crossing	This Feature will be Removed with this project.		
702(1)	Railroad Crossing, WB Indian School Road, West of 35th Ave	•3" horizontal gap at track crossing	This Feature will be Removed with this project.		
703(1)	Railroad Crossing, SB 35th Ave, South of Indian School Road	•3" horizontal gap at track crossing	This Feature will be Removed with this project.		
704(1)	Railroad Crossing, NB 35th Ave, South of Indian School Road	•3" horizontal gap at track crossing	This Feature will be Removed with this project.		

(1) – Feature owned by ADOT.
(2) – Feature owned by City of Phoenix.

9.0 TRAFFIC ISLANDS

There are a total of 5 traffic islands within the evaluated project limits. All features pertaining to the five traffic islands were evaluated in the sections above. These include curb ramps and pedestrian push buttons. All five traffic islands will be removed with this project.

APPENDIX A – ADA FEATURE LOCATION MAP (NON-COMPLIANT ONLY)

#101
Driveway
Cross Slope > 2%

#1
Curb Ramp
No Detectable Warnings
No Landing

#50
Curb Ramp
Running Slope > 12:1
No Detectable Warnings
No Landing

#106
Driveway
Cross Slope > 2%

#200
Driveway
Cross Slope > 2%

#201
Driveway
Cross Slope > 2%

#221
Driveway
Cross Slope > 2%

#220
Driveway
Cross Slope > 2%

#105
Driveway
Cross Slope > 2%

#110
Driveway
Cross Slope > 2%

#202
Driveway
Cross Slope > 2%

#110-A
Driveway
Cross Slope > 2%

#111
Driveway
Cross Slope > 2%

38th Drive

30

35

40

45

Exst R/W

PI 36+16.34

PC 38+77.69

PT 43+29.42

S89°39'30"E

Indian School Road

S89°39'03"E

S89°39'39"E

N82°26'3

#222
Driveway
Cross Slope > 2%

#104
Driveway
Cross Slope > 2%

#2
Curb Ramp
No Detectable Warnings
No Landing

#223
Driveway
Cross Slope > 2%

#102
Driveway
Cross Slope > 2%

#103
Driveway
Cross Slope > 2%

#107
Driveway
Cross Slope > 2%
No Sidewalk

21'11"E

38th Avenue

#109
Driveway
Cross Slope > 2%
Closed, Needs C&G

#112
Driveway
Cross Slope > 2%

#3
Curb Ramp
No Detectable Warnings
No Landing

#312
Sidewalk
S/W not flush/Damaged

#113
Driveway
Cross Slope > 2%

#115
Driveway
Cross Slope > 2%

#114
Driveway
Cross Slope > 2%

#108
Driveway
Cross Slope > 2%
No Sidewalk

N

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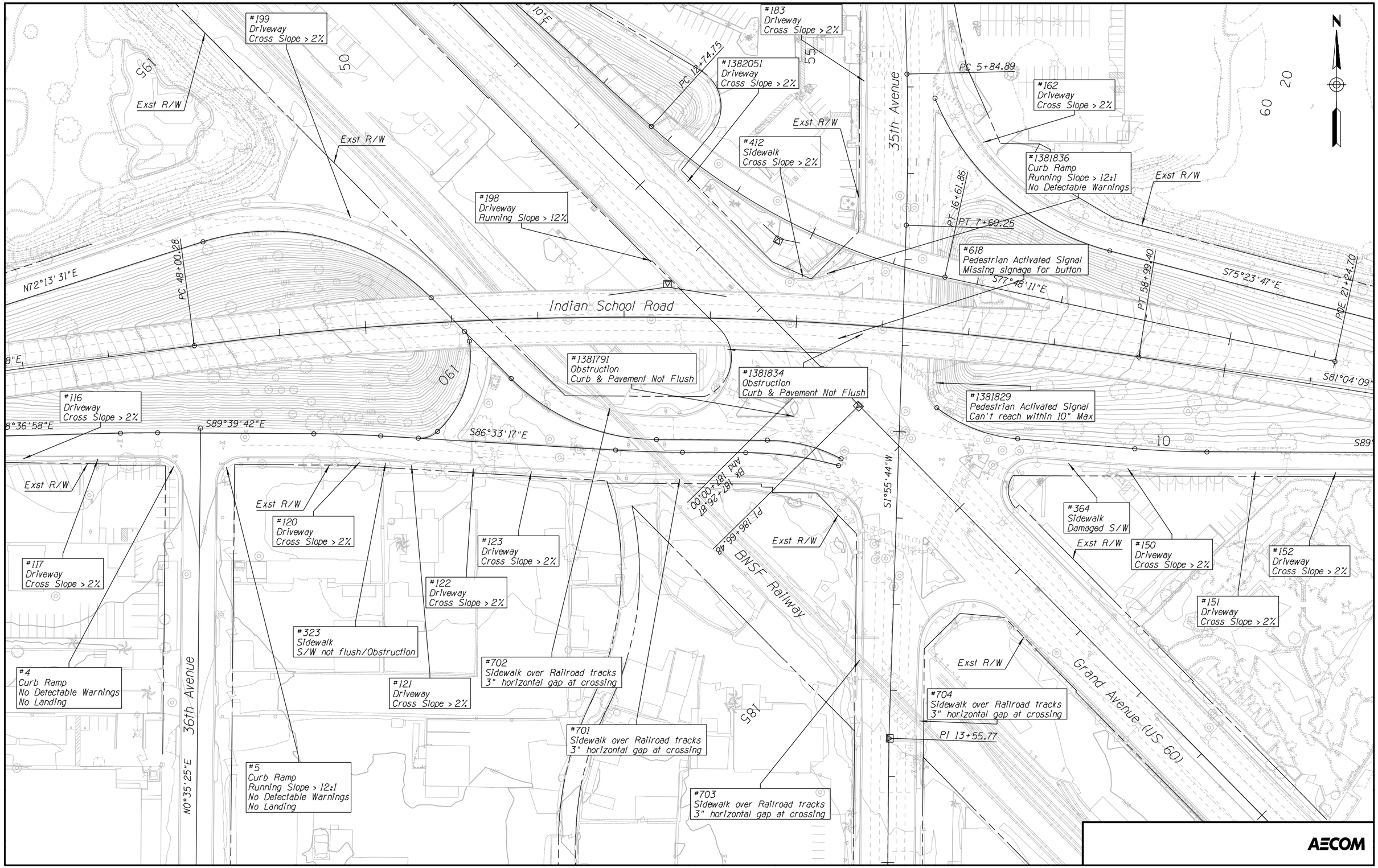

#199
Driveway
Cross Slope > 2%
#183
Driveway
Cross Slope > 2%
#1382051
Driveway
Cross Slope > 2%
PC 12+74.75
PC 5+84.89
#162
Driveway
Cross Slope > 2%
Exst R/W
#412
Sidewalk
Cross Slope > 2%
#1381836
Curb Ramp
Running Slope > 12:1
No Detectable Warnings
35th Avenue
#198
Driveway
Running Slope > 12%
PT 16+61.86
PT 7+60.25
#618
Pedestrian Activated Signal
Missing signage for button
N72°13'31"E
PC 48+00.28
S77°48'11"E
PT 58+99.40
S75°23'47"E
POE 21+24.70
Indian School Road
#1381791
Obstruction
Curb & Pavement Not Flush
#1381834
Obstruction
Curb & Pavement Not Flush
#1381829
Pedestrian Activated Signal
Can't reach within 10" Max
S81°04'09"
#116
Driveway
Cross Slope > 2%
S89°39'42"E
S86°33'17"E
S1°55'44"W
Bk 187+26.87
And 187+00.00
PI 186+66.48
#120
Driveway
Cross Slope > 2%
#123
Driveway
Cross Slope > 2%
#364
Sidewalk
Damaged S/W
#150
Driveway
Cross Slope > 2%
#152
Driveway
Cross Slope > 2%
#117
Driveway
Cross Slope > 2%
#122
Driveway
Cross Slope > 2%
BNSF Railway
#151
Driveway
Cross Slope > 2%
#323
Sidewalk
S/W not flush/Obstruction
#702
Sidewalk over Railroad tracks
3" horizontal gap at crossing
#4
Curb Ramp
No Detectable Warnings
No Landing
#121
Driveway
Cross Slope > 2%
#704
Sidewalk over Railroad tracks
3" horizontal gap at crossing
Grand Avenue (US 60)
36th Avenue
#701
Sidewalk over Railroad tracks
3" horizontal gap at crossing
PI 13+55.77
#5
Curb Ramp
Running Slope > 12:1
No Detectable Warnings
No Landing
N0°35'25"E
#703
Sidewalk over Railroad tracks
3" horizontal gap at crossing
AECOM

