# I-10/SR-101L
# System Traffic Interchange

## Ramp Feasibility Analysis

Prepared for

MARICOPA ASSOCIATION of GOVERNMENTS

Prepared by

**BURGESS & NIPLE**

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**November 2018**

## Table of Contents

## List of Figures



## List of Appendices

# 1.0 Introduction

The Interstate 10 (I-10) and State Route SR-101L (SR-101L) System Traffic Interchange (TI) Ramp Feasibility Analysis is being conducted by the Maricopa Association of Governments (MAG) to evaluate the feasibility of two new ramp connections. The Study Planning Partners include MAG, the Arizona Department of Transportation (ADOT), city of Tolleson (Tolleson), city of Avondale (Avondale), and city of Phoenix (Phoenix). The analysis is preliminary in nature; the Federal Highway Administration (FHWA) will be engaged during the next steps of project development.

## 1.1 Study Overview

Two additional connections were identified and evaluated during the study: (1) a new Direct High-Occupancy Vehicle (DHOV) ramp within the existing I-10/SR-101L system TI and (2) a new connection between southbound SR-101L and 91st Avenue. The proposed DHOV ramp will accommodate travel to/from the north along SR-101L and to/from the east along I-10. The proposed connection between SR-101L and 91st Avenue supplements the I-10/SR-101L system TI ramps and I-10/91st Avenue service TI ramps.

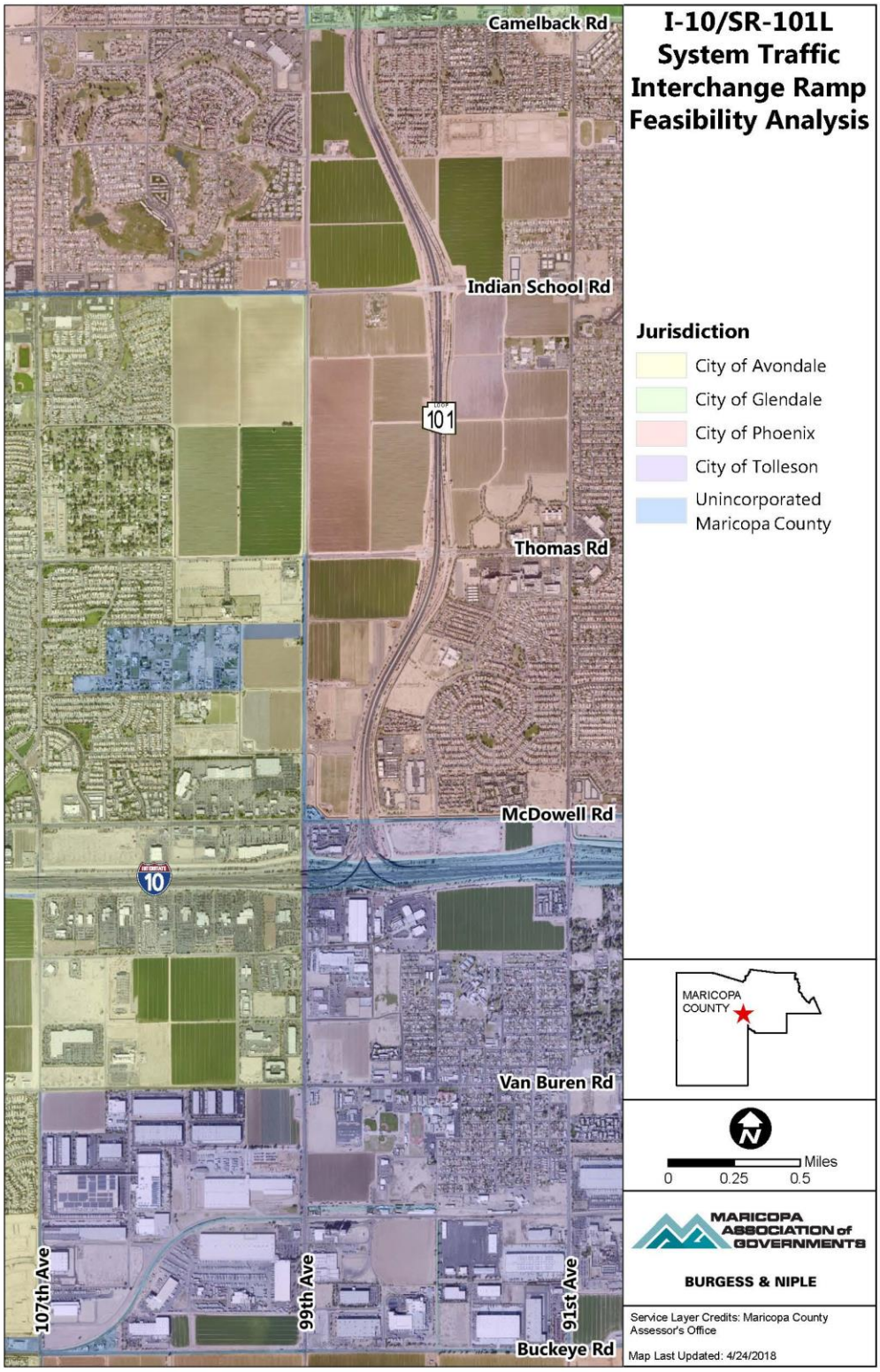
## 1.2 Study Area

The Study Area consists of the I-10/SR-101L system TI and is bound by 99th Avenue to the west, 91st Avenue to the east, and Thomas Road to the north. The Study Area is within both the cities of Tolleson and Phoenix, and adjacent to the city of Avondale to the west.

