

**APPENDIX A**  
**NORTHERN PARKWAY LOCATION SELECTION**  
**TECHNICAL MEMORANDUM**

# **NORTHERN PARKWAY LOCATION SELECTION SR 303L to El Mirage Road**

## **Technical Memorandum June 28, 2004**

The purpose of this memorandum is to document the studies, evaluations, and decisions made regarding the selection of the location for the Northern Parkway between SR 303L and El Mirage Road. Due to input from Luke Air Force Base (AFB), the location for the parkway was shifted northward away from the northern end of the runways at the AFB. This paper documents the rationale for recommending the location as displayed in the Northern Parkway Design Concept Report dated October 1, 2003.

When the City of Glendale first envisioned a super street on Northern Avenue, the vision was to upgrade Northern Avenue from SR 303L to Grand Avenue (US 60). The ballot initiative showed the super street as a straight corridor on the Northern Avenue section line. The DCR process began with this location assumption.

A stakeholder task force was formed and comprised of all affected governmental jurisdictions: Glendale, Peoria, El Mirage, Arizona Department of Transportation (ADOT), Maricopa County Department of Transportation (MCDOT), Flood Control District of Maricopa County (FCDMC), Maricopa Association of Governments (MAG), and Luke AFB. This task force met almost every month for a year and helped to guide the formation of the concept for Northern Parkway.

Through these stakeholder meetings, representatives from Luke AFB expressed concern regarding the placement of a grade separation structure at Northern Avenue and Litchfield Road due to the proximity to the end of the runway. The clear zone for the runway includes the existing intersection. Based on this request, the City of Glendale requested that alternative locations be explored that would satisfy the concerns of Luke AFB.

### **INITIAL LOCATION ALTERNATIVE**

Luke AFB indicated that as long as the parkway location was outside the clear zone, grade separation structures could be considered. The height of the structure would need to remain below the glide path. Through extended discussions with Luke AFB personnel, it was determined that if the parkway alignment were at least one-half mile north of Northern Avenue at Litchfield Road, the clearance requirements would be met.

In looking for suitable locations for the parkway, the following main criteria were used:

- Avoid impacts to major existing urban developments or land uses
- Cross major arterials at 90 degree angles
- Avoid unnecessary diagonal alignments across agricultural lands
- Meet minimum design speed criteria for 50 mph

Figure 1 provides an aerial photograph of the corridor area. Major land uses and property ownerships are highlighted on the figure. On the east end, there is a major storage unit property on the north side of Northern Avenue and west of El Mirage Road. The Hanson Pipe Company is just to the west and is planning some additional improvements on their property. As a result, the easternmost point of departure from Northern Avenue is approximately the one-half-mile point between El Mirage and Dysart roads. For the most part, the property to the west between Northern and Olive avenues is in agricultural uses. The major exception is the Falcon Dunes Golf Course which is affiliated with Luke AFB. This property lies in the northeast quarter section of Reems Road and Northern Avenue. It extends north of Northern Avenue one-half mile to the Butler Drive mid-section line halfway between Northern and Olive avenues.

The first location alternative laid out (Alternative A) would cross Dysart Road and then curve northward to the Butler Drive mid-section line and curve again to cross Litchfield Road near 90 degrees. This alternative would meet the Luke AFB clear-zone requirements, avoid urban development and the Falcon Dunes Golf Course, meet the design criteria, and have good perpendicular crossings of Dysart and Litchfield roads. The alternative would create less congestion and delay in the area of Litchfield Road in the event that Luke AFB experienced increased Force Protection levels that require more vehicle stacking/storage while executing enhanced security measures.

On the west end of the corridor, Alternative A would curve back to the Northern Avenue alignment between Reems Road and Sarival Avenue and interchange with SR 303L at Northern Avenue. This alignment has the disadvantages of cutting diagonally through more property and would combine the traffic volumes and functions of the Northern Parkway with those of Northern Avenue. This issue is discussed in more detail below.

## **OLIVE AVENUE**

Consideration was given to having the parkway extend northward to Olive Avenue to connect to SR 303L. Olive Avenue is designated a Road of Regional Significance, serves the White Tank Regional Park, and a grade separation is under construction for Olive Avenue to go over Grand and 75<sup>th</sup> avenues and the Burlington Northern Santa Fe (BNSF) Railroad. Olive Avenue has one of the few bridges over the Agua Fria River.

There are few east-west continuous arterials between SR 303L and SR 101L. Due to Luke AFB, Sun City, and Youngtown, the only through streets between Camelback Road on the south and Bell Road on the north (a distance of 9 miles) are Northern and Olive avenues. This limited road system is in fact one of the main reasons that the Northern super street concept was developed. As a result, it is very important to maintain both arterials and, perhaps, to supplement those arterials with a separate roadway (Northern Parkway) if possible.

The BNSF has a branch track that parallels Olive Avenue on the north side from Cotton Lane, across the SR 303L corridor to 143<sup>rd</sup> Avenue (midway between Bullard and Litchfield roads). The branch track serves an underground natural gas storage facility near Bullard and Olive avenues and a fertilizer plant on Cotton Lane north of Olive. Through discussions with representatives from BNSF, they indicated they would not likely abandon the track or right-of-

way across the SR 303L corridor even if the fertilizer plant were to stop use of the tracks. BNSF views this branch line as an asset to serve future industrial development in the general corridor area.

The presence of this track adjacent to Olive Avenue greatly complicates the design of an interchange at SR 303L. As a result, transferring the Northern Parkway to Olive Avenue at SR 303L was not favored.

Note that there is a recently abandoned BNSF spur track that parallels 143<sup>rd</sup> Avenue extending southward from Olive Avenue to Luke AFB. This track was used to deliver fuel to Luke AFB but that practice was discontinued after the 9/11 terrorist attack. The track is currently not used, but Luke AFB would like to keep it available for potential future use. The Northern Parkway should cross this track perpendicular, and it may have to be grade separated.

Figure 2 illustrates two alternative alignments for the Northern Parkway to transition to Olive Avenue. Alternative B was laid out using minimum horizontal curvature. It would cross Litchfield Road at a very difficult skew angle. Since Litchfield Road is viewed as a major north-south arterial, creation of such a skewed crossing would create traffic and cost issues. This alignment alternative was eliminated.

Alternative C is also shown in Figure 2. This alignment would require two “S” curves to transition from Northern to Olive. These curves cut diagonally through major properties thus reducing their development potential. Access from these properties to the parkway would be reduced in the curve areas. This alignment alternative was eliminated.

