Grand Avenue/35th Avenue/ Indian School Road

Intersection Concept Design Review and Cost Estimate

FINAL SUMMARY REPORT

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1. Introduction

1.1 Executive Summary

The purpose of this design review is to analyze the COMPASS recommended design concept at the intersection of Grand Avenue, 35th Avenue and Indian School Road, propose any potential changes or functional enhancements, and estimate the total development costs. The total costs will enable verifying if this transportation improvement meets the current budget allocation in the 2040 Regional Transportation Plan, which has been identified as $89.5M.

Review of the COMPASS design by Jacobs indicates that the grade separation concept is feasible and can be implemented with an estimated probable total project cost of $154,597,000 (2018 dollars). An alternative alignment has also been developed with the intersection moved northeast beyond Grand Avenue roadway limits, enabling construction of the intersection on fill. The estimated cost of the Alternative concept is $142,957,000 (2018 dollars). Detailed discussion, evaluation considerations, concept plans, and total project cost estimates are included in this *Concept Design Review and Cost Estimate Summary Report*.

1.2 Existing Conditions and Proposed Improvements

Grand Avenue (US-60) runs at a diagonal to the grid network that comprises the regional arterial street system in the Phoenix metropolitan area. This results in complex intersection configurations where the three roadways come together (see **Figure 1**). This is made more complex by the BNSF Railway corridor paralleling Grand Avenue to its south. To increase mobility, safety, and reliability along this route, grade separations are planned and/or have been implemented at major intersections along the Grand Avenue corridor.

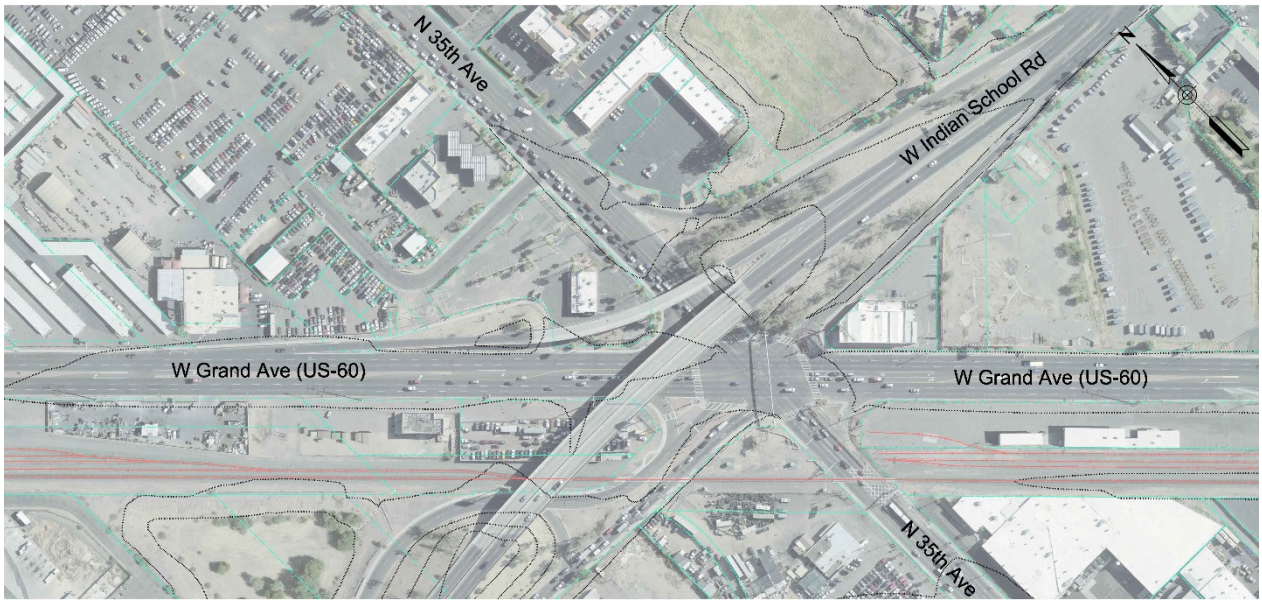


Figure 1. Existing Intersection Configuration

Several studies have identified the need for improvements at the Grand Avenue/35th Avenue/Indian School Road intersection, including elevating the Indian School Road/35th

Avenue intersection and approach roadways above Grand Avenue and the BNSF tracks. Preparation of these studies have been motivated by a desire for improvements to the US-60 corridor functionality, arterial street network multimodal opportunities (e.g., expansion of bicycle lane network), BNSF Railway corridor capacity (e.g., commuter rail), and reduction in pedestrian and vehicular incidents. Eight (8) of these primary studies are summarized in section *2.1 – Relevant Study Overviews.*

1.3 Stakeholders

Various agencies have jurisdiction over the transportation system in this vicinity, including the Arizona Department of Transportation (ADOT), City of Phoenix, and BNSF Railway. These stakeholders have been contacted and their comments have been addressed in this report.

2. Relevant Study Overviews

The following studies have been completed over the last ten (10) years and include recommendations for transportation improvements in the vicinity of the Grand Avenue/35th Avenue/Indian School Road intersection, including at the intersection itself, adjacent railroad corridor, and surrounding arterial street network. A description of each study and summary of relevant recommendations and/or cost estimates are included in the following sub-sections.

2.1 MAG US-60/Grand Ave Corridor Optimization, Access Management Plan, and System Study (COMPASS)

The *Corridor Optimization, Access Management Plan, and System Study (COMPASS)* (revised 2014) identifies a long-term solution along the Grand Avenue corridor for accommodating travel demands, establishing operating principles to improve the effectiveness of traffic operation, and preparing an Access Management Plan to provide a detailed milepost-by-milepost description of adjacent property access. The intersection of 35th Avenue at Indian School Road is highlighted as a complex, six-legged, signalized intersection with proposed improvement recommendations proposed.

The COMPASS recommends construction of an elevated intersection of 35th Avenue and Indian School Road, grade separated above Grand Avenue and the BNSF Railway, to optimize mobility along Grand Avenue and BNSF lines. The recommendation focuses on providing a connection between 35thAvenue/Indian School Road and 33rd Avenue and retaining the ramp from west inbound Indian School Road to outbound (northwest) Grand Avenue, and the connection from inbound Grand Avenue to eastbound Indian School Road.

Guide signs, conceptually similar to signage developed for 67th Avenue/Northern Avenue, will be important at this location. An acceptable Level of Service (LOS) D or better in both AM and PM peak hours was indicated by the operational analysis of the concept. **Figure 2** on the following page shows the recommended improvements for this location (also see **Appendix C1**).

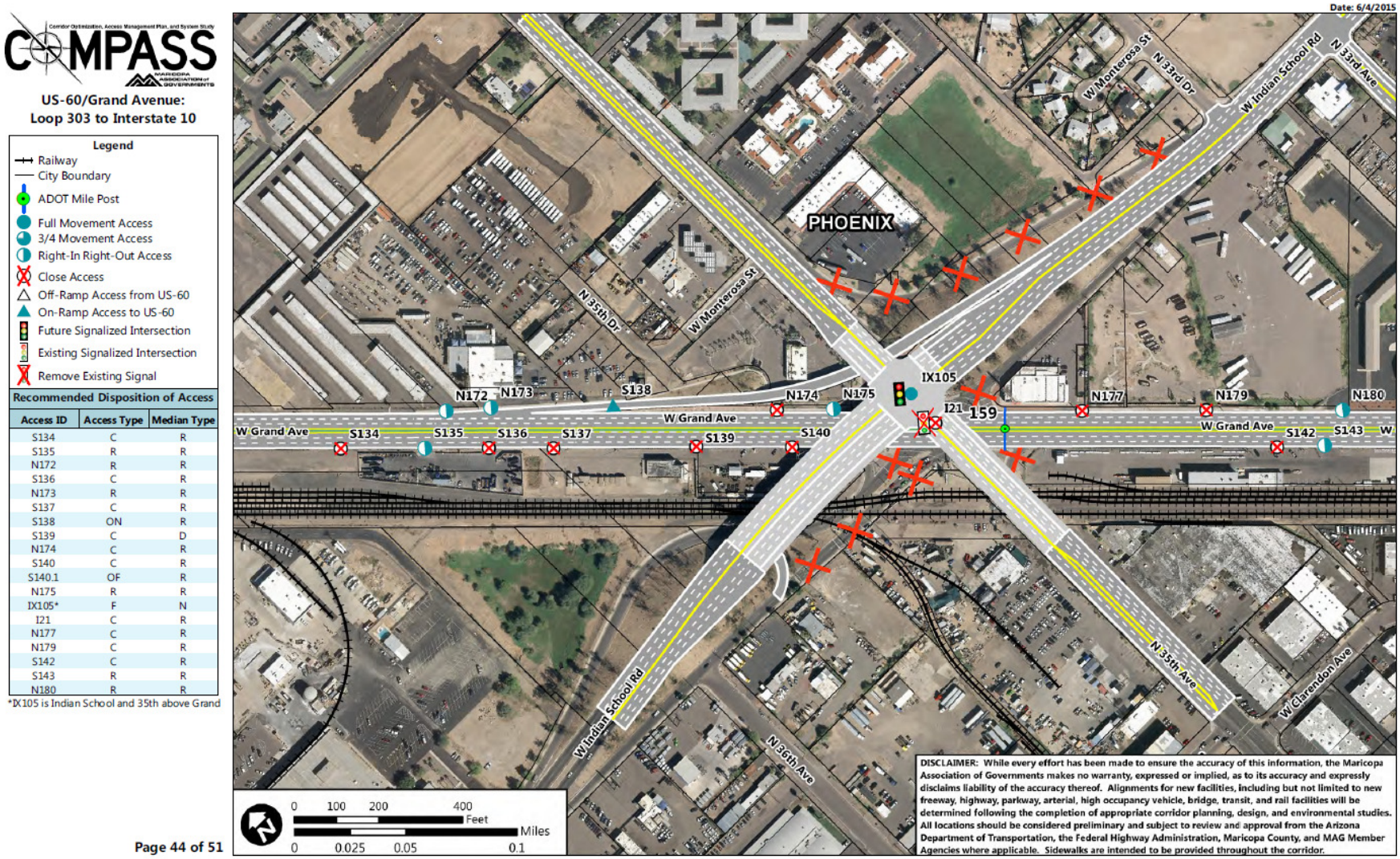


Figure 2. COMPASS Recommended Improvements

2.2 ADOT Arizona State Rail Plan

The *2011 ADOT Arizona State Rail Plan* was the first comprehensive assessment of the State's rail needs aimed at identifying the current rail system, determining infrastructure needs, and having rail projects included in the State's long-range planning process.

The study proposes relocation of the BNSF switching activities along Grand Avenue away from the current Mobest Yard location near downtown Phoenix, Az to a new facility in Surprise, Az. It would also replace the Auto Facility in El Mirage, Az and Desert Lift Facility in Glendale, Az. The new higher-capacity facility would increase freight rail movements into the Phoenix area. Concentration of multiple facilities into one new location would decrease the number of trains using the Grand Avenue corridor, alleviating traffic congestion at at-grade crossings and reducing potential conflicts between trains and vehicles. The study suggests the redevelopment of the Mobest Yard as a multimodal transportation hub.

A *Short-Term Implementation Action* within a 5-year term suggests a "Grade Separation Program" to prioritize and implement grade separations throughout Arizona, identifying a grade separation along Grand Avenue as a high priority. Commuter rail and Amtrak intercity passenger travel along Grand Avenue, as well as the new Intermodal and Freight Logistics Center in Surprise, Az, are suggested as intermediate 10-year term projects.

2.3 ADOT Draft US-60 Improvements Feasibility Report

This *ADOT Draft US-60 Improvements Feasibility Report* determined US-60's long-term needs and established an implementation plan for meeting them. The purpose of the *2008 Feasibility Report* was to explore potential improvements beyond those planned in the previous study.

The report outlined seven (7) total additional improvement intersections and identified viable alternatives. Improvements were recommended for the following intersections: Meeker Boulevard/Reems Road, Bell Road, Greenway Road, Thunderbird Road, 107th Avenue, 103rd Avenue, and Drainage Channel from Dysart Road to the Agua Fria River. Projects that received the highest priority were recommended to MAG for funding as part of Phase 2 of the Regional Transportation Program.

2.4 ADOT Grand Ave Major Investment Study Phase II

The purpose of the *ADOT Grand Ave Major Investment Study* (Phase II) was to provide recommendations for improvement projects within the Grand Avenue corridor, while considering pedestrians, bicyclists, transit, and community mitigation projects, in addition to traffic related projects.

The study recommended a grade separation at the 35th Avenue and Indian School Road intersection to eliminate the six-legged intersection at the Grand Avenue signal and improve level of service. The recommended approach also aims to improve continuity with the Grand Avenue overpass at 27th Avenue and Thomas Road to the south, and the Grand Avenue overpass at 43rd Avenue and Camelback Road to the north. The recommended grade separation was proposed as part of Phase 4 (2021 to 2025) of four total phases at an estimated cost of $37,472,000 in 2005 dollars.

In addition to the grade separation recommendation, the study recommended several access management and community mitigation improvements in Phase 1 (2006 to 2010) and Phase 2 (2011 to 2015) of the project. **Table 1** shows the details for each of the relevant sections.

Table 1. ADOT Grand Ave Major Investment Study Phase II: Access Management and Community Mitigation Improvements

Section	Proposed Cost Estimate	Access Management Improvements (RTP Phase)	Community Mitigation Improvements (RTP Phase)	Notes
43rd Ave to 35th Ave	• Phase 1: $1,843,714 • Phase 2: $2,457,037	• 4 median closures – 40th Ave, near 39th Ave, 37th Ave near 36th Ave • Rt-turn lane – 39th Ave (1) • Rt-in/Rt-out- 37th Ave (1) • 23 driveway closures (1)	• Sidewalk only – 41st Ave to 36th Ave (1) • Median Landscaping (1) • RR-side Landscape/Barrier (4) • Street Lighting (both sides) (1) • Utility Undergrounding – 41st Ave to Indian School Road (2)	• Full length improvements begin at 43rd Ave off-ramp due to existing Grand Ave overpass improvements and end at Indian School Rd. on-ramp • Other improvements identified but not recommended for funding in the 20-year planning period due to funding constraints.
35th Ave to 27th Ave	• Phase 1: $1,221,656 • Phase 2: $1,732,627	• Parcel purchase and access reconfiguration – SW corner of 31st Ave/Grand Ave (2) • 2 Rt-turn lanes – 33rd Ave, realigned Osborn Rd (1) • Rt-in/Rt-out – 31st Ave (1) • 2 median closures – near canal crossing, 31st Ave (1) • Remove Rd. – Osborn (1) • 12 driveway closures (1)	• Sidewalk Only – 29th Ave to Weldon Ave (1) • Median Landscaping (1) • RR-side Landscape/Barrier (4) • Street Lighting (both sides) (1) • Utility Undergrounding – 35th Ave to 31st Ave, Osborn Rd. to NW bound on-ramp (2)	• Other improvements identified but not recommended for funding in the 20-year planning period due to funding constraints.

2.5 MAG Grand Ave Commuter Rail Corridor Development Plan

The *MAG Grand Ave Commuter Rail Corridor Development Plan* (2010) investigates the feasibility of commuter rail to improve mobility in the northwestern Phoenix metropolitan area. Commuter rail would share existing BNSF Railway railroad right-of-way parallel to Grand Avenue. This project is a result of the 2008 Commuter Rail Strategic Plan, which provided guidance on how to pursue implementation of commuter rail service and corridor development plans for each potential commuter rail corridor.

In an effort to form a coherent examination and to make a case for projects to fully explore the possibility of commuter rail, the plan includes a mention of Grand Avenue under the Indian School Road/35th Avenue grade separation planned by ADOT. The mention is supported by a section on suggested improvements that would facilitate the implementation of commuter rail. These improvements include grade separations, additional grade crossing warning devices,

right-of-way improvements for commuter rail and automobile travel, and rail station planning and design.

The total estimated capital cost for the implementation of commuter rail service in the Grand Avenue corridor is $700.9 million. The cost for the planned Grand Avenue under Indian School Road/35th Avenue grade separation was not included in the report.

2.6 City of Phoenix Comprehensive Bicycle Master Plan

The *City of Phoenix Comprehensive Bicycle Mater Plan* (2014) is a 20-year framework for decision-making to increase and improve bicycling facilities in Phoenix, Az and identify specific actions, implementation schedule, and measurable outcomes.

Indian School Road was identified as the corridor with the most fatal bicyclist-involved crashes. Several of the crashes occurred at the intersection of Grand Avenue and 35th Avenue. In response to this issue, the City of Phoenix partnered with MAG to conduct a corridor safety assessment on Indian School Road between 27th Avenue and 51st Avenue in 2015. The City of Phoenix upgraded to larger diameter signal heads and added higher visibility street name signs along the entire corridor. Specific improvement projects on or near the Grand Avenue/35th Avenue and Indian School were not outlined in this report.

2.7 MAG Corridor Safety Assessment from 27th – 51st Ave

The MAG Corridor Safety Assessment from 27th – 51st Ave is currently unavailable. However, per the *City of Phoenix 2014 Comprehensive Bicycle Master Plan* Indian School Road was identified as the corridor with the most fatal bicyclist-involved crashes that transit serves (See Section 2.6 for additional information). From information obtained in stakeholder meetings, it appears in the past year there have been several fatalities at the intersection, and that there are a significant number of rear-end collisions at the BNSF gate arm location as northbound traffic stops for traffic signals within the gate arm footprint. The City of Phoenix has double-striped the area which has decreased the number of collisions.

2.8 City of Phoenix 35th Ave S/O Indian School Road Railroad Crossing Draft Project Assessment

The 2018 *City of Phoenix 35th Ave S/O Indian School Road Railroad Crossing Draft Project Assessment* aimed to establish a preferred alternative for the widening of 35th Avenue to accommodate a raised median and allow for new gate arms at the existing railroad crossing. The widening is proposed starting approximately 250-ft north of Clarendon Avenue and ending at the intersection of Indian School Road. Established in the report is a recommended alternative, including roadway geometrics, design parameters, and anticipated construction costs. Additionally, the report identifies ultimate right-of-way requirements for the 35th Avenue railroad crossing south of Indian School Road.

The 35th Avenue existing roadway configuration includes three northbound lanes, two southbound lanes, and a two-way left turn lane which transitions to a dedicated left turn lane at the Indian School Road intersection. This configuration would remain unchanged after widening

is implemented. The segment has an attached sidewalk on both sides and does not have bicycle facilities.

The topography of the corridor is marked by its high point at the railroad crossing south of Indian School Road at an approximate elevation of 1,118 feet above sea level. 35th Avenue slopes to the south at 1.00% and north at 0.50%. The total existing right-of-way is 40 feet on either side of the centerline. Six (6) different business owners are located along the segment. The railroad crossing includes cantilevers for both directions and a pre-signal in front of the northbound cantilever for the northbound direction.

35th Avenue will be widened on the east side and lined up with the configuration across the intersection to the north eliminating a shift for northbound traffic, with a median width of 10 feet and the southbound gate moved into the median.

The project will require the relocation of existing utilities, including SRP overhead electric facilities with at least two power poles, fire hydrants, water meters, water valve and manhole adjustments, traffic signal pull boxes, and telecommunication infrastructure. Relocation of two existing traffic signal poles will also be required and include: Type A Pole – 12" Vehicle Signal and Ped Signal and a Type A Pole – Pedestrian Push Button near the corner of the existing median island.

A preliminary opinion of probable construction costs estimated a total of $280,000 for construction of the project, with a total project estimated cost of $1,715,000.