12/26/2023

N

65

70

75

33rd Drive

Exst R/W

#155
Driveway
Cross Slope > 2%
Damaged Sidewalk

#156
Driveway
Cross Slope > 2%

#158
Driveway
Cross Slope > 2%

#153
Driveway
Cross Slope > 2%

PC 63+42.80

PT 66+12.36

#30
Curb Ramp
No Detectable Warnings

#31
Curb Ramp
No Detectable Warnings

#32
Curb Ramp
No Detectable Warnings

#159
Driveway
Cross Slope > 2%

Exst R/W

PI 69+30.51

#224
Driveway
Pavement Damaged/Obstruction

#56
Curb Ramp
No Detectable Warnings

#225
Driveway
Cross Slope > 2%

#57
Curb Ramp
No Detectable Warnings

#226
Driveway
Cross Slope > 2%

S89°49'47"E

49'45"E

Indian School Road

S89°49'09"E

Exst R/W

#154
Driveway
Cross Slope > 2%
Damaged Sidewalk

#370
Sidewalk
S/W Damaged/Obstruction

#369
Sidewalk
S/W Damaged/Obstruction

#157
Driveway
Cross Slope > 2%

#161
Driveway
Cross Slope > 2%

#374
Sidewalk
S/W not flush/Obstruction

33rd Avenue

#227
Driveway
Cross Slope > 2%

Exst R/W

#54
Curb Ramp
No Detectable Warnings

#55
Curb Ramp
No Detectable Warnings

#228
Driveway
Cross Slope > 2%

#229
Driveway
Cross Slope > 2%

#230
Driveway
Cross Slope > 2%

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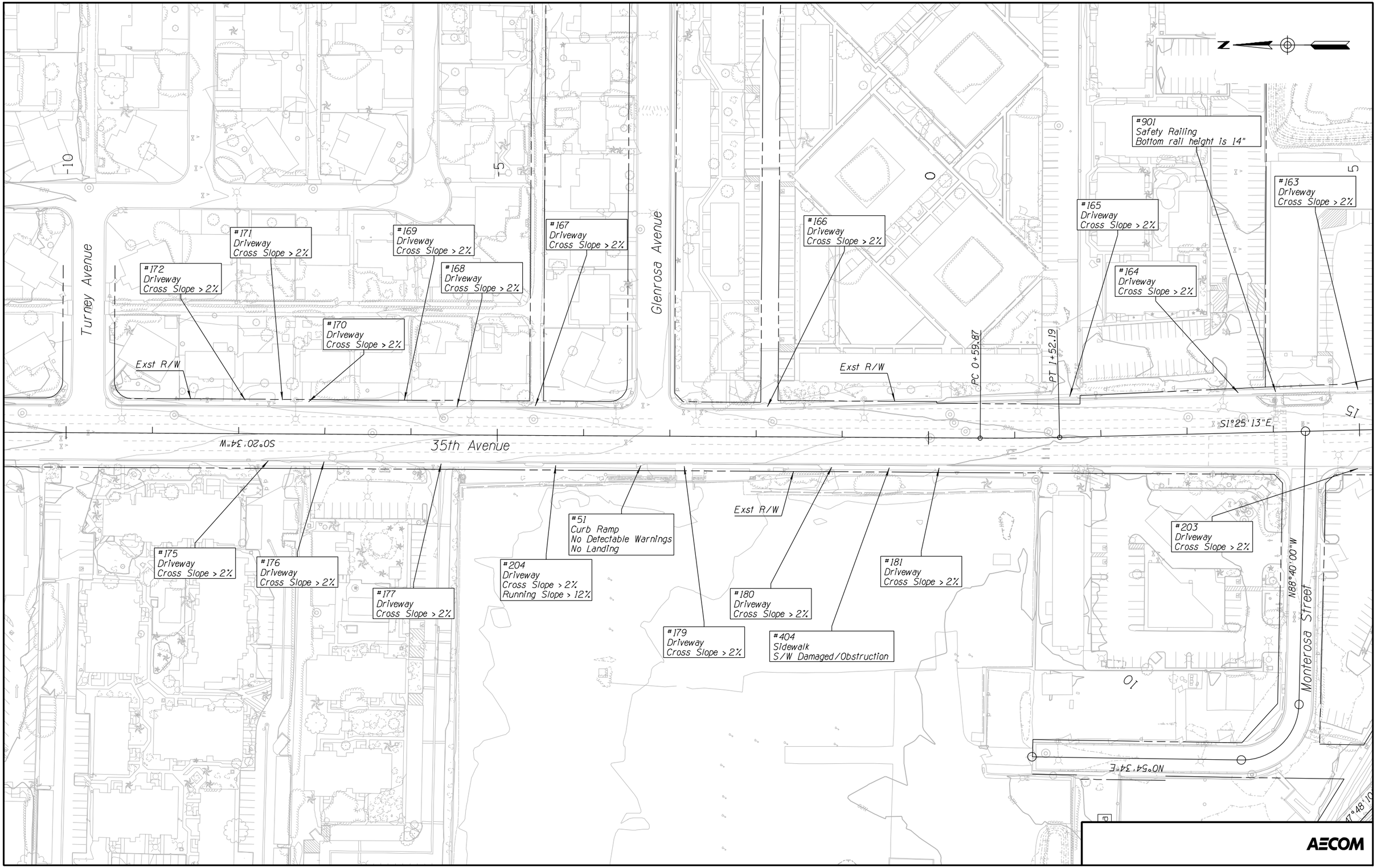

Turney Avenue
Glenrosa Avenue
35th Avenue
Monterosa Street
S0°20'34"W
S1°25'13"E
N88°40'00"W
N0°54'34"E
Exst R/W
PC 0+59.87
PT 1+52.19
#171 Driveway Cross Slope > 2%
#172 Driveway Cross Slope > 2%
#169 Driveway Cross Slope > 2%
#168 Driveway Cross Slope > 2%
#170 Driveway Cross Slope > 2%
#167 Driveway Cross Slope > 2%
#166 Driveway Cross Slope > 2%
#165 Driveway Cross Slope > 2%
#164 Driveway Cross Slope > 2%
#163 Driveway Cross Slope > 2%
#901 Safety Railing Bottom rail height is 14"
#175 Driveway Cross Slope > 2%
#176 Driveway Cross Slope > 2%
#177 Driveway Cross Slope > 2%
#204 Driveway Cross Slope > 2% Running Slope > 12%
#51 Curb Ramp No Detectable Warnings No Landing
#179 Driveway Cross Slope > 2%
#180 Driveway Cross Slope > 2%
#404 Sidewalk S/W Damaged/Obstruction
#181 Driveway Cross Slope > 2%
#203 Driveway Cross Slope > 2%
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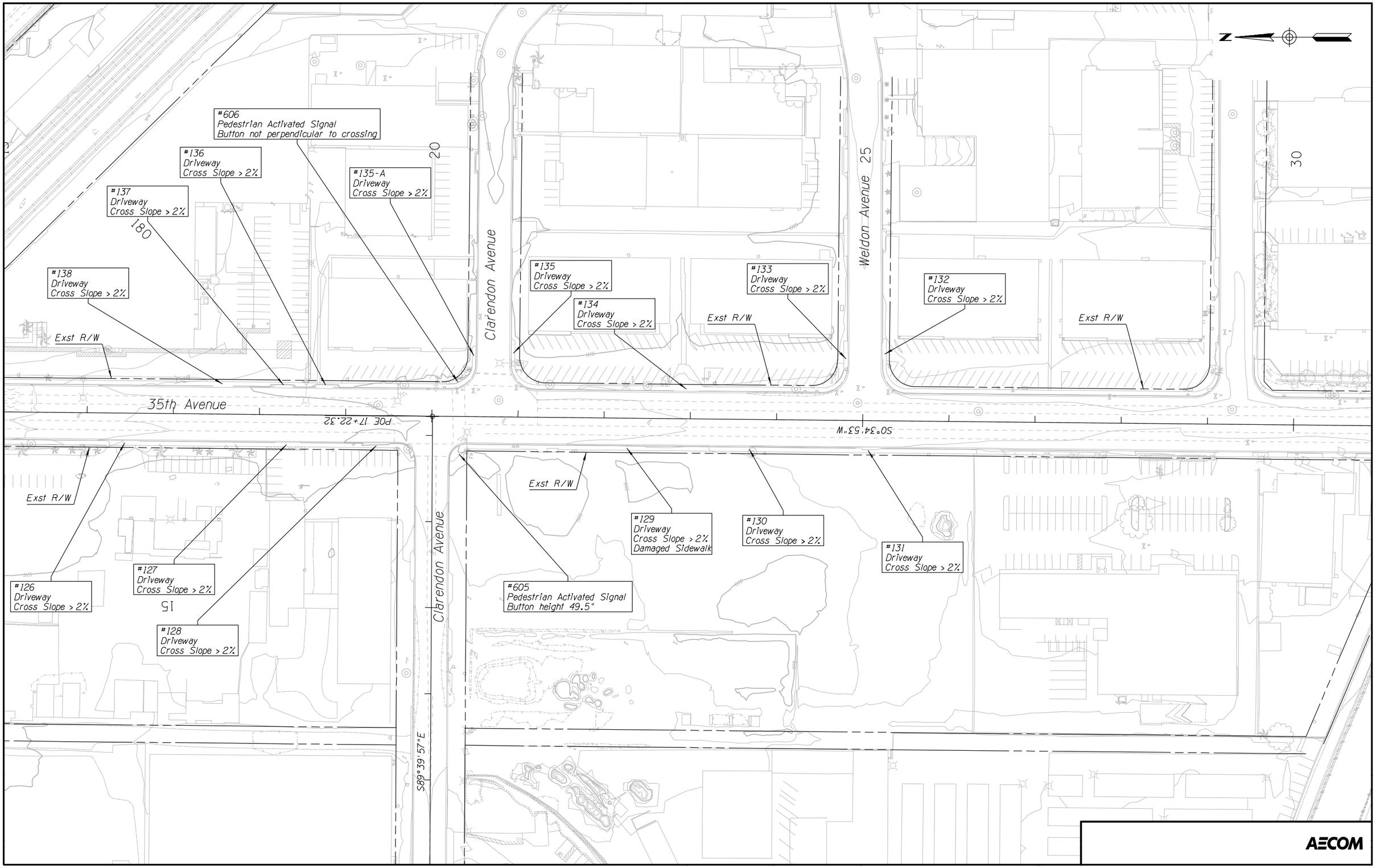
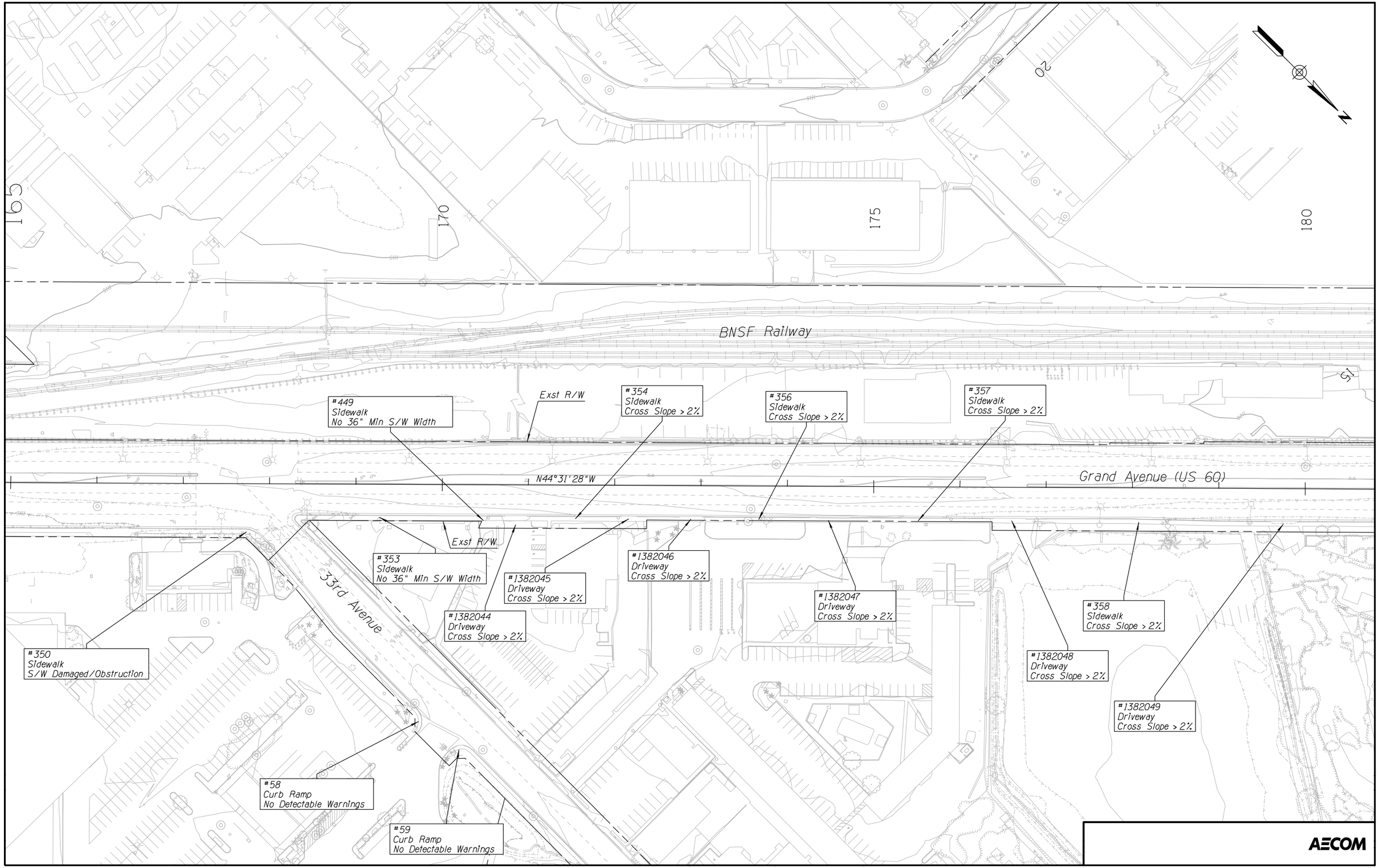