Other factors that entered into the discussion were the creation of out-of-direction travel and the potential for driver confusion created by an interchange at SR 303L for Olive that led to a road that became Northern Parkway. With either Alternative B or C, traffic traveling west and wanting to go south on SR 303L would have to travel two miles out of direction. It is believed that keeping the Parkway separate from Northern or Olive avenues would be less confusing to motorists.

For all of the above reasons, the alternatives to link Northern Parkway to Olive Avenue were considered and discarded.

## **SR 303L INTERCHANGE WITH NORTHERN PARKWAY**

The initial alternative described above has Northern Parkway intersecting SR 303L at the Northern Avenue section line, crossing Sarival Avenue, and then curving northward to the Butler Drive mid-section line at Reems Road. The planned interchange for Northern Avenue at SR 303L was a standard diamond as presented in the *SR 303L Initial Design Concept Report, Indian School Road to Clearview Boulevard* prepared for MCDOT by URS and dated April 24, 2002.

With the Northern super street concept, traffic volumes at this interchange would be much greater than projected in 2002. Based on preliminary traffic forecasts from MAG for 2025, it was determined that a westbound to southbound direct flyover ramp would be needed to handle the

projected traffic, and the basic interchange was changed to a single point urban interchange (SPUI) to accommodate higher traffic volumes.

Concurrent with the preparation of the Northern Parkway DCR, URS was working with MCDOT to update the SR 303L Initial DCR prepared in April 2002 to extend it to I-10 and US 60 and to incorporate other changes including the proposed Northern Parkway. It was decided to carry out the evaluation of Northern Parkway/SR 303L interchange locations and concepts as part of the SR 303L DCR. A technical memorandum was prepared, dated June 9, 2003. It is included as an appendix to this technical memorandum.

In the June 9, 2003 technical memorandum, five alternative Northern Parkway/SR 303L interchanges were identified and evaluated. The alternatives are as follows:

**Option 1:** SPUI with WB to SB direct flyover at Northern Avenue.

**Option 2:** WB to SB and NB to EB direct ramps between 303 and Parkway located at Butler Drive mid-section line. Half diamonds would be provided at Northern and Olive avenues connected by north-south one-way frontage roads.

**Option 3:** WB to SB direct ramps at Butler mid-section line and SB to EB and direct flyover at Olive. Olive Avenue would retain a full diamond but Northern Avenue would have a half diamond to the south.

**Option 4:** Fully directional trumpet at Butler Drive mid-section line. No interchanges at Northern or Olive avenues.

**Option 5:** Fully directional trumpet at Butler Drive mid-section line with half diamonds at Northern and Olive avenues connected by north-south one-way frontage roads.

The alternatives were evaluated and ranked based on several criteria. Updated traffic forecasts for 2030 were obtained from MAG and used in the evaluation. Based on input from ADOT, the Federal Highway Administration (FHWA), MCDOT, and the Northern Parkway and SR 303L agency stakeholders, the following recommendation was made:

“Option 5 is recommended as the preferred configuration and inclusion in the DCR for the SR 303L/Northern TI. It offers the highest capacity interchange with all movements accommodated equally to and from SR 303L. The only ramps that would be eliminated are those on the west side of the Northern/Sarival grade-separation intersection, which greatly simplifies the configuration. The ramps that would be eliminated between Northern Avenue and Olive Avenue are replaced by frontage roads, which still maintain access to those streets, and to the White Tank Regional Park via Olive. Construction can be phased to some extent, with frontage roads and individual ramps, although building the entire TI at once would be more cost and operationally efficient. The primary disadvantage of Option 5 is the increased construction and right-of-way cost.”

In addition to the above reasons, Option 5 avoids cutting diagonally through developable property and maintains service interchange and arterial access to properties along Northern and

Olive avenues. It provides the most uniform access from all directions to accommodate a variety of potential development patterns that could occur in the corridor.

Figure 3 shows the recommended location for the Northern Parkway and the SR 303L interchange configuration.

### **ALIGNMENT IN THE BUTLER DRIVE MID-SECTION LINE LOCATION**

Once the Butler Drive mid-section line was chosen for the Northern Parkway location from SR 303L to Litchfield Road, alignment studies were conducted to determine the alignment with the least adverse impact. The recommended alignment at Sarival Avenue is centered on the mid-section line. At approximately the mid-section line between Sarival Avenue and Reems Road, the alignment shifts to the north so that the centerline is approximately 100 feet north of the Butler Drive mid-section line. This alignment was chosen to avoid directly impacting existing farm houses to reduce the number of property owners impacted and to reduce the impact on wells, irrigation systems, and drainage channel.

East of Bullard Road, the alignment shifts slightly to the south so that the centerline would be 75 feet north of the mid-section line and the south right-of-way line would be on the mid-section line. Just west of Litchfield Road, the right-of-way would flair out to accommodate the grade-separated intersection at Litchfield Road. East of Litchfield Road, the alignment curves to the south to the Northern Avenue section line at Dysart Road.

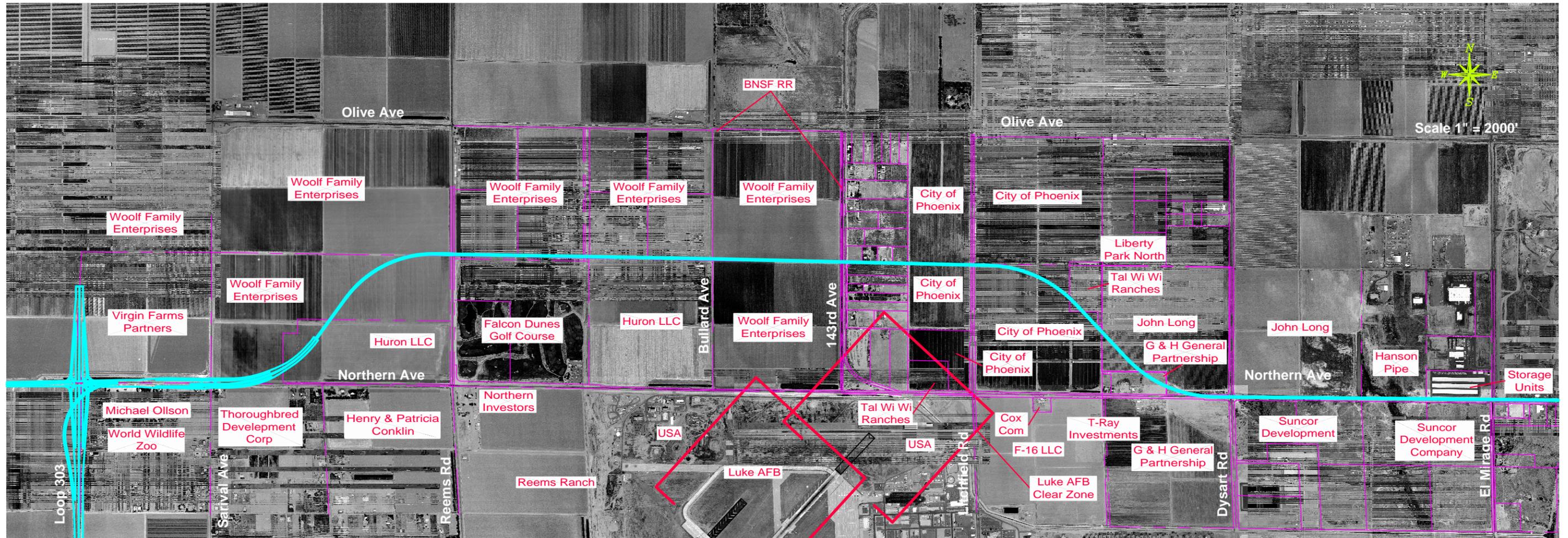
The alignment is shown in more detail in the *Final Design Concept Report for Northern Parkway Volume II* dated October 1, 2003.

