

**APPENDIX D**

**NORTHERN PARKWAY ALTERNATIVES –  
103<sup>RD</sup> AVENUE TO 91<sup>ST</sup> AVENUE**

**TECHNICAL MEMORANDUM  
NORTHERN PARKWAY ALTERNATIVES  
103<sup>RD</sup> AVENUE TO 91<sup>ST</sup> AVENUE**

**October 20, 2005**

**PURPOSE**

The purpose of this Technical Memorandum is to document the development and progression of alternatives evaluated for Northern Parkway between 103<sup>rd</sup> Avenue and 91<sup>st</sup> Avenue including the Loop 101 interchange. The concepts presented herein will be developed further and included in the Design Concept Report (DCR) and Environmental Assessment (EA) that are scheduled for completion in 2006.

**PREVIOUS DCR CONCEPT**

The initial DCR for Northern Parkway was published and issued in October 2003 and included improvements to Northern Avenue between 103<sup>rd</sup> Avenue and 91<sup>st</sup> Avenue. The proposed improvements included a grade separation structure at 103<sup>rd</sup> Avenue with Northern Parkway being depressed, realignment of 99<sup>th</sup> Avenue to the west which connects to Northern Parkway with an at-grade signalized intersection (see Figure 1), an eastbound to northbound flyover ramp at Loop 101, traffic signals at the Loop 101 ramps, relocated traffic signal to Peoria Crossings at 94<sup>th</sup> Avenue, and a grade separated structure at 91<sup>st</sup> Avenue with the parkway elevating over 91<sup>st</sup> Avenue.

The projected Maricopa Association of Governments (MAG) 2025 traffic volumes indicated the need for a two-lane flyover ramp from eastbound Northern Parkway to northbound Loop 101 to accommodate this anticipated heavy traffic movement. The location of this ramp required the relocation to the west of the existing 99<sup>th</sup> Avenue intersection with Northern Parkway. The new at-grade intersection would be controlled with a two-phase traffic signal with no left turns from Northern Parkway. Westbound to southbound left turns onto 99<sup>th</sup> Avenue off of Northern Parkway are expected to be an important movement especially during events at the stadiums located south of Glendale Avenue. To accommodate this movement, a two-lane one-way connector road was proposed connecting westbound Northern Parkway to 99<sup>th</sup> Avenue north of Northern Parkway. Westbound to southbound traffic would turn right onto the connector road and then turn left onto 99<sup>th</sup> Avenue. A traffic signal would be necessary at the connector roadway and 99<sup>th</sup> Avenue "T" intersection. Eastbound traffic on Northern Parkway desiring to go north on 99<sup>th</sup> Avenue must continue east 1 mile to 91<sup>st</sup> Avenue, make a U-turn at the proposed grade separation structure, and return west 1 mile and turn right on 99<sup>th</sup> Avenue.

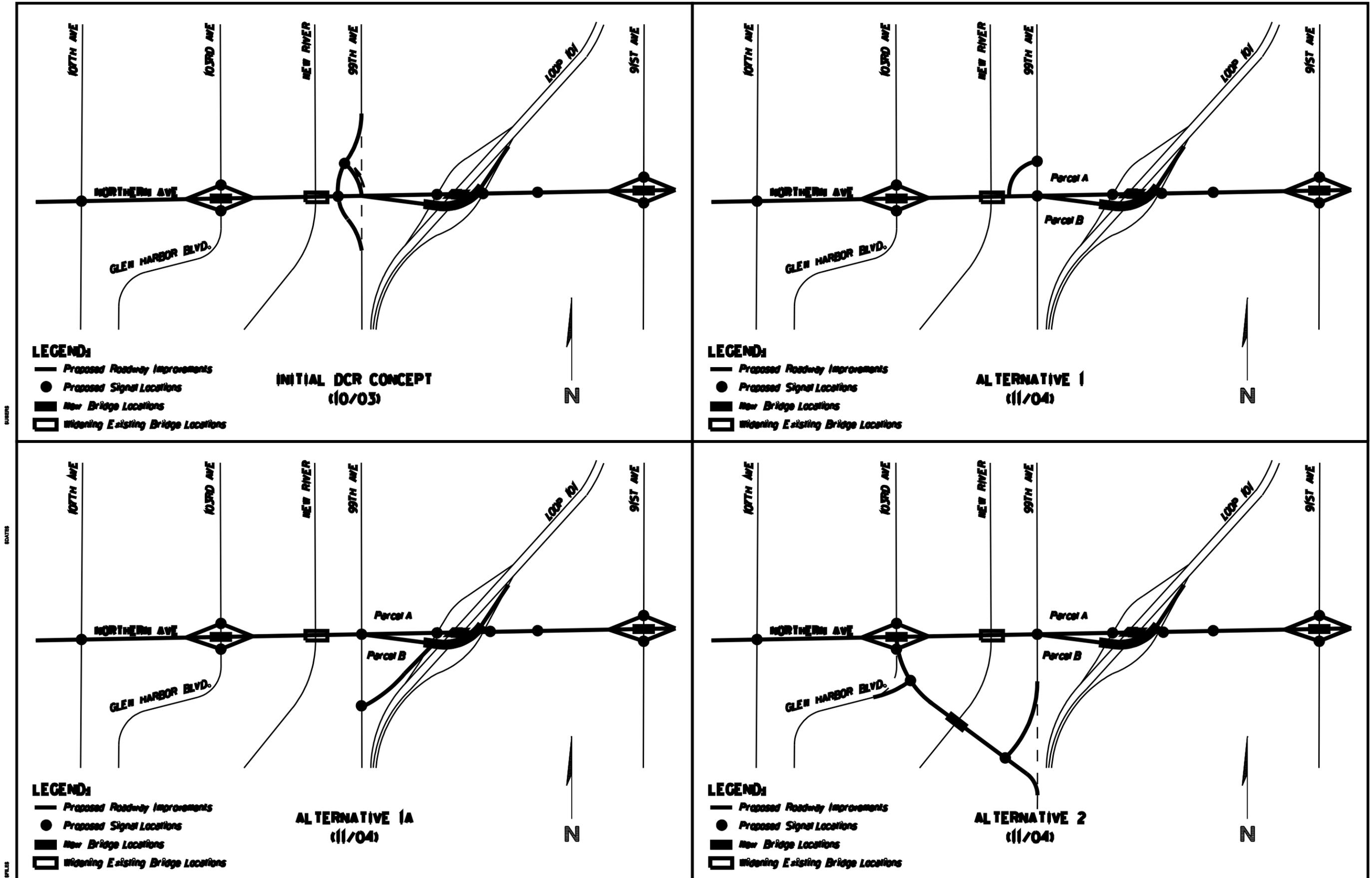


FIGURE 1 - POST INITIAL DCR ALTERNATIVES

The roadway section included in the previous DCR would vary from 103<sup>rd</sup> Avenue to 91<sup>st</sup> Avenue. It would consist of three lanes in each direction at the 103<sup>rd</sup> Avenue underpass, widening of the Northern Avenue New River Bridge to four westbound lanes and five eastbound lanes, five westbound lanes and four eastbound lanes between 99<sup>th</sup> Avenue and Loop 101, reconstructing the Loop 101 bridges over Northern Avenue to accommodate four lanes in each direction plus two westbound-to-southbound left-turn lanes, four lanes in each direction from Loop 101 to 91<sup>st</sup> Avenue, and three lanes in each direction at the 91<sup>st</sup> Avenue overpass.