#606
Pedestrian Activated Signal
Button not perpendicular to crossing
#136
Driveway
Cross Slope > 2%
#135-A
Driveway
Cross Slope > 2%
#137
Driveway
Cross Slope > 2%
180
20
#138
Driveway
Cross Slope > 2%
Exst R/W
Clarendon Avenue
#135
Driveway
Cross Slope > 2%
#134
Driveway
Cross Slope > 2%
#133
Driveway
Cross Slope > 2%
Exst R/W
Weldon Avenue 25
#132
Driveway
Cross Slope > 2%
Exst R/W
30
35th Avenue
POE 17+22.32
S0°34'53"W
Exst R/W
Exst R/W
#129
Driveway
Cross Slope > 2%
Damaged Sidewalk
#130
Driveway
Cross Slope > 2%
#131
Driveway
Cross Slope > 2%
#126
Driveway
Cross Slope > 2%
#127
Driveway
Cross Slope > 2%
15
#128
Driveway
Cross Slope > 2%
#605
Pedestrian Activated Signal
Button height 49.5"
Clarendon Avenue
S89°39'57"E
AECOM

12/26/2023



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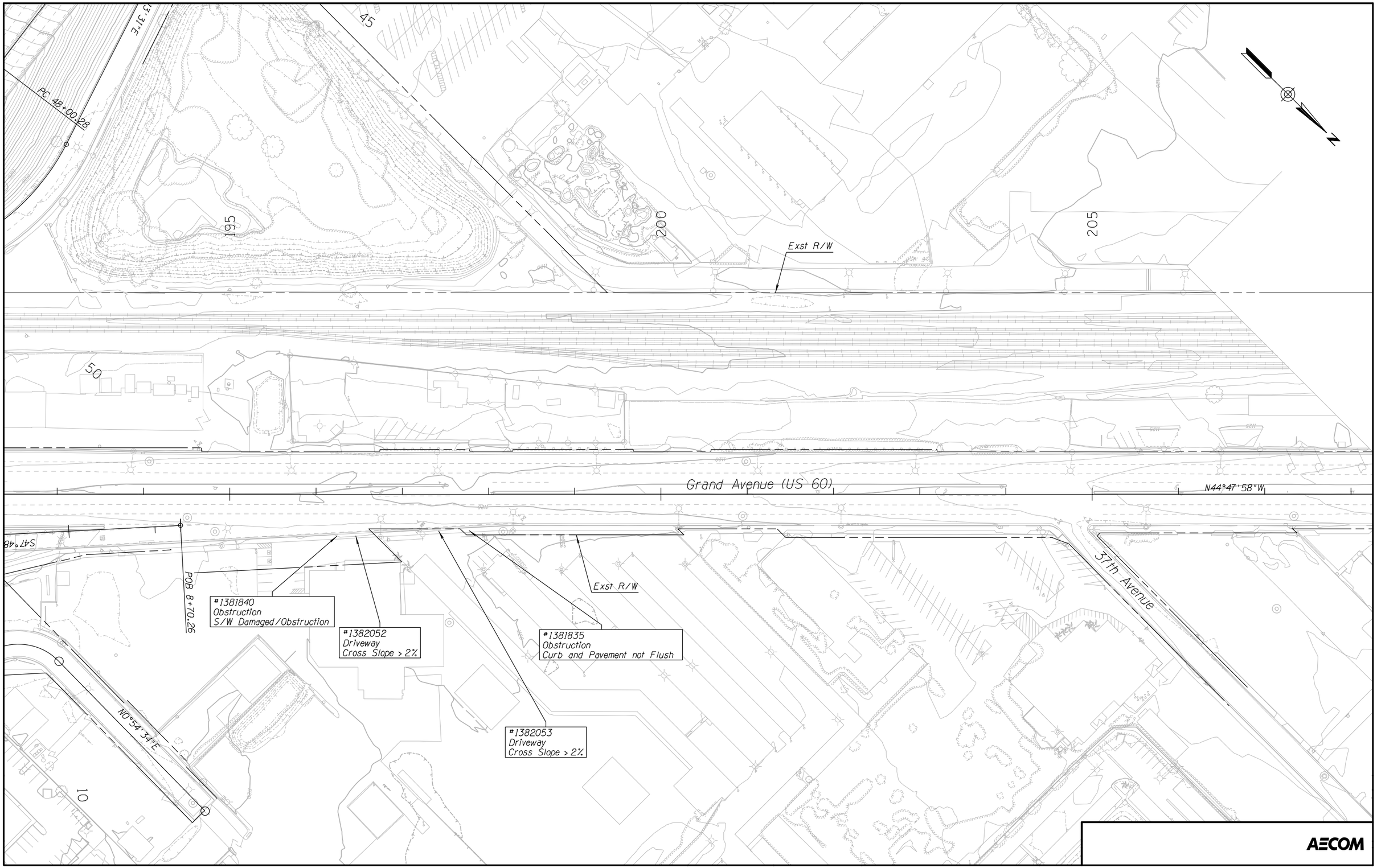

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1/2/2024

APPENDIX B – NON-COMPLIANT FEATURE PHOTO LOG (SIDEWALK – NOT INCLUDED IN ADOT FIS)

FIS Asset ID: #312
Location: Indian School Rd (EB)

Between 36th Ave and 38th Ave

FIS Asset ID: #323
Location: Indian School Rd (EB)

Between 36th Ave and 35th Ave

FIS Asset ID: #350
Location: Grand Ave (WB)

South of 33rd Ave

FIS Asset ID: #353
Location: Grand Ave (WB)

North of 33d Ave

FIS Asset ID: #354
Location: Grand Ave (WB)

North of 33d Ave

FIS Asset ID: #356
Location: North of 33d Ave

North of 33d Ave

FIS Asset ID: #357
Location: Grand Ave (WB)

Between Indian School Rd and 33rd Ave

FIS Asset ID: #358
Location: Grand Ave (WB)

Between Indian School Rd and 33rd Ave

FIS Asset ID: #364
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #369
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #370
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #374
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #404
Location: 35th Ave (SB)

North of Indian School Rd

FIS Asset ID: #412
Location: Grand Ave (WB)

North of Indian School Rd

FIS Asset ID: #449
Location: Grand Ave (WB)

Between Indian School Rd and 33rd Ave

APPENDIX C – NON-COMPLIANT FEATURE PHOTO LOG (CURB RAMPS – INCLUDED IN ADOT FIS)

FIS Asset ID: #1381836
Location: US 60 (WB)

SB 35th Ave to WB US 60 Turn-Lane

APPENDIX D – NON-COMPLIANT FEATURE PHOTO LOG (CURB RAMPS – NOT INCLUDED IN ADOT FIS)

FIS Asset ID: #1
Location: Indian School Rd (WB)

NW Corner of Indian School Rd and 38th Drive

FIS Asset ID: #2
Location: Indian School Rd (EB)

SW Corner of Indian School Rd and 38th Avenue

FIS Asset ID: #3
Location: Indian School Rd (EB)

SE Corner of Indian School Rd and 38th Avenue

FIS Asset ID: #4
Location: Indian School Rd (EB)