3. Design Considerations

3.1 Traffic

The lanes and ramps recommended in the COMPASS are used for roadway width and layout, with exceptions of retaining the outbound Grand Avenue ramp to eastbound Indian School Road and adding a southbound lane to 35th Avenue. No traffic modeling or analyses of network flow are included as a part of this report. The ramp configuration shown in the COMPASS report including westbound Indian School Road to outbound Grand Avenue and the loop ramp below the Indian School Road bridge on the west side of the intersection are used in the concept evaluation. The existing inbound (south eastbound) Grand Avenue to existing eastbound Indian School Road is retained per direction from MAG.

The *2035 Average Weekday Traffic Volumes* provided by MAG indicate thru lanes would be operating at a LOS C or better in 2035 with the exception of southbound 35th Avenue which would be operating at a LOS C, even with the addition of a median. Thus, a lane is added to south bound 35th Avenue in evaluation of the COMPASS and alternative concepts.

The COMPASS indicates the Indian School Road and 35th Avenue intersection will operate at LOS D for both the AM and PM peak hours in the year 2040 (see **Appendix C3**). However, individual movements range from LOS A through E. **Table 2** lists movements expected to operate at LOS E or F. Final design should evaluate the effect of adding left turn lanes at the cost of removing permissive turns.

Table 2: COMPASS Intersection Level of Service

Period	Travel Direction	Service Level
AM Peak Hour	SB Left, SB Thru, and EB Thru	LOS E
AM Peak Hour	WB Left	LOS F
PM Peak Hour	SB Left, NB Thru, EB Thru, and WB Thru	LOS E
PM Peak Hour	EB Left and WB Left	LOS F

3.2 BNSF Guidelines

BNSF guidelines are considered in evaluation of the concepts, including providing a minimum 23′-6″ vertical clearance to bottom of structure over the BNSF right-of-way. Piers are introduced at BNSF parcel boundary lines, where needed, and parallel with Grand Avenue and BNSF track alignments.

Structure types requiring falsework were not selected over the railroad tracks. BNSF does own several parcels between the tracks and Grand Avenue.

The ADOT railroad liaison should be contacted in Final Design for any BNSF permitting needs.

Comments from the BNSF coordination meeting held on November 8th, 2018 with Tiera Adams of BNSF of San Bernardino, CA via conference call have been incorporated into this report. Comments addressed included changing BNSF minimum vertical clearance to 23'-6" and adding a line item in the estimate for railroad permits, removals, and flagging (**Appendix B**).

3.3 Pedestrian and Bicycle Facilities

Indian School Road and 35th Avenue will each include 8-ft multi-use sidewalks to accommodate pedestrians and bicyclists. No known future bicycle corridors are identified in the *City of Phoenix Comprehensive Bicycle Master Plan*. Need for any additional access ramps and stairways should be included as a part of Final Design.

3.4 Environmental

Elevation of the 35th Avenue and Indian School Road intersection will affect noise levels on adjacent properties. A noise analysis will need to be conducted to determine the extent of noise impacts and any need for sound walls. Additional environmental considerations are discussed in individual concept sections.

Hazardous Waste LQP southwest of the intersection does not elicit concern for the purposes of this project.

3.5 Associated Projects

Along the off-ramp for westbound Indian School Road to north 35th Avenue, the City of Phoenix will be incorporating a pedestrian HAWK, refuge island, converting the yield sign to stop sign, and adding advance warning signs. Construction is scheduled for March 2019. The project will likely require right-of-way on the east of 35th Avenue.

The intersection of the BNSF track and 35th Avenue will be improved to include widening of 35th Avenue, median islands, and extended gate arms (See Section 2.7 for additional information).

Elevated intersections are proposed by COMPASS at 35th Avenue/Indian School Road, 51st Avenue, 67th Avenue/Northern Avenue, and 75th Avenue/Olive Avenue.

3.6 Topography

Contours in the **Appendix A** plans are obtained from Maricopa County online resources and were used to develop vertical roadway profiles. No additional survey or CAD topography was provided or used in the evaluation.

4. Planning-Level COMPASS Concept Refinement

4.1 COMPASS Concept Description

A high-level feasibility evaluation has been conducted to identify project costs and functionality, constructability, or other issues associated with the COMPASS concept design. The goal of this evaluation is to determine the overall feasibility and cost of the COMPASS concept design.

The COMPASS concept design creates a grade separated intersection of Indian School Road with 35th Avenue that is elevated above US-60 and the BNSF Railway. This eliminates the at-grade intersection with US-60 and eliminates all at-grade crossings of the BNSF Railway tracks. The three major roadways within the project limits (US-60, Indian School Road, and 35th Avenue) are reconstructed without changes in horizontal alignments.

Reconstruction of US-60 consists of constructing a continuous raised median island to eliminate left turns within the project limits. A proposed access management plan eliminates nine (9) driveways and converts the remaining driveways to right-in-right-out only.

Reconstruction of Indian School Road consists of adding a travel lane in each direction and adding turn lanes associated with the proposed elevated intersection with 35th Avenue. Vertical clearance requirements over the railroad tracks and anticipated structure depth over railroad right-of-way for both Indian School Road and 35th Avenue result in raising the profile for Indian School Road. Therefore, the existing Indian School Road bridge is replaced, and the new bridge must accommodate the elevated intersection with 35th Avenue. With the creation of the elevated intersection with 35th Avenue, the portion of existing Indian School Road between 36th Avenue and US-60 is eliminated along with the at-grade railroad crossing.

Reconstruction of 35th Avenue consists of constructing a new bridge that spans the BNSF Railway right-of-way and connects to the Indian School Road bridge and new approach roadways on embankment. To reduce the size of the roadway footprint and reduce right-of-way requirements, retaining walls are also proposed.

4.2 Evaluation Considerations

The evaluation of the COMPASS concept design addresses many issues, including functionality and safety, structures, impacts to adjacent properties and associated right-of-way costs, maintenance of traffic during construction and resultant impacts to construction sequencing, and project construction costs.

4.2.1 Functionality and Safety

Once constructed, the COMPASS concept design improves traffic flow and safety. The elimination of all at-grade railroad crossings improves traffic flow by eliminating traffic delays during rail operations and improves safety by eliminating the crossings and any potential crashes associated with railroad crossings, even those with gates and appropriate warning devices. Shifting of the signalized intersection from US-60/35th Avenue to Indian School Road/35th Avenue creates a typical arterial/arterial signalized intersection and removes left turns from US-60. This, along with the continual raised median island and driveway access

management on US-60, reduces turning movements to improve traffic flow and reduce potential crashes.

Along 35th Avenue, the roadway vertical profile is elevated within the project limits. Where the new profile is two or more feet above the existing street, access to adjacent properties will not be practical. This will reduce driveways and turning movements, thus improving traffic flow and safety.

Within the project limits, mainline Indian School Road is already elevated, and driveways were eliminated. With the creation of the elevated intersection with 35th Avenue, the portion of existing Indian School Road between 36th Avenue and US-60 is eliminated and the associated traffic shifts onto the reconstructed Indian School Road. While this adds some traffic, it is strictly turning traffic and is mitigated with turn lanes at the signalized intersection with 35th Avenue. Overall, traffic flow on Indian School Road is slightly decreased, due to the combining of through and turning traffic at the intersection. While there will be a potential for vehicle conflicts at the new intersection, the crash potential will be similar to many other signalized arterial street intersections throughout the metropolitan area.

The horizontal alignment of Indian School Road includes a horizontal curve through the 35th Avenue intersection that has a large radius that will allow for an adverse cross slope of 2% that will match the proposed 35th Avenue profile of approximately 2% using the standard ADOT and the American Association of State Highway and Transportation Officials (AASHTO) design guidelines for open highways.

4.2.2 Adjacent Properties and Associated Right-of-Way Costs

Right-of-way impacts are greater in areas that require the vertical alignments to be elevated above the existing grade. To determine these impacts a preliminary vertical profile for 35th Avenue was developed to span US-60 and the BNSF right-of-way with required clearances. The profile is based on a 45-mph design speed and appropriate superstructure depths for probable span lengths. The Indian School Road profile was also developed and closely matches the existing Indian School Road profile.

Refer to **Figure 3** for Map ID numbers and a visual location of the parcels and **Table 3** for a list of affected businesses. **Appendix D** contains detailed parcel information and acquisition costs.

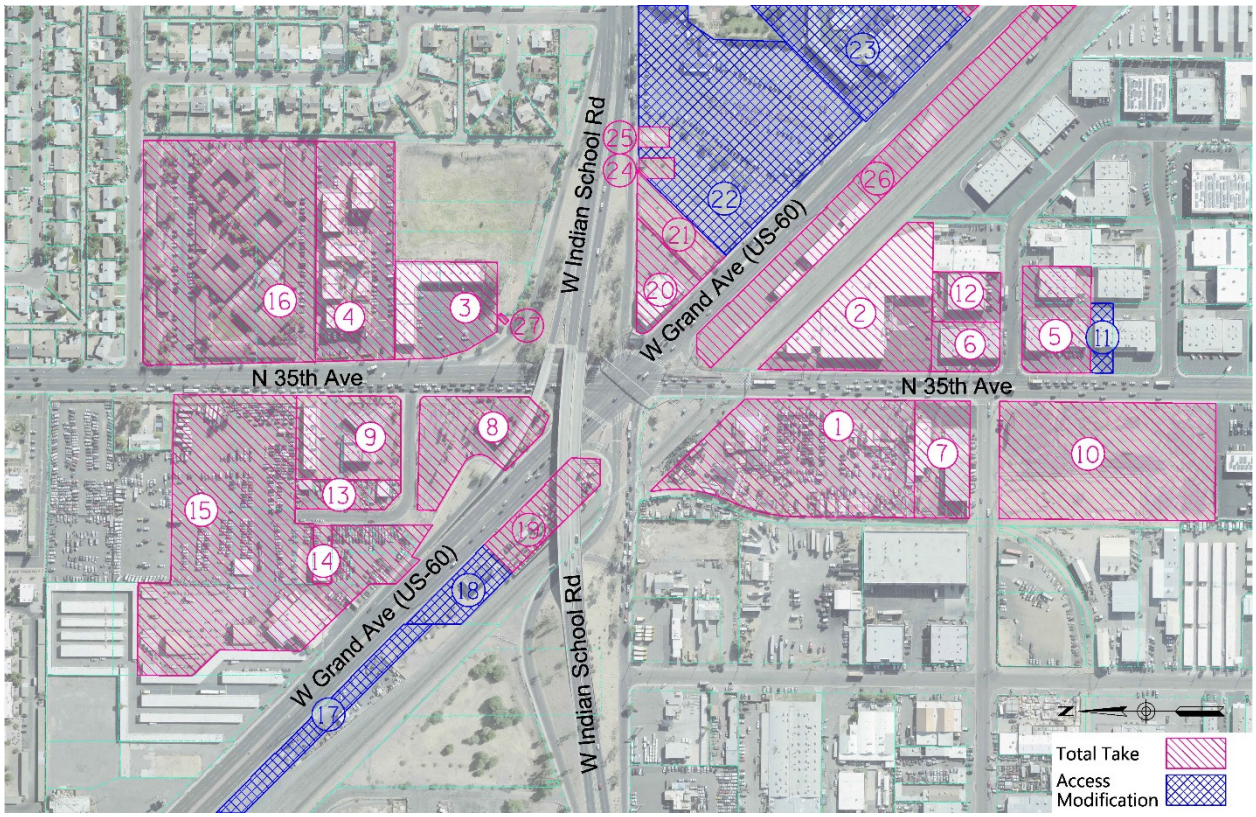


Figure 3. Right-of-Way Parcels for COMPASS Concept

Table 3. COMPASS Concept Access Impacts and Right-of-Way Requirements

Map ID	Business	Impact to Parcel	R/W Required
1	Auto Salvage on west side of 35th	Total Take	4.18 Acres + 5 small buildings
2	Large building on east side of 35th	Total Take	2.55 Acres + 67,580 sf building
3	Strip Mall on east side of 35th	Total Take	1.61 Acres + 21,000 sf building
4	Tamarak Garden Apartments	Total Take	3.31 Acres + 6 buildings
5	Industrial on SE corner 35th/Clarendon	Total Take	1.22 Acres + 22,200 sf buildings
6	Industrial on NE corner 35th/Clarendon	Total Take	0.57 Acres + 14,000 sf building
7	Castle Steel	Total Take	1.11 Acres + 5,600 sf buildings + 13,300 sf canopy
8	Fox's Cabaret	Total Take	1.57 Acres + 4,200 sf building

9	Gas station and strip mall	Total Take	1.49 Acres + 2 buildings
10	Vacant lot-SW cor 35th/Clarendon	Total Take	4.35 Acres + 1 billboard
11	Industrial on NE cor 35th/Weldon	Modify Access	0.02 Acres, 2 parking spaces
12	Master Mobile Mechanics	Total Take	0.57 Acres + 10,000 sf building
13	Salvage & equipment storage	Total Take	0.50 Acres + 2,400 sf building, canopies, cell tower
14	Auto repair on 35th Dr	Total Take	0.14 Acres + 2,400 sf building
15	Sierra Auction	Total Take	7.17 Acres
16	Franciscan Apartments	Total Take	0.48 Acres
17	Goddess Scrap LLC	Modify Access	1 of 2 accesses closed, buy leases
18	Alternative Portable Buildings	Close Access	Buy leases
19	Sun Valley Motor's LLC	Total Take	0.89 Acres + 1 building
20	Super Pawn	Total Take	0.67 Acres + 11,300 sf building
21	DJK Inc	Total Take	0.64 Acres
22	Trailers Plus	Modify Access	0
23	US Vets	Modify Access	0
24	Mountain States Telephone and Telegraph Co	Total Take	0.12 Acres + 260 sf building
25	DJK Inc	Total Take	0.10 Acres + 1 billboard
26	Adobe Commercial LLC	Total Take	0.85 Acres + 1 billboard
27	OS Advertising Company of Phx Inc	Total Take	0.01 Acres + 1 billboard

4.2.3 Maintenance of Traffic and Construction Sequencing

Construction of this project will impact existing traffic on three (3) major roadways and require an efficient combination of maintenance of traffic plan and construction sequencing to minimize disruption to traffic flow while providing efficiencies in construction to make the project as cost efficient as possible.

4.2.3.1 Reconstruction of US-60

Reconstruction of US-60 consists of adding a raised median island, closing driveways, and removing the signalized intersection with 35th Avenue. Therefore, it is reasonable to assume that US-60 traffic should be maintained in place during construction, using temporary lane closures to create the small work zones needed for the construction of the median island and closure of driveways. Reconstruction of US-60 must be performed after reconstruction of 35th Avenue and Indian School Road are complete to allow for the removal of the traffic signal at US-60 and 35th Avenue.

There are not any issues with the reconstruction that would significantly increase construction costs.

4.2.3.2 Reconstruction of Indian School Road

The existing bridge is to be replaced with a wider bridge with a revised profile. Due to the horizontal overlap of the new and the existing bridges, it would normally require construction of the new bridge using two construction phases (half-width construction). The first phase would maintain traffic on existing Indian School Road while the south half of the new bridge is constructed. After shifting traffic to the new bridge, the existing bridge is demolished, and the north half of the new bridge is constructed in the second phase. If half-width construction is achievable, it would only be with the cast-in-place reinforced concrete structure type, as the steel plate girder option requires that the straddle bents be built first. Additionally, complicated staged-construction analysis for the already complex curved, offset, two-way structure would be required to verify the phased construction viability.

It is likely that traffic on Indian School Road be detoured during construction of the new bridge and reconstruction of the approaches. Probable detour routes will use major arterial streets, such as Thomas Road, Camelback Road, 27th Avenue, and 43rd Avenue. This will inconvenience traffic and impact traffic flows along the detour routes.

The need to detour Indian School Road traffic will increase maintenance of traffic costs. However, with traffic detoured away from the construction site, constructability will be improved for the contractor and may reduce construction time.

4.2.3.3 Reconstruction of 35th Avenue

Reconstruction will initially require the closure of the existing elevated ramp from westbound Indian School Road to westbound US-60. This will require a detour via arterial streets, such as north on 27th Avenue, west on Camelback Road, north on 43rd Avenue, and then west onto US-60. While all other potential detours are shorter than the suggested detour, they will require detoured traffic to travel through the construction site.

There are two alternatives for maintenance of traffic.

1. Allow the closure of 35th Avenue during construction. This will require detouring traffic to adjacent arterial streets, such as 43rd Avenue and 27th Avenue. While this opens the work zone for easier construction, it inconveniences the businesses and residents along 35th Avenue. This alternative is not the best for maintaining traffic along 35th Avenue and will require approval by the stakeholders.
2. Maintain traffic on 35th Avenue during construction. Since the new construction is on top of existing 35th Avenue, local temporary detours will be needed to convey 35th Avenue traffic around the construction work zones. This will require relocating the at-grade railroad crossing. It may be difficult to get permission and approvals from the railroad to move this crossing. The local detours can traverse through properties that have been acquired due to access loss. However, the detours will tie into 35th Avenue within the project limits, requiring phased construction of the north and south ends of 35th Avenue.

4.2.4 Structures

The COMPASS concept includes elevation of the Indian School Road and 35th Avenue intersection above Grand Avenue, with the intersection uncentered over Grand Avenue. Two structure types are evaluated which can be used for implementation of the COMPASS concept.

The COMPASS bridge footprint is modified for additional spans and touchdowns located farther beyond the intersection. This will result in higher structures costs than originally estimated. The roadway profile is set to provide 23'-6" over the railroad right-of-way, and slopes down towards the intersection. The roadway remains high over Grand Avenue, enabling a deeper structure depth and falsework (if needed) while maintaining vertical construction clearance. Beyond the abutments, the roadway profile transition to existing grade can be accommodated using either retaining walls or embankment.

A structure concept which can accommodate the COMPASS concept and limits substructure is to use precast, prestressed AASHTO Type VI girders over the BNSF railroad and adjacent west span, and reinforced concrete box beams for the remainder of the intersection. Beyond the railroad right-of-way and as the profile lowers, the structure consists of one-way, cast-in-place, reinforced concrete box girder bridges for the approaches and two-way, reinforced concrete box beams for the intersection core. **Figure 4** on the following page is an example of a grade separated reinforced concrete box girder intersection. The estimated structure depth is 8.4-ft structure with 155' maximum span. All piers are aligned with the Grand Avenue right-of-way.

An alternate structure type is a continuous steel plate girder for all spans. A possible configuration is to support the interior spans on four (4) separate cast-in-place, post-tensioned straddle bents, and outer spans on column bents. Some straddle columns may be located within the future Grand Avenue median. Girders for Indian School Road can be continuous through the intersection, and girders for 35th Avenue would terminate at expansion joints at the

intersection. The drawback to this concept is the high number of columns placed under the intersection and the restriction on future roadway widening and modifications to Grand Avenue.

The COMPASS alignment yields a bridge structure with approximately a 46-degree skew when piers are aligned with the Grand Avenue right-of-way. It is understood that BNSF owns parcels adjacent to the existing tracks. Piers for the proposed structure are located on boundary lines beyond the existing BNSF right-of-way.

Figure 4. Grade Separated Reinforced Concrete Box Girder Intersection in Seattle, Washington

4.2.5 Utilities

The following table is a list of existing utility companies with facilities located within the project area.