### **LUKE AFB FLIGHT PATH ANALYSIS**

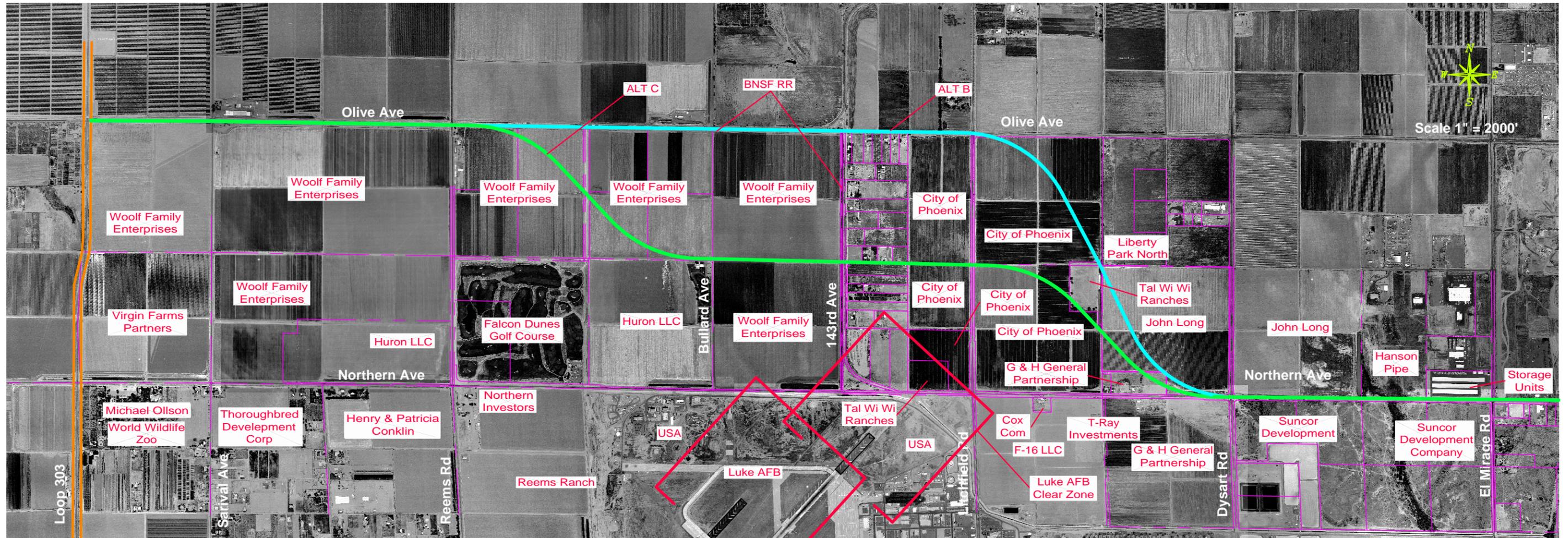
In a meeting held at MCDOT on May 10, 2004, representatives from Luke AFB indicated that some recent changes have been made in their criteria for location of facilities in the approach to runways. As a result, URS prepared more specific drawings to indicate the relationship between the recommended Northern Parkway and the glide path to the runway.

An e-mail and attached graphics are provided in the appendix to this technical memorandum. The graphics indicate that there are no planned structures in the 6,000-foot-long zone of frangibility. The second graphic indicates that the bottom of the glide path would be 27 feet above the top of a standard light pole erected on top of the proposed Northern Parkway structure over Litchfield Road. Lower light poles can be considered if desired.

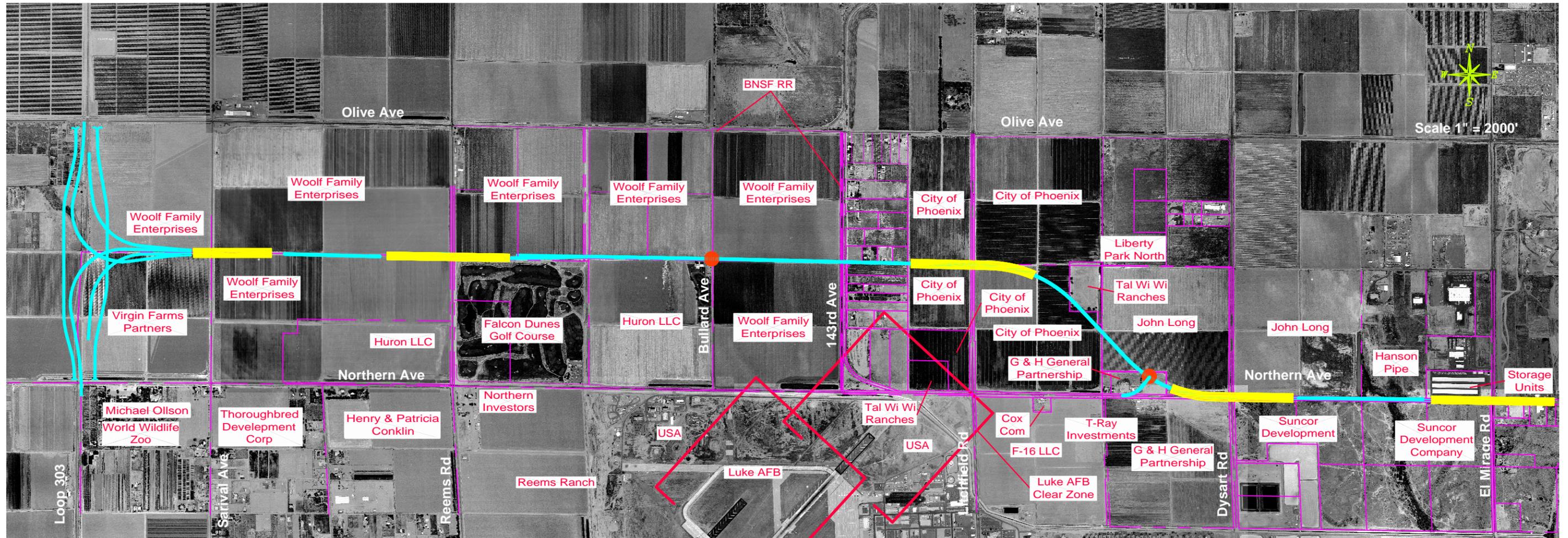
This information was submitted to Luke AFB staff by the City of Glendale staff in May 2004. No adverse comments have been received as of the date of this memorandum.