## **POST INITIAL DCR ALTERNATIVES**

Following the completion of the previous DCR (October 2003), several conditions changed that affected the configuration of Northern Parkway and 99<sup>th</sup> Avenue. ADOT adopted the new 2001 AASHTO requirements for stopping sight distance (SSD) (February 2004). The object height used for calculating the SSD changed from 6 inches to 2 feet. This resulted in the reduction of the Loop 101 flyover ramp crest vertical curve length from 1,600 feet to 1,000 feet. The proposed flyover ramp would no longer impact the existing 99<sup>th</sup> Avenue and Northern Avenue intersection, which made the relocation of the intersection as shown in the DCR concept no longer necessary. In addition, the City of Peoria indicated that they had plans to realign 99<sup>th</sup> Avenue north of Northern Avenue so that it would bridge the New River and line up with 99<sup>th</sup> Avenue north of Olive Avenue. This change would result in more traffic volumes on 99<sup>th</sup> Avenue in the future. Lastly, both Peoria and Glendale were concerned about access to commercial sites adjacent to Northern Parkway and 99<sup>th</sup> Avenue. Parcel A was the label given to the commercial site on the northeast corner of 99<sup>th</sup> Avenue and Northern Parkway, west of Loop 101, while Parcel B represented the property southeast of 99<sup>th</sup> Avenue and Northern Parkway west of Loop 101.

Due to these changed conditions, six additional concepts were developed and evaluated during Fall 2004. The concepts consisted of Alternative 1, Alternative 1A, Alternative 2, Alternative 3, Alternative 3A, and an Alternative 4 as described in the following paragraphs.

### **Alternative 1**

This alternative would modify the DCR concept by moving the 99<sup>th</sup> Avenue intersection with Northern Parkway back to its existing location and replace the connector roadway east of the realigned 99<sup>th</sup> Avenue with a “jug handle” connector roadway located in the northwest quadrant of the intersection (see Figure 1).

As with the original DCR concept, the most significant negative for this alternative is eastbound Northern Parkway traffic wanting access to Parcel A and 99<sup>th</sup> Avenue north or Northern Parkway (see Table 1). In order to make this movement, traffic must go 1 mile east of 99<sup>th</sup> Avenue and make a U-turn at the 91<sup>st</sup> Avenue grade separation structure and then return 1 mile to 99<sup>th</sup> Avenue and make a right turn or directly into Parcel A east of 99<sup>th</sup> Avenue.

### **Alternative 1A**

Alternative 1A is very similar to Alternative 1 in that it would keep a signalized intersection at 99<sup>th</sup> Avenue and Northern Parkway as well as the eastbound fly-over ramp to northbound Loop 101. The difference in Alternative 1A is it would remove the jug-handle connector from the northwest quadrant of the intersection that was presented in Alternative 1 and add a new connector road on the east side of Parcel B (see Figure 1). The connector roadway would function like a one-way frontage road for Loop 101 and utilize the same signalized intersection for the Loop 101 southbound off-ramp and southbound on-ramp with Northern Parkway. The frontage road would continue south along the west side of Loop 101 providing direct right-in/right-out access to Parcel B, and terminate at 99<sup>th</sup> Avenue approximately 1/4-mile south of Northern Parkway. It would provide excellent access to Parcel B and much improved access to Parcel A and require very little new right-of-way (see Table 1).

### **Alternative 2**

Alternative 2 does not provide either the “jug handle” in the northwest quadrant as in Alternative 1 or the connector road/frontage road of Alternative 1A. The at-grade signalized intersection at 99<sup>th</sup> Avenue with no left turns off Northern Parkway is the same as Alternatives 1 and 1A; however, the anticipated traffic volumes at the intersection are reduced significantly through realignment of 99<sup>th</sup> Avenue traffic both south and north of Northern Parkway. Approximately 1/2 mile south of Northern Avenue, 99<sup>th</sup> Avenue would curve to the west, cross the New River with a new bridge, tie into Glen Harbor Boulevard south of Northern Parkway, continue along 103<sup>rd</sup> Avenue north of Northern Parkway, and curve back to the east to align with the existing 99<sup>th</sup> Avenue at Olive Avenue. Alternative 2 would eliminate the need for the City of Peoria planned improvements on 99<sup>th</sup> Avenue south of Olive Avenue including the bridge over the New River (see Figure 1).