Table 4. Existing Utility Companies within Project Area

Utility Company / Entity	Type	Description
Arizona Public Service (APS)	Overhead electric	230 kV overhead transmission
Salt River Project (SRP)	Overhead electric	12 kV
CenturyLink	Telephone	UG conduits
MCI	Telecommunications	Fiber optic

Southwest Gas	Gas	2” & 4”
City of Phoenix	Water Services Dept	8” water and distribution
City of Phoenix	Water Services Dept	18” sewer
City of Phoenix	Traffic Services	Signals and lighting
City of Phoenix	Storm Drain	48” storm drain
AZ Dept. of Transportation	Traffic Services	Drainage, signals and lighting
BNSF Railway	Railroad	Railroad crossing equipment

4.2.5.1 Electric Companies

The current Indian School Road bridge is located near a pole for the APS 230 kV transmission line on the northern edge of the BNSF right-of-way. The COMPASS design with the Indian School Road/35th Avenue on a structure spanning both US-60 and the BNSF right-of-way creates a new high point on the Indian School Road leg of the structure and a new high point crossing of the 35th Avenue leg that must go under the existing APS transmission lines with adequate clearance. The new 35th Avenue crossing is mid-span between two transmission poles where the transmission lines will sag to their lowest elevation and maintaining adequate clearance should be a priority as any design is progressed.

There will be limited impacts to the SRP electric facilities along US-60 and Indian School Road. It is anticipated that there will be significant impacts to the SRP overhead lines along 35th Avenue due to the raised profile and the increased width of the roadway footprint. Most if not all the SRP overhead facilities are assumed to be impacted in the areas where retaining walls are required along 35th Avenue.

4.2.5.2 Telecommunication and Gas Companies

There will be limited impacts to the telecommunication and gas facilities along US-60. More impacts to these facilities are anticipated for the realignment of Indian School Road and the ramp to westbound US-60.

It is anticipated that there will be significant impacts to these facilities along 35th Avenue due to the raised profile and the increased width of the roadway footprint and some relocations should be assumed.

4.2.5.3 ADOT and City of Phoenix Facilities

Construction of this project will have minimal impact to the existing ADOT facilities along US-60. The existing traffic signal will be removed and impacts to the US-60 lighting will need to be addressed. The installation of new curb and gutter along US-60 in the area of the existing 35th Avenue/US-60 intersection may alter the existing pavement drainage patterns and will require additional drainage analysis and may require additional drainage improvements along US-60.

The City of Phoenix facility impacts within US-60 and along Indian School Road are generally limited to raising the existing sanitary sewer manholes and existing water valve covers to the new grade.

Raising the profile of 35th Avenue may have a significant impact to the City of Phoenix facilities due to the substantial additional fill or retaining wall height. As the new 35th Avenue profile deviates from the existing, raising the existing sanitary sewer manholes and water valves to grade is no longer practical and relocation to the sidewalk area and beyond the retaining wall footings is anticipated. Existing fire hydrants along 35th Avenue will need to remain at the existing ground level but relocated outside the limits of the retaining walls along 35th Avenue.

The existing 48" storm drains under 35th Avenue may have up to an additional 25-feet of fill, so they may need to be relocated and a new system installed with the new pavement, complete with new catch basins, laterals and trunk line that will connect to the existing system when 35th Avenue returns to the existing grade.

The existing signal at Clarendon Avenue will need to be reconstructed due to the change in profile of 35th Avenue. Additionally, it appears the roadway lighting mast arms along 35th Avenue are on the existing SRP overhead power poles which will be relocated. New separate 35th Avenue lighting is anticipated.

4.2.5.4 BNSF facilities

Construction of this project will allow removal of the exiting at-grade crossings and the associated flashers and gates. Structure piers are located along parcel right-of-way lines to facilitate the addition of future tracks.

4.2.6 Drainage

The entire project limits lie outside any special flood hazard areas. **Figure 5** on the following page identifies the extent and FEMA designation. Zone X is defined as "0.2% Annual Chance Flood Hazard, Areas of 1% annual chance food with average depth less than one foot or with drainage area less than one square mile."

As mentioned previously, the installation of new curb and gutter along US-60 in the area of the existing 35th Avenue/US-60 intersection may alter the existing pavement drainage patterns and will require additional drainage analysis and may require additional drainage improvements along US-60.

There are existing storm drain systems in the embankment fill to the east and west of the existing Indian School Road bridge. Several catch basins will need to be removed and replaced on the west side, and the manholes adjusted to the new grade. It is assumed most of the laterals and trunk line may be utilized with the new Indian School Road profile. Eventually all the catch basins, laterals, and trunk line will need to be removed and replaced with new appurtenances due to the horizontal and vertical changes. The treatment of the east side storm drain system is similar to the west. Near the bridge the catch basins, laterals, and trunk line are removed, and new features installed, and as the roadway profile returns to the existing grade the existing trunk lines and laterals may be utilized, manholes raised to grade, and catch basins removed and replaced as needed. The ultimate outfall of both systems will remain unchanged.

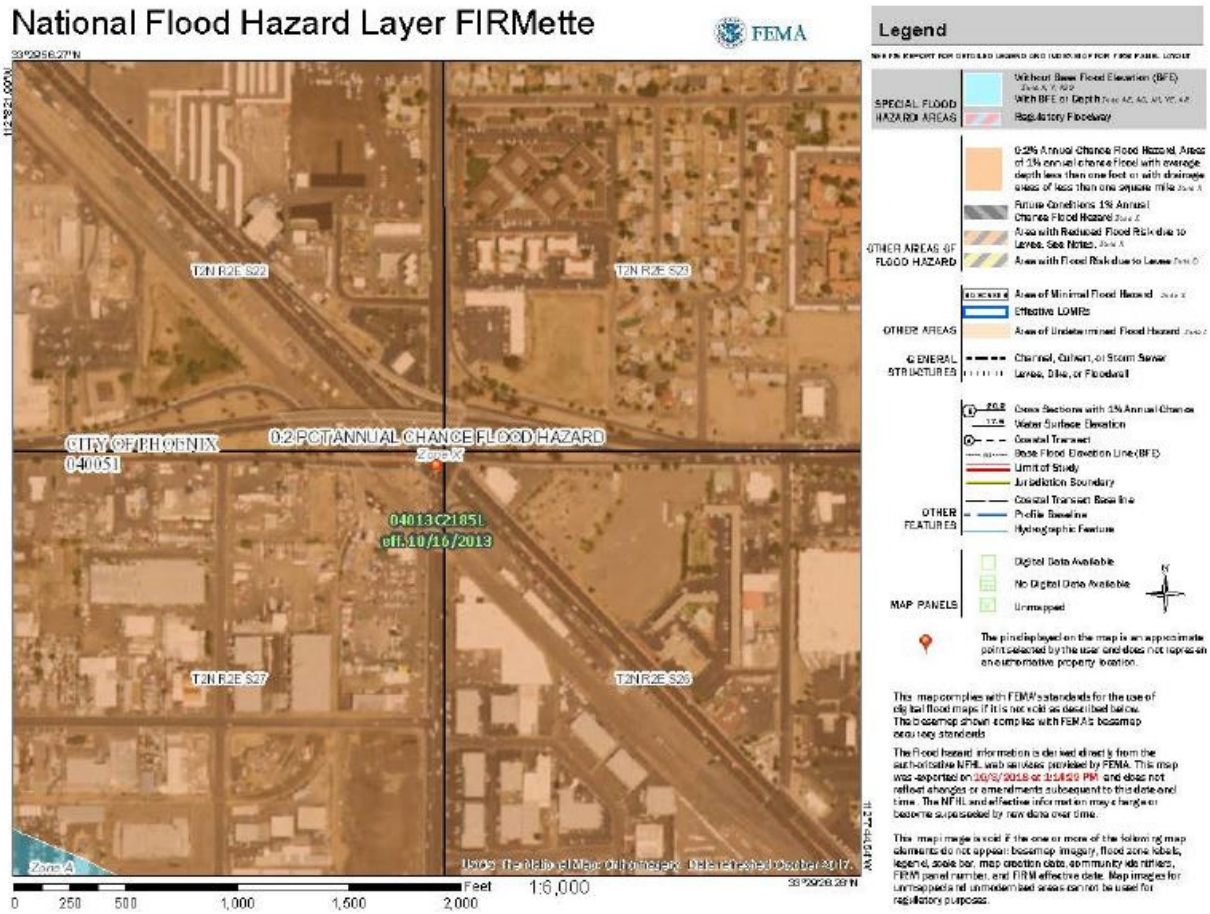


Figure 5. FEMA Designation and Limits

The existing 48" storm drains under 35th Avenue may have up to an additional 25-feet of fill, so they may need to be relocated due to the additional loading and a new system installed with the new pavement, complete with new catch basins, laterals and trunk line that will connect to the existing system when 35th Avenue returns to the existing grade both north and south of US-60.

The pavement width of both Indian School Road and 35th Avenue will increase, and the additional runoff will need to be analyzed and addressed with the existing storm drain or with additional retention basins likely located on parcels where a full right-of-way take is required.

4.2.7 Environmental

Environmental impacts due to the proposed construction will need to be analyzed and addressed early in the design process. Major items that will need to be addressed include hazardous waste in the project area, noise impacts due to raising 35th Avenue and revising the profile of Indian School Road, and short-term and long-term socioeconomic impacts.

4.3 Summary

As stated previously, once the COMPASS design is constructed, it meets the project goals of improving traffic flow and safety on all three roadways; mainly by shifting the 35th Avenue at-

grade intersection from US-60 to Indian School Road and by eliminating the 35th Avenue at-grade railroad crossing.

However, the COMPASS design has several cost and construction-related issues that indicate that an alternative design should be developed and evaluated. Any such alternative must meet the project goals while resolving the COMPASS cost and construction issues noted above.

4.4 Cost Estimate

The COMPASS design review by Jacobs indicates that the grade separation concept is feasible and can be implemented with an estimated probable total project cost of $154,597,000. See **Appendix B** for the detailed cost estimate.

Right-of-Way costs used in this report are based on a November 9th, 2018 meeting for ADOT RTPFP projects held with ADOT management, MAG representatives, and the ADOT right-of-way group. See **Appendix D** for detailed estimated right-of-way acquisition costs.

5. Alternative Concept

5.1 Alternative Concept Description

The COMPASS design has several access, cost, and construction-related issues that indicate that an alternative design should be developed and evaluated. Any such alternative must meet the project goals while resolving the COMPASS cost and construction issues noted in Section 3.1 previously.

Most of the COMPASS design cost and construction-related issues are associated with the location of the new Indian School Road/35th Avenue intersection and the construction of the approach structures and roadways, especially 35th Avenue. **Appendix A** plans show a proposed alternative that shifts the intersection to the northwest. Design features and advantages of this alternative are detailed below.

Like the COMPASS concept design, this alternative creates a grade separated intersection of Indian School Road with 35th Avenue that is elevated above US-60. This eliminates the at-grade intersection with US-60 and eliminates all at-grade crossings of the BNSF Railway tracks. The COMPASS concept design for the reconstruction of US-60 will be retained. Unlike the COMPASS concept design, both Indian School Road and 35th Avenue are shifted to improve maintenance of traffic during construction and to retain access to businesses. This alternative retains the same number of travel lanes, turn lanes, and new bridges as the COMPASS concept design. The major difference is the shifting of the Indian School Road and 35th Avenue intersection.

The Indian School Road/35th Avenue intersection is shifted to the northwest, outside the existing US-60 and 35th Avenue envelopes. This will simplify design of the structural supports for the intersection and will result in improved construction phasing. It is recommended that consideration be given to designing the intersection to be on fill supported by retaining walls that act as abutments.

The alignment of Indian School Road is shifted to the north. This allows existing Indian School Road traffic to remain in place during construction of the new bridge and the new intersection with 35th Avenue.

35th Avenue is shifted to the west onto parcels that would be acquired anyway due to loss of access via the new vertical profile of 35th Avenue. This allows existing 35th Avenue traffic to remain in place during construction of the new bridge(s) and the new approaches. It also allows the at-grade railroad crossing to remain in place during construction of 35th Avenue.

5.2 Evaluation Considerations

The evaluation of the alternative concept design addresses many issues, including functionality and safety, structures, and maintenance of traffic during construction and resultant impacts to construction sequencing.

5.2.1 Functionality and Safety

Once constructed, the alternative concept design will improve traffic flow and safety; just like the COMPASS concept design. The elimination of all at-grade railroad crossings improves traffic flow by eliminating traffic delays during rail operations and improves safety by eliminating the crossings and any potential crashes associated with railroad crossings, even those with gates and appropriate warning devices. Shifting of the signalized intersection from US-60/35th Avenue to Indian School Road/35th Avenue creates a typical arterial/arterial signalized intersection and removes left turns from US-60. This, along with the continual raised median island and driveway access management on US-60, reduces turning movements to improve traffic flow and reduce potential crashes.

Along 35th Avenue, the roadway vertical profile is elevated within the project limits. Where the new profile is at least two or more feet above the existing street, access to adjacent properties will not be feasible. This will reduce driveways and turning movements, thus improving traffic flow and safety.

Within the project limits, mainline Indian School Road is already elevated, and driveways were eliminated. With the creation of the elevated intersection with 35th Avenue, the portion of existing Indian School Road between 36th Avenue and US-60 is eliminated and the associated traffic shifts onto the reconstructed Indian School Road. While this adds some traffic, it is strictly turning traffic and is accounted for with turn lanes at the signalized intersection with 35th Avenue. Overall, traffic flow on Indian School Road is slightly decreased, due to the combining of through and turning traffic at the intersection. While there will be a potential for vehicle conflicts at the new intersection, the crash potential will be like many other arterial street intersections throughout the metropolitan area.

The horizontal alignment of Indian School Road includes a horizontal curve through the 35th Avenue intersection that has a radius that will allow for an adverse cross slope of 2% that will match the proposed 35th Avenue profile of approximately 2% using the AASHTO design criteria for low-speed urban design. This radius of the curve is much smaller than the radius used in the COMPASS design analysis.

The 35th Avenue horizontal alignment was also developed utilizing the AASHTO low-speed urban design methodology.

5.2.2 Adjacent Properties and Associated Right-of-Way Costs

The alternative concept design has similar vertical profiles and right-of-way impacts as the COMPASS concept design.

For differences refer to **Figure 6** for Map ID numbers and a visual location of the parcels and **Table 5** for a list of affected businesses. **Appendix D** contains detailed parcel information and acquisition costs.

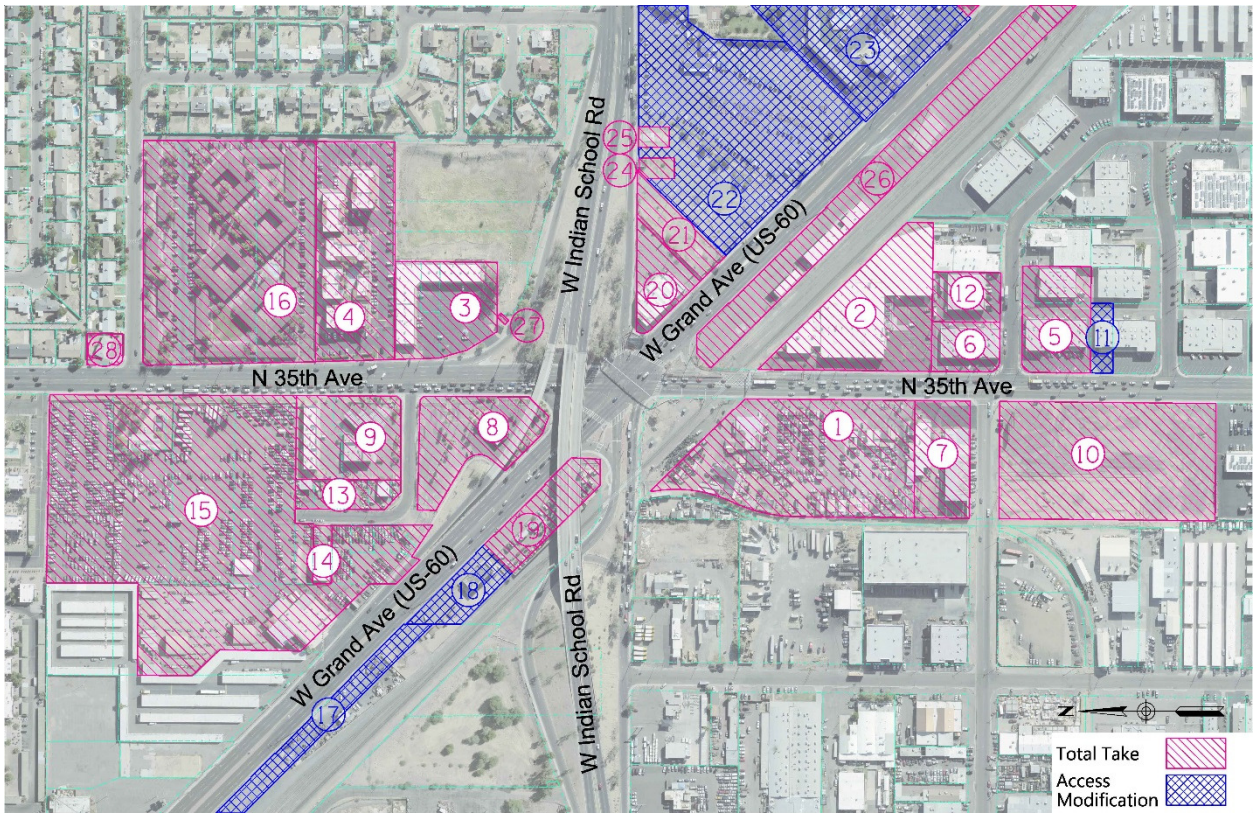


Figure 6. Right-of-Way Parcels for Alternative Concept

Table 5. Alternative Concept Access Impacts and Right-of-Way Requirements

Map ID	Business	Impact to Parcel	R/W Required
1	Auto Salvage on west side of 35th	Total Take	4.18 Acres + 5 small buildings
2	Large building on east side of 35th	Total Take	2.55 Acres + 67,580 sf building
3	Strip Mall on east side of 35th	Total Take	1.61 Acres + 21,000 sf building
4	Tamarak Garden Apartments	Total Take	3.31 Acres + 6 buildings
5	Industrial on SE corner 35th/Clarendon	Total Take	1.22 Acres + 22,200 sf buildings
6	Industrial on NE corner 35th/Clarendon	Total Take	0.57 Acres + 14,000 sf building
7	Castle Steel	Total Take	1.11 Acres + 5,600 sf buildings + 13,300 sf canopy
8	Fox's Cabaret	Total Take	1.57 Acres + 4,200 sf building

9	Gas station and strip mall	Total Take	1.49 Acres + 2 buildings
10	Vacant lot-SW corner 35th/Clarendon	Total Take	4.35 Acres + 1 billboard
11	Industrial on NE corner 35th/Weldon	Modify Access	0.02 Acres, 2 parking spaces
12	Master Mobile Mechanics	Total Take	0.57 Acres + 10,000 sf building
13	Salvage & equipment storage	Total Take	0.50 Acres + 2,400 sf building, canopies, cell tower
14	Auto repair on 35th Dr	Total Take	0.14 Acres + 2,400 sf building
15	Sierra Auction	Total Take	11.17 Acres
16	Franciscan Apartments	Total Take	0.48 Acres
17	Goddess Scrap LLC	Modify Access	1 of 2 accesses closed, buy leases
18	Alternative Portable Buildings	Close Access	Buy leases
19	Sun Valley Motor's LLC	Total Take	0.89 Acres + 1 building
20	Super Pawn	Total Take	0.67 Acres + 11,300 sf building
21	DJK Inc	Total Take	0.64 Acres
22	Trailers Plus	Modify Access	0
23	US Vets	Modify Access	0
24	Mountain States Telephone and Telegraph Co	Total Take	0.12 Acres + 260 sf building
25	DJK Inc	Total Take	0.10 Acres + 1 billboard
26	Adobe Commercial LLC	Total Take	0.85 Acres + 1 billboard
27	OS Advertising Company of Phx Inc	Total Take	0.01 Acres + 1 billboard
28	Home	Total Take	0.19 Acres + 1,118 sf home

5.2.3 Maintenance of Traffic and Construction Sequencing

Construction of this project will impact existing traffic on three (3) major roadways and require an efficient combination of Maintenance of Traffic Plan and construction sequencing to minimize disruption to traffic flow while providing efficiencies in construction to make the project as cost efficient as possible.