The system TI provides directional ramps serving all major system movements between I-10 and SR-101L. Nested within the system TI are the I-10 service TIs with 99th Avenue and 91st Avenue. Within the study area, SR-101L has a partial diamond TI at McDowell Road and a full diamond TI at Thomas Road.

A map of the Study Area is included as ***Figure 1***.

## Figure 1 – Study Area Map



# 2.0 Study Approach

## 2.1 Background Information

In 2016, a conceptual study produced by ADOT was undertaken to evaluate the improvements required at the I-10/SR-101L system TI to add a DHOV ramp. Produced from this was an alternative that would require the replacement of the eastbound I-10 to northbound SR-101L ramp and the 91st Avenue Bridge over I-10.

The current study is intended to identify an additional feasible alternative for the DHOV ramp and a connection from southbound SR-101L to 91st Avenue. These alternatives are planned with the future SR-101L general purpose lane (GPL) widening project in mind. Design funds for this project are currently programmed for fiscal year 2023.

## 2.2 Stakeholder Engagement

A kickoff meeting and two progress meetings were conducted with the project stakeholders.

### 2.2.1 Kickoff Meeting

The kickoff meeting took place on April 25, 2018, in the city of Tolleson's City Hall conference room. Representatives from MAG, ADOT, the city of Tolleson, and the design team attended the meeting. The meeting purpose was to introduce the study, provide an overview of the background information, review Study Area issues, and to initiate concept development. Study Area issues included weaving (lane changes) from the I-10 High-Occupancy Vehicle (HOV) lane to the SR-101L exit ramp, proper signing and layout, and reducing impacts to existing structures and private property. The attendees participated in a workshop planning exercise where multiple potential alternatives were sketched. The stakeholders agreed to reconvene in June to discuss preliminary findings.

Meeting materials for each of the following meetings, including agenda, presentation, and summary, are provided in **Appendix A**.

### 2.2.2 Progress Meeting One

Progress Meeting One took place on June 19, 2018, in the city of Tolleson's City Hall conference room. Representatives from MAG, ADOT, the city of Tolleson, and the design team attended the meeting. The meeting purpose was to discuss the progress made on

DHOV ramp alternatives and 91st Avenue access alternatives. Alternative specifics pertaining to right-of-way requirement, structure requirements, maintenance of traffic, driver convenience, safety, and order of magnitude cost were presented for each alternative. Meeting attendees held a brief discussion regarding potential alternative evaluation criteria. Proposed criteria were safety, value (as opposed to cost), operations (merge/weave/signage/safety), and constructability.

### 2.2.3 Progress Meeting Two

Progress Meeting Two took place on September 25, 2018, in the city of Tolleson's City Hall conference room. Representatives from MAG, ADOT, the city of Tolleson, and the design team attended the meeting. The meeting purpose was to discuss the DHOV ramp alternatives and the 91st Avenue access alternatives. Alternative specifics pertaining to right-of-way requirement, structure requirements, driver convenience, and safety were presented for each alternative. Alternative 1 and Alternative E were selected as the preferred alternatives for DHOV connection and 91st Avenue access, respectively.

## 2.3 Regional Travel

To continue to develop the DHOV lane network in the Phoenix metropolitan highway system, a connection from I-10 to SR-101L is necessary. This study investigated alternatives that would create this connection. During the study, an existing weaving issue was discovered on southbound SR-101L.

### 2.3.1 DHOV Connection

Six system TIs within the Phoenix metropolitan area have DHOV ramps:

(1) I-10 (Maricopa Freeway)/SR-202L (Red Mountain Freeway)/SR-51;
(2) I-10 (Maricopa Freeway)/US-60 (Superstition Freeway);
(3) I-10 (Maricopa Freeway)/SR-202L (Santan Freeway and South Mountain Freeway);
(4) SR-101L (Price Freeway)/SR-202L (Santan Freeway);
(5) SR-101L (Pima Freeway)/SR-51; and
(6) I-10 (Papago Freeway)/SR-202L (South Mountain Freeway) *(under construction)*.