**TABLE 1  
POST INITIAL DCR ALTERNATIVES**

**Northern Parkway Alternatives**  
103rd Avenue to 91st Avenue

Evaluation Criteria	Alternative 1	Rank	Alternative 1A	Rank	Alternative 2	Rank	Alternative 3	Rank	Alternative 3A	Rank	Alternative 4	Rank
Length of New Arterial Street	0.5 miles	1	0.5 miles	1	1.6 miles	5	1.2 miles	3	1.3 miles	4	0.8 miles	3
New Structures In Addition to Northern Pkwy Concept	99th Avenue over New River	1	99th Avenue ovr New River	1	99th/103rd Avenue over New River	2	99th Avenue over New River Loop Road over New River 99th/Northern Ave Grade Separation	4	99th Avenue over New River 99th/Northern Ave Grade Separation	2	99th Avenue over New River EB & WB Frontage Roads over New River 99th/Northern Ave Grade Separation Northern over Frontage Roads, L101 Ramps & Mainline	5
Eliminate Signals In Northern Pkwy Concept	None	3	None	4	None	4	Northern/99th Eliminated	2	Northern/99th Eliminated	2	Northern Through Traffic Bypasses 1 Signal at Peoria Crossing, 2 Signals at L101, and 1 Signal at 99th Ave	1
Roadway Curvature	Sharp Radius on Jug Handle (low volume)	3	N/A	1	Sharp Radii on 99th Avenue Realignment South of Olive Avenue	5	Sharp Radius on Loop Road	3	Sharp Radii on Jug Handles	4	N/A	1
Drainage	N/A	1	N/A	1	N/A	1	99th Avenue Underpass Would Require a Pump Station	4	99th Avenue Underpass Would Require a Pump Station	4	99th Ave Semi-Depressed, Can Gravity Drain	3
Compatibility With Peoria Plans for 99th Avenue	Compatible	1	Compatible	1	Not Compatible - 99th Avenue Realignment South of Olive Avenue	5	Compatible	1	Compatible	1	Compatible	1
Access to Parcel A	From West: Requires U-turn at 91st Ave From East: Direct Access From South: Direct Access (Signal at Northern) From North: Direct Access From Continuous 99th Ave	5 1 3 1	From West: Requires Use of SB Frontage Road/99th Ave From East: Direct Access From South: Direct Access (Signal at Northern) From North: Direct Access From Continuous 99th Ave	3 1 4 1	From West: Requires Use of 103rd Ave/99th Ave or U-turn at 91st Avenue From East: Direct Access From South: Direct Access Via Realigned 99th Ave From North: Direct Access	5 1 5 5	From West: Requires Use of Loop Road/99th Ave or SB Frontage Road/99th Ave From East: Direct Access From South: Direct Access (No Signal at Northern) From North: Direct Access From Continuous 99th Ave	2 1 1 1	From West: Requires Use of Jug Handle/99th Ave or SB Frontage Road/99th Ave From East: Direct Access From South: Direct Access (No Signal at Northern) From North: Direct Access From Continuous 99th Ave	1 1 1 1	From West: Exit at 103rd, Use EB Frontage Road From East: Exit at 91st, Use WB Frontage Road From South: Direct Access (TI Signals) From North: Direct Access From Continuous 99th Ave	4 5 3 1
	<b>Overall Rank</b>	<b>3</b>	<b>Overall Rank</b>	<b>3</b>	<b>Overall Rank</b>	<b>5</b>	<b>Overall Rank</b>	<b>2</b>	<b>Overall Rank</b>	<b>1</b>	<b>Overall Rank</b>	<b>4</b>
Access to Parcel B	From West: Direct Access From 99th Avenue From East: Requires Use of Jug Handle From South: Direct Access From North: Direct Access From Continuous 99th Ave	1 1 1 3	From West: Direct Access From 99th Avenue From East: Requires Use of SB Frontage Road From South: Direct Access From North: Direct Access From Continuous 99th Ave	1 2 1 4	From West: Direct Access From 99th Avenue From East: Requires U-turn at 103rd Avenue From South: Direct Access Via Realigned 99th Ave From North: Direct Access From 99th Avenue	1 5 5 5	From West: Requires Use of Loop Road/99th Avenue or SB Frontage Road/99th Ave From East: Requires Use of SB Frontage Road From South: Direct Access From North: Direct Access From Continuous 99th Ave; No Signal at Northern	5 2 1 1	From West: Requires Use of Jug Handle/99th Avenue or SB Frontage Road/99th Ave From East: Use of SB Frontage Road or Jug Handle From South: Direct Access From North: Direct Access From Continuous 99th Ave; No Signal at Northern	4 1 1 1	From West: Exit at 103rd, Use EB Frontage Road From East: Exit at 91st, Use WB Frontage Road From South: Direct Access From North: Direct Access From Continuous 99th Ave	3 4 1 3
	<b>Overall Rank</b>	<b>1</b>	<b>Overall Rank</b>	<b>2</b>	<b>Overall Rank</b>	<b>5</b>	<b>Overall Rank</b>	<b>3</b>	<b>Overall Rank</b>	<b>1</b>	<b>Overall Rank</b>	<b>4</b>
Access to Peoria Crossing	From West: Via 91st Avenue From East: Direct Access	1	From West: Via 91st Avenue From East: Direct Access	1	From West: Via 91st Avenue From East: Direct Access	1	From West: Via 91st Avenue From East: Direct Access	1	From West: Via 91st Avenue From East: Direct Access	1	From West: Exit 103rd Ave, Use EB Frontage Road From East: Exit 91st Ave, Use WB Frontage Road	5
Access to Stadium Site	SB on Continuous 99th Ave (Signal at Northern) WB From Loop 101 Use Jug Handle For Entry	4	SB on Continuous 99th Ave (Signal at Northern) Loop 101 Direct Connection to SB Frontage Road	4	SB Via 103rd/99th Ave (Signal at Northern G.S.) WB From Loop 101 Use 103rd/99th Ave Connector	5	SB on Continuous 99th Ave (No Signal at Northern) Loop 101 Direct Connection to SB Frontage Road	1	SB on Continuous 99th Ave (No Signal at Northern) Loop 101 Direct Connection to SB Frontage Road	1	SB on Continuous 99th Ave (Signal at Northern G.S.) Loop 101 to WB Frontage Road	3
Stadium Site Exit	NB Exit Via Continuous 99th Ave (Signal at Northern) Access to Loop 101	1	NB Exit Via Continuous 99th Ave (Signal at Northern) Access to Loop 101	3	NB Exit Via 99th & 103rd Ave (Signal At Northern G.S.) Access to Loop 101 Via 99th/103rd Ave	4	NB Exit Via Continuous 99th Ave (No Signal at Northern) Access to Loop 101 Via Loop Road	5	NB Exit Via Continuous 99th Ave (No Signal at Northern) Access to Loop 101 Via Jug Handle	1	NB Exit Via Continuous 99th Ave (Signal at Northern G.S.) Access to Loop 101 Via EB Frontage Road	2
99th Avenue Continuity	Continuous - Signal at Northern	3	Continuous - Signal at Northern	4	Continuous By Way of 103rd Avenue - Somewhat Out of Direction; Signal at Northern	5	Continuous - Signal at Northern Pkwy Eliminated	1	Continuous - No Signal at Northern	1	Continuous - Signal at Northern Ramps	3
Affect on Capacity of Northern Parkway Concept	Same as DCR	4	Same as DCR	5	Slight Improvement Due to Reduced Volume on 99th Ave	4	Would Be Greatly Improved Due to Eliminating Signal at 99th Avenue	2	Would Be Greatly Improved Due to Eliminating Signal at 99th Avenue	2	Would Have Most Improvement Due to Eliminating Signals at 99th Avenue, Loop 101 and Peoria Crossing	1
Multiple Destination Exits	None	1	None	1	EB Exit at 103rd for 103rd and 99th	4	EB Exit at 103rd for 103rd and 99th WB Exit at 103rd for 103rd and 99th	3	None	1	EB Exit at 103rd for 103rd, 99th, L101, & 91st WB Exit at 91st for 91st, L101 & 99th	5
Relative Cost	N/A											
Construction		\$12,782,000		\$19,225,750		\$20,995,125		\$16,574,500		\$25,597,625		
Right of Way		\$210,000		\$3,525,000		\$1,815,000		\$3,600,000		\$1,950,000		
Total		\$12,992,000		\$22,750,750		\$22,810,125		\$20,174,500		\$27,547,625		

Alternative 2 has several significant disadvantages. It would require construction of 1.6 miles of arterial street to connect through 99<sup>th</sup> Avenue traffic to 103<sup>rd</sup> Avenue and back to the 99<sup>th</sup> Avenue alignment (see Table 1). Access to Parcel A from the west would be very difficult. It would require making a U-turn at 91<sup>st</sup> Avenue or exiting at 103<sup>rd</sup> Avenue and connecting to 99<sup>th</sup> Avenue approximately 1/2 mile south of Northern Parkway. Westbound traffic wanting to access Parcel B would exit at 103<sup>rd</sup> Avenue and make a U-turn and travel back to 99<sup>th</sup> Avenue.

### **Alternative 3**

Alternative 3 would replace the traffic signal at 99<sup>th</sup> Avenue with a grade-separated structure by depressing 99<sup>th</sup> Avenue under Northern Parkway, which would remain at grade. This alternative would also include the connector roadway/frontage road concept shown in Alternative 1A. In addition, Alternative 3 would include a connector road located 1/4 mile south of Northern Parkway that connects 99<sup>th</sup> Avenue to Glen Harbor Boulevard (see Figure 2). A new bridge over the New River would be required.

Elimination of the traffic signal at 99<sup>th</sup> Avenue and Northern Parkway would improve capacity and operation of Northern Parkway in this critical segment of the parkway. All traffic from Northern Parkway wanting to go either north or south on 99<sup>th</sup> Avenue would exit at 103<sup>rd</sup> Avenue or at the Loop 101 west traffic signal. Traffic exiting at 103<sup>rd</sup> Avenue desiring to get to 99<sup>th</sup> Avenue would head south on Glen Harbor Boulevard and use the new connector roadway, and cross the New River to 99<sup>th</sup> Avenue (see Table 1). Access to Parcel A from the west would get off at 103<sup>rd</sup> Avenue and use the connector roadway south of Northern Parkway or the frontage road while access to Parcel B must use these same roadways.