SW Corner of Indian School Rd and 36th Avenue

FIS Asset ID: #5
Location: Indian School Rd (EB)

SE Corner of Indian School Rd and 36th Avenue

FIS Asset ID: #30
Location: Indian School Rd (WB)

NE Corner of Indian School Rd and 33rd Avenue

FIS Asset ID: #31
Location: Indian School Rd (WB)

NE Corner of Indian School Rd and 33rd Avenue

FIS **Asset ID:** #32
Location: Indian School Rd (WB)

NW Corner of Indian School Rd and 33rd Avenue

FIS Asset ID: #50
Location: Indian School Rd (WB)

EW Corner of Indian School Rd and 38th Drive

FIS Asset ID: #51
Location: 35th Ave (SB)

EB Ramp crossing 35th Ave at Glenrosa Ave

APPENDIX E – NON-COMPLIANT FEATURE PHOTO LOG (PEDESTRIAN ACTIVATED SIGNALS – INCLUDED IN ADOT FIS)

FIS Asset ID: #1381829
Location: 35th Ave (NB)

NE Corner of 35th Ave and
EB Indian School Rd

APPENDIX F – NON-COMPLIANT FEATURE PHOTO LOG (PEDESTRIAN ACTIVATED SIGNALS – NOT INCLUDED IN ADOT FIS)

FIS Asset ID: #605
Location: 35th Ave (SB)

SW Corner of 35th Ave and Clarendon Ave

FIS Asset ID: #606
Location: 35th Ave (NB)

NE Corner of 35th Ave and Clarendon Ave

FIS Asset ID: #618
Location: 35th Ave (SB)

Median Island Between
SB 35th Ave and WB US 60

APPENDIX G – NON-COMPLIANT FEATURE PHOTO LOG (HANDRAIL – NOT INCLUDED IN ADOT FIS)

FIS Asset ID: #901
Location: 35th Ave (NB)

Median Island Between
SB 35th Ave and WB US 60

APPENDIX H – NON-COMPLIANT FEATURE PHOTO LOG (OBSTRUCTIONS OR NEEDS – INCLUDED IN ADOT FIS)

FIS Asset ID: #1381791
Location: Grand Ave (WB)

Indian School Median
West of Grand Ave

FIS Asset ID: #1381834
Location: 35th Ave (SB)

Median Island
SB 35th Ave to WB US 60

FIS Asset ID: #1381835
Location: Grand Ave (WB)

North of Indian School Rd

FIS Asset ID: #1381840
Location: Grand Ave (WB)

North of Indian School Rd

APPENDIX I – NON-COMPLIANT FEATURE PHOTO LOG (DRIVEWAYS – INCLUDED IN ADOT FIS)

FIS Asset ID: #1382044
Location: US 60 (WB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #1382045
Location: US 60 (WB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #1382046
Location: US 60 (WB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #1382047
Location: US 60 (WB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #1382048
Location: US 60 (WB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #1382049
Location: US 60 (WB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #1382051
Location: US 60 (WB)

Between 35th Ave and 37th Ave

FIS Asset ID: #1382053
Location: US 60 (WB)

Between 35th Ave and 37th Ave

FIS Asset ID: #1382054
Location: US 60 (WB)

Between 35th Ave and 37th Ave

APPENDIX J – NON-COMPLIANT FEATURE PHOTO LOG (DRIVEWAYS – NOT INCLUDED IN ADOT FIS)

FIS Asset ID: #101
Location: Indian School Rd (WB)

Between 39th Ave and 38th Dr

FIS Asset ID: #102
Location: Indian School Rd (EB)

Between 39th Ave and 38th Ave

FIS Asset ID: #103
Location: Indian School Rd (EB)

Between 39th Ave and
38th Ave

FIS Asset ID: #104
Location: Indian School Rd (EB)

Between 39th Ave and
38th Ave

FIS Asset ID: #105
Location: Indian School Rd (EB)

Between 39th Ave and
38th Ave

FIS Asset ID: #106
Location: Indian School Rd (EB)

Between 39th Ave and 38th Ave

FIS Asset ID: #107
Location: 38th Ave (SB)

South of Indian School Rd

FIS Asset ID: #108
Location: 38th Ave (NB)

South of Indian School Rd

FIS Asset ID: #109
Location: Indian School Rd (EB)

Between 38th Ave and
36th Ave

FIS Asset ID: #110
Location: Indian School Rd (EB)

Between 38th Ave and
36th Ave

FIS Asset ID: #110-A
Location: Indian School Rd (EB)

Between 38th Ave and
36th Ave

FIS Asset ID: #111
Location: Indian School Rd (EB)

Between 38th Ave and
36th Ave

FIS Asset ID: #112
Location: Indian School Rd (EB)

Between 38th Ave and
36th Ave

FIS Asset ID: #113
Location: Indian School Rd (EB)

Between 38th Ave and
36th Ave

FIS Asset ID: #114
Location: Indian School Rd (EB)

Between 38th Ave and 36th Ave

FIS Asset ID: #115
Location: Indian School Rd (EB)

Between 38th Ave and 36th Ave

FIS Asset ID: #116
Location: Indian School Rd (EB)

Between 38th Ave and 36th Ave

FIS Asset ID: #117
Location: Indian School Rd (EB)

Between 38th Ave and 36th Ave

FIS Asset ID: #119
Location: 36th Ave (NB)

South of Indian School Rd

FIS Asset ID: #120
Location: Indian School Rd (EB)

Between 36th Ave and 35th Ave

FIS Asset ID: #121
Location: Indian School Rd (EB)

Between 36th Ave and
35th Ave

FIS Asset ID: #122
Location: Indian School Rd (EB)

Between 36th Ave and
35th Ave

FIS Asset ID: #123
Location: Indian School Rd (EB)

Between 36th Ave and
35th Ave

FIS Asset ID: #126
Location: 35th Ave (SB)

Between Indian School Rd and Clarendon Ave

FIS Asset ID: #127
Location: 35th Ave (SB)

Between Indian School Rd and Clarendon Ave

FIS Asset ID: #128
Location: 35th Ave (SB)

Between Indian School Rd and Clarendon Ave

FIS Asset ID: #129
Location: 35th Ave (SB)

Between Clarendon Ave and Weldon Ave

FIS Asset ID: #130
Location: 35th Ave (SB)

Between Clarendon Ave and Weldon Ave

FIS Asset ID: #131
Location: 35th Ave (SB)

Between Clarendon Ave and Weldon Ave

FIS Asset ID: #132
Location: Weldon Ave (EB)

SE Corner 35th Ave and Weldon Ave

FIS Asset ID: #133
Location: Weldon Ave (WB)

NE Corner 35th Ave and Weldon Ave

FIS Asset ID: #134
Location: 35th Ave (SB)

Between Clarendon Ave and Weldon Ave

FIS Asset ID: #135
Location: Clarendon Ave (WB)

SE Corner 35th Ave and Clarendon Ave

FIS Asset ID: #135-A
Location: Clarendon Ave (WB)

NE Corner 35th Ave and Clarendon Ave

FIS Asset ID: #136
Location: 35th Ave (NB)

Between Indian School Rd and Clarendon Ave

FIS Asset ID: #137
Location: 35th Ave (NB)

Between Indian School Rd and Clarendon Ave

FIS Asset ID: #138
Location: 35th Ave (NB)

Between Indian School Rd and Clarendon Ave

FIS Asset ID: #150
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #151
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #152
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #153
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #154
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #155
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #156
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #157
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #158
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #159
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #161
Location: Indian School Rd (EB)

Between 35th Ave and 33rd Ave

FIS Asset ID: #162
Location: 35th Ave (NB)

Between Indian School Rd and Monterosa St

FIS Asset ID: #163
Location: 35th Ave (NB)

Between Indian School Rd and Monterosa St

FIS Asset ID: #164
Location: 35th Ave (NB)

Between Monterosa St and Glenrosa Ave

FIS Asset ID: #165
Location: 35th Ave (NB)

Between Monterosa St and Glenrosa Ave

FIS Asset ID: #166
Location: 35th Ave (NB)

Between Monterosa St and Glenrosa Ave

FIS Asset ID: #167
Location: 35th Ave (NB)

Between Glenrosa Ave and Turney Ave

FIS Asset ID: #168
Location: 35th Ave (NB)

Between Glenrosa Ave and Turney Ave

FIS Asset ID: #179
Location: 35th Ave (SB)

Between Monterosa St and Glenrosa Ave

FIS Asset ID: #180
Location: 35th Ave (SB)

Between Monterosa St and Glenrosa Ave

FIS Asset ID: #181
Location: 35th Ave (SB)

Between Monterosa St and Glenrosa Ave

FIS Asset ID: #183
Location: 35th Ave (SB)

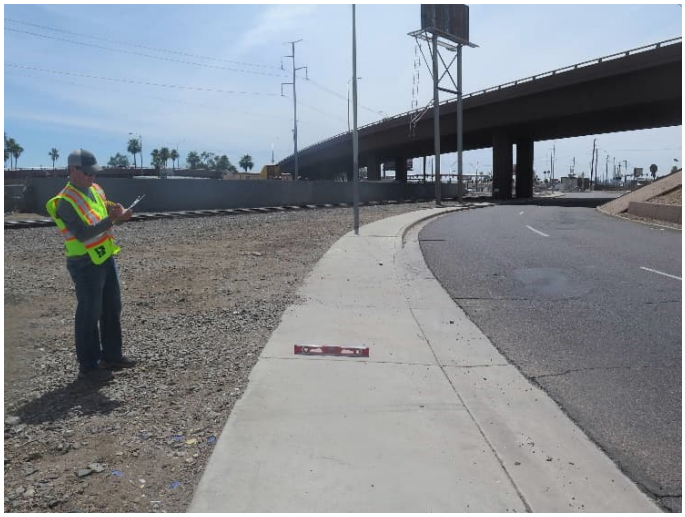
Between Monterosa St and Indian School Rd

FIS Asset ID: #198
Location: US 60 (EB)

Between 35th Ave and
33rd Ave

FIS Asset ID: #199
Location: Indian School Rd (WB)