At the existing I-10 (Papago Freeway)/SR-101L (Agua Fria Freeway) system TI under study, westbound I-10 HOV traffic destined for northbound SR-101L must traverse four lanes of traffic to exit to SR-101L. A DHOV ramp would eliminate this weave.

### 2.3.2 Weave

A planning level weave analysis was performed for the section of southbound SR-101L between the Thomas Road entrance ramp and McDowell Road exit ramp with future year (2040) traffic using HCS7 software. The analysis assessed a build scenario in which the weave section has five lanes (four GPL and one HOV), the Thomas Road entrance ramp has one lane, and the McDowell Road exit ramp has one lane. This is the configuration proposed by the future SR-101L GPL widening project.

2040 ramp and freeway traffic volumes were developed using the 2017 volumes in the ADOT Transportation Data Management System (TDMS) as a basis and the MAG 2040 Model Year forecasts. The growth factors from ADOT TDMS were also compared to the model based growth for validation purposes.

The analysis of the planning level traffic volumes indicates the weaving segment is anticipated to perform at Level-of-Service (LOS) F in 2040 for the described configuration. This failing level of service was previously unknown and was discovered through this study.

A cursory analysis of the weave for different entrance and exit ramp lane configurations (while maintaining all existing access points) was conducted. No braid-less configuration was identified that provided acceptable LOS values using 2040 traffic.

## 2.4 Local Travel

Due to the geometric configuration of the existing I-10/SR-101L system TI and the proximity of the adjacent service TIs, there is no direct access from southbound SR-101L to 91st Avenue. In existing conditions, traffic must exit from southbound SR-101L onto McDowell Rd and travel east to reach 91st Avenue. Direct access from SR-101L to 91st Avenue is desirable for the city of Tolleson.

# 3.0 Preferred Alternatives

Two alternatives were investigated to provide DHOV connection and five alternatives were investigated to provide access to 91st Avenue. The stakeholders reviewed the various concepts and identified Conceptual Alternative 1: DHOV Ramp and Conceptual Alternative E: Braided Ramp to 91st Avenue as the preferred alternatives.

**Appendix B** includes roll plots depicting the preferred alternatives.

## 3.1 Alternative 1: DHOV Ramp

Conceptual Alternative 1 is a freeway-to-freeway system interchange ramp from westbound I-10 to northbound SR-101L and southbound SR-101L to eastbound I-10 for HOV traffic only.

### 3.1.1 Geometric Observations

The typical DHOV ramp cross-section of this alternative consists of two (2) twelve-foot lanes, with ten-foot outside shoulders and six-foot inside shoulders separated by barrier wall. The proposed construction centerline aligns with the inside barrier wall.

The ramp initially splits vertically from mainline I-10 approximately 2,000 feet west of 91st Avenue, flies over westbound I-10 and Ramp E-N, parallels the SR-101L mainline, and ties in vertically approximately 2,500 feet north of McDowell Road. There is 33 feet of separation between the southbound and northbound SR-101L bridges over McDowell Road. Consequently, the DHOV ramp is two levels (approximately 45 feet) above McDowell Road.

To create the necessary lateral space for the DHOV ramp, I-10 and SR-101L mainlines are realigned as the ramp approaches the highway mainlines to tie-in vertically. Vertical geometry was not designed, but was considered using engineering rules-of-thumb. The geometry has enabled all existing ramps to be salvaged. In this alternative, the vertical levels of infrastructure in the TI are as follows:

- Level 0: 99th Avenue
- Level 1: I-10 Mainline, McDowell Road
- Level 2: S-W Ramp, S-E Ramp, W-N Ramp
- Level 3: E-N Ramp
- Level 4: DHOV Ramp

The new fly-over structure will be elevated approximately 80 to 100 feet above Level 1 and will become the highest level in the interchange.

### 3.1.2 Operations

The DHOV ramp eliminates the weaving motion of traffic moving from the HOV lanes when traveling to/from the north along SR-101L and to/from the east along I-10. The elimination of weaving increases safety for all traffic on I-10 and SR-101L. Since the DHOV ramp will tie-into and extend the existing HOV lanes, the main operations concern is signing. Consequently, a detailed signing discussion is included in the following section.

#### 3.1.2.1 Signing

The signing along westbound I-10 and southbound SR-101L will be modified to communicate the ramp destination to HOV traffic. Signs detailed below are necessary based on new roadway operations. Additionally, existing signs that conflict with proposed construction activities will need to be relocated.

The following signs would be removed along southbound SR-101L:

- "Lane Ends" warning sign located north of Thomas Road and
- "HOV Lane Ends Merge Right" overhead signs on the Indian School Road Bridge.