### **Alternative 3A**

Alternative 3A is the same as Alternative 3, except it would eliminate the connector road between 103<sup>rd</sup> Avenue and 99<sup>th</sup> Avenue located 1/4 mile south of Northern Parkway and add “jug handle” roadways in the northwest and southwest quadrants of the intersection of 99<sup>th</sup> Avenue and Northern Parkway (see Figure 2).

The benefits of Alternative 3A would be similar to those for Alternative 3. The “jug handle” roadways would provide good access to both Parcels A and B, and to 99<sup>th</sup> Avenue.

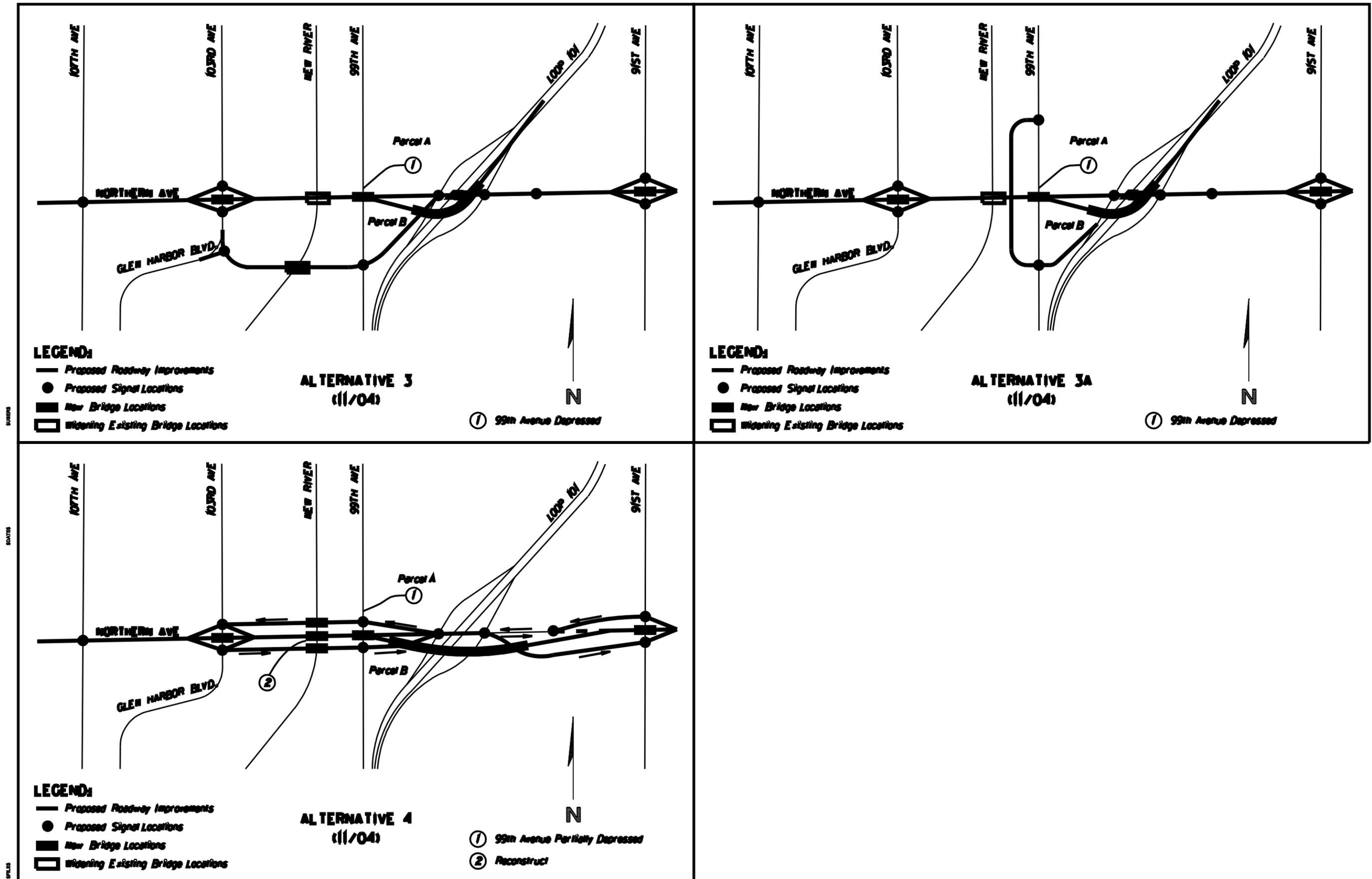


FIGURE 2 - POST INITIAL DCR ALTERNATIVES

## Alternative 4

Alternative 4 is considerably different from the previous DCR concept and the other alternatives described in this Technical Memorandum thus far. The eastbound Northern Parkway to northbound Loop 101 flyover that is in all the other alternatives is not included. The removal of the flyover is made possible by separating the Northern Parkway through traffic movements from motorists that want to connect to Loop 101. The separation would be achieved at both 103<sup>rd</sup> Avenue and 91<sup>st</sup> Avenue (see Figure 2). Through traffic would go under 103<sup>rd</sup> Avenue, go over the New River via a new reconstructed bridge, go over a partially depressed 99<sup>th</sup> Avenue, go over Loop 101 and the Northern Parkway ramps, and go over 91<sup>st</sup> Avenue. The alignment for the through movements or the “bypass” shifts to the south from 99<sup>th</sup> Avenue to approximately 93<sup>rd</sup> Avenue. New one-way two-lane frontage roads would be provided between 103<sup>rd</sup> Avenue and 99<sup>th</sup> Avenue. Between 99<sup>th</sup> Avenue and Loop 101, the eastbound frontage road crosses under Northern Parkway to combine with Northern Avenue at Loop 101. Only three through lanes are required at Loop 101 so the Loop 101 bridges over Northern Avenue do not require reconstruction in Alternative 4. East of Loop 101, eastbound traffic separates from Northern Avenue and forms a three-lane one-way frontage road along the south side of Northern Parkway until 91<sup>st</sup> Avenue. At 91<sup>st</sup> Avenue eastbound traffic can turn onto 91<sup>st</sup> Avenue or continue east on a ramp/connector roadway to the Northern Parkway mainline.

Alternative 4 has significant benefits and several negatives (see Table 1). For through traffic, Alternative 4 eliminates all traffic signals between 107<sup>th</sup> Avenue and 87<sup>th</sup> Avenue that were included in the previous DCR concept. However, traffic from the west with destinations adjacent to 103<sup>rd</sup> Avenue, 99<sup>th</sup> Avenue, Parcels A and B, Loop 101, Peoria Crossings, and 91<sup>st</sup> Avenue must all exit the Parkway at 103<sup>rd</sup> Avenue. Similarly, traffic from the east with the same destinations must exit the Parkway at 91<sup>st</sup> Avenue. Alternative 4 does retain the east ramps at 103<sup>rd</sup> Avenue but not the west ramps at 91<sup>st</sup> Avenue. The cost of this alternative is significantly more than the other alternatives considered.