WB Indian School Frontage Rd
West of Grand Ave



FIS Asset ID: #200
Location: Indian School Rd (WB)

WB Indian School Frontage Rd
West of Grand Ave

FIS Asset ID: #201
Location: Indian School Rd (WB)

WB Indian School Frontage Rd
West of Grand Ave

FIS Asset ID: #202
Location: Indian School Rd (WB)

WB Indian School Frontage Rd
West of Grand Ave

FIS Asset ID: #203
Location: 35th Ave (SB)

Between Monterosa St and
Indian School Rd

FIS Asset ID: #204
Location: 35th Ave (NB)

Between Glenrosa Ave and Turney Ave

APPENDIX K – NON-COMPLIANT FEATURE PHOTO LOG (RAILROAD CROSSINGS – NOT INCLUDED IN ADOT FIS)

FIS Asset ID: #701
Location: Indian School Rd (EB)

Railroad Crossing
South Side of Indian School Rd

FIS Asset ID: #702
Location: Indian School Rd (WB)

Railroad Crossing
North Side of Indian School Rd

FIS Asset ID: #703
Location: 35th Avenue (SB)

Railroad Crossing
West Side of 35th Ave

FIS Asset ID: #704
Location: 35th Avenue (NB)

Railroad Crossing
East Side of 35th Ave

APPENDIX G – AASHTO Controlling Criteria Report

PROJECT F0272 01L

US 60 (Grand Avenue) 35th Avenue and Indian School Road Intersection

AASHTO CONTROLLING DESIGN CRITERIA REPORT

May 2024

ARIZONA DEPARTMENT OF TRANSPORTATION

INTERMODAL TRANSPORTATION DIVISION

ROADWAY ENGINEERING GROUP

ROADWAY PREDESIGN SECTION

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LIST OF EXISTING FEATURES REQUIRING DESIGN EXCEPTIONS

The following is a list of the existing design features requiring design exceptions:

(Note: The analysis of all design elements of the following roadways have been compared with the recommended AASHTO Controlling Design Criteria to identify geometric elements that do not comply with the AASHTO 2018 "Green" Book criteria.)

INDIAN SCHOOL ROAD

The superelevation rate is less than the recommended minimum on the following horizontal curves:

1. HPI Station 64+77.71 – 0.008 ft/ft less than the minimum.

This segment of roadway will be removed under this project, and no design exception will be required.

WB INDIAN SCHOOL ROAD CONNECTOR TO WB US 60

The existing shoulder provides less than the AASHTO recommended horizontal stopping sight distance due to roadway curvature and the placement of concrete barrier adjacent to the outside shoulder:

1. HPI Station 14+74.19 – 22' less than the recommended 275'.

This segment of roadway will be removed under this project, and no design exception will be required.

The vertical curve stopping sight distance is less than the recommended as follows:

1. VPI Station 10+10.00 – 94' less than the recommended 274'.

This segment of roadway will be removed under this project, and no design exception will be required.

WB INDIAN SCHOOL ROAD FRONTAGE ROAD, WEST OF GRAND AVENUE

The existing degree of curve exceeds the recommended maximum of 15º 26'37" as follows:

1. HPI Station 9+92.12 – 6º 33'23" greater than the maximum.
2. HPI Station 13+49.75 – 8º 33'23" greater than the maximum.
3. HPI Station 16+12.42 – 15º 35'02" greater than the maximum.

This segment of roadway will be removed under this project, and no design exception will be required.

The superelevation rate is less than the recommended minimum on the following horizontal curves:

1. HPI Station 3+71.89 – 0.009 ft/ft less than the minimum.

This segment of roadway will be removed under this project, and no design exception will be required.

EB INDIAN SCHOOL ROAD FRONTAGE, WEST OF GRAND AVENUE

The superelevation rate is less than the recommended minimum on the following horizontal curves:

1. HPI Station 4+61.44 – 0.006 ft/ft less than the minimum.
2. HPI Station 7+27.51 – 0.006 ft/ft less than the minimum.
3. HPI Station 9+69.05 – 0.006 ft/ft less than the minimum.
4. HPI Station 13+19.54 – 0.006 ft/ft less than the minimum.
5. HPI Station 14+86.59 – 0.020 ft/ft less than the minimum.

This segment of roadway will be removed under this project, and no design exception will be required.

WB INDIAN SCHOOL ROAD TO NB 35TH AVENUE

The existing degree of curve exceeds the recommended maximum of 15º 26’37” as follows:

1. HPI Station 7+20.07 – 3º 34’39” greater than the maximum.

This segment of roadway will be removed under this project, and no design exception will be required.

The superelevation rate is less than the recommended minimum on the following horizontal curves:

1. HPI Station 14+65.98 – 0.008 ft/ft less than the minimum.

This segment of roadway will be removed under this project, and no design exception will be required.

EB INDIAN SCHOOL ROAD FRONTAGE ROAD, EAST OF GRAND AVENUE

The existing degree of curve exceeds the recommended maximum of 10º 45’00” as follows:

1. HPI Station 7+19.00 – 21º 04’52” greater than the maximum.

This segment of roadway will be removed under this project, and no design exception will be required.

The superelevation rate is less than the recommended minimum on the following horizontal curves:

1. HPI Station 7+46.66 – 0.014 ft/ft less than the minimum.

This segment of roadway will be removed under this project, and no design exception will be required.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
US 60 (Grand Avenue)

PROJECT NUMBER:	060-B(227)T	**ROUTE:**	US 60
PROJECT LOCATION:	US 60 (Grand Avenue/Indian School Road)	**BEGINNING MP:**	158.62
HIGHWAY SECTION:	Wickenburg - Phoenix Highway	**ENDING MP:**	159.32
FUNCTIONAL CLASSIFICATION:	Urban Arterial		

LANE AND SHOULDER WIDTH

	EXISTING (Feet)	PROPOSED (Feet)	AASHTO RECOMMENDED MINIMUM (Feet)
LANE WIDTH:	N/A	N/A	N/A
INSIDE SHOULDER WIDTH:	N/A	N/A	N/A
OUTSIDE SHOULDER WIDTH:	N/A	N/A	N/A

DESIGN SPEED

THE POSTED SPEED LIMIT IS: 45 MPH
TERRAIN IS: LEVEL

GRADES

EXISTING MAXIMUM GRADE IS: N/A

AASHTO ALLOWABLE MAXIMUM GRADE IS: N/A

CROSS SLOPE

EXISTING CROSS SLOPE IS: N/A

AASHTO ALLOWABLE RANGE IS: N/A

TRAFFIC VOLUMES AND FACTORS

Existing 2022	Design Year 2042	TRAFFIC FACTORS
		K = 9% D = 0.70 T = 11%
ADT (VPD)	ADT (VPD)	
43,900	69,100	

REMARKS

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
US 60 (Grand Avenue) - CONTINUED

VERTICAL CLEARANCE

STRUCTURE	MILEPOST	Preconstruction Clearance	Post Construction Clearance	AASHTO Minimum Allowable Clearance
Indian School Road OP (09704)	158.94	N/A	N/A	N/A

STRUCTURES

STRUCTURE	MILEPOST	Existing Bridge Width	Recommended Bridge Width	Bridge Barrier Geometry Adequate?	Bridge Barrier Adequate?	Existing Structural Capacity	Recommended Structural Capacity
Not Applicable							

VERTICAL ALIGNMENT AND STOPPING SIGHT DISTANCE

VPI STATION	Approach Grade (%)	Departure Grade (%)	Length of Curve (Feet)	Existing Sight Distance (Feet)	Required Sight Distance (Feet)	Existing Speed (MPH)	Posted Speed (MPH)
161+50.00	0.2289	0.2246	0	252,486	360	>90	45
168+00.00	0.2246	0.3557	0	>1500	361	>90	45
175+00.00	0.3557	-0.2780	400	1,903	361	>90	45
180+00.00	-0.2780	0.1480	400	>1500	361	>90	45
185+00.00	0.1480	0.5156	200	>1500	362	>90	45
187+00.00	0.5156	-0.3100	250	1,432	362	>90	45
190+00.00	-0.3100	0.1430	300	>1500	361	>90	45
200+00.00	0.1430	0.4711	400	>1500	362	>90	45
209+00.00	0.4711	0.2750	0	5,502	362	>90	45
213+00.00	0.2750	0.6100	400	>1500	363	>90	45
219+00.00	0.6100	0.2600	400	3,283	363	>90	45
224+00.00	0.2600	0.6100	400	>1500	363	>90	45

HORIZONTAL ALIGNMENT, SUPERELEVATION, AND STOPPING SIGHT DISTANCE

HPI STATION	SUPERELEVATION Maximum (Ft/Ft)	SUPERELEVATION Existing (Ft/Ft)	SUPERELEVATION Minimum (Ft/Ft)	EXISTING SPEED (MPH)	DEGREE OF CURVE Maximum	DEGREE OF CURVE Existing
Not Applicable						

REMARKS

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Indian School Road

PROJECT NUMBER:	060-B(227)T	**ROUTE:**	Indian School Road
PROJECT LOCATION:	US 60 (Grand Avenue/Indian School Road)	**BEGINNING MP:**	Not Applicable
HIGHWAY SECTION:	Wickenburg - Phoenix Highway	**ENDING MP:**	Not Applicable
FUNCTIONAL CLASSIFICATION:	Urban Arterial		

LANE AND SHOULDER WIDTH

	EXISTING (Feet)	PROPOSED (Feet)	AASHTO RECOMMENDED MINIMUM (Feet)
LANE WIDTH:	N/A	N/A	N/A
INSIDE SHOULDER WIDTH:	N/A	N/A	N/A
OUTSIDE SHOULDER WIDTH:	N/A	N/A	N/A