The following signs would be placed:

- Exit Direction signs at the nose of painted gore on both westbound I-10 and southbound SR-101L
- A sequence of Advance Guide signs on each freeway approaching the DHOV ramp:
    - On southbound SR-101L, a sign with legend "HOV EAST I-10 ½ MILE" is to be placed on the existing overhead sign structure located at Thomas Road;
    - On southbound SR-101L, a sign with legend "HOV EAST I-10 1½ MILES" is to be placed on the Indian School Road Bridge;
    - On westbound I-10, a sign with legend "HOV EAST LOOP 101 ¼ MILE" is to be placed on the 91st Avenue Bridge;
    - On westbound I-10, a sign with legend "HOV EAST LOOP 101 ½ MILE" is to be placed on the existing overhead sign structure located at the 91st Avenue exit ramp; and
    - On westbound I-10, a sign with legend "HOV EAST I-10 1½ MILES" is to be placed on the 83rd Avenue Bridge.

### 3.1.3 Structure Requirements

This alternative requires approximately 3,780 lineal feet of DHOV ramp structure. The pier locations of this fly-over structure can accommodate the future improvements to or replacement of the E-N Ramp when it is converted to two-lanes. All existing structures will be salvaged.

### 3.1.4 Right-of-Way Impacts

No new right-of way is required.

### 3.1.5 Construction Costs

Cost opinions were developed for each conceptual alternative and are included in **Appendix C**. Unit costs were sourced from ADOT's E2C2 Historical Unit Price web program and were escalated utilizing recent bid data. Major construction items were measured and quantified, such as pavement and structure areas. Contingencies were used where appropriate due to the high-level planning nature of this analysis. The unit costs in the cost opinion reflect data from current bid tabulations; the unit costs should be continuously updated during the future stages of project development to reflect construction cost trends.

The cost opinion for Alternative 1 is estimated to be approximately $110 million in 2018 dollars. The largest contributor to this cost is the new bridge area that will need to be constructed.

## 3.2 Alternative E: Braided Ramp to 91st Avenue

Conceptual Alternative E is a freeway exit ramp from southbound SR-101L to 91st Avenue. Due to the failure of the weave between Thomas Road and McDowell Road in 2040 (discussed in Section 2.3.2), the exit from southbound SR-101L to McDowell Road is relocated and combined with the exit from southbound SR-101L to 91st Avenue.

### 3.2.1 Geometric Observations

The ramp initially splits from mainline southbound SR-101L north of Thomas Road, crosses over Thomas Road and the southbound SR-101L entrance ramp from Thomas Road, and then aligns adjacent to the southbound SR-101L as proposed by Alternative 1. It then provides an exit ramp to McDowell Road and flies over I-10 to connect to 91st

Avenue. The "cross-over" alignment is what gives this ramp the "braid" feature, as it is referred to colloquially. The typical cross-section of this alternative in the direction of travel consists of a twelve-foot lane, a six-foot shoulder on the left, and a ten-foot shoulder on the right. Approaching the McDowell Road exit ramp, the cross-section in the direction of travel consists of two twelve-foot lanes, a six-foot shoulder on the left, and a ten-foot shoulder on the right. The proposed construction centerline will align with the right-hand edge of travel lane.

The new fly-over structure to 91st Avenue will be elevated approximately 80 to 100 feet above ground level and will be the highest level in the interchange, along with the DHOV Ramp proposed in Alternative 1. The pier locations of this fly-over structure can accommodate the future replacement of the existing E-N Ramp for a two-lane ramp.

### 3.2.2 Operations

A braided ramp configuration is anticipated to perform better than the existing condition by locating the exits to 91st Avenue and McDowell Road along southbound SR-101L to north of Thomas Road. This configuration disallows vehicles entering at Thomas Road from exiting to 91st Avenue or McDowell Road, eliminating some of the weaving movement on southbound SR-101L between McDowell Road and Thomas Road. The elimination of weaving increases safety for all traffic in this location. Due to the multiple decision points created by this ramp, a primary operations concern is signing. Consequently, a detailed signing discussion is included in the following section.

#### 3.2.2.1 Signing

The signing along southbound SR-101L will be modified to communicate the ramp destination to traffic. Signs detailed below are necessary based on new roadway operations. Additionally, existing signs that conflict with proposed construction activities will need to be relocated.

The following signs would be removed along southbound SR-101L:

- The existing overhead sign structure located north of Thomas Avenue

The following signs would be placed:

- Exit Direction signs at the nose of painted gore at where the braided exit ramp splits from the mainline and on the braided ramp, between the McDowell Road and 91st Avenue exit ramps

- A sequence of Advance Guide signs on southbound SR-101L approaching the braided ramp:
    - On southbound SR-101L, the existing Thomas Road Advance Guide sign on the Indian School Road Bridge would be replaced with a guide sign that directs to what is now the Thomas Road, McDowell Road, and 91st Avenue exit lane.;
    - On southbound SR-101L, the existing exit only Thomas Avenue Guide sign panel located on the cantilever sign structure between Thomas Road and Indian School Road would be replaced with a guide sign that directs to the Thomas Road, McDowell Road, and 91st Avenue exit lane;
    - On westbound I-10, the southbound panel of the butterfly sign structure between Thomas Road and Indian School Road would need to be replaced to reflect the changed distance to the McDowell Road exit ramp and addition of a 91st Avenue exit;
- A cantilever Guide signs on the braided ramp, at the location where the cross-section bumps out to add the parallel exit lane for McDowell Road
- Prior to the paved gore area approaching the I-10 eastbound 91st Avenue exit ramp, an Entering Roadway Added lane warning sign.
- Along the I-10 eastbound 91st Avenue exit ramp, prior to the paved gore, an Added Lane warning sign

The Dynamic Message Sign on southbound SR-101L north of Thomas will need to be relocated upstream to meet minimum guide sign spacing criteria.