## RECOMMENDATION

After review by the stakeholder agencies including the City of Glendale, City of Peoria, and Maricopa County Department of Transportation, it was agreed that Alternative 3A provided the best traffic flow and access to adjacent streets and properties. The City of Peoria had several minor variations that they recommended for Alternative 3A:

1. Keep Northern Parkway at grade at 99<sup>th</sup> Avenue by fully depressing 99<sup>th</sup> Avenue.
2. Make the two “jug handles” two-way.
3. Ensure that the “jug handles” intersect 99<sup>th</sup> Avenue at-grade.

## **ADDITIONAL ALTERNATIVES**

Following the acceptance of Alternative 3A for Northern Parkway from 103<sup>rd</sup> Avenue to 91<sup>st</sup> Avenue, additional information became available that had a direct impact on the alternatives for this segment of Northern Parkway. Perhaps the most significant was the change in the traffic pattern at Loop 101 and Northern Parkway in the new calibrated 2030 MAG model. The new MAG 2030 traffic projections indicated that the Northern Parkway eastbound to Loop 101 northbound “flyover” ramp was no longer necessary (see Northern Parkway Traffic Memorandum, May 19, 2005).

Also, utility information was obtained that showed significant utility relocation required to depress 99<sup>th</sup> Avenue. Many utilities were found in both the 99<sup>th</sup> Avenue right-of-way and the Northern Avenue right-of-way including a 36-42-inch diameter sewer interceptor line and metering station vault. It was estimated that the cost to relocate the utilities necessary to depress 99<sup>th</sup> Avenue would be over \$2.5 million. This caused a re-evaluation of the concept to depress 99<sup>th</sup> Avenue.

Lastly, development activity in Parcel A increased. A mixed-use development is proposed for Parcel A called the Villages at Northern. The Villages at Northern consists of 300,000 square feet of commercial, 100,000 square feet of office, and 200 units of residential. The developers want signalized access to both Northern Parkway and 99<sup>th</sup> Avenue. The additional signal on Northern Parkway is not consistent with the parkway concept and would form a bottleneck in this segment of the parkway which has the highest projected future traffic volume of the entire corridor.

As a result of the above new information, several new alternatives were developed for Northern Parkway from 103<sup>rd</sup> Avenue to 91<sup>st</sup> Avenue as described in the following sections.

### **Alternative 3B**

Alternative 3B is similar to Alternative 3A developed previously except the alignment of 99<sup>th</sup> Avenue would be shifted to the west and elevated to avoid the utilities in 99<sup>th</sup> Avenue (see Figure 3). This alternative was eliminated from further consideration due to its inclusion of the “flyover” ramp that is no longer necessary.

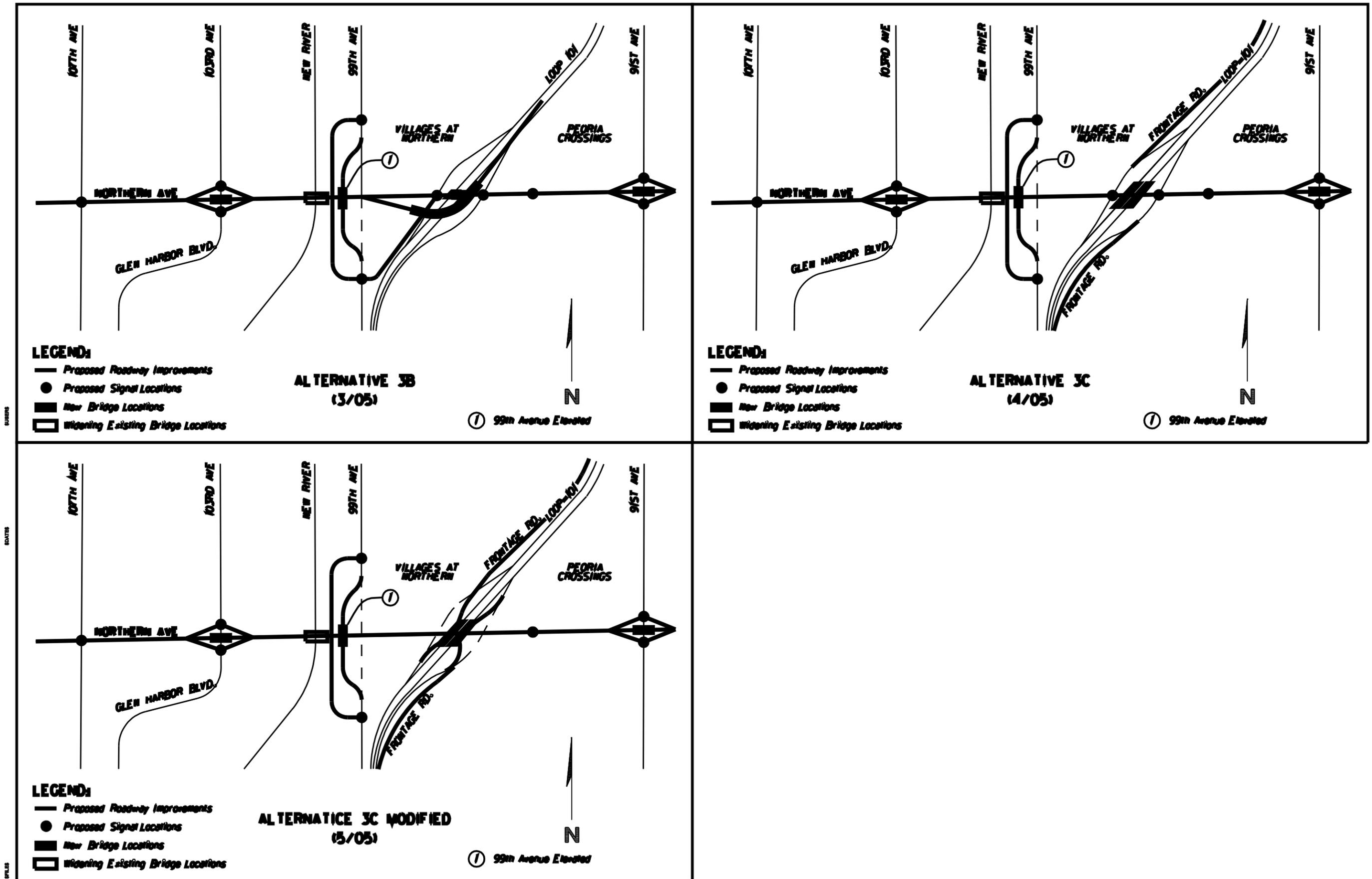


FIGURE 3 - ADDITIONAL ALTERNATIVES

### **Alternative 3C**

Alternative 3C is the same as Alternative 3B except the Northern Parkway eastbound to Loop 101 northbound flyover ramp is eliminated (see Figure 3). The elimination of the “flyover” ramp requires the addition of two eastbound left-turn lanes to the northbound ramp onto Loop 101. These left-turn lanes combined with the westbound left-turn lanes plus four through lanes in each direction would require the reconstruction of the Loop 101 Northern Avenue bridges.

Alternative 3C also accommodates Loop 101 frontage roads. A developer and the City of Peoria are planning a frontage road on the west side of Loop 101 from Olive Avenue to Northern Avenue. The City of Glendale is also considering a frontage road on the east side of Loop 101 from Glendale Avenue to Northern Parkway. These frontage roads would add traffic to the ramp terminals, which are projected to be congested. A traffic capacity and Level of Service (LOS) analysis were performed at Northern Parkway and Loop 101 for the year 2030, and the result was LOS F indicating inadequate capacity in the peak hour.