**FIGURE 1  
INITIAL LOCATION  
ALTERNATIVE A**



**FIGURE 2  
LOCATION  
ALTERNATIVES  
B & C**



**Legend**

-  Grade Separated Intersection
-  Northern Avenue Realignment
-  Signalized Intersection



**FIGURE 3  
RECOMMENDED LOCATION  
FOR NORTHERN PARKWAY**

## Technical Memorandum

### SR 303L/Northern TI Alternatives Evaluation Technical Memorandum and Recommendation of Preferred Alternative

SR 303L I-10 to US 60 DCR/EA  
MCDOT Work Order # 69016

June 9, 2003

#### PURPOSE

The purpose of this memorandum is to document the development of various SR 303L/ Northern TI configurations, the evaluation of those different TI configurations and the recommendations resulting from those evaluations.

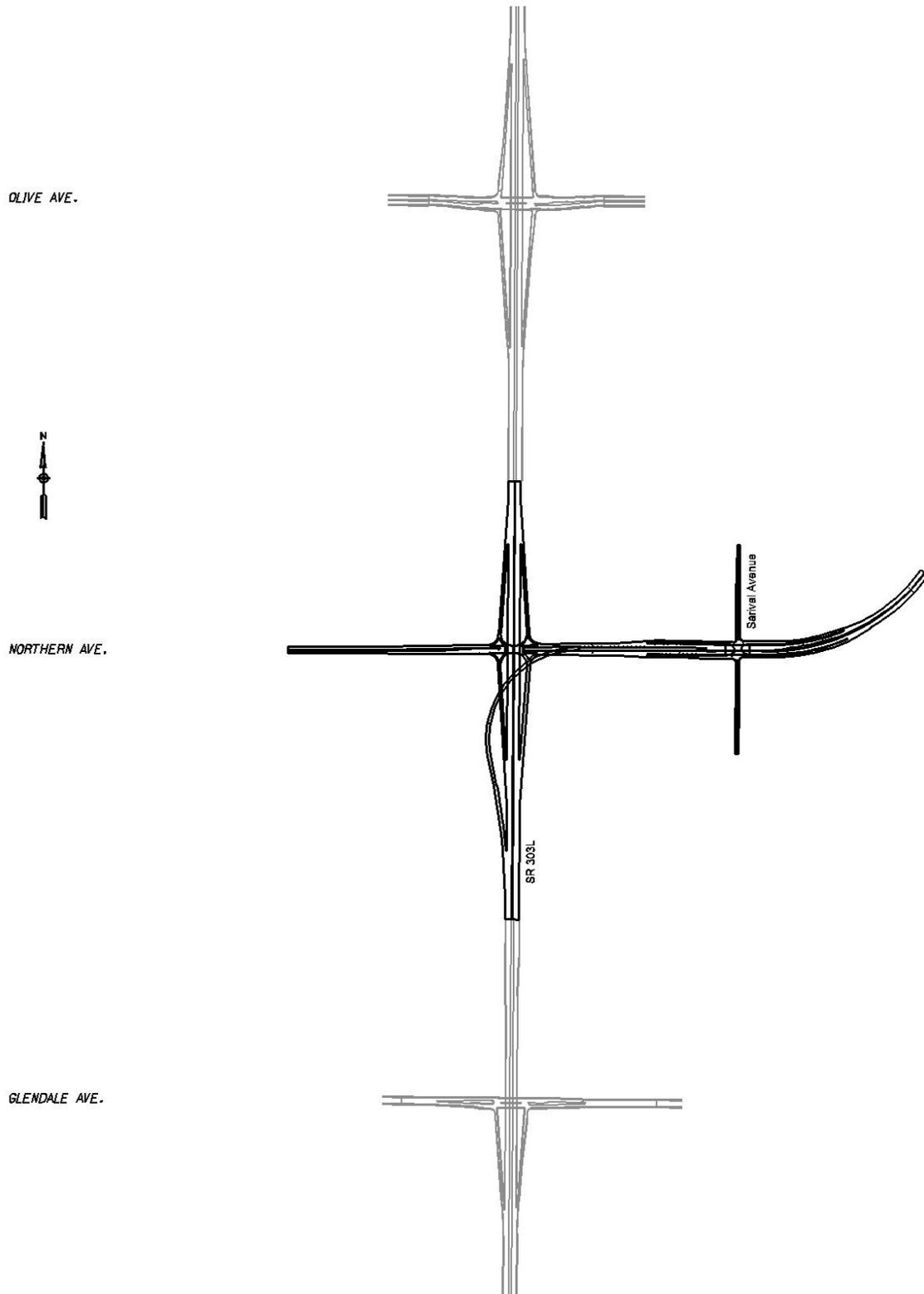
#### BACKGROUND

As part of its contract with the City of Glendale, URS is developing the "Super Street" concept for the Northern Avenue corridor from Grand Avenue to SR 303L. The Super Street will have grade-separated interchanges at the major mile cross streets and traffic signals at the minor half-mile cross streets and is expected to carry upwards of 80,000 vehicles per day with an average travel speed of 45 mph. The typical section would consist of three lanes over the major cross streets and four lanes with no left turns at the minor ones. The Northern Super Street will follow along the current Northern Avenue alignment from Grand Avenue to Dysart Road. At Dysart Road, the roadway alignment shifts ½ mile north to avoid Luke AFB clear zone. As originally proposed by Glendale west of Reems Road, the roadway would shift ½ mile south to return to the existing Northern Avenue alignment and intersect SR 303L at the current Northern Avenue location. Northern will become a major east-west thoroughfare and the connection to SR 303L needs to be carefully considered.