### 3.2.3 Structure Requirements

This alternative requires structures over Thomas Road, the Thomas Road entrance ramp, McDowell Road, the S-W Ramp, the E-N Ramp, and the I-10 mainline. Structure over these roadways is necessary, however, two value engineering opportunities have been identified:

- if the necessary structures should be combined into a few longer structures and
- if the proposed ramp should remain on structure to minimize right-of-way impacts to an undeveloped parcel.

A preliminary pier arrangement was developed for the fly-over. The arrangement consists of 11 total bridge spans, with the longest spanning 243 feet. The pier locations of this fly-over structure can accommodate the future improvements to or replacement of the E-N Ramp when it is converted to two-lanes. All existing structures will be salvaged.

### 3.2.4 Right-of-Way Impacts

Rights-of-way are required for this alternative. The amount of right-of-way need is dependent on length of structures and construction of retaining walls versus fill slopes. The minimum right-of-way impact is 1/10 of an acre. This impact is located at a right-of way pinch-point just south of the structure over the Thomas Road entrance ramp. This is the only location where rights-of-way are needed. The minimum impact would be maintained by constructing additional structure from the Thomas Road entrance ramp approaching to where the braided ramp parallels mainline SR-101L.

### 3.2.5 Construction Costs

Cost opinions were developed for each conceptual alternative and are included in **Appendix C**. Unit costs were sourced from ADOT's E2C2 Historical Unit Price web program and were escalated utilizing recent bid data. Major construction items were measured and quantified, such as pavement and structure areas. Contingencies were used where appropriate due to the high-level planning nature of this analysis. The unit costs in the cost opinion reflect data from current bid tabulations; the unit costs should be continuously updated during the future stages of project development to reflect construction cost trends.

The cost opinion for Alternative E is estimated to be approximately $63 million in 2018 dollars. The largest contributor to this cost are the new bridges that will need to be constructed over Thomas Road, the Thomas Road entrance ramp, McDowell Road, the S-W Ramp, the E-N Ramp, and the I-10 mainline.

# 4.0 Conclusion

This study resulted in two preferred alternative concepts: Alternative 1 and Alternative E. These alternatives enhance regional travel, eliminate existing weaving and safety issues, and improve connectivity to support economic development. After discussions with city officials and other agencies involved with the I-10/SR-101L System Traffic Interchange Study, the study reached a consensus on the two preferred alternatives.

The following is a general list of steps that should be taken to implement the study findings:

***Accept the Recommendations*** – The recommendations should be accepted by the MAG Regional Council and adopted as an illustrative project(s) in the Regional Transportation Plan.

***Incorporate Preferred Concepts into Existing and Future Studies and Planning Documents –*** Involved agencies should adopt the study findings and include them in future planning efforts. Any future changes to the findings should still address the underlying issues identified by this study. Specifically, any future studies to improve the E-N Ramp should consider the preferred alternatives.

***Complete ADOT Scoping Phase (Design Concept Report) –*** The concepts should be carried forward as Design Concept Alternatives in ADOT's project development process. ***The geometric recommendations are conceptual in nature; the formal ADOT Scoping Phase will need to be completed, including required typical local, state, and federal agencies approvals.*** Use of the information contained herein for right-of-way acquisition and similar activities is not recommended until the appropriate time during ADOT's project development process. Potential additional Design Concept Alternatives that may surface through ADOT's process should be consistent with the operational and access goals of this study.

Prior to the final design of any improvements, additional investigation and analyses should be conducted, including necessary environmental/NEPA evaluations, geotechnical investigations, and others.

***Project Funding –*** Funding for study improvements has not yet been identified. Agencies will need to develop a collaborative approach to funding.

# Appendix A

# Kickoff Meeting

# I-10/SR-101L
# System Traffic Interchange
Ramp Feasibility Analysis

# SUMMARY

## Kickoff Meeting

Wednesday, April 25, 2018
2:30 p.m.
City of Tolleson
City Hall Conference Room

Meeting Purpose – Kickoff meeting that will engage ADOT, MAG, and City of Tolleson (Tolleson) in a discussion about the study's purpose and study area issues.