### **Alternative 3C Modified**

Due to the capacity problem with Alternative 3C, Alternative 3C was modified to replace the existing diamond interchange at Loop 101 with a Single Point Urban Interchange (SPUI) (see Figure 3). SPUIs have a higher capacity than diamond interchanges but require the elimination of the center bridge piers common with diamond interchanges. Removing this center support increases the structural depth of the bridge from 5 feet to approximately 11 feet. This would involve raising the elevation of the Loop 101 bridges and reconstructing approximately 3/4 mile of the freeway. The operation of the SPUI would improve the situation at Loop 101 and Northern Parkway; however, the LOS is projected to be F in the 2030 PM peak hour. Since the anticipated cost of reconstructing Loop 101 would be very high and it still would not achieve an acceptable LOS, Alternative 3C Modified was eliminated from further consideration.

### **Alternative 4A**

Alternative 4A incorporates the concept in Alternative 4 that separates through traffic from the local traffic in the vicinity of Loop 101 to help with traffic capacity problems associated with other alternatives. The through traffic bypass to the south as shown in Alternative 4 would be extended west to 103<sup>rd</sup> Avenue and east to 91<sup>st</sup> Avenue forming a separate elevated, free flow facility with access control (see Figure 4). Northern Parkway in Alternative 4A would begin to

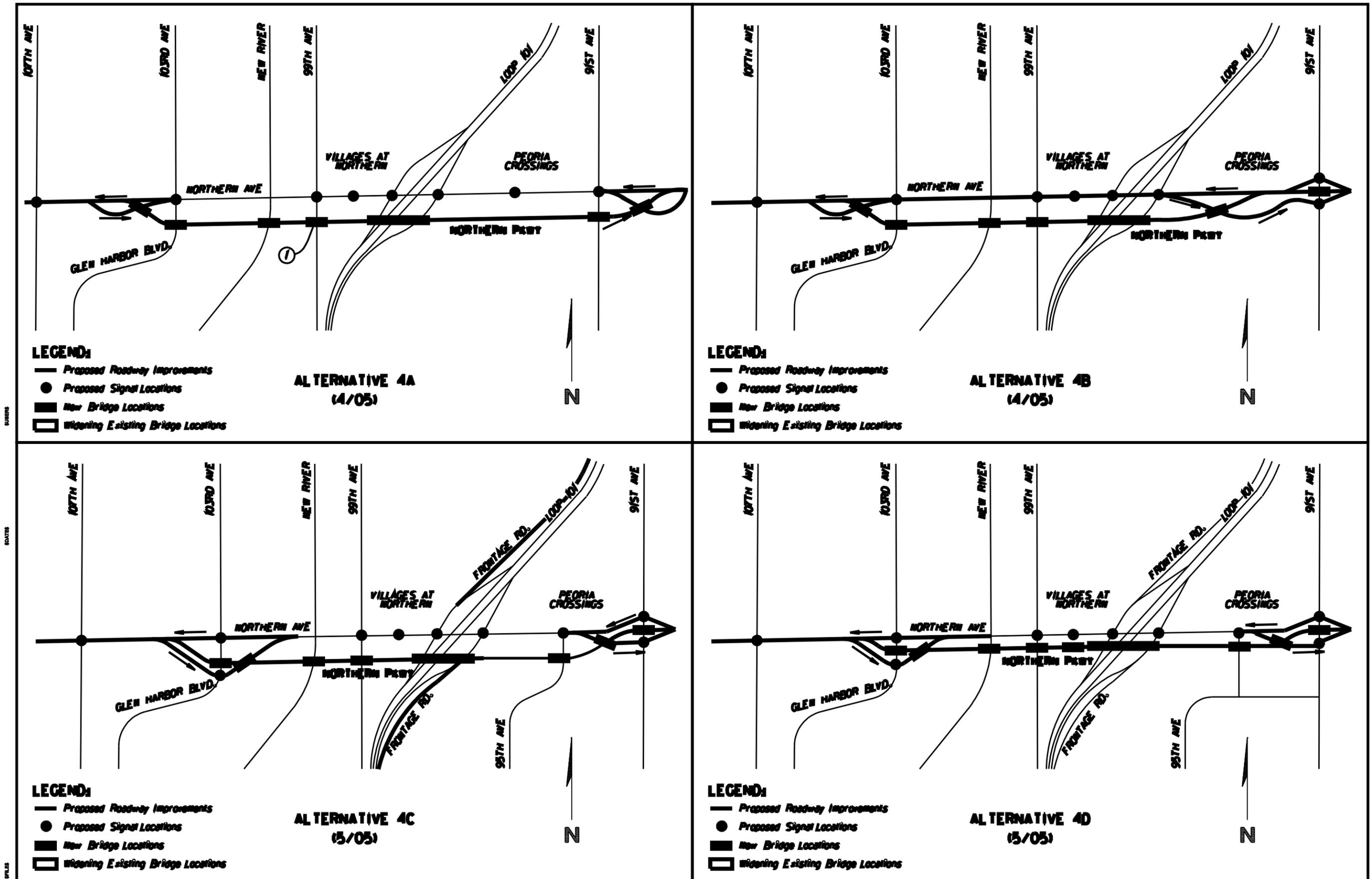


FIGURE 4 - ADDITIONAL ALTERNATIVES

shift to the south west of 103<sup>rd</sup> Avenue and remain on the bypass alignment until 91<sup>st</sup> Avenue where the alignment would shift to the north to rejoin the existing Northern Avenue alignment. Eastbound traffic with destinations adjacent to 103<sup>rd</sup> Avenue, 99<sup>th</sup> Avenue, Villages at Northern, Loop 101, Peoria Crossings, and 91<sup>st</sup> Avenue would exit west of 103<sup>rd</sup> Avenue, bridge over Northern Parkway and join Northern Avenue at 103<sup>rd</sup> Avenue, which would remain an arterial from 103<sup>rd</sup> Avenue to 91<sup>st</sup> Avenue. Eastbound traffic on the Northern Avenue arterial wanting to continue east on Northern Parkway would cross under Northern Parkway east of 91<sup>st</sup> Avenue and merge into the Parkway near 87<sup>th</sup> Avenue. Westbound traffic with destinations adjacent to 91<sup>st</sup> Avenue, Peoria Crossings, Loop 101, Villages at Northern, 99<sup>th</sup> Avenue, and 103<sup>rd</sup> Avenue would exit the Parkway at 91<sup>st</sup> Avenue. Westbound traffic on the Northern Avenue arterial with destinations further west would join Northern Parkway west of 103<sup>rd</sup> Avenue.

Alternative 4A was eliminated from further consideration due to major impacts to the new residential subdivision called Rovey Farm Estates located on the south side of Northern Parkway east of 89<sup>th</sup> Avenue.

#### **Alternative 4B**

Alternative 4B was developed from the Alternative 4A concept to resolve the impacts to Rovey Farms Estates discovered in Alternative 4A. Modifications were made to the eastern portion of the alignment by shifting the southern alignment of the through parkway back to the original Northern Avenue alignment before 91<sup>st</sup> Avenue (see Figure 4). Eastbound Northern Avenue traffic would separate from the westbound traffic east of Loop 101 by going under the Parkway and continue to 91<sup>st</sup> Avenue on the south side of the Parkway.