5.2.3.1 Reconstruction of US-60

Reconstruction of US-60 consists of adding a raised median island, closing driveways, and removing the signalized intersection with 35th Avenue. Therefore, it is reasonable to assume that US-60 traffic should be maintained in place during construction, using temporary lane closures to create the small work zones needed for the construction of the median island and closure of driveways. Reconstruction of US-60 must be performed after reconstruction of 35th Avenue and Indian School Road are complete to allow for the removal of the traffic signal at US-60 and 35th Avenue.

There are not any issues with the reconstruction that would significantly increase construction costs.

5.2.3.2 Reconstruction of Indian School Road

Reconstruction will initially require the closure of the existing elevated ramp from westbound Indian School Road to westbound US-60. This will require a detour via arterial streets, such as north on 27th Avenue, west on Camelback Road, north on 43rd Avenue, and then west onto US-60. While all other potential detours are shorter than the suggested detour, they will require detoured traffic to travel through the construction site.

The existing bridge is to be replaced with one with a higher profile. Due to the shift in alignment of Indian School Road, the new bridge, the intersection with 35th Avenue, and most of the new approach roadways can be constructed while maintaining traffic on existing Indian School Road and 35th Avenue. Phased construction will be needed where the new approach roadways match into the existing roadway. No major detours are anticipated. This will significantly reduce inconvenience to the traveling public and impacts to the local businesses and could reduce maintenance of traffic costs. Simplified construction sequencing will result in construction efficiencies and should reduce construction costs.

5.2.3.3 Reconstruction of 35th Avenue

The alternative concept design shifts 35th Avenue to the west enough to maintain traffic on 35th Avenue, including the use of the at-grade railroad crossing. No major detours are anticipated. This will significantly reduce inconvenience to the traveling public and impacts to the local businesses and could reduce maintenance of traffic costs. Phased construction will be needed where the new approach roadways match into the existing roadway. Simplified construction sequencing will result in construction efficiencies and should reduce construction costs.

The proximity of new 35th Avenue to existing 35th Avenue will require the use of retaining walls. Where the walls are significantly high, it might be feasible to add spans to the bridge. An

evaluation will be needed during final design to determine the most economical locations for ending the 35th Avenue bridge.

5.2.4 Structures

The structures for the Alternative Concept are simplified for the construction of the Indian School Road and 35th Avenue intersection on fill. The south and west legs of the intersection can be two separate structures, each crossing Grand Avenue and the BNSF tracks. The bridges can each be 4-span, continuous, precast, prestressed concrete AASHTO Type VI girders. Inner abutments (abutting the intersection) would be full-height abutments and outer abutments stub abutments with slope paving. The westbound Indian School Road ramp to outbound Grand Avenue under 35th Avenue can be achieved using a cast-in-place reinforced concrete "tunnel".

5.2.5 Utilities

Table 4 of exiting utilities in the project area for the COMPASS design is applicable to this alternative.

5.2.5.1 Electric Companies

The current Indian School Road bridge is located near a pole for the APS 230 kV transmission line on the northern edge of the BNSF right-of-way. The alternative design with the Indian School Road/35th Avenue on a structure spanning both US-60 and the BNSF right-of-way creates a new high point crossing on the Indian School Road leg of the structure and a new high point crossing of the 35th Avenue leg that must go under the existing APS transmission lines with adequate clearance. The new Indian School Road crossing and the new 35th Avenue crossing will be at the approximate mid-span between two transmission poles where the transmission lines will sag to their lowest elevation and maintaining adequate clearance should be a priority as any design is progressed.

There will be limited impacts to the SRP electric facilities along US-60 and Indian School Road.

It is anticipated that there will be significant impacts to the SRP overhead lines along the west side of 35th Avenue due to the revised horizontal alignment, raised profile, and the increased width of the roadway footprint. Most if not all the SRP overhead facilities on the west side of 35th Avenue are assumed to be impacted in the areas where retaining walls are required along 35th Avenue. It is assumed that SRP facilities to the east side of 35th Avenue may remain.

5.2.5.2 Telecommunication and Gas Companies

There will be limited impacts to the telecommunication and gas facilities along US-60. More impacts to these facilities are anticipated for the realignment of Indian School Road and the ramp to westbound US-60.

It is anticipated that there will be significant impacts to these facilities along 35th Avenue due to the raised profile and the increased width of the roadway footprint and some relocations should be assumed, similar to the COMPASS design.

5.2.5.3 ADOT and City of Phoenix Facilities

Construction of this project will have minimal impact to the existing ADOT facilities along US-60 and will be similar to the COMPASS design. The existing traffic signal will be removed and impacts to the US-60 lighting will need to be addressed. The installation of new curb and gutter along US-60 may alter the existing pavement drainage patterns and will require additional drainage analysis and may require additional drainage improvements along US-60.

The City of Phoenix facility impacts within US-60 and along Indian School Road are generally limited to raising the existing sanitary sewer manholes and existing water valve covers to the new grade and will be similar to the COMPASS design.

Shifting the horizontal alignment of 35th Avenue to the west prior to raising the profile of 35th Avenue may have less impacts to some of the City of Phoenix facilities. The existing sanitary sewer manholes and water valves can be adjusted to grade or remain unaffected in the old 35th Avenue roadway prism. Existing fire hydrants along 35th Avenue to the east will remain, and new fire hydrants and service lines placed beyond the limits of the new fill or retaining walls on the west side. Impacts to the existing sanitary sewer will be reduced in comparison to the impacts from the COMPASS design.

The existing 48" storm drains under 35th Avenue will not be impacted. There will need to be a new storm drain system installed with the new pavement, complete with new catch basins, laterals and trunk line that will connect to the existing system when 35th Avenue returns to the existing grade.

The existing signal at Clarendon Avenue will need to be reconstructed due to the change in profile of 35th Avenue. New separate 35th Avenue lighting is anticipated.

5.2.5.4 BNSF

Construction of this project will allow removal of the exiting at-grade crossings and the associated flashers and gates.

5.2.6 Drainage

The alternative design impacts to off-site drainage are the same as for the COMPASS design.

Similar to the COMPASS design, the installation of new curb and gutter along US-60 in the area of the existing 35th Avenue/US-60 intersection may alter the existing pavement drainage patterns and will require additional drainage analysis and may require additional drainage improvements along US-60.

There are existing storm drain systems in the embankment fill to the east and west of the existing Indian School Road bridge. Several catch basins will need to be removed and replaced on the west side, and the manholes adjusted to the new grade. It is assumed most of the laterals and trunk line may be utilized with the new Indian School Road profile. Eventually all the catch basins, laterals, and trunk line will need to be removed and replaced with new appurtenances due to the horizontal and vertical changes. The treatment of the east side storm drain system is similar to the west. Near the bridge the catch basins, laterals, and trunk line are removed, and new features installed, and as the roadway profile returns to the existing grade

the existing trunk lines and laterals may be utilized, manholes raised to grade, and catch basins removed and replaced as needed. The ultimate outfall of both systems will remain unchanged.

The existing 48" storm drains under 35th Avenue will not be impacted with this alternative. There will need to be a new storm drain system installed with the new pavement, complete with new catch basins, laterals and trunk line that will connect to the existing system when 35th Avenue returns to the existing grade both north and south of US-60 similar to the COMPASS design.

The pavement width of both Indian School Road and 35th Avenue will increase, and the additional runoff will need to be analyzed and addressed with the existing storm drain or with additional retention basins likely located on parcels where a full right-of-way take is required.

5.2.7 Environmental

Environmental impacts due to the proposed construction are similar to the COMPASS design and will need to be analyzed and addressed early in the design process. Major items that will need to be addressed include hazardous waste in the project area, noise impacts due to raising 35th Avenue and revising the profile of Indian School Road, and short-term and long-term socioeconomic impacts.

5.3 Summary

This alternative meets the project goals of improving traffic flow and safety on all three roadways; mainly by shifting the 35th Avenue at-grade intersection from US-60 to Indian School Road and by eliminating the 35th Avenue at-grade railroad crossing. Traffic access during construction is maintained, and simplified construction is anticipated.

5.4 Cost Estimate

An alternative alignment has been developed with the intersection moved northeast beyond Grand Avenue roadway limits, enabling construction of the intersection on fill. The estimated probable total project cost of the Alternative is $142,957,000. See **Appendix B** for a detailed cost estimate.

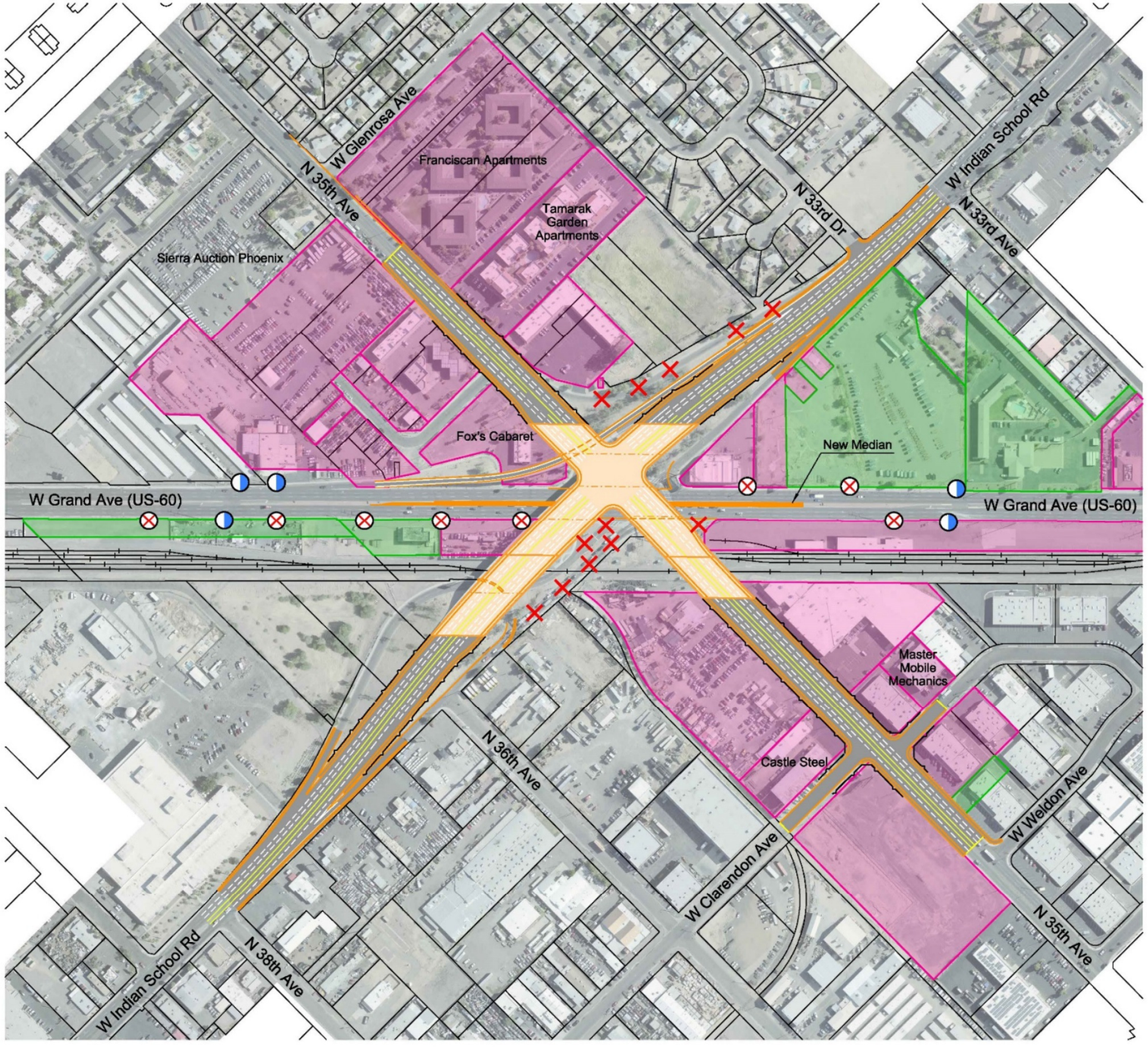
Right-of-Way costs used in this report are based on a November 9th, 2018 meeting for ADOT RTPFP projects held with ADOT management, MAG representatives, and the ADOT right-of-way group. See **Appendix D** for detailed right-of-way acquisition costs.

6. Final Planning-Level Concept

The COMPASS concept and alternative concept both meet the objectives of this study and are feasible to consider for a final planning level concept. While comparable in project costs and impact to right-of-way the alternative concept presents an option that has possible advantages in constructability, maintenance of traffic, and structure selection/design as the raised Indian School Road/35th Avenue intersection is located on fill instead of on a structure over US-60.

Appendix A: Concept Plans

COMPASS Concept



LEGEND:

- Total R/W Take
- Requires Access Modification
- Close Access
- Right-In Right-Out Access
- Street Removal
- BNSF Railway
- Parcels
- New Retaining Wall
- New Structure
- New Pavement

N

SCALE: Hor: 1"=150'

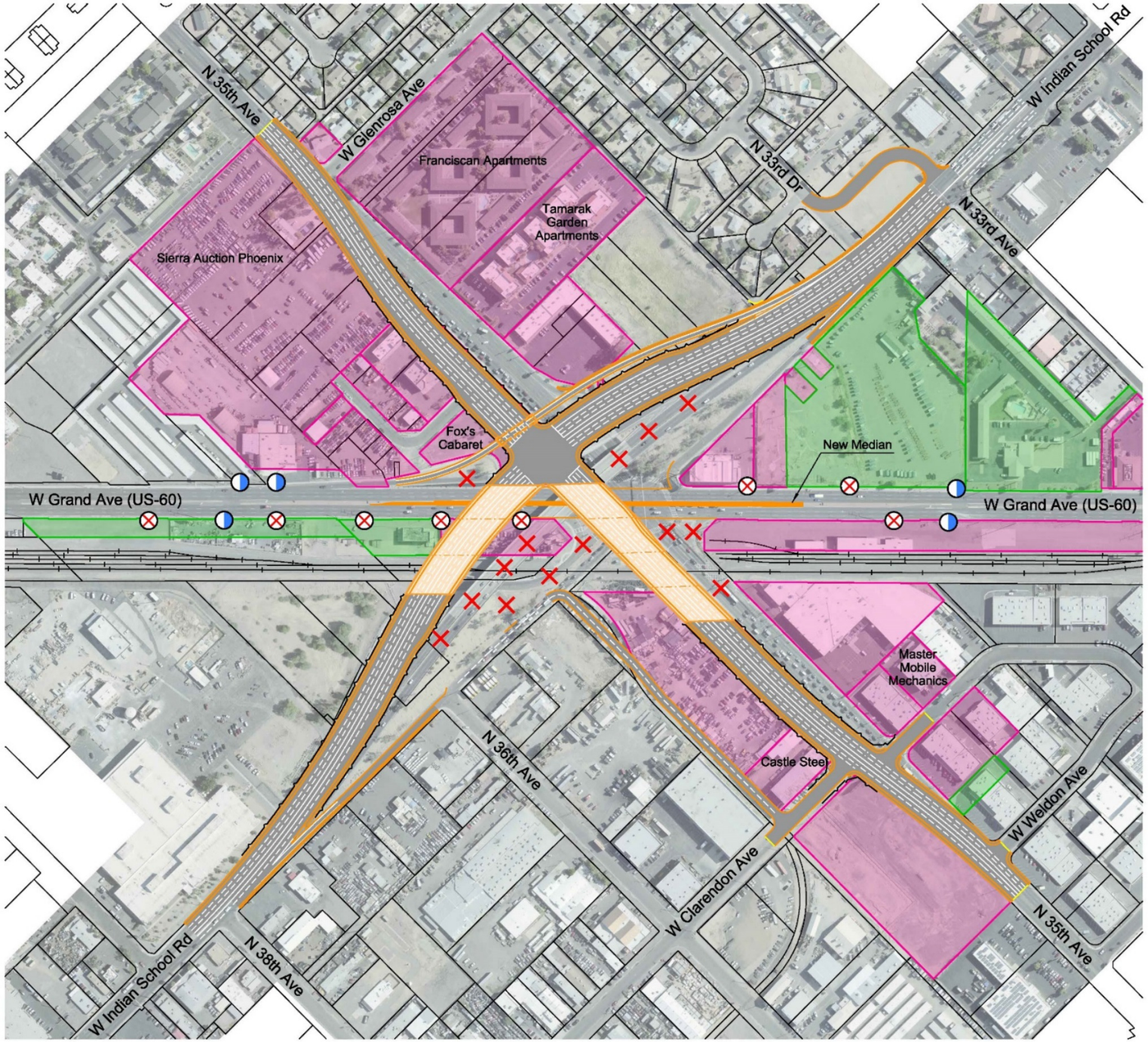
150 0 150 300
SCALE IN FEET

MARICOPA ASSOCIATION of GOVERNMENTS

JACOBS

US-60/GRAND AVENUE & INDIAN SCHOOL ROAD & 35th Ave

Alternative Concept



LEGEND:

- Total R/W Take
- Requires Access Modification
- Close Access
- Right-In Right-Out Access
- Street Removal
- BNSF Railway
- Parcels
- New Retaining Wall
- New Structure
- New Pavement

N

SCALE: Hor: 1"=150'

150 0 150 300

SCALE IN FEET

MARICOPA ASSOCIATION of GOVERNMENTS

JACOBS

US-60/GRAND AVENUE & INDIAN SCHOOL ROAD & 35th Ave

Appendix B: Cost Estimates

ARIZONA DEPARTMENT OF TRANSPORTATION
CONSTRUCTION COST ESTIMATE SUMMARY - COMPASS DESIGN

ROUTE: US 60 (Grand Avenue) **PROJECT DESCRIPTION:** New grade separated intersection
SEGMENT: Indian School Rd / 35th Avenue Intersection **ESTIMATE LEVEL:** Level 0
LENGTH: 1.4 miles combined **TRACS NO.: COMPASS design** **DATE:** 12/20/18