Attendees:
Steve Boschen – ADOT
Steve O'Brien – ADOT
Bob Hazlett – MAG
Jason Earp – Tolleson
Paul Gilmore – Tolleson
Reyes Medrano, Jr. – Tolleson
Pilar Sinawi – Tolleson
Dana Biscan – B&N
David Lenzer – B&N
Olivier Mirza – B&N
Jason Pagnard – B&N
Nexus Consulting (Via conference call)

1. Introductions

Bob Hazlett opened the meeting and asked attendees to introduce themselves.

2. Project Overview

Mr. Hazlett provided an overview of the project, indicating it is a feasibility study for up to three alternatives. Alternatives will investigate providing a DHOV lane for travel to/from the north along SR-101L and to/from the east along I-10 as well as a new direct connection from SR-101L to 91st Avenue. The focus will be to develop options, determine whether they are feasible, and prepare planning-level cost estimates.

3. Scope of Services and Study Goals and Objectives

Reyes Medrano, Jr. noted that 91st Avenue is the gateway to Tolleson, as well as a key entry point to the city of Avondale. A connection to 91st Avenue would benefit both communities and possibly the city of Phoenix. He noted the lack of a direct connection to SR-101L creates challenges for Tolleson when trying to attract commercial developers. He added this study may provide information for a future grant. He noted that during the 1970s, Tolleson struggled to gain access to I-10 and that they now need a direct connection to the SR-101L. Mr. Medrano expressed several of Tolleson's goals, including supporting economic development and providing safe access.

4. Study Area Issues

Steve Boschen indicated safety is very important to ADOT; safety is a key reasons for considering the DHOV ramps to eliminate weaving. Mr. Boschen stated both FHWA and ADOT would not be supportive of a slip ramp between existing ramps to connect SR-101L to 91st Avenue. Concerns include proper signing and layout, among other things. Mr. Hazlett illustrated the "football" layout required to provide DHOV lanes connecting SR-101L and I-10. In general, the "football" is a wider median to make room for the ramp terminals within the median; accordingly, I-10 would spread north and south. There was a general discussion regarding the need for the DHOV connection and safety/crash concerns. Mr. Medrano indicated that Tolleson wants to avoid impacts to private property, but understands the importance and safety of the DHOV for the region.

Regarding a connection between SR-101L and 91st Avenue, Mr. Medrano indicated Tolleson is currently widening 91st Avenue to 4 lanes with a two-way left-turn lane. He added Van Buren Street was renamed Paseo del Luces and that Tolleson has been improving the area.

Attendees debated and identified three potential conceptual alternatives:

- Median, two-way DHOV ramp connection;
- SR-101L flyover ramp to 91st Avenue south of I-10;
- SR-101L flyover ramp to 91st Avenue north of I-10.

A study, by others, is underway to determine if the large drainage basins north of I-10 are needed.

Other provisions for consideration in alternative development are:

- Include HOV widening along SR-101L in the cost.
- Include provision for Encanto Crossing; and
- Separate cost estimates for 91st Avenue connection and DHOV connection.

5. Next Steps

Jason Pagnard indicated concept development was originally included in the second workshop, but was accomplished with group concurrence. Attendees agreed to reconvene in June to discuss preliminary findings.

**I-10/SR-101L**
**System Traffic Interchange**
Ramp Feasibility Analysis

# SIGN-IN SHEET

**Kickoff Meeting**
Wednesday, April 25, 2018
2:30 p.m.
City of Tolleson
City Hall Conference Room

| Present | Name | Agency |
|---|---|---|
| | | |
| SCB | Steve Boschen | ADOT |
| SOB | Steve O'Brien | ADOT PMG |
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| | | |
| RH | Bob Hazlett | MAG |
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| | | |
| | | |
| | | |
| | Marisabel Delgado | City of Tolleson |
| JE | Jason Earp | City of Tolleson |
| PG | Paul Gilmore | City of Tolleson |
| RM | Reyes Medrano, Jr. | City of Tolleson |
| PS | Pilar Sinawi | City of Tolleson |
| | | |
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| | | |
| | | |
| | | |
| DB | Dana Biscan | Burgess & Niple |
| DL | David Lenzer | Burgess & Niple |
| OM | Olivier Mirza | Burgess & Niple |
| JP | Jason Pagnard | Burgess & Niple |
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MARICOPA ASSOCIATION OF GOVERNMENTS
TASK ORDER 6

ON-CALL CONTRACT NO. 780-A, BURGESS & NIPLE, INC.
FY 2017 MAG REGIONAL TRANSPORTATION PLANNING ON-CALL

I-10/SR-101L SYSTEM TRAFFIC INTERCHANGE RAMP FEASIBILITY ANALYSIS
0600-0110-17-E003-0780-A.000006

## TASK ORDER SUMMARY

The purpose of this project is to evaluate the feasibility of two new ramp connections within the Interstate 10 (I-10) and State Route 101L (SR-101L) system Traffic Interchange (TI).