Alternative 4B was eliminated from further consideration due to major impacts to the Coca Cola site located on the south side of Northern Parkway west of 103<sup>rd</sup> Avenue.

#### **Alternative 4C**

Alternative 4C is a concept developed from Alternative 4B, when it was noticed that the east connector road that was developed between 107<sup>th</sup> Avenue and 103<sup>rd</sup> Avenue had major impacts to an approved Coca Cola development. The concept was to shift the connector road to a location that would not impact the Coca Cola parcel. This was done by beginning a southern deflection of the parkway alignment closer to 103<sup>rd</sup> Avenue (see Figure 4). Eastbound traffic with destinations east of 103<sup>rd</sup> Avenue would exit the Parkway at 103<sup>rd</sup> Avenue and continue east over the Parkway east of 103<sup>rd</sup> Avenue and join Northern Avenue west of New River.

Alternative 4C would accommodate future frontage roads on the west side of Loop 101 from Olive Avenue to Northern Parkway and on the east side of Loop 101 from Glendale Avenue to Northern Parkway. In addition, the traffic signal to Peoria Crossings would remain at its existing location at 93<sup>rd</sup> Avenue and a future realigned 95<sup>th</sup> Avenue from the south connects to Northern Avenue at 93<sup>rd</sup> Avenue. The realigned 95<sup>th</sup> Avenue would go under the elevated Northern Parkway “bypass” with a grade separation structure.

#### **Alternative 4D**

Alternative 4D is similar to Alternative 4C except for the typical section of the elevated “bypass” Northern Parkway. Alternative 4C consists of embankment slopes, which required considerable right-of-way from important property that the City of Glendale envisions being developed into commercial and employment uses in the future. In order to reduce the amount of property needed to construct the Northern Parkway “bypass,” Alternative 4D would have retaining walls instead of embankment slopes. This alternative would allow the alignment of the “bypass” to be located closer to the existing Northern Avenue, which requires less right-of-way (see Figure 4). Alternative 4D would also include a connection to the south at 93<sup>rd</sup> Avenue to Northern Avenue forming a signalized intersection at the existing signalized entrance to Peoria Crossings. A grade-separated connection from Northern Avenue to Parcel B under the Northern Parkway “bypass” roadway would also be included at the location of the future signalized entrance to the Villages at Northern development on the north side of Northern Avenue.

#### **Alternative 5**

This concept was developed with the intent of providing access to 99<sup>th</sup> Avenue, minimizing impacts to the utilities along 99<sup>th</sup> Avenue, and reducing right-of-way impacts to Parcel A.

The concept includes an eastbound and a westbound frontage road from 103<sup>rd</sup> Avenue to 99<sup>th</sup> Avenue as well as slip ramps to and from Northern Parkway east of 103<sup>rd</sup> Avenue and east of 99<sup>th</sup> Avenue (see Figure 5). During development of this concept, it was noticed that there would not be sufficient distance for motorists on the eastbound 99<sup>th</sup> Avenue on-ramp to weave across three lanes of traffic to make a left turn to access the Loop 101 northbound on-ramp. This area would also encounter some conflicting movements from eastbound through traffic on the Parkway wanting access to the southbound on-ramp to Loop 101. This alternative was eliminated from further consideration due to the difficulty of the anticipated weaving movements between the eastbound on ramp at 99<sup>th</sup> Avenue to northbound Loop 101 ramp and eastbound Parkway traffic to southbound Loop 101 ramp traffic.

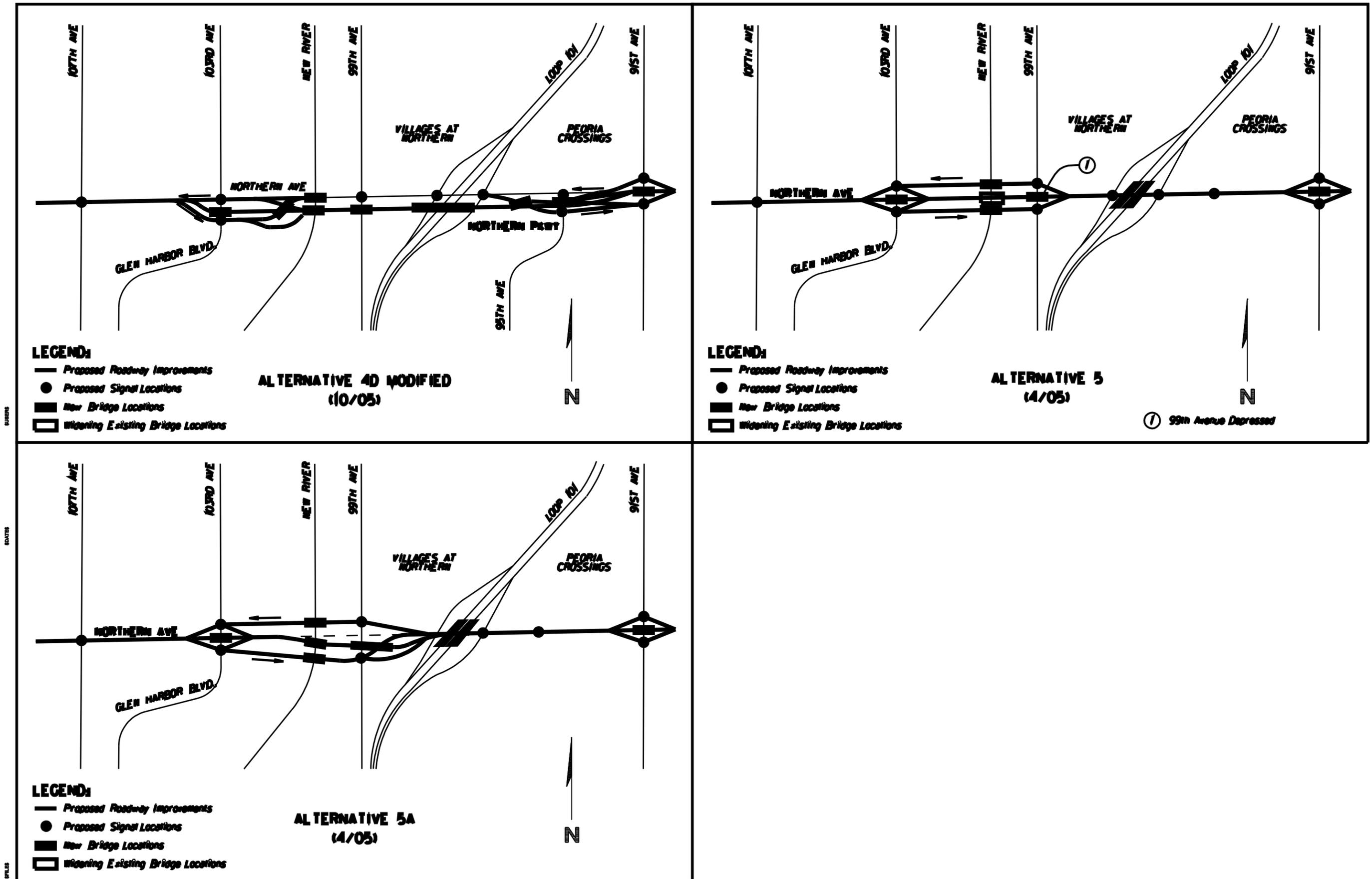


FIGURE 5 - ADDITIONAL ALTERNATIVES

## Alternative 5A

This alternative was investigated when Alternative 5 failed to accommodate all the necessary weaving movements between 99<sup>th</sup> Avenue and Loop 101 ramps. The concept provides an eastbound and a westbound frontage road between 103<sup>rd</sup> Avenue and 99<sup>th</sup> Avenue separated by the Parkway through traffic similar to Alternative 5 (see Figure 5). The Parkway traffic would go over 99<sup>th</sup> Avenue with separate bridges. The eastbound 99<sup>th</sup> Avenue on-ramp would begin on the south side of the Parkway, cross under the eastbound Parkway traffic, and merge into the Parkway from the left just west of Loop 101.