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	670,000	670,000
	ROADWAY EXCAVATION	CU.YD.	20,000	9.00	180,000
	DRAINAGE EXCAVATION	CU.YD.			
	BORROW	CU.YD.	87,000	16.00	1,392,000
	SUBGRADE TREATMENT	SQ.YD.			
	FURNISH WATER	L.SUM	1	260,000	260,000
	MISCELLANEOUS ITEMS	L.SUM	1	50,000	50,000
	TOTAL ITEM 200				2,552,000
300 & 400	**BASE AND SURFACE TREATMENT**				
	AGGREGATE BASE	CU.YD.			
	CONCRETE PAVEMENT	SQ.YD.			
	ASPHALT PAVEMENT	SQ.YD.	43,300	37.00	1,602,100
	ARAC SURFACE	SQ.YD.			
	MILLING & OVERLAY	SQ.YD.			
	MISCELLANEOUS ITEMS	L.SUM	1	25,000	25,000
	TOTAL ITEM 300 & 400				1,627,100
500	**DRAINAGE**				
	DRAINAGE SYSTEM (CLOSED)	L.FT.	2500	250	625,000
	DRAINAGE SYSTEM (OPEN)	L.FT.			
	DRAINAGE SYSTEM (CONVEYANCE CHANNEL)	L.FT.			
	PUMP STATION (NEW)	EACH			
	PIPE CULVERTS	L.FT.	1	200,000	200,000
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 500				825,000
600	**STRUCTURES**				
	FLYOVER RAMP (NEW SYSTEM TI)	SQ.FT.			
	FLYOVER HOV RAMP	SQ.FT.			
	OVERPASS TI BRIDGE	SQ.FT.	175,703	180.00	31,626,540
	RIVER CROSSING BRIDGE	SQ.FT.			
	PEDESTRIAN BRIDGE	SQ.FT.			
	BRIDGE WIDENING	SQ.FT.			
	BRIDGE REHABILITATION	SQ.FT.			
	BOX CULVERT	L.FT./CELL			
	SIGN STRUCTURES	EACH	4	100,000	400,000
	ITS STRUCTURE AND PANEL	EACH			
	UNDERGROUND STRUCTURES	EACH			0
	O&M CROSSING	EACH			
	MISCELLANEOUS ITEMS (REMOVE 2 BRIDGES)	L.SUM	1	1,038,000	1,038,000
	TOTAL ITEM 600				33,064,540
700	**TRAFFIC ENGINEERING**				
	SIGNING (FREEWAY)	MILE/DIR			
	SIGNING (STREET)	MILE	1.36	200,000	272,727
	PAVEMENT MARKING	LANE-MILE	4.20	100,000	420,455
	LIGHTING	MILE	1.36	400,000	545,455
	TRAFFIC SIGNAL	EACH	1	500,000	500,000
	INTELLIGENT TRANSPORTATION SYSTEM (ITS)	MILE			
	MISCELLANEOUS ITEMS	L.SUM			
	TOTAL ITEM 700				1,738,637
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING AND TOPSOIL	SQ.YD.	39,900	6.00	239,400
	UTILITY RELOCATION	L.SUM	1.00	20,000	20,000
	MISCELLANEOUS ITEMS	L.SUM	1.00	20,000	20,000
	TOTAL ITEM 800				279,400
900	**INCIDENTALS**				
	RETAINING WALLS	SQ.FT.	70,220	75.00	5,266,500
	SOUND WALLS	SQ.FT.			
	ROADWAY APPURTENANCES	L.SUM	1	1,170,000	1,170,000
	ADA IMPROVEMENTS	EACH			
	TRANSIT APPURTENANCES	L.SUM	1	100,000	100,000
	RAILROAD (PERMITS, REMOVALS, AND FLAGGING)	L.SUM	1	490,000	490,000
	MISCELLANEOUS ITEMS	L.SUM	1.00	20,000	20,000
	TOTAL ITEM 900				7,046,500
	SUBTOTAL A (ITEM SUBTOTAL)				**$47,133,200**

ARIZONA DEPARTMENT OF TRANSPORTATION
CONSTRUCTION COST ESTIMATE SUMMARY - COMPASS DESIGN

ROUTE: US 60 (Grand Avenue) **PROJECT DESCRIPTION:** New grade separated intersection
SEGMENT: Indian School Rd / 35th Avenue Intersection **ESTIMATE LEVEL:** Level 0
LENGTH: 1.4 miles combined **TRACS NO.: COMPASS design** **DATE:** 12/20/18

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
PW	**PROJECT WIDE**				
	TRAFFIC CONTROL (8% OF SUBTOTAL A)			8.0%	3,770,700
	DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER)			0.0%	0
	QUALITY CONTROL (1% OF SUBTOTAL A)			1.0%	471,300
	CONSTRUCTION SURVEYING (1.5% OF SUBTOTAL A)			1.5%	707,000
	EROSION CONTROL (1% OF SUBTOTAL A)			1.0%	471,300
	MOBILIZATION (8% OF SUBTOTAL A)			8.0%	3,770,700
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)			20.0%	9,426,600
	SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)				**$65,750,800**
OTHER PROJ	**OTHER PROJECT COSTS**				
	DPS TRAFFIC CONTROL				0
	JOINT PROJECT AGREEMENT ITEMS				0
	CONTRACTOR INCENTIVES				0
	ENVIRONMENTAL MITIGATION				0
	PRESENT YEAR CONSTRUCTION BID COST (EXCLUDING UTILITIES & R/W)				**$65,751,000**
INFL	**INFLATION AND BELOW THE LINE ITEMS**				
	LABOR AND MATERIAL INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			1.00	0
	POST DESIGN SERVICES (1% OF SUBTOTAL A)			1.0%	657,500
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL A)			5.0%	3,287,600
	CONSTRUCTION ENGINEERING (8% OF SUBTOTAL A)			8.0%	5,260,100
	INDIRECT COST ALLOCATION (10.02% OF SUBTOTAL B + OTHER PROJECT COSTS)			10.02%	7,510,600
	CONSTRUCTION YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)				**$82,466,800**
DES	**PREDESIGN AND FINAL DESIGN**				
	PREDESIGN/NEPA/PI SERVICES (3% OF CONSTRUCTION YEAR COST)			3.0%	1,972,500
	FINAL DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST)			8.0%	5,260,100
	INDIRECT COST ALLOCATION (10.02% OF ALL DESIGN COSTS)			10.02%	724,700
	TOTAL ESTIMATED DESIGN COST				**$7,957,300**
UTIL	**UTILITY RELOCATION**				
	PRIOR RIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS		1	720,000	720,000
	INDIRECT COST ALLOCATION (10.02% OF ALL UTILITY COSTS)			10.02%	72,100
	UTILITY RELOCATION COST INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			1.00	0
	TOTAL ESTIMATED UTILITY COST				**$792,100**
R/W	**RIGHT-OF-WAY**				
	RIGHT-OF-WAY	L.SUM	1	57,608,000	57,608,000
	INDIRECT COST ALLOCATION (10.02% OF ALL RIGHT-OF-WAY COSTS)			10.02%	5,772,300
	RIGHT-OF-WAY PRICE ESCALATION TO ACQUISITION YEAR 20xx (X%/YR)			1	0
	ACQUISITION YEAR RIGHT-OF-WAY COSTS				**$63,380,300**
	TOTAL ESTIMATED PROJECT COST				**$154,597,000**

ARIZONA DEPARTMENT OF TRANSPORTATION

CONSTRUCTION COST ESTIMATE SUMMARY - ALTERNATIVE DESIGN

ROUTE: US 60 (Grand Avenue)
SEGMENT: Indian School Rd / 35th Avenue Intersection
LENGTH: 1.5 miles combined **TRACS NO.: Alternative Design**
PROJECT DESCRIPTION: New grade separated intersection
ESTIMATE LEVEL: Level 0
DATE: 12/20/18

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	630,000	630,000
	ROADWAY EXCAVATION	CU.YD.	20,000	9.00	180,000
	DRAINAGE EXCAVATION	CU.YD.			0
	BORROW	CU.YD.	169,000	16.00	2,704,000
	SUBGRADE TREATMENT	SQ.YD.			0
	FURNISH WATER	L.SUM	1	350,000	350,000
	MISCELLANEOUS ITEMS	L.SUM	1	50,000	50,000
	TOTAL ITEM 200				3,914,000
300 & 400	**BASE AND SURFACE TREATMENT**				
	AGGREGATE BASE	CU.YD.			0
	CONCRETE PAVEMENT	SQ.YD.			0
	ASPHALT PAVEMENT	SQ.YD.	62,700	37.00	2,319,900
	ARAC SURFACE	SQ.YD.			0
	MILLING & OVERLAY	SQ.YD.			0
	MISCELLANEOUS ITEMS	L.SUM	1	25,000	25,000
	TOTAL ITEM 300 & 400				2,344,900
500	**DRAINAGE**				
	DRAINAGE SYSTEM (CLOSED)	L.FT.	4500.00	250	1,125,000
	DRAINAGE SYSTEM (OPEN)	L.FT.			0
	DRAINAGE SYSTEM (CONVEYANCE CHANNEL)	L.FT.			0
	PUMP STATION	EACH			0
	PIPE CULVERTS	L.FT.			0
	MISCELLANEOUS ITEMS	L.SUM	1	200,000	200,000
	TOTAL ITEM 500				1,325,000
600	**STRUCTURES**				
	FLYOVER RAMP (NEW SYSTEM TI)	SQ.FT.			0
	FLYOVER HOV RAMP	SQ.FT.			0
	OVERPASS TI BRIDGE	SQ.FT.	117,075	160.00	18,732,000
	RIVER CROSSING BRIDGE	SQ.FT.			0
	PEDESTRIAN BRIDGE	SQ.FT.			0
	BRIDGE WIDENING	SQ.FT.			0
	BRIDGE REHABILITATION	SQ.FT.			0
	BOX CULVERT	L.FT.			0
	SIGN STRUCTURES	EACH	4	100,000	400,000
	ITS STRUCTURES	EACH			0
	UNDERGROUND STRUCTURES (IS to US 60 Box)	EACH	1	750,000	750,000
	O&M CROSSING	EACH			0
	MISCELLANEOUS ITEMS (REMOVE 2 BRIDGES)	L.SUM	1	1,038,000	1,038,000
	TOTAL ITEM 600				20,920,000
700	**TRAFFIC ENGINEERING**				
	SIGNING (FREEWAY)	MILE			0
	SIGNING (STREET)	MILE	1.52	200,000	303,000
	PAVEMENT MARKING	LANE-MILE	4.73	100,000	473,500
	LIGHTING	MILE	1.52	400,000	606,100
	TRAFFIC SIGNAL (SPECIAL DESIGN)	EACH	1	400,000	400,000
	INTELLIGENT TRANSPORTATION SYSTEM (ITS)	MILE			0
	MISCELLANEOUS ITEMS	L.SUM			0
	TOTAL ITEM 700				1,782,600
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING AND TOPSOIL	SQ.YD.	31,500	6.00	189,000
	UTILITY RELOCATION	L.SUM	1.00	21,000	21,000
	MISCELLANEOUS ITEMS	L.SUM	1.00	20,000	20,000
	TOTAL ITEM 800				230,000
900	**INCIDENTALS**				
	RETAINING WALLS	SQ.FT.	110,135	75.00	8,260,125
	SOUND WALLS	SQ.FT.			0
	ROADWAY APPURTENANCES	L.SUM	1	1,374,400	1,374,400
	ADA IMPROVEMENTS	EACH			0
	TRANSIT APPURTENANCES	L.SUM	1	100,000	100,000
	RAILROAD (PERMITS, REMOVALS, AND FLAGGING)	L.SUM	1	490,000	490,000
	MISCELLANEOUS ITEMS	L.SUM	1.00	20,000	20,000
	TOTAL ITEM 900				10,244,525
	SUBTOTAL A (ITEM SUBTOTAL)				**$40,761,025**

ARIZONA DEPARTMENT OF TRANSPORTATION

CONSTRUCTION COST ESTIMATE SUMMARY - ALTERNATIVE DESIGN

ROUTE: US 60 (Grand Avenue) **PROJECT DESCRIPTION:** New grade separated intersection
SEGMENT: Indian School Rd / 35th Avenue Intersection **ESTIMATE LEVEL:** Level 0
LENGTH: 1.5 miles combined **TRACS NO.: Alternative Design** **DATE:** 12/20/18

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
PW	**PROJECT WIDE**				
	TRAFFIC CONTROL (8% OF SUBTOTAL A)			8.0%	3,260,900
	DUST PALLIATIVE (0% OF SUBTOTAL A)(INCLUDED IN FURNISH WATER)			0.0%	0
	QUALITY CONTROL (1% OF SUBTOTAL A)			1.0%	407,600
	CONSTRUCTION SURVEYING (1.5% OF SUBTOTAL A)			1.5%	611,400
	EROSION CONTROL (1% OF SUBTOTAL A)			1.0%	407,600
	MOBILIZATION (8% OF SUBTOTAL A)			8.0%	3,260,900
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)			20.0%	8,152,200
	SUBTOTAL B (SUBTOTAL A + PROJECT WIDE)				**$56,861,600**
OTHER PROJ	**OTHER PROJECT COSTS**				
	DPS TRAFFIC CONTROL				0
	JOINT PROJECT AGREEMENT ITEMS				0
	CONTRACTOR INCENTIVES				0
	ENVIRONMENTAL MITIGATION				0
	PRESENT YEAR CONSTRUCTION BID COST (EXCLUDING UTILITIES & R/W)				**$56,862,000**
INFL	**INFLATION AND BELOW THE LINE ITEMS**				
	LABOR AND MATERIAL INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			1.00	0
	POST DESIGN SERVICES (1% OF SUBTOTAL A)			1.0%	568,600
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL A)			5.0%	2,843,100
	CONSTRUCTION ENGINEERING (8% OF SUBTOTAL A)			8.0%	4,549,000
	INDIRECT COST ALLOCATION (10.02% OF SUBTOTAL B + OTHER PROJECT COSTS)			10.02%	6,495,200
	CONSTRUCTION YEAR DEPARTMENT CONSTRUCTION COST (EXCLUDING UTILITIES & R/W)				**$71,317,900**
DES	**PREDESIGN AND FINAL DESIGN**				
	PREDESIGN/NEPA/PI SERVICES (3% OF CONSTRUCTION YEAR COST)			3.0%	1,705,900
	FINAL DESIGN SERVICES (8% OF CONSTRUCTION YEAR COST)			8.0%	4,549,000
	INDIRECT COST ALLOCATION (10.02% OF ALL DESIGN COSTS)			10.02%	626,700
	TOTAL ESTIMATED DESIGN COST				**$6,881,600**
UTIL	**UTILITY RELOCATION**				
	PRIOR RIGHT UTILITY RELOCATIONS & SERVICE AGREEMENTS		1	270,000	270,000
	INDIRECT COST ALLOCATION (10.02% OF ALL UTILITY COSTS)			10.02%	27,100
	UTILITY RELOCATION COST INFLATION TO CONSTRUCTION YEAR 20xx (X%/YR)			1.00	0
	TOTAL ESTIMATED UTILITY COST				**$297,100**
R/W	**RIGHT-OF-WAY**				
	RIGHT-OF-WAY	L.SUM	1	58,590,000	58,590,000
	INDIRECT COST ALLOCATION (10.02% OF ALL RIGHT-OF-WAY COSTS)			10.02%	5,870,700
	RIGHT-OF-WAY PRICE ESCALATION TO ACQUISITION YEAR 20xx (X%/YR)			1	0
	ACQUISITION YEAR RIGHT-OF-WAY COSTS				**$64,460,700**
	TOTAL ESTIMATED PROJECT COST				**$142,957,000**

Appendix C: References from Related Studies

Appendix C1: MAG US-60/Grand Ave Corridor Optimization, Access Management Plan, and System Study (COMPASS)

COMPASS

US-60/Grand Avenue:
Loop 303 to Interstate 10

Legend

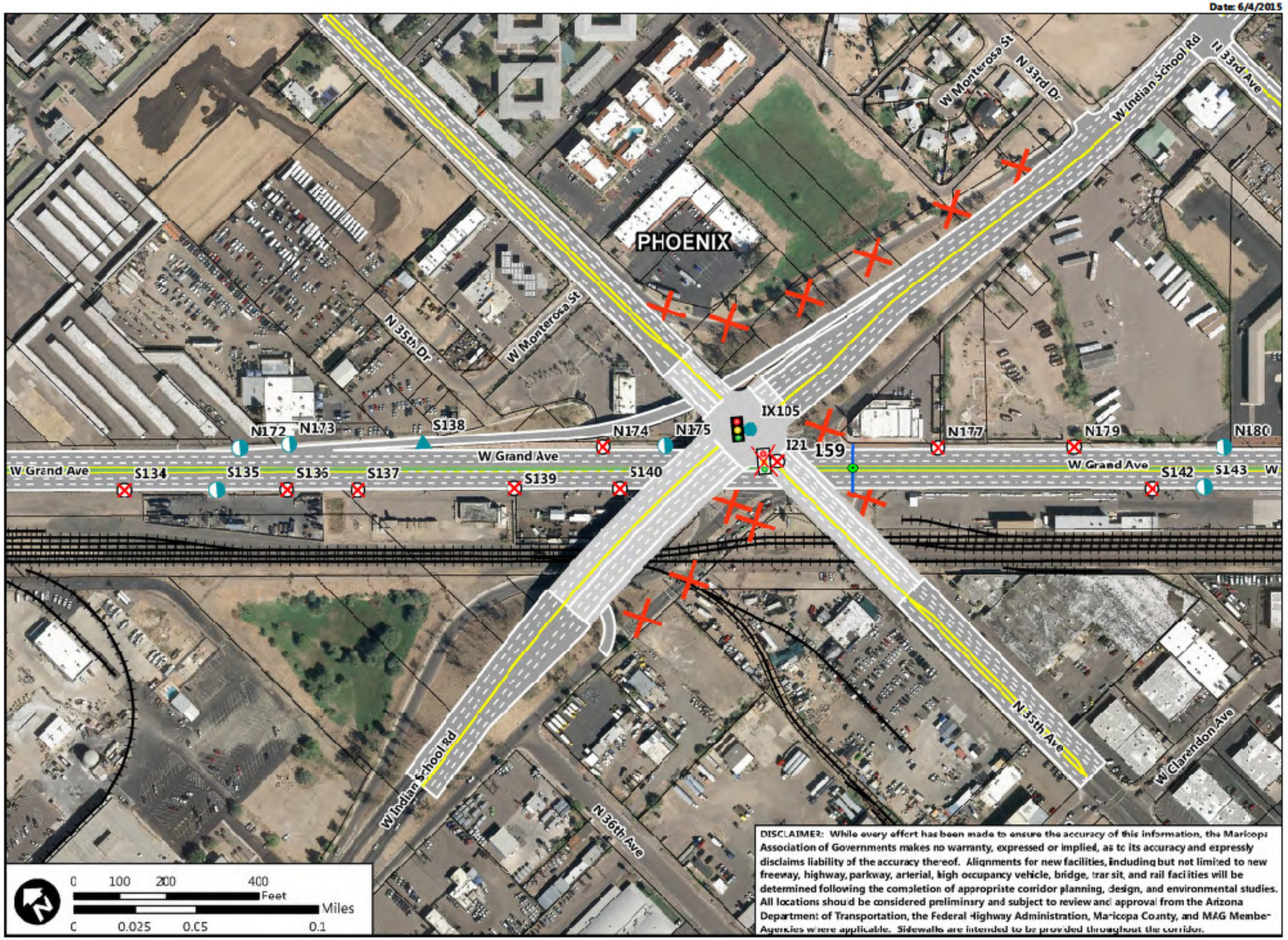
- Railway
- City Boundary
- ADOT Mile Post
- Full Movement Access
- 3/4 Movement Access
- Right-In Right-Out Access
- Close Access
- Off-Ramp Access from US-60
- On-Ramp Access to US-60
- Future Signalized Intersection
- Existing Signalized Intersection
- Remove Existing Signal

Recommended Disposition of Access

Access ID	Access Type	Median Type
S134	C	R
S135	R	R
N172	R	R
S136	C	R
N173	R	R
S137	C	R
S138	ON	R
S139	C	D
N174	C	R
S140	C	R
S140.1	OF	R
N175	R	R
IX105*	F	N
I21	C	R
N177	C	R
N179	C	R
S142	C	R
S143	R	R
N180	R	R

*IX105 is Indian School and 35th above Grand

Date: 6/4/2015



DISCLAIMER: While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability of the accuracy thereof. Alignments for new facilities, including but not limited to new freeway, highway, parkway, arterial, high occupancy vehicle, bridge, transit, and rail facilities will be determined following the completion of appropriate corridor planning, design, and environmental studies. All locations should be considered preliminary and subject to review and approval from the Arizona Department of Transportation, the Federal Highway Administration, Maricopa County, and MAG Member Agencies where applicable. Sidewalks are intended to be provided throughout the corridor.