The existing I-10/SR-101L system TI is located within the City of Tolleson, situated between 99th Avenue to the west, 91st Avenue to the east, and McDowell Road to the north. The system TI provides directional ramps serving all major system movements between I-10 and SR-101L. Nested within the system TI are the I-10 service TIs with 99th Avenue and 91st Avenue, as well as SR-101L at McDowell Road.

This project will develop an alternative(s) to accommodate a new Direct High-Occupancy Vehicle (DHOV) ramp within the existing I-10/SR-101L system TI. The proposed DHOV ramp will accommodate travel to/from the north along SR-101L and to/from the east along I-10. This project will investigate a new connection between SR-101L and 91st Avenue via the I-10/SR-101L system TI ramps and I-10/91$^{st}$ Avenue service TI ramps.

The Scope of Services described below will not be modified except at the Maricopa Association of Government's (MAG)'s request or with MAG's concurrence. Any services rendered by Burgess & Niple (CONSULTANT) that MAG considers to be outside the Scope of Services of this Task Order will not be the responsibility of MAG.

## TOTAL TASK ORDER BUDGET

The total amount of this task order will not exceed $79,997.46.

## SCOPE OF SERVICES

### Task 1: Initiate Project

The CONSULTANT will initiate the study and complete a Project Management Plan (PMP). The CONSULTANT will conduct a kickoff meeting with MAG and the Planning Partners including the Arizona Department of Transportation (ADOT), Federal Highway Administration (FHWA), City of Tolleson, City of Avondale, and City of Phoenix to familiarize all agencies with the study scope and discuss study area opportunities and constraints.

### Task 2: Collect and Review Data

The CONSULTANT will obtain from MAG and the Planning Partners relevant documents, including recording drawings and studies/reports. It is anticipated that MAG will provide sufficient aerial imagery and ADOT (via MAG) will provide CAD (MicroStation) basemap files to facilitate the conceptual alternatives development process. The CONSULTANT will review the collected data.

**Task 3: Develop Conceptual Alternatives**

The CONSULTANT will prepare for, conduct, and document a half-day charrette with the Planning Partners technical staff to develop up to three (3) conceptual alternatives for a two-way I-10/SR-101L DHOV ramp. B&N will also develop an alternative to connect SR-101L to 91st Avenue, such as a slip ramp connection between the I-10/SR-101L system ramps and I-10/91st Avenue service TI ramps.

Following the charrette, the CONSULTANT will develop the ramp conceptual alternatives in MicroStation. Engineering judgement/rules-of-thumb will be utilized for vertical geometry. For the HOV bridge flyover layout, focus will be on the bridge span configurations, depth and substructure locations using engineering judgement/rules-of-thumb.

It is assumed that MicroStation basemap files obtained under Task 2 contain line work for the existing roadways (mainline, ramps, and crossroads). The CONSULTANT's focus will be to develop line work for only new ramps of focus under this Task Order. The CONSULTANT does not anticipate developing MicroStation line work for the existing facilities (e.g. entire I-10/SR-101L system TI). If MicroStation basemap files are not available for the existing facilities, aerial imagery will be utilized.