DESIGN SPEED

THE POSTED SPEED LIMIT IS: 40 MPH
TERRAIN IS: LEVEL

GRADES

EXISTING MAXIMUM GRADE IS: N/A
AASHTO ALLOWABLE MAXIMUM GRADE IS: N/A

CROSS SLOPE

EXISTING CROSS SLOPE IS: N/A
AASHTO ALLOWABLE RANGE IS: N/A

TRAFFIC VOLUMES AND FACTORS

Existing 2021	Design Year 2050	TRAFFIC FACTORS		
		K = 7%	D = 0.60	T = 7%
ADT (VPD) 46,700	ADT (VPD) 63,000			

REMARKS

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Indian School Road - Continued

VERTICAL CLEARANCE

STRUCTURE	MILEPOST	Preconstruction Clearance	Post Construction Clearance	AASHTO Minimum Allowable Clearance
Not Applicable				

STRUCTURES

STRUCTURE	MILEPOST	Existing Bridge Width	Recommended Bridge Width	Bridge Barrier Geometry Adequate?	Bridge Barrier Adequate?	Existing Structural Capacity	Recommended Structural Capacity
Indian School Road OP (09704)	N/A	N/A	N/A	N/A	N/A	42 ton inventory/ 104 ton operating	HS 20 Adequate

VERTICAL ALIGNMENT AND STOPPING SIGHT DISTANCE

VPI STATION	Approach Grade (%)	Departure Grade (%)	Length of Curve (Feet)	Existing Sight Distance (Feet)	Required Sight Distance (Feet)	Existing Speed (MPH)	Posted Speed (MPH)
43+85.00	-0.2940	6.0119	530	382	332	44	40
52+25.00	6.0119	-5.1453	1000	440	332	48	40
61+75.00	-5.1453	0.7087	720	524	327	54	40

HORIZONTAL ALIGNMENT, SUPERELEVATION, AND STOPPING SIGHT DISTANCE

HPI STATION	SUPERELEVATION Maximum (Ft/Ft)	SUPERELEVATION Existing (Ft/Ft)	SUPERELEVATION Minimum (Ft/Ft)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)	DEGREE OF CURVE Maximum	DEGREE OF CURVE Existing	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING	HORIZONTAL SSD REQUIRED
41+03.97	0.040	0.020	0.020	41	40	10°-45'-00"	1°-45'-00"	NA			
53+54.85	0.040	0.020	0.020	44	40	10°-45'-00"	1°-30'-00"	8	-6.0119	495	332
64+77.71	0.040	0.020	0.028 *	29	40	10°-45'-00"	3°-15'-00"	NA			

REMARKS * DESIGN EXCEPTION NOT REQUESTED BECAUSE THIS ROADWAY WILL BE REMOVED WITH THIS PROJECT.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Westbound Indian School Road Exit to WB Grand Avenue

PROJECT NUMBER:	060-B(227)T
PROJECT LOCATION:	US 60 (Grand Avenue/Indian School Road)
HIGHWAY SECTION:	Wickenburg - Phoenix Highway
FUNCTIONAL CLASSIFICATION:	Diagonal Ramp
DESCRIPTION:	WB Exit Ramp

MAINLINE MILEPOST: 158.82

LANE AND SHOULDER WIDTH

	EXISTING (Feet)	PROPOSED (Feet)	AASHTO RECOMMENDED MINIMUM (Feet)
LANE WIDTH:	N/A	N/A	N/A
INSIDE SHOULDER WIDTH:	N/A	N/A	N/A
OUTSIDE SHOULDER WIDTH:	N/A	N/A	N/A

DESIGN SPEED

THE POSTED SPEED LIMIT IS: NOT POSTED, ASSUMED 35 MPH
TERRAIN IS: LEVEL

GRADES

EXISTING MAXIMUM GRADE IS: N/A

AASHTO ALLOWABLE MAXIMUM GRADE IS: N/A

CROSS SLOPE

EXISTING CROSS SLOPE IS: N/A

AASHTO ALLOWABLE RANGE IS: N/A

TRAFFIC VOLUMES AND FACTORS

Existing 2021	Design Year 2050	TRAFFIC FACTORS K =	D =	T =
ADT (VPD) 5,500	ADT (VPD) 6,500		Not Available	

REMARKS

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Westbound Indian School Road Exit to WB Grand Avenue - Continued

VERTICAL CLEARANCE

STRUCTURE	MILEPOST	Preconstruction Clearance	Post Construction Clearance	AASHTO Minimum Allowable Clearance
Not Applicable				

STRUCTURES

STRUCTURE	MILEPOST	Existing Bridge Width	Recommended Bridge Width	Bridge Barrier Geometry Adequate?	Bridge Barrier Adequate?	Existing Structural Capacity	Recommended Structural Capacity
Indian School Road at Grand Avenue Ramp (09705)	N/A	N/A	N/A	N/A	N/A	43 ton inventory/ 104 ton operating	HS 20 Adequate

VERTICAL ALIGNMENT AND STOPPING SIGHT DISTANCE

VPI STATION	Approach Grade (%)	Departure Grade (%)	Length of Curve (Feet)	Existing Sight Distance (Feet)	Required Sight Distance (Feet)	Existing Speed (MPH)	Posted Speed (MPH)
10+10.00	-0.2004	6.8099	220	180	274	26	35
15+15.00	6.8099	-5.8163	700	346	274	41	35
19+65.00	-5.8163	-2.9000	200	422	237	51	35

HORIZONTAL ALIGNMENT, SUPERELEVATION, AND STOPPING SIGHT DISTANCE

HPI STATION	SUPERELEVATION Maximum (Ft/Ft)	SUPERELEVATION Existing (Ft/Ft)	SUPERELEVATION Minimum (Ft/Ft)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)	DEGREE OF CURVE Maximum	DEGREE OF CURVE Existing	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING	HORIZONTAL SSD REQUIRED
14+74.19	0.040	0.035	0.034	37	35	15°-26'-37"	7°-45'-00"	11	-6.8099	253 *	275

REMARKS * DESIGN EXCEPTION NOT REQUESTED BECAUSE THIS RAMP WILL BE REMOVED WITH THIS PROJECT.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Westbound Indian School Road Frontage Road, West of Grand Avenue

PROJECT NUMBER: 060-B(227)T
MAINLINE MILEPOST: Not Applicable
PROJECT LOCATION: US 60 (Grand Avenue/Indian School Road)
HIGHWAY SECTION: WB Indian School Road Frontage Road, West of Grand Avenue
FUNCTIONAL CLASSIFICATION: Urban Collector

LANE AND SHOULDER WIDTH

	EXISTING (Feet)	PROPOSED (Feet)	AASHTO RECOMMENDED MINIMUM (Feet)
LANE WIDTH:	N/A	N/A	N/A
INSIDE SHOULDER WIDTH:	N/A	N/A	N/A
OUTSIDE SHOULDER WIDTH:	N/A	N/A	N/A

DESIGN SPEED

THE POSTED SPEED LIMIT IS: NOT POSTED, ASSUMED 35 MPH
TERRAIN IS: LEVEL

GRADES

EXISTING MAXIMUM GRADE IS: N/A
AASHTO ALLOWABLE MAXIMUM GRADE IS: N/A

CROSS SLOPE

EXISTING CROSS SLOPE IS: N/A
AASHTO ALLOWABLE RANGE IS: N/A

TRAFFIC VOLUMES AND FACTORS

Existing 2021	Design Year 2050	TRAFFIC FACTORS
		K = D = T =
ADT (VPD)	ADT (VPD)	Not Available
Not Available	Not Applicable	

REMARKS

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Westbound Indian School Road Frontage Road, West of Grand Avenue - Continued

VERTICAL CLEARANCE

STRUCTURE	MILEPOST	Preconstruction Clearance	Post Construction Clearance	AASHTO Minimum Allowable Clearance
Indian School Road OP (09704)	Not Applicable	N/A	N/A	N/A

STRUCTURES

STRUCTURE	MILEPOST	Existing Bridge Width	Recommended Bridge Width	Bridge Barrier Geometry Adequate?	Bridge Barrier Adequate?	Existing Structural Capacity	Recommended Structural Capacity
Not Applicable							

VERTICAL ALIGNMENT AND STOPPING SIGHT DISTANCE

VPI STATION	Approach Grade (%)	Departure Grade (%)	Length of Curve (Feet)	Existing Sight Distance (Feet)	Required Sight Distance (Feet)	Existing Speed (MPH)	Posted Speed (MPH)
3+15.00	1.5500	2.9043	80	>1500	256	>90	35
4+30.00	2.9043	-0.4553	150	396	256	48	35
9+00.00	-0.4553	0.6119	80	>1500	248	>90	35
13+20.00	0.6119	0.0000	80	1,803	248	>90	35
13+60.00	0.0000	-0.0411	0	26,247	246	>90	35
15+30.28	-0.0411	-0.1590	0	9,152	246	>90	35

HORIZONTAL ALIGNMENT, SUPERELEVATION, AND STOPPING SIGHT DISTANCE

HPI STATION	SUPERELEVATION Maximum (Ft/Ft)	SUPERELEVATION Existing (Ft/Ft)	SUPERELEVATION Minimum (Ft/Ft)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)	DEGREE OF CURVE Maximum	DEGREE OF CURVE Existing	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING	HORIZONTAL SSD REQUIRED
3+71.89	0.040	0.020	0.029 *	23	35	15°-26'-37"	5°-00'-00"	NA			
9+92.12	0.040	0.020	**	<15	35	15°-26'-37"	22°-00'-00"	NA			
13+49.75	0.040	0.020	**	<15	35	15°-26'-37"	24°-00'-00"	NA			
16+12.42	0.040	0.020	**	<15	35	15°-26'-37"	31°-01'-39"	NA			

REMARKS

* DESIGN EXCEPTION NOT REQUESTED BECAUSE THIS RAMP WILL BE REMOVED WITH THIS PROJECT.
** NOT CALCULATED BECAUSE EXISTING DEGREE OF CURVE EXCEEDS MAXIMUM DEGREE OF CURVE.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Eastbound Indian School Road Frontage Road, West of Grand Avenue

PROJECT NUMBER: 060-B(227)T
MAINLINE MILEPOST: Not Applicable
PROJECT LOCATION: US 60 (Grand Avenue/Indian School Road)
HIGHWAY SECTION: EB Indian School Road Frontage Road, West of Grand Avenue
FUNCTIONAL CLASSIFICATION: Urban Collector