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Timings

48: IX 105 - W. Indian School Road & 35th Avenue

4/29/2015

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	300	980	500	40	770	450	90	1590	240	270	660	230
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	1	6	7	5	2	3	7	4	5	3	8	1
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	3	7	4	5	3	8	1
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	12.0	21.0	12.0	12.0	21.0	12.0	12.0	21.0	12.0	12.0	21.0	12.0
Total Split (s)	23.0	39.0	27.0	12.0	28.0	19.0	27.0	40.0	12.0	19.0	32.0	23.0
Total Split (%)	20.9%	35.5%	24.5%	10.9%	25.5%	17.3%	24.5%	36.4%	10.9%	17.3%	29.1%	20.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	Max	None	None	Max	None	None	None	None	None	None	None
Act Effct Green (s)	45.7	34.2	48.8	29.6	23.0	42.0	44.6	35.0	46.6	52.5	39.4	62.1
Actuated g/C Ratio	0.42	0.31	0.44	0.27	0.21	0.38	0.41	0.32	0.42	0.48	0.36	0.57
v/c Ratio	0.92	0.97	0.69	0.25	0.79	0.69	0.27	1.07	0.35	1.00	0.39	0.25
Control Delay	61.1	58.2	22.2	24.2	47.2	24.0	17.6	78.8	12.6	84.2	27.7	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.1	58.2	22.2	24.2	47.2	24.0	17.6	78.8	12.6	84.2	27.7	2.3
LOS	E	E	C	C	D	C	B	E	B	F	C	A
Approach Delay		48.6			38.2			67.7			35.8	
Approach LOS		D			D			E			D	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 109.7

Natural Cycle: 110

Control Type: Actuated-Uncoordinated

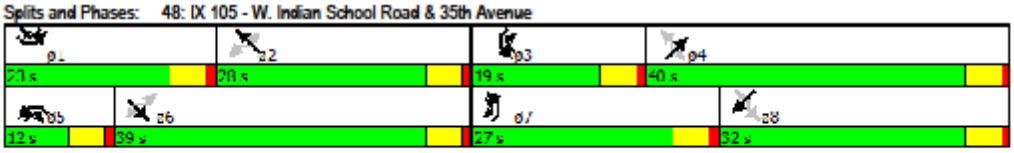
Maximum v/c Ratio: 1.07

Intersection Signal Delay: 50.0 — Intersection LOS: D

Intersection Capacity Utilization 93.8% — ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 48: IX 105 - W. Indian School Road & 35th Avenue



2040 AM Peak Hour

Synchro 8 Report
Page 1

Legend: SE=SB, NW=NB, NE=EB, SW=WB

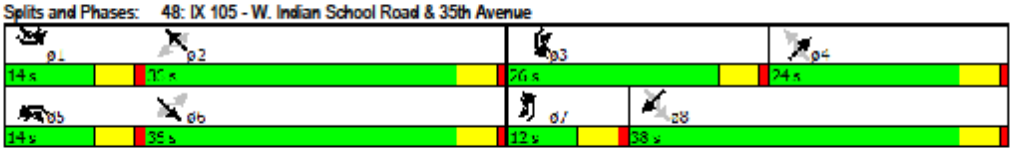
Timings

48: IX 105 - W. Indian School Road & 35th Avenue 4/29/2015

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	200	680	210	100	1450	350	200	850	120	450	1600	380
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	1	6	7	5	2	3	7	4	5	3	8	1
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	7	5	2	3	7	4	5	3	8	1
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	12.0	21.0	12.0	12.0	21.0	12.0	12.0	21.0	12.0	12.0	21.0	12.0
Total Split (s)	14.0	36.0	12.0	14.0	36.0	26.0	12.0	24.0	14.0	26.0	38.0	14.0
Total Split (%)	14.0%	36.0%	12.0%	14.0%	36.0%	26.0%	12.0%	24.0%	14.0%	26.0%	38.0%	14.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	Max	None	None	Max	None	None	None	None	None	None	None
Act Effct Green (s)	40.7	31.7	43.7	39.3	31.0	57.0	26.0	19.0	32.3	45.0	33.0	47.0
Actuated g/C Ratio	0.41	0.32	0.44	0.39	0.31	0.57	0.26	0.19	0.32	0.45	0.33	0.47
v/c Ratio	0.93	0.66	0.30	0.41	1.00	0.41	1.10	0.96	0.22	1.10	1.04	0.53
Control Delay	67.7	33.0	9.0	21.1	57.9	10.9	117.7	61.0	5.3	99.0	65.7	17.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.7	33.0	9.0	21.1	57.9	10.9	117.7	61.0	5.3	99.0	65.7	17.8
LOS	E	C	A	C	E	B	F	E	A	F	E	B
Approach Delay		34.7			47.3			65.0			64.4	
Approach LOS		C			D			E			E	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.10	
Intersection Signal Delay: 54.6	Intersection LOS: D
Intersection Capacity Utilization 97.8%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 48: IX 105 - W. Indian School Road & 35th Avenue



Legend: SE=SB, NW=NB, NE=EB, SW=WB

Appendix C2 - City of Phoenix 35th Ave S/O Indian School Road Railroad Crossing Draft Project Assessment

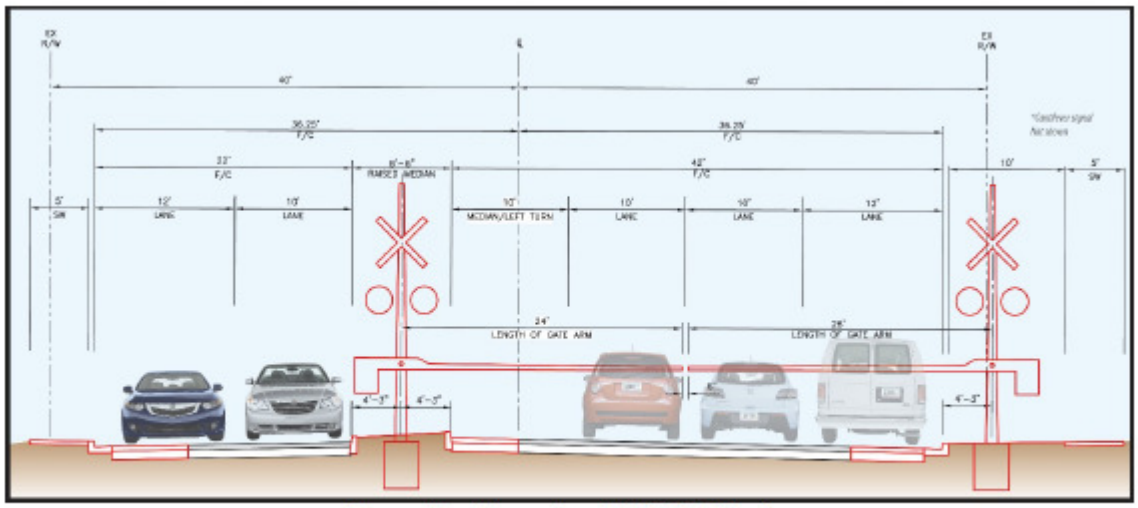


Figure 7 – Alternative #1 Typical Section

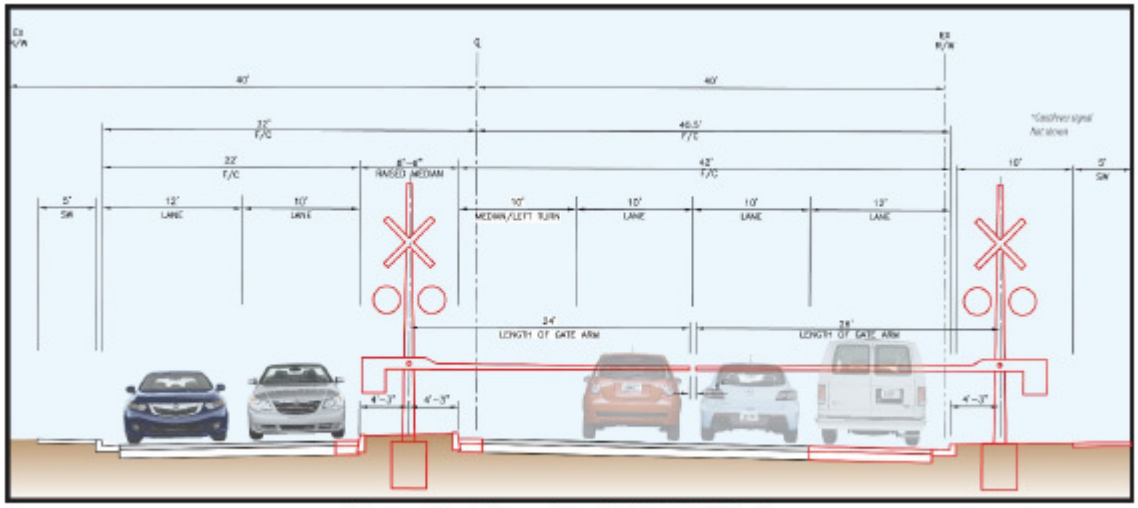
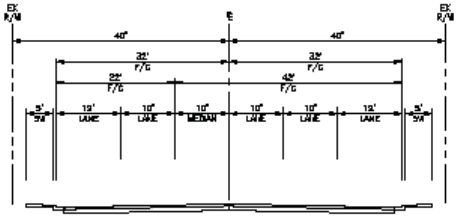
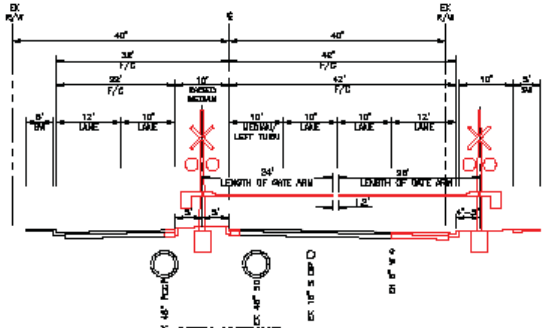


Figure 8 – Alternative #2 Typical Section

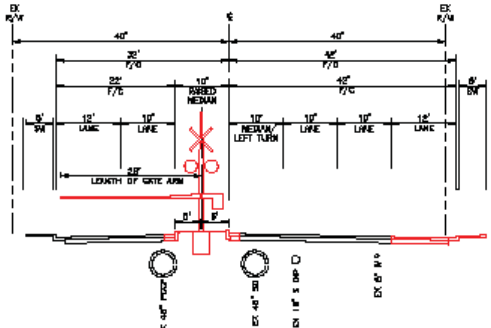
35TH AVENUE
S/O INDIAN SCHOOL ROADING
PROJECT ASSESSMENT



35TH AVENUE
NTS
SHOWN AT STA 24+00



35TH AVENUE
NTS
SHOWN AT STA 8+25&27



35TH AVENUE
NTS
SHOWN AT STA 7+63&27

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ.	STBG100289-2		-	-

TALLIN INTERNATIONAL — T.Y.LIN INTERNATIONAL, CONSULTING ENGINEER

DESIGNED | DR: ART | CK: DSB | DATE: 10/18

CONTRACTOR IS RESPONSIBLE FOR LOCATING AND VERIFYING ELEVATIONS FOR ALL UNDERGROUND UTILITIES WITHIN THE PROJECT LIMITS.

"PER CITY OF PHOENIX CITY CODE CHAPTER 2, SECTION 9-38, THESE PLANS ARE FOR OFFICIAL USE ONLY AND MAY NOT BE SHARED WITH OTHERS EXCEPT AS REQUIRED TO FULFILL THE OBLIGATIONS OF THE CONTRACTOR'S CONTRACT WITH THE CITY OF PHOENIX."

TYPICAL SECTIONS

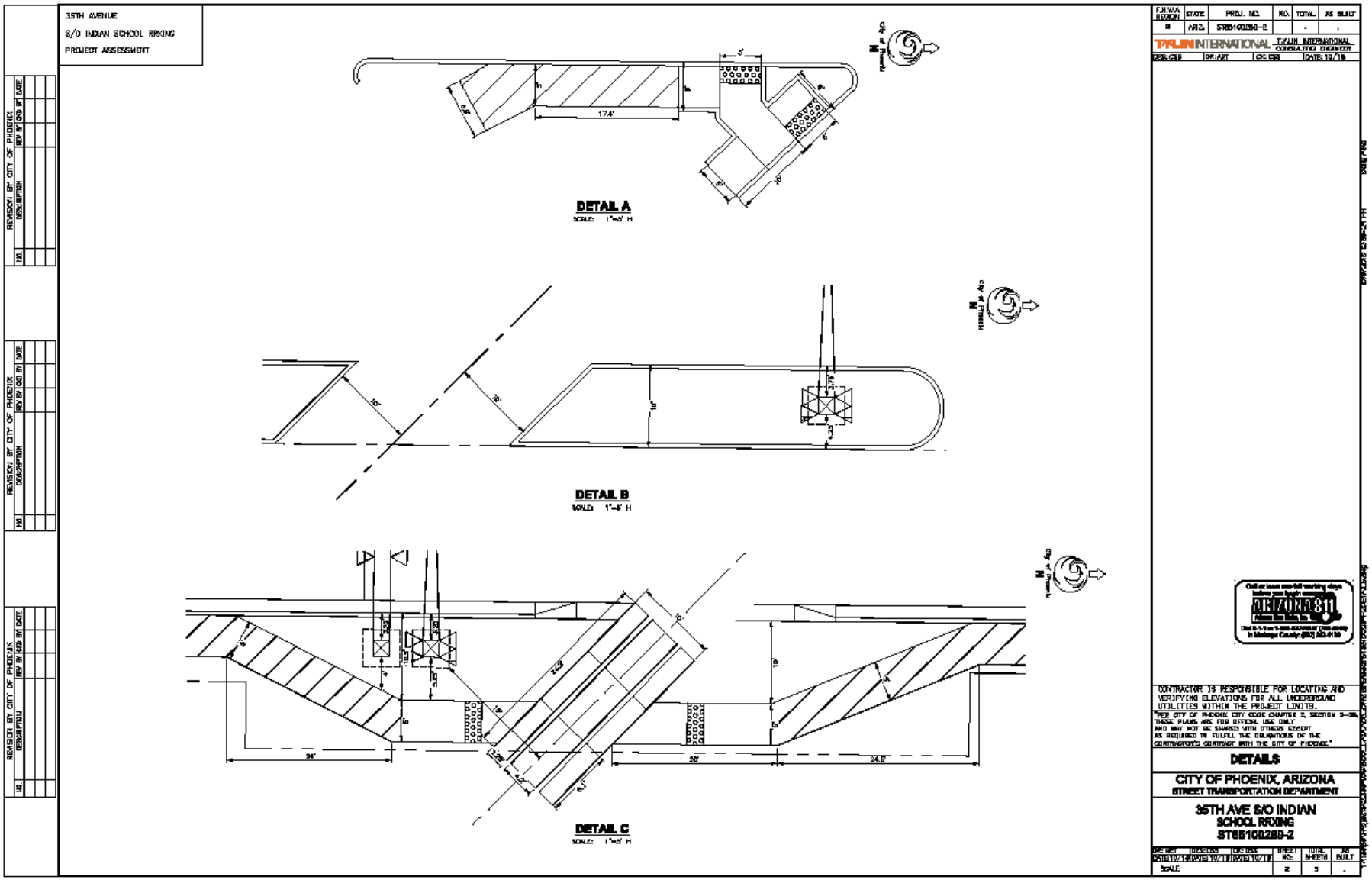
CITY OF PHOENIX, ARIZONA
STREET TRANSPORTATION DEPARTMENT

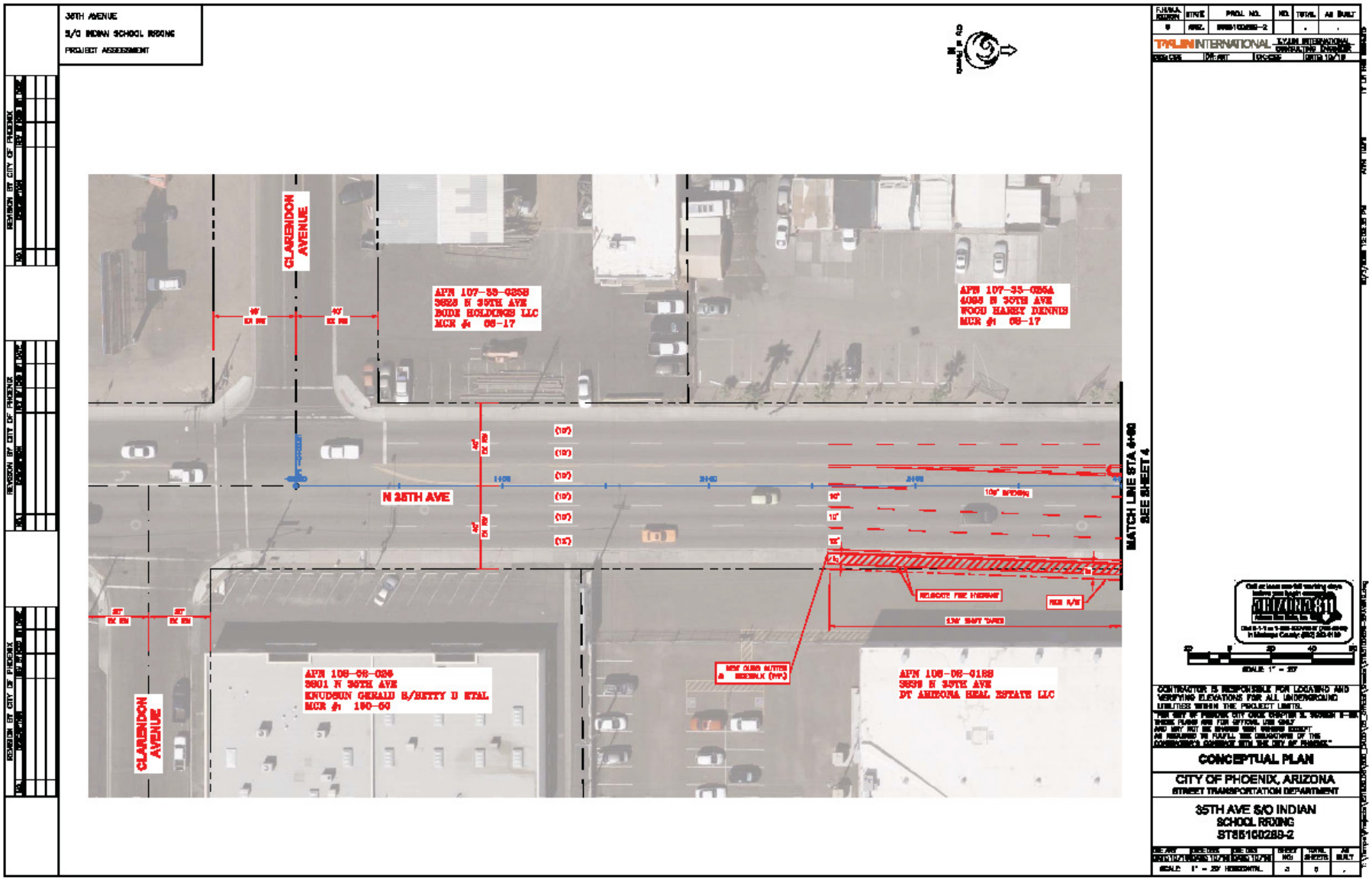
35TH AVE S/O INDIAN SCHOOL ROADING
STBG100289-2