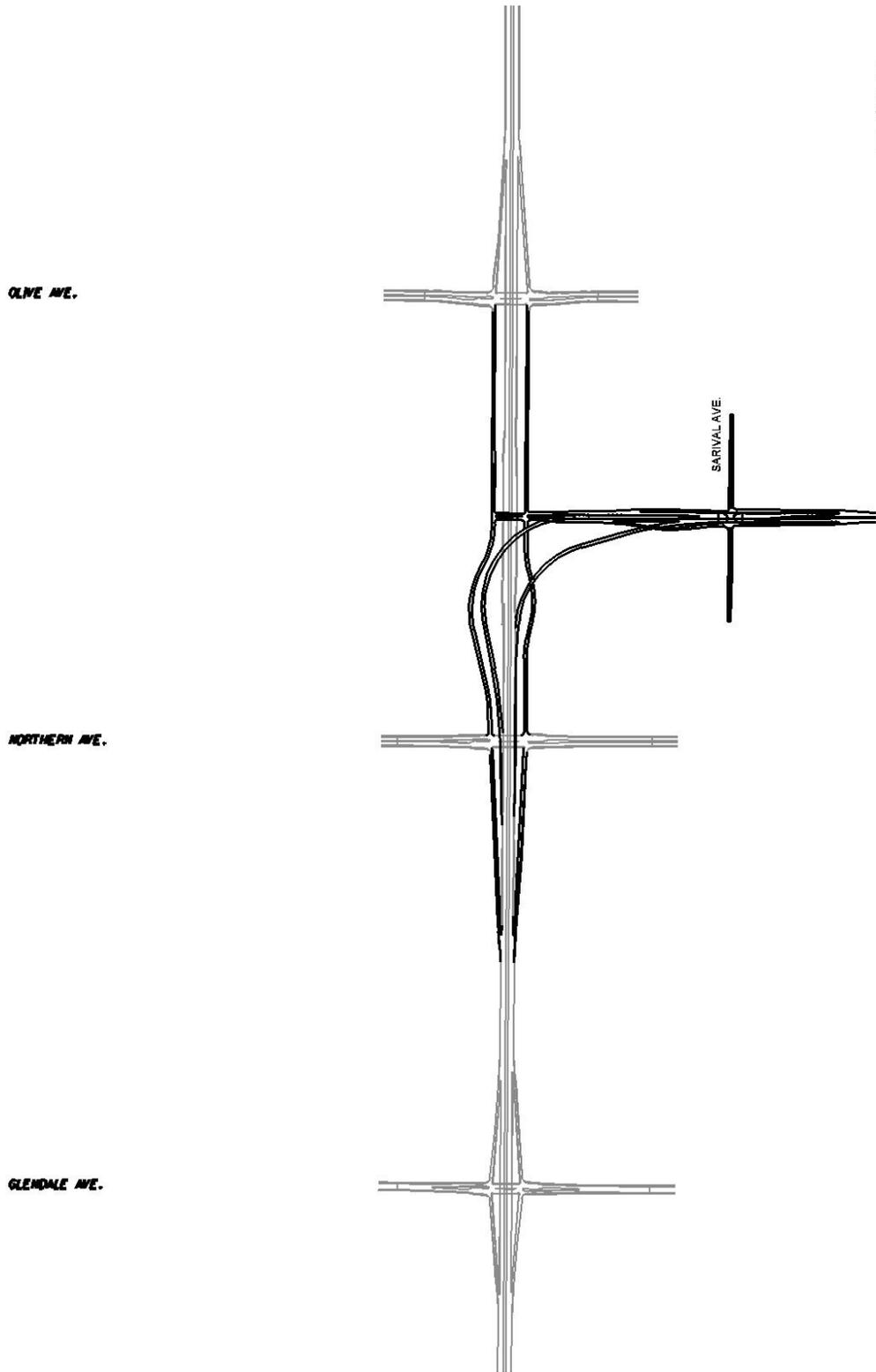
#### DEVELOPMENT OF ALTERNATIVES

A stakeholder meeting was held on April 29, 2003 and major stakeholders present included MCDOT, ADOT, FHWA, MAG, City of Goodyear, City of Glendale, Luke AFB and FCDMC. At that meeting, URS showed two alternative configurations for the SR 303L/Northern TI:

1. Option 1 – This concept consists of a SPUI interchange at the current Northern Avenue location with a directional flyover ramp for the WB-to-SB movement. This was the original TI concept proposed by the City of Glendale (See Figure 1).
2. Option 2 – This concept assumes that the Northern Superstreet remains ½ mile north of the existing Northern Avenue alignment and intersects SR 303L between Olive Avenue and Northern Avenue. Directional ramps would provide free-flow connections for the WB-to-SB and NB-to-EB movements. The ramps on the south side of the Olive TI and the north side of the Northern Avenue TI would be eliminated. One-way frontage roads would connect Olive and Northern and allow all other movements onto SR 303L via the frontage roads (See Figure 2).



**Figure 1**  
**Option 1**  
 SR 303L/Northern TI  
 At Existing Northern Avenue Location



**Figure 2**  
**Option 2**  
 SR 303L/Northern TI  
 At Half Mile Section Line with Frontage Roads

FHWA raised concerns that Option 1 would require three ramps on SB SR 303L between Northern Avenue and Glendale Avenue. At the very least, the ramps on the north side of the Glendale Avenue TI would probably have to be eliminated to accommodate this configuration (Figure 1 reflects the ramp elimination).

A coordination meeting was held on May 13, 2003 between ADOT, MCDOT and URS where Options 1 and 2 were presented for comment. ADOT noted that Option 1 seemed more desirable due to the simpler configuration and signing requirements.