LANE AND SHOULDER WIDTH

	EXISTING (Feet)	PROPOSED (Feet)	AASHTO RECOMMENDED MINIMUM (Feet)
LANE WIDTH:	N/A	N/A	N/A
INSIDE SHOULDER WIDTH:	N/A	N/A	N/A
OUTSIDE SHOULDER WIDTH:	N/A	N/A	N/A

DESIGN SPEED

THE POSTED SPEED LIMIT IS: NOT POSTED, ASSUMED 35 MPH
TERRAIN IS: LEVEL

GRADES

EXISTING MAXIMUM GRADE IS: N/A
AASHTO ALLOWABLE MAXIMUM GRADE IS: N/A

CROSS SLOPE

EXISTING CROSS SLOPE IS: N/A
AASHTO ALLOWABLE RANGE IS: N/A

TRAFFIC VOLUMES AND FACTORS

Existing 2021	Design Year 2050	TRAFFIC FACTORS
		K = D = T =
ADT (VPD)	ADT (VPD)	Not Available
Not Available	Not Available	

REMARKS

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Eastbound Indian School Road Frontage Road, West of Grand Avenue - Continued

VERTICAL CLEARANCE

STRUCTURE	MILEPOST	Preconstruction Clearance	Post Construction Clearance	AASHTO Minimum Allowable Clearance
Not Applicable				

STRUCTURES

STRUCTURE	MILEPOST	Existing Bridge Width	Recommended Bridge Width	Bridge Barrier Geometry Adequate?	Bridge Barrier Adequate?	Existing Structural Capacity	Recommended Structural Capacity
Not Applicable							

VERTICAL ALIGNMENT AND STOPPING SIGHT DISTANCE

VPI STATION	Approach Grade (%)	Departure Grade (%)	Length of Curve (Feet)	Existing Sight Distance (Feet)	Required Sight Distance (Feet)	Existing Speed (MPH)	Posted Speed (MPH)
3+25.16	1.0667	-0.8348	150	642	249	65	35
4+40.16	-0.8348	0.1581	80	>1500	249	>90	35
7+50.00	0.1581	-0.2857	0	2,431	247	>90	35
8+55.00	-0.2857	0.4367	0	>1500	247	>90	35
11+00.00	0.4367	1.7500	80	>1500	244	>90	35
11+40.00	1.7500	1.7444	0	194,220	240	>90	35
12+30.00	1.7444	0.0000	80	659	246	66	35
12+70.00	0.0000	-0.0371	0	29,081	246	>90	35
14+31.71	-0.0371	-0.2108	0	6,212	246	>90	35

HORIZONTAL ALIGNMENT, SUPERELEVATION, AND STOPPING SIGHT DISTANCE

HPI STATION	SUPERELEVATION Maximum (Ft/Ft)	SUPERELEVATION Existing (Ft/Ft)	SUPERELEVATION Minimum (Ft/Ft)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)	DEGREE OF CURVE Maximum	DEGREE OF CURVE Existing	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING	HORIZONTAL SSD REQUIRED
4+61.44	0.040	0.020	0.026 *	26	35	15°-26'-37"	4°-00'-00"	NA			
7+27.51	0.040	0.020	0.026 *	26	35	15°-26'-37"	4°-00'-00"	NA			
9+69.05	0.040	0.020	0.026 *	26	35	15°-26'-37"	4°-00'-00"	NA			
13+19.54	0.040	0.020	0.026 *	26	35	15°-26'-37"	4°-00'-00"	NA			
14+86.59	0.040	0.020	0.04 *	<15	35	15°-26'-37"	14°-00'-00"	NA			

REMARKS

* DESIGN EXCEPTION NOT REQUESTED BECAUSE THIS RAMP WILL BE REMOVED WITH THIS PROJECT.
** NOT CALCULATED BECAUSE EXISTING DEGREE OF CURVE EXCEEDS MAXIMUM DEGREE OF CURVE.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Westbound Indian School Road Ramp to Northbound 35th Avenue

PROJECT NUMBER: 060-B(227)T
PROJECT LOCATION: US 60 (Grand Avenue/Indian School Road)
HIGHWAY SECTION: WB Indian School Road to NB 35th Avenue
FUNCTIONAL CLASSIFICATION: Diagonal Ramp
MAINLINE MILEPOST: Not Applicable

LANE AND SHOULDER WIDTH

	EXISTING (Feet)	PROPOSED (Feet)	AASHTO RECOMMENDED MINIMUM (Feet)
LANE WIDTH:	N/A	N/A	N/A
INSIDE SHOULDER WIDTH:	N/A	N/A	N/A
OUTSIDE SHOULDER WIDTH:	N/A	N/A	N/A

DESIGN SPEED

THE POSTED SPEED LIMIT IS: NOT POSTED, ASSUMED 35 MPH
TERRAIN IS: LEVEL

GRADES

EXISTING MAXIMUM GRADE IS: N/A
AASHTO ALLOWABLE MAXIMUM GRADE IS: N/A

CROSS SLOPE

EXISTING CROSS SLOPE IS: N/A
AASHTO ALLOWABLE RANGE IS: N/A

TRAFFIC VOLUMES AND FACTORS

Existing 2021	Design Year 2050	TRAFFIC FACTORS
ADT (VPD)	ADT (VPD)	K = D = T =
Not Available	Not Applicable	Not Available

REMARKS

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Westbound Indian School Road Movement to Northbound 35th Avenue - Continued

VERTICAL CLEARANCE

STRUCTURE	MILEPOST	Preconstruction Clearance	Post Construction Clearance	AASHTO Minimum Allowable Clearance
Not Applicable				

STRUCTURES

STRUCTURE	MILEPOST	Existing Bridge Width	Recommended Bridge Width	Bridge Barrier Geometry Adequate?	Bridge Barrier Adequate?	Existing Structural Capacity	Recommended Structural Capacity
Not Applicable							

VERTICAL ALIGNMENT AND STOPPING SIGHT DISTANCE

VPI STATION	Approach Grade (%)	Departure Grade (%)	Length of Curve (Feet)	Existing Sight Distance (Feet)	Required Sight Distance (Feet)	Existing Speed (MPH)	Posted Speed (MPH)
8+00.00	0.1778	-0.4051	0	1,851	246	>90	35
13+90.00	-0.4051	0.4199	80	>1500	247	>90	35

HORIZONTAL ALIGNMENT, SUPERELEVATION, AND STOPPING SIGHT DISTANCE

HPI STATION	SUPERELEVATION Maximum (Ft/Ft)	SUPERELEVATION Existing (Ft/Ft)	SUPERELEVATION Minimum (Ft/Ft)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)	DEGREE OF CURVE Maximum	DEGREE OF CURVE Existing	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING	HORIZONTAL SSD REQUIRED
7+20.07	0.040	0.020	**	<15	35	15°-26'-37"	19°-01'-16"	NA			
14+65.98	0.040	0.020	0.028 *	24	35	15°-26'-37"	4°-45'-00"	NA			

REMARKS

* DESIGN EXCEPTION NOT REQUESTED BECAUSE THIS RAMP WILL BE REMOVED WITH THIS PROJECT.
** NOT CALCULATED BECAUSE EXISTING DEGREE OF CURVE EXCEEDS MAXIMUM DEGREE OF CURVE.

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Eastbound Indian School Road Frontage Road, East of Grand Avenue

PROJECT NUMBER: 060-B(227)T
MAINLINE MILEPOST: Not Applicable
PROJECT LOCATION: US 60 (Grand Avenue/Indian School Road)
HIGHWAY SECTION: EB Indian School Road Frontage Road, East of Grand Avenue
FUNCTIONAL CLASSIFICATION: Urban Collector

LANE AND SHOULDER WIDTH

	EXISTING (Feet)	PROPOSED (Feet)	AASHTO RECOMMENDED MINIMUM (Feet)
LANE WIDTH:	N/A	N/A	N/A
INSIDE SHOULDER WIDTH:	N/A	N/A	N/A
OUTSIDE SHOULDER WIDTH:	N/A	N/A	N/A

DESIGN SPEED

THE POSTED SPEED LIMIT IS: 40 MPH
TERRAIN IS: LEVEL

GRADES

EXISTING MAXIMUM GRADE IS: N/A
AASHTO ALLOWABLE MAXIMUM GRADE IS: N/A

CROSS SLOPE

EXISTING CROSS SLOPE IS: N/A
AASHTO ALLOWABLE RANGE IS: N/A

TRAFFIC VOLUMES AND FACTORS

Existing 2021	Design Year 2050	TRAFFIC FACTORS
		K = D = T =
ADT (VPD)	ADT (VPD)	Not Available
5,000	7,000	

REMARKS

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
Eastbound Indian School Road Frontage Road, East of Grand Avenue - Continued

VERTICAL CLEARANCE

STRUCTURE	MILEPOST	Preconstruction Clearance	Post Construction Clearance	AASHTO Minimum Allowable Clearance
Not Applicable				

STRUCTURES

STRUCTURE	MILEPOST	Existing Bridge Width	Recommended Bridge Width	Bridge Barrier Geometry Adequate?	Bridge Barrier Adequate?	Existing Structural Capacity	Recommended Structural Capacity
Not Applicable							

VERTICAL ALIGNMENT AND STOPPING SIGHT DISTANCE

VPI STATION	Approach Grade (%)	Departure Grade (%)	Length of Curve (Feet)	Existing Sight Distance (Feet)	Required Sight Distance (Feet)	Existing Speed (MPH)	Posted Speed (MPH)
7+93.54	-0.2918	-0.6144	0	3,344	303	>90	40
9+27.00	-0.6144	0.2136	0	>1500	303	>90	40
12+50.00	0.2136	0.1865	0	39,764	299	>90	40
13+19.71	0.1865	0.7750	0	>1500	299	>90	40
13+59.71	0.7750	-0.2750	80	1,068	301	88	40

HORIZONTAL ALIGNMENT, SUPERELEVATION, AND STOPPING SIGHT DISTANCE

HPI STATION	SUPERELEVATION Maximum (Ft/Ft)	SUPERELEVATION Existing (Ft/Ft)	SUPERELEVATION Minimum (Ft/Ft)	EXISTING SPEED (MPH)	POSTED SPEED (MPH)	DEGREE OF CURVE Maximum	DEGREE OF CURVE Existing	EXISTING HSO (FT)	EXISTING GRADE (%)	HORIZONTAL SSD EXISTING	HORIZONTAL SSD REQUIRED
7+19.00	0.040	0.020	**	<15	40	10°-45'-00"	31°-49'-52"	NA			
9+46.66	0.040	0.020	0.034 *	22	40	10°-45'-00"	5°-36'-28"	NA			

REMARKS

* DESIGN EXCEPTION NOT REQUESTED BECAUSE THIS RAMP WILL BE REMOVED WITH THIS PROJECT.
** NOT CALCULATED BECAUSE EXISTING DEGREE OF CURVE EXCEEDS MAXIMUM DEGREE OF CURVE.