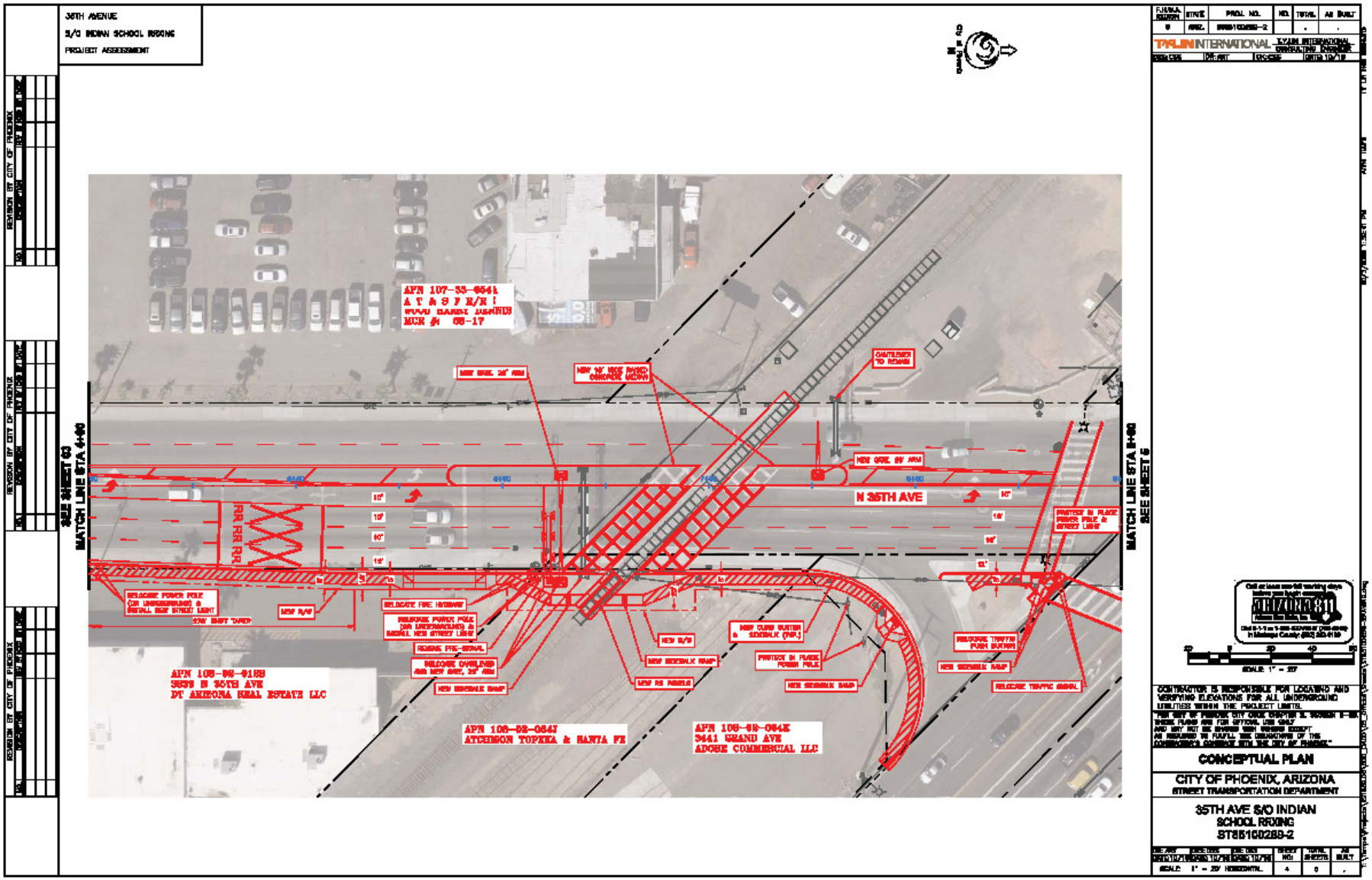
DR: ART	DESIGNED	CK: DSB	SHEET NO.	TOTAL SHEETS	AS BUILT
DATE: 10/18	DATE: 10/18	DATE: 10/18	1	3	-
SCALE:					

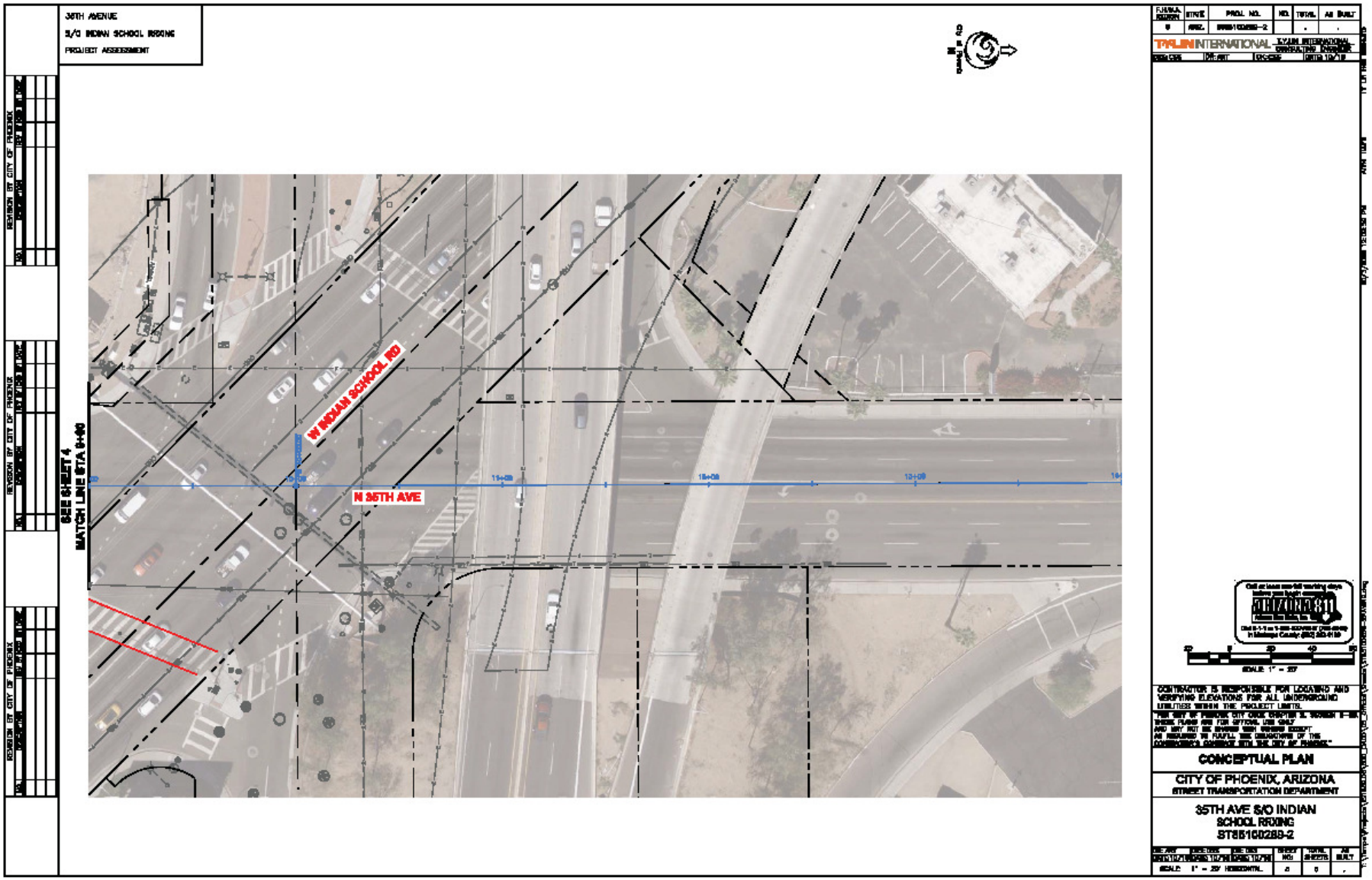
REVISION BY CITY OF PHOENIX

NO.	DESCRIPTION	REV BY	CKD BY	DATE


35TH AVENUE
S/O INDIAN SCHOOL RDXING
PROJECT ASSESSMENT
DETAIL A
SCALE: 1"=5' H
DETAIL B
SCALE: 1"=5' H
DETAIL C
SCALE: 1"=5' H
CONTRACTOR IS RESPONSIBLE FOR LOCATING AND VERIFYING ELEVATIONS FOR ALL UNDERGROUND UTILITIES WITHIN THE PROJECT LIMITS.
DETAILS
CITY OF PHOENIX, ARIZONA
STREET TRANSPORTATION DEPARTMENT
35TH AVE S/O INDIAN SCHOOL RDXING
ST85100289-2


35TH AVENUE
S/O INDIAN SCHOOL ROADWAY
PROJECT ASSESSMENT
CLARENDON AVENUE
N 35TH AVE
MATCH LINE STA 6+00
SEE SHEET 4
CONCEPTUAL PLAN
CITY OF PHOENIX, ARIZONA
STREET TRANSPORTATION DEPARTMENT
35TH AVE S/O INDIAN
SCHOOL ROADWAY
ST85100289-2

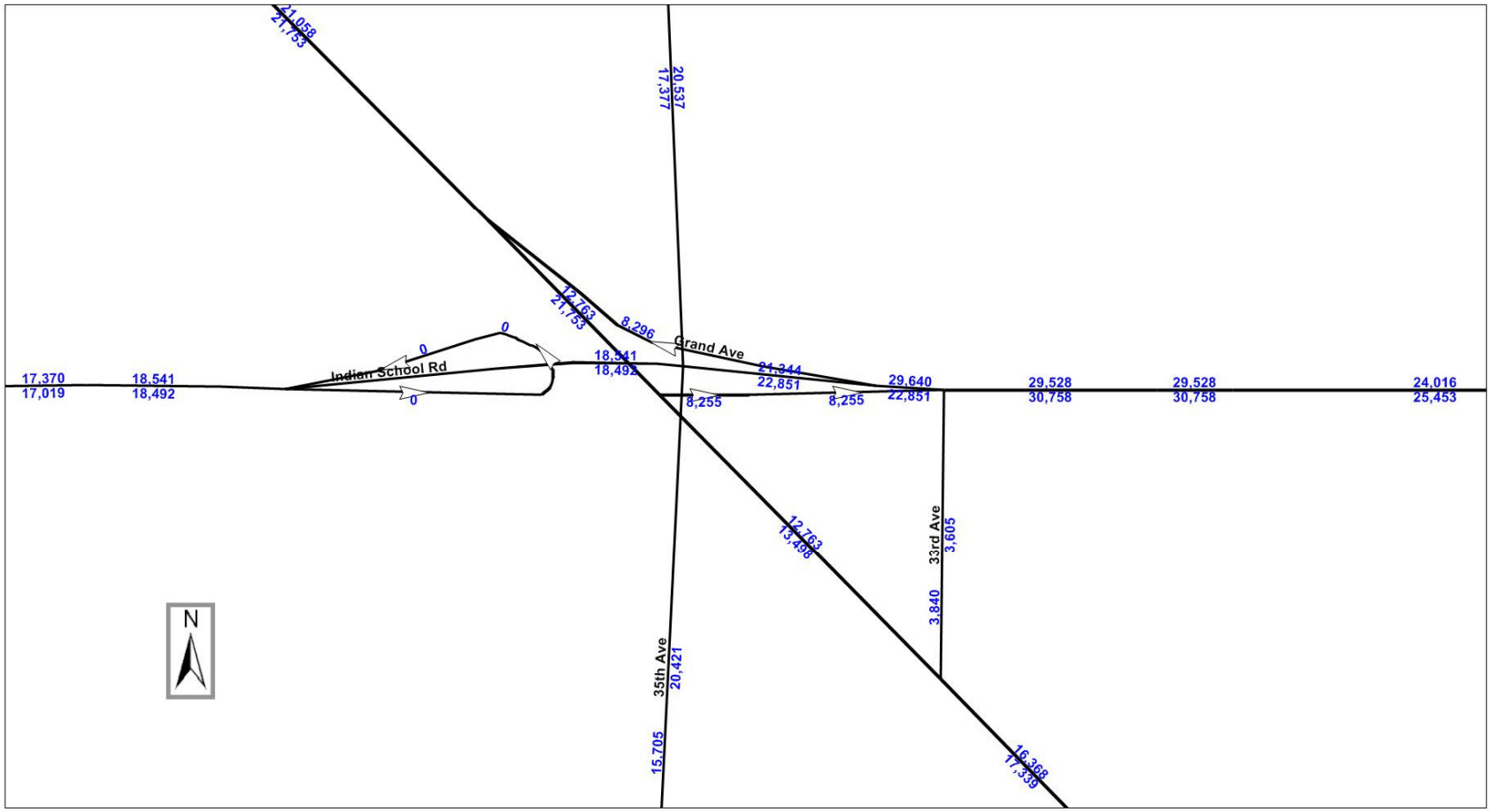

35TH AVENUE
S/O INDIAN SCHOOL ROADWAY
PROJECT ASSESSMENT
MATCH LINE STA 4+00
SEE SHEET 03
MATCH LINE STA 8+00
SEE SHEET 5
N 35TH AVE
APN 107-33-054A
A T & S F R/R
APN 108-02-018B
3639 N 35TH AVE
PT ARIZONA REAL ESTATE LLC
APN 108-02-054J
ATCHINSON TOPEKA & SANTA FE
APN 108-02-054K
3441 GRAND AVE
ADOBE COMMERCIAL LLC
CONCEPTUAL PLAN
CITY OF PHOENIX, ARIZONA
STREET TRANSPORTATION DEPARTMENT
35TH AVE S/O INDIAN
SCHOOL ROADWAY
ST85100289-2
SCALE: 1" = 20' HORIZONTAL


35TH AVENUE
S/O INDIAN SCHOOL ROADWAY
PROJECT ASSESSMENT
W INDIAN SCHOOL RD
N 35TH AVE
SEE SHEET 4
MATCH LINE STA 9+00
CONCEPTUAL PLAN
CITY OF PHOENIX, ARIZONA
STREET TRANSPORTATION DEPARTMENT
35TH AVE S/O INDIAN
SCHOOL ROADWAY
ST85100289-2
TALIN INTERNATIONAL

Appendix C3 – MAG 2035 Traffic Models

MARICOPA ASSOCIATION of GOVERNMENTS

2035 Average Weekday Traffic Volumes

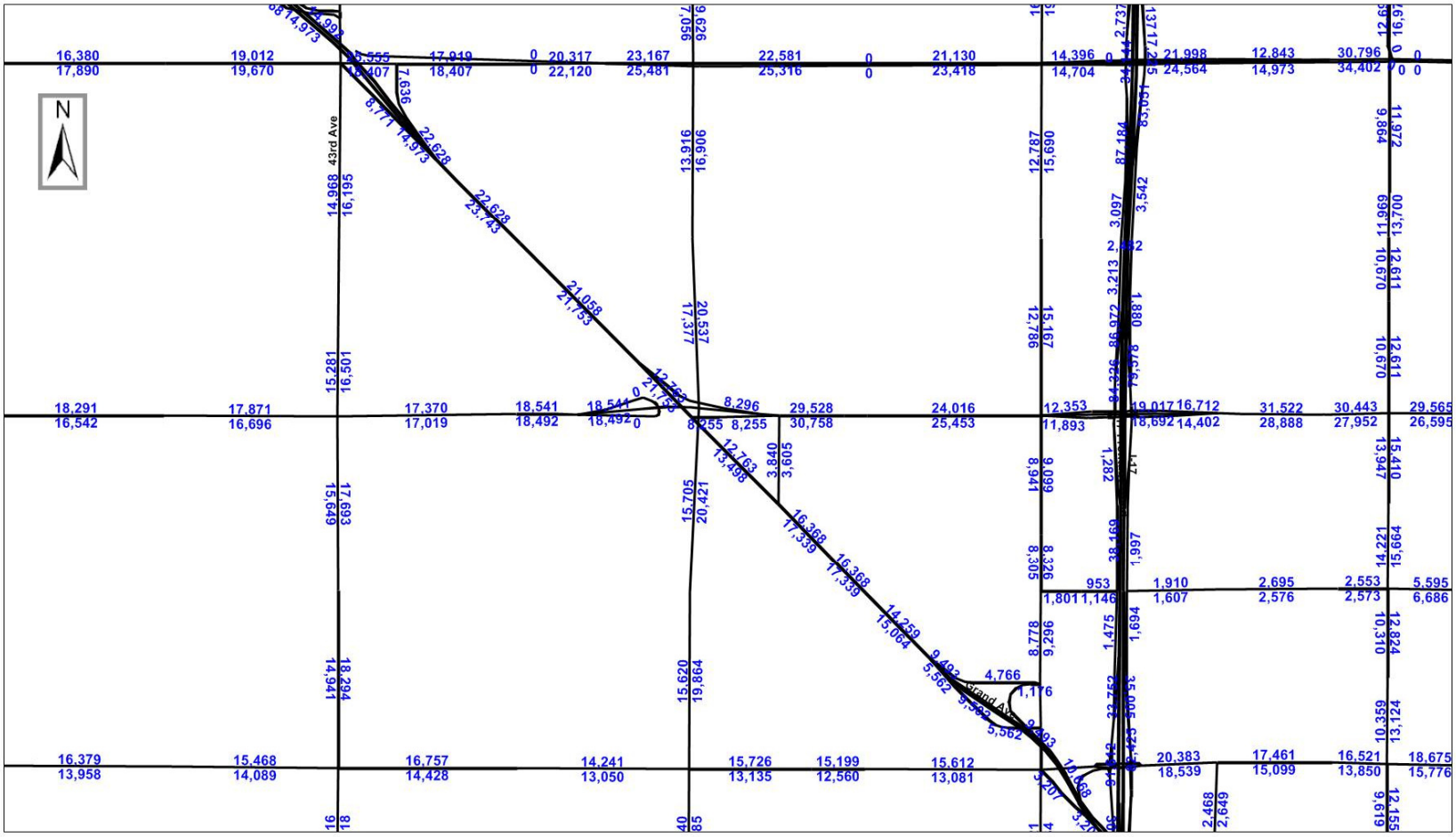


Sreevatsa Nippani, Fri Oct 19 11:53:01 2018

Source: I:\10_STAFF\Sreel\Workspace\Work Space\Modeling Requests_2018\MAG_Quinn_Oct_2018