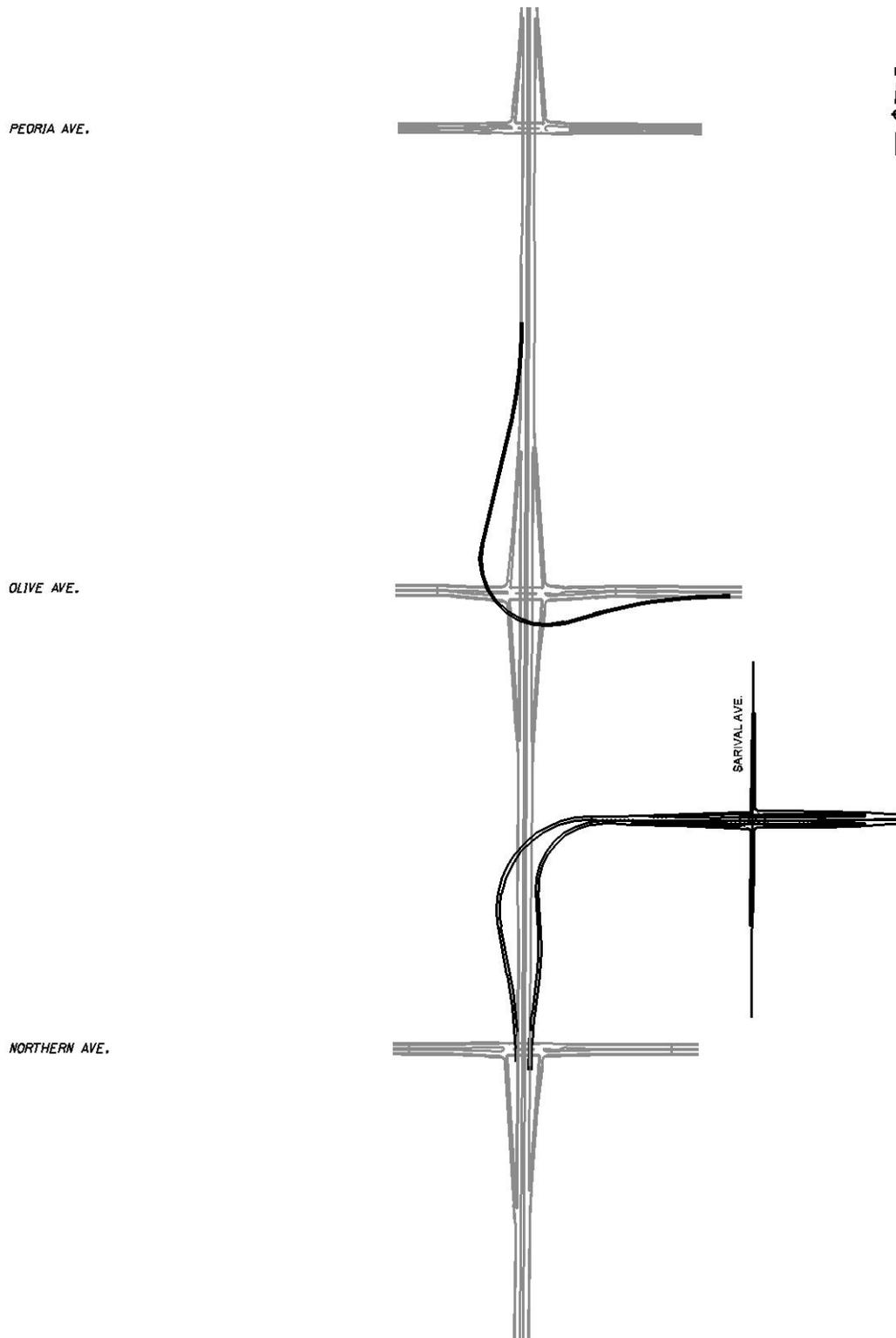
At the regular bi-monthly project status meeting on May 19, 2003, which was attended by MCDOT and URS, four TI configurations were presented:

1. Option 1 – Similar to configuration presented on April 29.
2. Option 2 – Similar to configuration presented on April 29.
3. Option 3 – This option is similar to Option 2 in that it provides flyovers for the WB-to-SB and NB-to-EB movements to and from the Northern Super Street. However, the frontage roads were eliminated and a flyover would be provided at Olive Avenue for the SB-to-EB movement. The ramps on the south side of Olive and the south side of Peoria were eliminated, as well as all four ramps at existing Northern. The ramps on the west side of the Sarival/Northern Super Street TI were eliminated (See Figure 3).
4. Option 4 – This option has fully directional ramps for all movements at the Northern Super Street. All ramps were eliminated at Olive and Northern, and those streets would be grade separated only at SR 303L. The ramps on the west side of the Sarival/Northern Superstreet TI were eliminated. Olive Avenue would tie into the Northern Superstreet at Reems Road (See Figure 4).

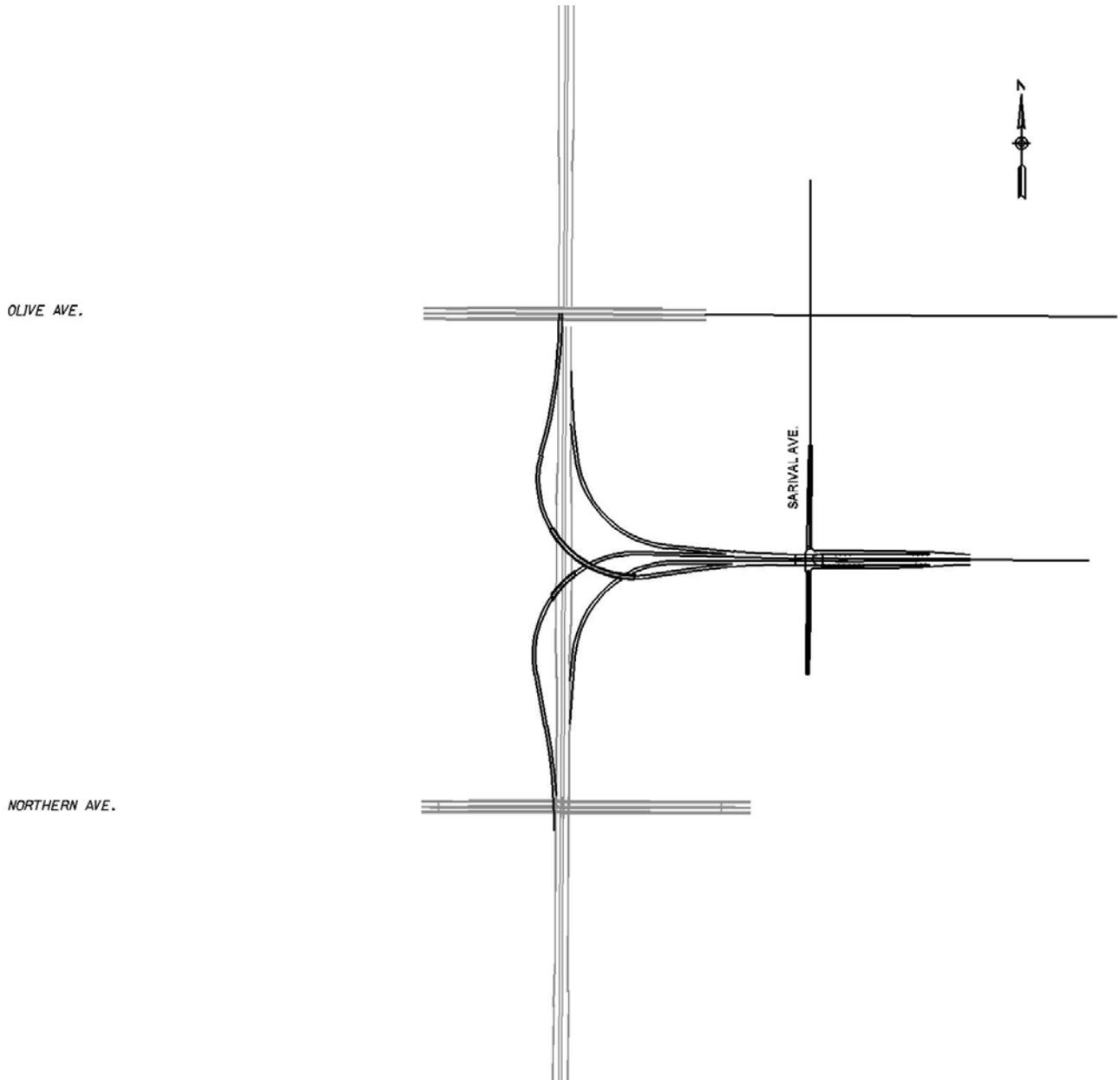
A brief evaluation matrix comparing all four options based on number of free-flow connections, number of ramps eliminated and relative construction cost was presented at the meeting.