The concept would allow access to and from 99<sup>th</sup> Avenue to the Parkway but encountered constraints in providing access to southbound Loop 101. The tight diamond configuration at 99<sup>th</sup> Avenue could not easily accommodate another ramp that would provide access onto the southbound Loop 101 on ramp and accommodate the merge from vehicles along eastbound Northern Parkway desiring to go onto the same ramp. This concept was abandoned due to complexity with the merges in advance of the Loop 101 ramp terminal.

## EVALUATION

Alternatives 3C, 4C, and 4D were selected for further evaluation while the remaining alternatives were eliminated from additional analysis. Table 2 contains an evaluation matrix for the three alternatives. Alternative 4C was eliminated from further consideration since it is the most expensive, does not provide improvement in traffic operation over Alternative 4D, and requires too much right-of-way from prime commercial property.

Alternative 3C will cost about \$24 million less than Alternative 4D but will require much more right-of-way primarily due to the “jug handles.” Alternative 3C cannot meet the needs of the 2030 forecast traffic especially at Loop 101. This alternative limits the capacity of the Parkway to just slightly more than a typical arterial street. Access to the properties east and west of Loop 101 with Alternative 3C could be provided by traffic signals on Northern Parkway, but these signals would add considerably to the congestion on the parkway. The capacity can be increased by the elimination of the proposed Loop 101 frontage roads and elimination of property access signals east and west of Loop 101.

Alternative 4D provides twice the capacity for Northern Parkway at Loop 101 and can serve the 2030 forecast volumes for all movements except the turn movements between the west leg of Northern Parkway and the south leg of Loop 101. This alternative provides good access to

**TABLE 2  
ADDITIONAL ALTERNATIVES**

**Northern Parkway Alternatives**  
103rd Avenue to 91st Avenue

<b>Evaluation Criteria</b>	<b>Alternative 3C</b>	<b>Rank</b>	<b>Alternative 4C</b>	<b>Rank</b>	<b>Alternative 4D</b>	<b>Rank</b>
New Structures In Addition to Northern Pkwy DCR Concept	99th Avenue over Northern Parkway	1	EB Crossover East of 103rd, New River Bridge, 99th Ave Bridge, Parcel B Access Bridge, Loop 101 Bridge, 95th Ave Bridge, EB Crossover West of 91st Ave	3	EB Crossover East of 103rd, New River Bridge, 99th Ave Bridge, Parcel B Access Bridge, Loop 101 Bridge, 95th Ave Bridge, EB Crossover West of 91st Ave	3
Access to Streets and Properties between 103rd and 91st Avenues	Access Provided via 99th Avenue "Jug Handles" , 91st Avenue, 103rd Avenue, and right in/right/out to Properties	3	Motorists must exit at beginning of Segment, then has full access to Properties	2	Motorists must exit at beginning of Segment, then has full access to Properties	2
Northern Parkway Through Traffic	Parkway Traffic Intersects Loop 101 Ramp Traffic	3	Parkway Traffic is Free Flow from 107th to 87th Avenues	1	Parkway Traffic is Free Flow from 107th to 87th Avenues	1
Access to Peoria Crossing	Existing Signal to be Relocated	2	Existing Signal to Remain	1	Existing Signal to Remain	1
Access to 95th Avenue	Does not provide connection	3	Provides connection at existing Peoria Crossing Signal	1	Provides connection at existing Peoria Crossing Signal	1
Access to the Villages at Northern	Does not Provide Signal	2	Provides Signal on Northern Avenue	1	Provides Signal on Northern Avenue	1
Capacity on Northern at Loop 101	3100 vph one way; V/C=1.47	2	6425 vph one way; V/C=0.69	1	6425 vph one way; V/C=0.69	1
Impact to Loop 101	Replace Loop 101 Bridges to Widen Northern. LOS F	3	Don't Need to Replace Loop 101 Bridges. LOS F	2	Don't Need to Replace Loop 101 Bridges. LOS F	2
Right-of-Way	51.5 Acres	2	53.8 Acres	3	37.8 Acres	1
Relative Cost	\$60 million	1	\$84 million	3	\$79 million	2

abutting properties from Northern Avenue, but Parkway traffic will have to exit at either 103<sup>rd</sup> Avenue or 91<sup>st</sup> Avenue to access property and Loop 101. Alternative 4D provides capacity through the critical 103<sup>rd</sup> Avenue to 91<sup>st</sup> Avenue segment of Northern Parkway that is commensurate with the rest of the Parkway; however, it does not fully accommodate all movements at Loop 101. Elimination of the proposed frontage roads would improve its ability to meet the future needs of the interchange. Alternative 4D also allows Northern Avenue to operate satisfactorily with minor arterial improvements for a long time prior to construction of the “bypass” and construction of the “bypass” will not severely impact the operation of Northern Avenue during construction.

## **RECOMMENDATION**

Alternative 4D is the recommended alternative for Northern Parkway between 103<sup>rd</sup> Avenue and 91<sup>st</sup> Avenue since it best meets the traffic needs of the anticipated 2030 traffic volumes and requires less right-of-way from the prime developable commercial property adjacent to the Parkway. Alternative 4D was presented to both the Northern Parkway Management Committee and the Northern Parkway Technical Advisory Committee and was adopted as the recommended alternative.

## **ALTERNATIVE 4D MODIFIED**

Subsequent to the adoption of Alternative 4D as the recommended alternative, a modification to Alternative 4D was proposed to improve the traffic operation of the Northern Avenue/Loop 101 interchange. The modification consisted of adding the east ramps at 103<sup>rd</sup> Avenue and the west ramps at 91<sup>st</sup> Avenue to allow traffic from these two arterials access the Parkway without going through the traffic signals at 99<sup>th</sup> Avenue, Villages at Northern, Loop 101, and Peoria Crossings (see Figure 5). To accommodate these new ramps, the eastbound crossover to Northern Avenue east of 103<sup>rd</sup> Avenue needs to be shifted to the east close to the New River. This shift required the reconstruction of the Northern Avenue New River Bridge and raising the intersection of 99<sup>th</sup> Avenue and Northern Avenue approximately 2 feet. Similarly, the eastbound Northern Avenue traffic needs to shift to the south side of the parkway “bypass” east of Loop 101 to allow for the west ramps for 91<sup>st</sup> Avenue. In addition, the traffic signal for Peoria Crossings and the realigned 95<sup>th</sup> Avenue from the south needs to be shifted to about the 94<sup>th</sup> Avenue alignment across from the existing west entrance to Peoria Crossings.

Alternative 4D Modified is now the recommended alternative for Northern Parkway between 103<sup>rd</sup> Avenue and 91<sup>st</sup> Avenue because it improves the traffic operation at Northern Avenue and Loop 101.