MARICOPA ASSOCIATION of GOVERNMENTS

2035 Average Weekday Traffic Volumes



Sreevatsa Nippani, Fri Oct 19 11:40:58 2018

Appendix D: Right-of-Way Acquisition Costs

U560 GRAND, INDIAN SCHOOL RD - 35TH AVE TI COMPASS DESIGN

Table 3 Map ID	Ownership	Total or Partial	Relocation	APN	Total Area (SF)	Acquisition Area (SF)	Acquisition Area (acre)	TCE Area (sf)	TCE Area (acre)	PUE Area (sf)	PUE Area (acre)	Land Value	Improvements	Cost to Cure	Severance Damage	Total Acq. Cost	Demolition	Relocation	TCE Cost	Total Cost	Notes
	3304 W Grand Avenue LLC			108-02-008N	14,730	14,730	0.34					$ 350,000						$ 150,000		$ 500,000	Business: Mary's Auto Sales LLE; Total Take
	SRAZI LLC			108-02-008K	37,462	37,462	0.86					$ 600,000						$ 200,000		$ 800,000	Close Grand Avenue Access, Business: Spearmint Rhino Dirty's Topless Bar; Total Take
	Malko Shawel A/Dimaggio Alan			108-02-008M	9,148	9,148	0.21					$ 300,000						$ 250,000		$ 550,000	Close Grand Avenue Access, Business: Ortiz Core Machine Shop; Total Take
23	P West Properties XX LLC			108-02-008L	158,689	0	0.00							$ 200,000				$ -		$ 200,000	Rt In Rt Out on Grand only; Close one of two Grand Avenue Accesses; US Vets - Care Facility??
22	DJK Inc (Improvements)			108-02-005J	239,057	0	0.00							$ 100,000				$ -		$ 100,000	Close one of two Grand Avenue Accesses and one of three on Indian School Road; TrailersPlus Factory Direct Trailers
21	DJK Inc			108-02-003A	27,891	27,891	0.64					$ 310,000						$ 50,000		$ 360,000	Close all access, assume total take, no buildings, same owner as adjacent parcel
25	DJK Inc			108-02-004	4,356	4,356	0.10														Close all access, Billboard, assume total take
20	S & L Property Management LLC			108-02-002A	29,151	29,151	0.67					$ 1,400,000						$ 450,000		$ 1,850,000	Close all access, assume total take, Building 11,300 SQFT, Billboard on building
24	Mountain States Telephone & Telegraph Co.			108-002-063B	5,271	5,271	0.12					$ 60,000						$ -		$ 60,000	Close all access, assume total take, Building 260 SQFT
8	HBR Properties LLC			107-11-020C	68,252	68,252	1.57					$ 900,000						$ -		$ 900,000	Close all access, assume total take, Building 4,200 sqft, for sale
17	Atchison Topeka & Santa Fe			107-11-046	50,530	0	0.00							$ 100,000				$ 150,000		$ 250,000	Buy Leases; Close one of two accesses to Goddess Scrap
18	Atchison Topeka & Santa Fe			107-11-044B	30,056	0	0.00							$ 100,000				$ 100,000		$ 200,000	Buy Leases; Close access to business, Alternative Portable Buildings - 3,000 sqft
19	Enriquez-Vargas Pablo/Renova Romana			107-11-044C	38,591	38,591	0.89					$ 400,000						$ 350,000		$ 750,000	Close all access, assume total take, Sun Valley Motor's LLC, building is manufactured building. Billboard on Property
26	Adobe Commercial LLC			108-02-064K	118,305	118,305	2.72					$ 2,600,000						$ 200,000		$ 2,800,000	Total Takes; Close two of three accesses
26	Adobe Commercial LLC			108-02-064L	36,541	36,541	0.84														Total Takes; Close access, have access from adjacent property with same owner; Billboard
27	OS Advertising Company of Phx Inc.			154-23-085A	450	450	0.01					$ 5,000						$ 65,000		$ 70,000	Total take - Small Billboard NE corner 35th and Indian School Rc
3	ME Lam & Thu Kim Tang Trust/Tang HOA/TAM			154-23-076E, 154-23-067, 154-23-070B	69,957	69,957	1.61					$ 2,500,000						$ 1,000,000		$ 3,500,000	Closing all access, Total Take, Shopping center 21,000 sqft
4	Tamarak Gardens Apartments LLC			154-23-078	144,096	144,096	3.31					$ 5,300,000						$ 2,000,000		$ 7,300,000	200 Apt. Units; Closing All Access, Total Take, Tamarak Apartments , 3 stories, 90,000 sqft
16	Franciscan LLC			154-23-073D, 154-23-073C	274,864	20,708	0.48					$ 2,000,000						$ 1,000,000		$ 3,000,000	The Franciscan Apartments, may be able to mitigate with COMPASS design
	Jaramillo Sara J			154-22-110	8,128	~~8,128~~	~~0.19~~					$ -						$ -		$ -	Home with 1,118 sqft Living Space, total take due to close of access NOT NEEDED for COMPASS
	Barea Real Estate Inc.			107-11-039D	22,491	~~22,491~~	~~0.52~~					$ -						$ -		$ -	Total Take, close of access, Single Story Ranch type building 3,700 sqft. NOT NEEDED FOR COMPASS
	Barea Real Estate Inc.			107-11-040	151,692	~~3,060~~	~~0.07~~					$ -						$ -		$ -	SierraAuction.com - Same owner as Total Take properties. Reducing access - Minimum take along 107-11-039D
15	Barea Real Estate Inc.			107-11-014	85,987	6,495	0.15														ASSUME ACCESS CAN BE PROVIDED: SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-033	34,412	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access, 3,000 sqft canopy
15	Barea Real Estate Inc.			107-11-031	51,706	9,237	0.21														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-008	8,276	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-018A	97,182	0	0.00					$ 500,000						$ 500,000		$ 1,000,000	SierraAuction.com -Same owner as Total Take properties. Reducing access to other connecting properties. Building 13,000 sqft, 10,500 sqft of canopy. Billboard
15	Barea Real Estate Inc.			107-11-010A	7,841	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-011	3,920	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-012	3,920	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-013A	5,881	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-024	13,068	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
14	Louis Terry/Sousan			107-11-009	8,015	8,015	0.18					$ 200,000						$ 250,000		$ 450,000	Removing access, total take, Metal Building 2,400 sqft
13	Whittaker James L TR			107-11-038	3,920	3,920	0.09					$ 100,000						$ 250,000		$ 350,000	Removing access, total take, Steel canopy, pump under canopy
13	Jones Douglas C/Terrence B			107-11-001A	12,059	12,059	0.28					$ 150,000						$ 350,000		$ 500,000	Removing access, total take, Cell Tower
13	Whittaker James L TR			107-11-004	4,574	4,574	0.11					$ 100,000						$ 300,000		$ 400,000	Removing access, total take, Steel canopy
13	Chevalier Hazel L (Deceased)			107-11-005A	1,168	1,168	0.03					$ 15,000						$ -		$ 15,000	Removing access, total take
9	Semo Venture Group LLC			107-11-036B	26,907	26,907	0.62					$ 900,000						$ 1,000,000		$ 1,900,000	Removing access, total take, 5+ Business 6,300 single Story Building
9	Sunny JOJO Inc.			107-11-036C	38,037	38,037	0.87					$ 2,500,000						$ 500,000		$ 3,000,000	Removing access, total take 76 Gas Station, Building 4,000 sqft,
	Wood Harry Dennis			107-33-029	14,329	14,329	0.33														Removing access, total take
1	Wood Harry Dennis			107-33-025A	64,475	64,475	1.48					$ 800,000						$ 2,000,000		$ 2,800,000	Removing access, total take, canopies. Parcel 107-33-025A (Wood), southwest corner of 35th avenue and BNSF, the assessor lists it as 64,475 sq. ft (1.48 acres), but the cadd file of the parcels has it as 182,020 sq. ft (4.18 acres). During the next review by the right of way group the area should be verified and the right of way cost adjusted.
7	Bobe Holdings LLC			107-33-025B	48,255	48,255	1.11					$ 900,000						$ 2,000,000		$ 2,900,000	Removing access, total take, Castle Steel Inc. Canopy with Crane 13,300 sqft, Building 5,600 sqft
10	IN-LAWS LLC			107-33-026F	189,350	189,350	4.35					$ 800,000						$ 250,000		$ 1,050,000	Significant reduction in access, assume full take, Billboarc

US60 GRAND, INDIAN SCHOOL RD - 35TH AVE TI COMPASS DESIGN

Table 3 Map ID	Ownership	Total or Partial	Relocation	APN	Total Area (SF)	Acquisition Area (SF)	Acquisition Area (acre)	TCE Area (sf)	TCE Area (acre)	PUE Area (sf)	PUE Area (acre)	Land Value	Improvements	Cost to Cure	Severance Damage	Total Acq. Cost	Demolition	Relocation	TCE Cost	Total Cost	Notes
11	Grand Avenue Industrial Properties/ETAL			108-02-032A	11,684	680	0.02														Take two parking spaces to relocate driveway
5	Grand Avenue Industrial Properties/ETAL			108-02-031A	34,742	34,742	0.80					$ 1,800,000						$ 600,000		$ 2,400,000	Removing access, total take, Several Businesses, Building 14,000 sqft
5	Grand Avenue Industrial Properties/ETAL			108-02-030	18,461	18,461	0.42														Removing access, total take, for rent, Building 8,200 sqft
12	Knudson Gerald R/Betty D ETAL			108-02-027	24,973	24,973	0.57					$ 1,800,000						$ 1,000,000		$ 2,800,000	Removing access, total take, Master Mobile Mechanics, Building 10,500 sqft
6	Knudson Gerald R/Betty D ETAL			108-02-026	24,854	24,854	0.57														Total take; Businesses: Smart Start, MR Flooring, and Copper State Auto Electric; Building 14,000 sqft
2	DT Arizona Real Estate LLC			108-02-012B	111,078	111,078	2.55					$ 2,300,000						$ -		$ 2,300,000	Total take; Large Building 570,000 sqft
	SUBTOTALS				2,488,782	1,300,197	29.85			0	0.00	$ 29,590,000	$ -	$ 500,000	$ -	$ -	$ -		$ -	$ 45,055,000	
	Estimated Plans/Survey Cost																			$ -	
	Estimated Appraisal Cost																			$ 217,000	
	Estimated Misc. Cost (40% of Acq. Cost)											$ 11,836,000								$ 11,836,000	
	ROW Plans & ADOT ROW Staff Time _%:																			$ 500,000	
	ICAP (10.02%):																			$ 5,772,322	
	TOTAL R/W ESTIMATE				2,488,782	1,300,197	30			0	0	$ 41,426,000	$ -	$ 500,000	$ -	$ -	$ -		$ -	$ 63,380,322	

US60 GRAND, INDIAN SCHOOL RD - 35TH AVE TI ALTERNATIVE DESIGN

Table 5 Map ID	Ownership	Total or Partial	Relocation	APN	Total Area (SF)	Acquisition Area (SF)	Acquisition Area (acre)	TCE Area (sf)	TCE Area (acre)	PUE Area (sf)	PUE Area (acre)	Land Value	Improvements	Cost to Cure	Severance Damage	Total Acq. Cost	Demolition	Relocation	TCE Cost	Total Cost	Notes
	3304 W Grand Avenue LLC			108-02-008N	14,730	14,730	0.34					$ 350,000						$ 150,000		$ 500,000	Business: Mary's Auto Sales LLE; Total Take
	SRAZ LLC			108-02-008K	37,462	37,462	0.86					$ 600,000						$ 200,000		$ 800,000	Close Grand Avenue Access, Business: Spearmint Rhino Dirty's Topless Bar; Total Take
	Malko Shawel A/Dimaggio Alan			108-02-008M	9,148	9,148	0.21					$ 300,000						$ 250,000		$ 550,000	Close Grand Avenue Access, Business: Ortiz Core Machine Shop; Total Take
23	P West Properties XX LLC			108-02-008L	158,689	0	0.00							$ 200,000				$ -		$ 200,000	R: In Rt: Out on Grand only; Close one of two Grand Avenue Accesses; US Vets - Care Facility ??
22	DJK Inc (Improvements)			108-02-005J	239,057	0	0.00							$ 100,000				$ -		$ 100,000	Close one of two Grand Avenue Accesses and one of three on Indian School Road. TrailersPlus Factory Direct Trailers
21	DJK Inc			108-02-003A	27,891	27,891	0.64					$ 310,000						$ 50,000		$ 360,000	Close all access, assume total take, no buildings, same owner as adjacent parcel
25	DJK Inc			108-02-004	4,356	4,356	0.10														Close all access, Billboard, assume total take
20	S & L Property Management LLC			108-02-002A	29,151	29,151	0.67					$ 1,400,000						$ 450,000		$ 1,850,000	Close all access, assume total take, Building 11,300 SQFT, Billboard on building
24	Mountain States Telephone & Telegraph Co.			108-002-063B	5,271	5,271	0.12					$ 60,000						$ -		$ 60,000	Close all access, assume total take, Building 260 SQFT
8	HBR Properties LLC			107-11-020C	68,252	68,252	1.57					$ 900,000						$ -		$ 900,000	Close all access, assume total take, Building 4,200 sqft, for sale
17	Atchison Topeka & Santa Fe			107-11-046	50,530	0	0.00							$ 100,000				$ 150,000		$ 250,000	Buy Leases, Close one of two accesses to Goddess Scrap
18	Atchison Topeka & Santa Fe			107-11-044B	30,056	0	0.00							$ 100,000				$ 100,000		$ 200,000	Buy Leases; Close access to business, Alternative Portable Buildings - 3,000 sqft
19	Enrique?-Vargas Pablo/Renova Romana			107-11-044C	38,591	38,591	0.89					$ 400,000						$ 350,000		$ 750,000	Close all access, assume total take, Sun Valley Motor's LLC, building is manufactured building. Billboard on Property
26	Adobe Commercial LLC			108-02-064K	118,305	118,305	2.72														Total Takes; Close two of three accesses
26	Adobe Commercial LLC			108-02-064L	36,541	36,541	0.84					$ 2,600,000						$ 200,000		$ 2,800,000	Total Takes; Close access, have access from adjacent property with same owner; Billboard
27	OS Advertising Company of Phx Inc.			154-23-065A	450	450	0.01					$ 5,000						$ 65,000		$ 70,000	Total take - Small Billboard NE corner 35th and Indian School Rt
3	ME Lam & Thu Kim Tang Trust/Tang HOA/TAM			154-23-076E, 154-23-067, 154-23-070B	69,957	69,957	1.61					$ 2,500,000						$ 1,000,000		$ 3,500,000	Closing all access, Total Take, Shopping center 21,000 sqft
4	Tamarak Gardens Apartments LLC			154-23-078	144,096	144,096	3.31					$ 5,300,000						$ 2,000,000		$ 7,300,000	200 Apt. Units, Closing All Access, Total Take, Tamarak Apartments , 3 stories, 90,000 sqft
16	Franciscan LLC			154-23-073D, 154-23-073C	274,884	20,708	0.48					$ 2,000,000						$ 1,000,000		$ 3,000,000	The Franciscan Apartments. MAY BE ABLE TO MITIGATE WITH ALTERNATIVE
28	Jaramillo Sara J			154-23-110	8,128	8,128	0.19					$ 150,000						$ 200,000		$ 350,000	Home with 1,118 sqft Living Space, total take due to close of access
15	Barea Real Estate Inc.			107-11-039D	22,491	22,491	0.52					$ 200,000						$ 250,000		$ 450,000	Total Take, close of access, Single Story Ranch type building 3,700 sqft.
15	Barea Real Estate Inc.			107-11-040	151,692	3,060	0.07					$ 30,000						$ -		$ 30,000	SierraAuction.com - Same owner as Total Take properties. Reducing access - Minimum take along 107-11-039D
15	Barea Real Estate Inc.			107-11-014	85,987	6,495	0.15														ASSUME ACCESS CAN BE PROVIDED: SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-033	34,412	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access, 3,000 sqft canopy
15	Barea Real Estate Inc.			107-11-031	51,706	9,237	0.21														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-008	8,276	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-018A	97,182	0	0.00					$ 500,000						$ 500,000		$ 1,000,000	SierraAuction.com -Same owner as Total Take properties. Reducing access to other connecting properties. Building 13,000 sqft, 10,500 sqft of canopy. Billboard
15	Barea Real Estate Inc.			107-11-010A	7,841	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-011	3,920	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-012	3,920	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-013A	5,881	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
15	Barea Real Estate Inc.			107-11-024	13,068	0	0.00														SierraAuction.com -Same owner as Total Take properties. Reducing access
14	Louis Terry/Sousan			107-11-009	8,015	8,015	0.18					$ 200,000						$ 250,000		$ 450,000	Removing access, total take, Metal Building 2,400 sqft
13	Whittaker James L TR			107-11-038	3,920	3,920	0.09					$ 100,000						$ 250,000		$ 350,000	Removing access, total take, Steel canopy, pump under canopy
13	Jones Douglas C/Terrence B			107-11-001A	12,069	12,069	0.28					$ 150,000						$ 350,000		$ 500,000	Removing access, total take, Cell Tower
13	Whittaker James L TR			107-11-004	4,574	4,574	0.11					$ 100,000						$ 300,000		$ 400,000	Removing access, total take, Steel canopy
13	Chevalier Hazel L (Deceased)			107-11-005A	1,168	1,168	0.03					$ 15,000						$ -		$ 15,000	Removing access, total take
9	Semo Venture Group LLC			107-11-036B	26,907	26,907	0.62					$ 900,000						$ 1,000,000		$ 1,900,000	Removing access, total take, 5- Business 6,300 single Story Building
9	Sunny JOJO Inc.			107-11-036C	38,037	38,037	0.87					$ 2,500,000						$ 500,000		$ 3,000,000	Removing access, total take 76 Gas Station, Building 4,000 sqft.
	Wood Harry Dennis			107-33-029	14,329	14,329	0.33														Removing access, total take
1	Wood Harry Dennis			107-33-025A	64,475	64,475	1.48					$ 800,000						$ 2,000,000		$ 2,800,000	Removing access, total take, canopies. Parcel 107-33-025A (Wood), southwest corner of 35th avenue and BNSF, the assessor lists it as 64,475 sq. ft (1.48 acres), but the cadd file of the parcels has it as 182,020 sq. ft (4.18 acres). During the next review by the right of way group the area should be verified and the right of way cost adjusted.
7	Bobe Holdings LLC			107-33-025B	48,255	48,255	1.11					$ 900,000						$ 2,000,000		$ 2,900,000	Removing access, total take, Castle Steel Inc. Canopy with Crane 13,300 sqft, Building 5,600 sqft
10	IN-LAWS LLC			107-33-026F	189,350	189,350	4.35					$ 800,000						$ 250,000		$ 1,050,000	Significant reduction in access, assume full take, Billboarc

US60 GRAND, INDIAN SCHOOL RD - 35TH AVE TI ALTERNATIVE DESIGN

Table 5 Map ID	Ownership	Total or Partial	Relocation	APN	Total Area (SF)	Acquisition Area (SF)	Acquisition Area (acre)	TCE Area (sf)	TCE Area (acre)	PUE Area (sf)	PUE Area (acre)	Land Value	Improvements	Cost to Cure	Severance Damage	Total Acq. Cost	Demolition	Relocation	TCE Cost	Total Cost	Notes
11	Grand Avenue Industrial Properties/ETAL			108-02-032A	11,684	680	0.02														Take two parking spaces to relocate driveway
5	Grand Avenue Industrial Properties/ETAL			108-02-031A	34,742	34,742	0.80					$ 1,800,000						$ 600,000		$ 2,400,000	Removing access, total take, Several Businesses, Building 14,000 sqft
5	Grand Avenue Industrial Properties/ETAL			108-02-030	18,461	18,461	0.42														Removing access, total take, for rent, Building 8,200 sqft
12	Knudson Gerald R/Betty D ETAL			108-02-027	24,973	24,973	0.57					$ 1,800,000						$ 1,000,000		$ 2,800,000	Removing access, total take, Master Mobile Mechanics, Building 10,500 sqft
6	Knudson Gerald R/Betty D ETAL			108-02-026	24,854	24,854	0.57														Total take; Businesses: Smart Start, MR Flooring, and Copper State Auto Electric; Building 14,000 sqft
2	DT Arizona Real Estate LLC			108-02-012B	111,078	111,078	2.55					$ 2,300,000						$ -		$ 2,300,000	Total take; Large Building 570,000 sqft. MAY BE MITIGATED WITH ALTERNATIVE
	SUBTOTALS				2,488,782	1,300,197	29.85			0	0.00	$ 29,970,000	$ -	$ 500,000	$ -	$ -	$ -		$ -	$ 45,885,000	
	Estimated Plans/Survey Cost																			$ -	
	Estimated Appraisal Cost																			$ 217,000	
	Estimated Misc. Cost (40% of Acq. Cost)											$ 11,988,000								$ 11,988,000	
	ROW Plans & ADOT ROW Staff Time _%																			$ 500,000	
	ICAP (±0.02%)																			$ 5,870,718	
	TOTAL R/W ESTIMATE				2,488,782	1,300,197	30			0	0	$ 41,958,000	$ -	$ 500,000	$ -	$ -	$ -		$ -	$ 64,460,718	