A coordination meeting was held on May 28, 2003 between ADOT, City of Glendale and URS in order to discuss the four TI options presented in the project status meeting on May 19. An evaluation matrix compared and ranked all four options based on number of free-flow connections, number of ramps eliminated, additional ROW required, simplicity of connection to the Northern Super Street, number of half diamonds, direct access to the regional park, ease of phased development and relative construction cost. A fifth option (Option 5) was suggested by the City of Glendale in the meeting that combines the split diamond and frontage roads of Option 2 and the full system TI of Option 4 (See Figure 5).

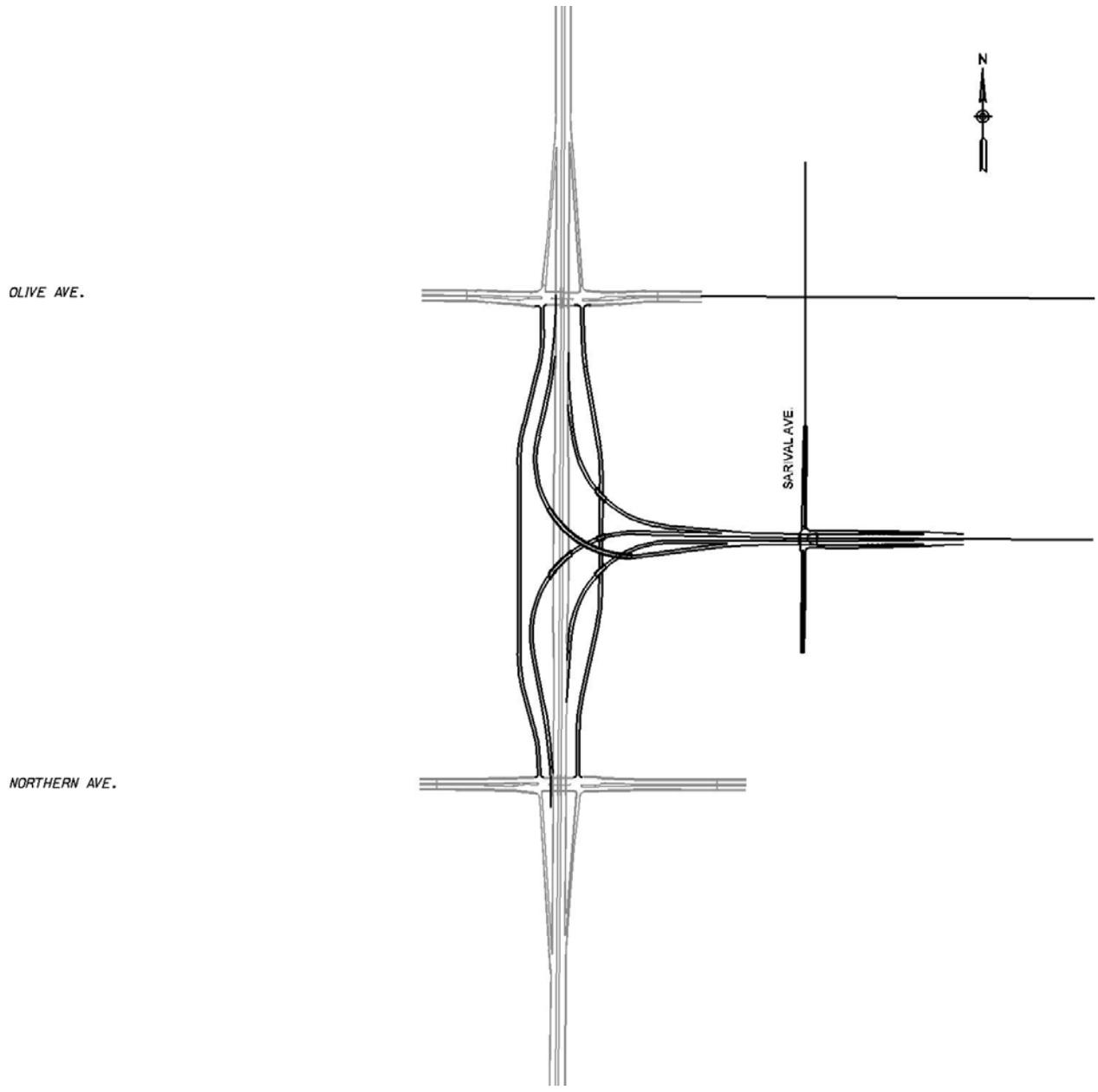
As described above, the five TI alternatives were developed in concert with MCDOT, ADOT, the City of Glendale and other stakeholders through a series of meetings and consultations where comments were made and the different configurations were refined. Option 1 was revised to delete the ramps on the north side of the Glendale TI in response to FHWA's comments at the stakeholder meeting held on April 19, 2003. Other options were similarly refined based on comments at various meetings, mainly to the number of ramps eliminated at nearby TI's. The configurations shown in Figures 1 through 5 are the final iterations to date.