ATTACHMENT NO. 1

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA

VERTICAL ALIGNMENT AND STOPPING SIGHT DISTANCE

VPI Station	Curve Length (Ft)	Grades (%)		Existing SDs (Ft)	Required SDs (Ft)	Existing Speed (mph)	Posted Speed (mph)
		Approach	Departure				
Grand Avenue							
161+50.00	GB	0.2289	0.2246	GB	GB	GB	45
168+00.00	GB	0.2246	0.3557	GB	GB	GB	45
175+00.00	400	0.3557	-0.2780	1,903	361	>90	45
180+00.00	400	-0.2780	0.1480	>1500	361	>90	45
185+00.00	200	0.1480	0.5156	>1500	362	>90	45
187+00.00	250	0.5156	-0.3100	1,432	362	>90	45
190+00.00	300	-0.3100	0.1430	>1500	361	>90	45
200+00.00	400	0.1430	0.4711	>1500	362	>90	45
209+00.00	GB	0.4711	0.2750	GB	GB	GB	45
213+00.00	400	0.2750	0.6100	>1500	363	>90	45
219+00.00	400	0.6100	0.2600	3,283	363	>90	45
224+00.00	400	0.2600	0.6100	>1500	363	>90	45
Indian School Road							
43+85.00	530	-0.2940	6.0119	382	332	44	40
52+25.00	1,000	6.0119	-5.1453	440	332	48	40
61+75.00	720	-5.1453	0.7087	524	327	54	40
WB Indian School to WB Grand Ave							
10+10.00	220	-0.2004	6.8099	180	274	26	35
15+15.00	700	6.8099	-5.8163	346	274	41	35
19+65.00	200	-5.8163	-2.9000	422	237	51	35
WB Indian School Frontage Rd, West of Grand Ave							
3+15.00	80	1.5500	2.9043	>1500	256	>90	35
4+30.00	150	2.9043	-0.4553	396	256	46	35
9+00.00	80	-0.4553	0.6119	>1500	248	>90	35
13+20.00	80	0.6119	0.0000	1,803	248	>90	35
13+60.00	GB	0.0000	-0.0411	GB	GB	GB	35
15+30.28	GB	-0.0411	-0.1590	GB	GB	GB	35
EB Indian School Frontage Rd, West of Grand Ave							
3+25.16	150	1.0667	-0.8348	642	249	64	35
4+40.16	80	-0.8348	0.1581	>1500	249	>90	35
7+50.00	GB	0.1581	-0.2857	GB	GB	GB	35
8+55.00	GB	-0.2857	0.4367	GB	GB	GB	35
11+00.00	80	0.4367	1.7500	>1500	244	>90	35
11+40.00	GB	1.7500	1.7444	GB	GB	GB	35
12+30.00	80	1.7444	0.0000	659	246	66	35
12+70.00	GB	0.0000	-0.0371	GB	GB	GB	35
14+31.71	GB	-0.0371	-0.2108	GB	GB	GB	35
WB Indian School to NB 35th Ave							
8+00.00	GB	0.1778	-0.4051	GB	GB	GB	35
13+90.00	80	-0.4051	0.4199	>1500	247	>90	35
EB Indian School Frontage Rd, East of Grand Ave							
7+93.54	GB	-0.2918	-0.6144	GB	GB	GB	40
9+27.00	GB	-0.6144	0.2136	GB	GB	GB	40
12+50.00	GB	0.2136	0.1865	GB	GB	GB	40
13+19.71	GB	0.1865	0.7750	GB	GB	GB	40
13+59.71	80	0.7750	-0.2750	1,068	301	88	40

Meaning of Symbols

GB - Grade Break - Stopping Sight Distance and Speed not calculated

ATTACHMENT NO. 2

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA

HORIZONTAL ALIGNMENT AND SUPERELEVATION

HPI Station	Superelevation			Existing Speed (MPH)	Posted Speed (MPH)	Degree Curve	
	Max	Existing	Minimum			Max	Existing
Indian School Road							
41+03.97	0.040	0.020	0.020	41	40	10°-45'-00"	1°-45'-00"
53+54.85	0.040	0.020	0.020	44	40	10°-45'-00"	1°-30'-00"
64+77.71	0.040	0.020	0.028	29	40	10°-45'-00"	3°-15'-00"
WB Indian School to WB Grand Ave							
14+74.19	0.040	0.035	0.034	37	35	15°-26'-37"	7°-45'-00"
WB Indian School Frontage Rd, West of Grand Ave							
3+71.89	0.040	0.020	0.029	23	35	15°-26'-37"	5°-00'-00"
9+92.12	0.040	0.020	0.040	<15	35	15°-26'-37"	22°-00'-00"
13+49.75	0.040	0.020	0.040	<15	35	15°-26'-37"	24°-00'-00"
16+12.42	0.040	0.020	0.040	<15	35	15°-26'-37"	31°-01'-39"
4+61.44	0.040	0.020	0.026	26	35	15°-26'-37"	4°-00'-00"
7+27.51	0.040	0.020	0.026	26	35	15°-26'-37"	4°-00'-00"
9+69.05	0.040	0.020	0.026	26	35	15°-26'-37"	4°-00'-00"
14+86.59	0.040	0.020	0.026	<15	35	15°-26'-37"	14°-00'-00"
WB Indian School to NB 35th Ave							
14+65.98	0.040	0.020	0.028	24	35	15°-26'-37"	4°-45'-00"
EB Indian School Frontage Rd, East of Grand Ave							
7+19.00	0.040	0.020	0.040	<15	40	10°-45'-00"	31°-49'-52"
9+46.66	0.040	0.020	0.034		40	10°-45'-00"	5°-36'-28"

Stopping Sight Distances - Horizontal Obstruction

Project : Grand Ave/Indian School Road
Design :
Review :

Barrier/Parapet Locations	Station	Design Speed (mph)	Horizontal Curvature (Deg)	Horizontal Radius at Center of Target Lane (ft)	Effective Vertical Grade (%)	SDs Required (ft)	Horizontal SDs Provided (ft)	Horizontal Offset Required to face of Barrier (ft)	Horizontal Offset Provided to face of Barrier (ft)	Additional Offset Required to face of Barrier (ft)	Design Speed Provided (mph)	Meets Design Crieria
EB Indian School Outside	53+54.85	40	1°-30'-00"	3798.64	-5.1453	327	493	3.5	8.0	N/A	>40	**Yes**
WB Indian School Inside	53+54.85	40	1°-30'-00"	3828.8	-6.0119	332	495	3.6	8.0	N/A	>40	**Yes**
WB I.S. to WB Grand	14+74.19	35	7°-45'-00"	728.30	-6.8099	275	253	12.9	11.0	1.9	33.2	**No**

NOTE:

1. Face of barrier is used to measure obstruction distance (M) from middle of adjacent travel lane.
2. SSD required was calculated from AASHTO 2018 formula.

ROADWAY ENGINEERING GROUP
ROADWAY PREDESIGN SECTION

DATE: 5/30/2024

TO: **Enamul Hoque,PE**
BRIDGE GROUP
BRIDGE MANAGEMENT SECTION, MD 635E

FEDERAL REFERENCE NO: _____ TRACS NO: _____
HIGHWAY: _____
LOCATION: Indian Sch Rd @ 35th Ave
MP LIMITS: NA TO: NA

FROM: **Shahid Bhuiyan, PE**
ADOT Predesign

PROJECT DESCRIPTION: Pavement Preservation

SUBJECT: **BRIDGE EVALUATION REQUEST**

Please evaluate the following structures per AASHTO guidelines:

ROUTE NO.	MILEPOST	STR. NO. AND NAME	BRIDGE LENGTH	BRIDGE ROADWAY WIDTH	BRIDGE RAIL / BARRIER					AC OVERLAY			VERTICAL CLEARANCE (MINIMUM)		BRIDGE LOAD RATING	BRIDGE SUFFICIENCY RATING
					TYPE	GEOM. OK	STRUC OK	Railings OK	Transitions OK	THICKNESS (EXISTING)	REMOVE	REPLACE / NEW				
N7*	N11	N8 & A209	N49	N51	A206A	A206B	A206C	N36A	N36B	A201	(MINIMUM)	(MAXIMUM)	NB/EB	SB/WB	N66	SRB
0	0	9704 Railroad Bridge	650	59	Concrete Barrier	Yes	Yes	Yes	Yes	0"	NA	NA	NA	NA	HS20+	82.00
		Comment: Inspection done by HDR . Repair deck spalls and failed patch.Replace/repair modular deck joint sections.														
0	0	9705 Railroad Bridge	380	23.9	1-Tube steel rail on Concrete	Yes	Yes	Yes	Yes	0"	NA	NA	NA	NA	HS20+	94.60
		Comment: Inspection done by HDR . Repair deck cutouts and failed patches.														

Evaluation Completed by: Masudur Rahman Date: 5/30/2024

Note: *N numbers are NBI numbers and A numbers are Arizona Items Number for bridge inventory