**Figure 3**  
**Option 3**  
 SR 303L/Northern TI  
 At Half Mile Section Line with Directional Ramp at Olive



**Figure 4**  
**Option 4**  
 SR 303L/Northern TI  
 At Half Mile Section Line with Full System TI



**Figure 5**  
**Option 5**  
 SR 303L/Northern TI  
 At Half Mile Section Line with Full System TI and Frontage Roads

## EVALUATION OF ALTERNATIVES

The five Northern TI options were evaluated and ranked on several different factors:

1. Number of free-flow connections – Number of ramps that provide fully directional, free-flow traffic movements between SR 303L and the Northern Super Street. Configurations with more free-flow connections are ranked higher.
2. Number of ramps eliminated – Number of ramps that have to be eliminated from nearby TI's due to the proposed SR 303L/Northern TI configuration. Configurations that eliminated fewer ramps are ranked higher.
3. Additional ROW required – Additional ROW required by the proposed SR 303L/Northern TI configuration over and above the current ROW set aside for SR 303L. ROW from eliminated ramps was assumed to remain and not be sold off. Configurations that require less additional ROW are ranked higher.
4. Simplicity of connection – The simplicity of connection between SR 303L and the Northern Super Street. Takes into account how confusing signing might be, how well the TI coincides with driver expectations and how direct the route is to Northern. Configurations that would be less confusing and less complex are ranked higher.
5. Number of half diamonds – Half diamond TI's are generally not favored because of potential driver confusion. Configurations with fewer half diamonds are ranked higher.
6. Direct access to the regional park – This factor measures the directness or circuitousness of the access to the White Tank Regional Park located west on Olive Avenue. Configurations with more direct access to the park are ranked higher.
7. Ease of phased development – The ease of constructing parts of the configuration as an interim TI configuration. Also takes into account the ease of upgrading the interim TI to the ultimate configuration. Configurations that are more easily constructed in phases are ranked higher.
8. Relative construction cost – A broad-brush estimate of relative construction cost of the configurations, not including additional ROW costs. Less expensive configurations are ranked higher.

At the coordination meeting held on May 29, 2003, ADOT and the City of Glendale expressed disfavor with Option 2 because it provides indirect movements between the Northern Super Street and the north leg of SR 303L. Connections to Olive from SR 303L south leg would also be indirect and require traffic to pass through 2 or 3 signalized intersections. Option 3 was also not favored because of the separation of movements from SR 303L to Olive and Northern. There would be driver confusion to exit at Olive to reach Northern. These comments were considered in the evaluation and ranking. The evaluation matrix is shown in Figure 6. Option 1 would provide unbalanced capacity for the various movements between SR 303L and Northern Super Street. Option 1 would eliminate access to too many arterials.

**Northern Superstreet TI Comparison - Ranked**

	OPTION									
	1		2		3		4		5	
	Rank	Comments	Rank	Comments	Rank	Comments	Rank	Comments	Rank	Comments
<b>No. of Free-Flow Connections</b>	4	1 @ Northern: WS	3	2 @ Northern: WS & NE	2	2 @ Northern: WS & NE 1 @ Olive: SE	1	4 @ Northern: WS, NE, SE, WN	1	4 @ Northern: WS, NE, SE, WN
<b>No. of Ramps Eliminated</b>	1	2 - N. side of Glendale	2	Ramps between Olive & Northern replaced by frontage roads	3	2 - S. Side of Peoria 2 - N. Side of Northern	4	All 4 at Olive All 4 at Northern 2 - W. side of TI at Sarival & Northern SS	2	Ramps between Olive & Northern replaced by frontage roads; 2 - W. side of TI at Sarival & Northern SS
<b>Additional ROW Required</b>	1	Add'l ROW req'd in SW quad.(~ 5 ac)	3	Add'l ROW req'd betw. Olive & Northern for FR & ramps (~ 45 ac)	3	Add'l ROW req'd @ Olive & N. of Northern (~ 40 ac)	4	Add'l ROW req'd betw. Olive & Northern for ramps (~ 40 ac)	5	Add'l ROW req'd betw. Olive & Northern for ramps & SR (~ 65 ac)
<b>Simplicity of Connection - SR303L &amp; Northern SS</b>	2	Simpler signing - no confusion between Northern SS and Northern Ave.	4	More complex signing and possibility of confusion betw. Northern SS & Northern Ave.; Dir. ramps for WS & NE movements only - all other movements require exiting 1/2+ mile ahead & going thru FR	3	Some possibility of confusion betw. Northern SS & Northern Ave.; Only WS & NE movements accommodated - all other movements require use of arterial network to access Northern SS	1	Some possibility of confusion betw. Northern SS & Northern Ave.; All movements accommodated to/from Northern SS	1	Some possibility of confusion betw. Northern SS & Northern Ave.; All movements accommodated to/from Northern SS
<b>No. of Half Diamond TI's</b>	2	1 Half Diamond @ Glendale	1	No Half Diamonds	2	1 Half Diamond @ Peoria	1	No Half Diamonds	1	No Half Diamonds
<b>Direct Access to White Tank Regional Park</b>	1	Exit ramps @ Olive	2	Exit ramps on N. side of Olive w/ FR on S. side	1	Exit ramps @ Olive	4	No ramps @ Olive; must reach park using arterial network	2	Exit ramps on N. side of Olive w/ FR on S. side
<b>Phased Development</b>	2	SPUI @ Northern could be built in interim and flyover added later when warranted	3	FR could be built in interim and dir. ramps built later when warranted	1	Dir. ramp @ Olive could be delayed until warranted	4	Dir. ramps could be built separately as warranted, but should be built all at once	3	FR could be built in interim and dir. ramps built later when warranted
<b>Relative Construction Cost</b>	1	Least - addition of one flyover bridge and retaining walls	3	Moderately costly - 4 bridges, retaining walls, 2 miles of frontage roads	2	Moderate - 2 flyover bridges	2	Moderate - 2 flyover bridges	4	Most - 5 bridges & 2 miles of FR

**Figure 6**  
Evaluation Matrix

## RECOMMENDATION

Option 5 is recommended as the preferred configuration and inclusion in the DCR for the SR 303L/Northern TI. It offers the highest capacity interchange with all movements accommodated equally to and from SR 303L. The only ramps that would be eliminated are those on the west side of the Northern/Sarival grade-separated intersections, which greatly simplifies the configuration. The ramps that would be eliminated between Northern Avenue and Olive Avenue are replaced by frontage roads, which still maintain access to those streets, and to the White Tank Regional Park via Olive. Construction can be phased to some extent, with the frontage roads and individual ramps, although building the entire TI at once would be more cost and operationally efficient. The primary disadvantage of Option 5 is the increased construction and ROW costs.