**Task 4: Prepare Technical Memorandum**

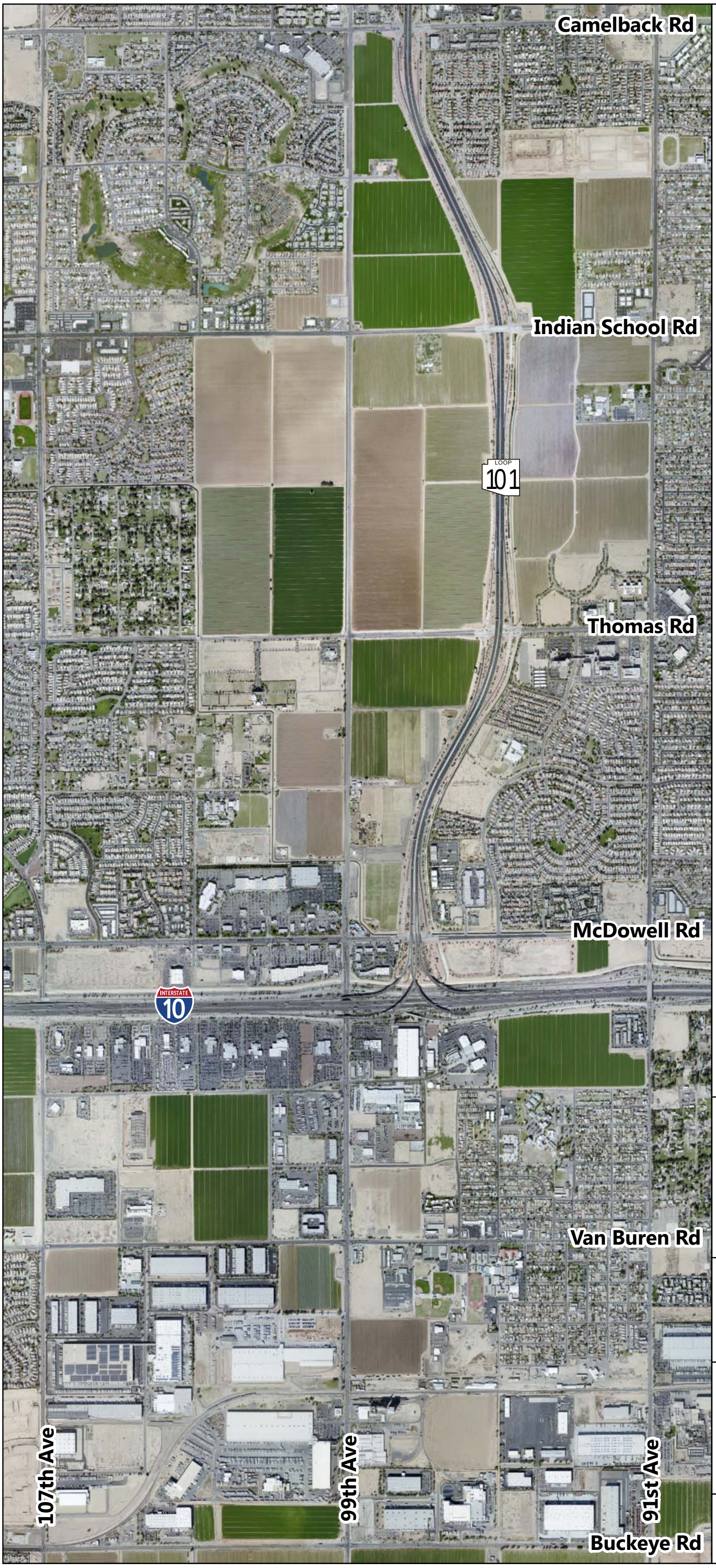
The CONSULTANT will evaluate the conceptual alternatives based on technical advantages and disadvantages of each alternative. The CONSULTANT will prepare planning-level project cost opinions for each conceptual alternative. The CONSULTANT will prepare a technical memorandum documenting the findings.

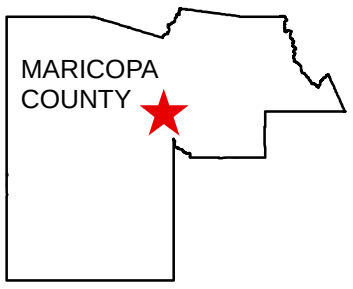
The CONSULTANT will prepare for, conduct, and document a Planning Partners meeting to present the study findings. The meeting summary will be included as an attachment to the technical memorandum.

**DELIVERABLES**

- Deliverable 1. The CONSULTANT will complete a PMP.
- Deliverable 2. The CONSULTANT will prepare meeting materials and document the Kickoff Meeting.
- Deliverable 3. The CONSULTANT will prepare a listing/catalog of collected data.
- Deliverable 4. The CONSULTANT will conduct a half-day charrette to develop conceptual alternatives.
- Deliverable 5. The CONSULTANT will prepare a technical memorandum documenting the study findings.

# I-10/SR-101L System Traffic Interchange Ramp Feasibility Analysis

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MARICOPA ASSOCIATION of GOVERNMENTS

BURGESS & NIPLE

Service Layer Credits: Maricopa County Assessor's Office

Map Last Updated: 4/24/2018

# Progress Meeting One

# I-10/SR-101L
# System Traffic Interchange
Ramp Feasibility Analysis

# SUMMARY

## Follow-Up Meeting

Tuesday, June 19, 2018
2:30 p.m.
City of Tolleson
City Hall Conference Room

Meeting Purpose – Present draft Conceptual Alternatives to ADOT, MAG, and the City of Tolleson.

Attendees:
Steve Boschen – ADOT
Rimpal Shah – ADOT
Bob Hazlett – MAG
Pilar Sinawi – Tolleson
Jason Earp – Tolleson
Paul Gilmore – Tolleson
Jason Pagnard – B&N
Dana Biscan – B&N
David Lenzer – B&N
Olivier Mirza – B&N

1. Introductions

Bob Hazlett opened the meeting and asked attendees to introduce themselves. A scan of the sign-in sheet is attached.

2. Project Overview

David Lenzer provided an overview of the progress made for the two DHOV Ramp Alternatives (Alternative 1 and Alternative 2) and the four 91st Avenue Access Alternatives, (Alternative A, Alternative B, Alternative C, and Alternative D). Alternative 1 and Alternative 2 provide a DHOV lane to/from the north along SR-101L and to/from the east along I-10. The four 91st Avenue Access Alternatives provide a direct connection from the SR-101L to 91st Avenue.

3. Conceptual Alternatives

Mr. Lenzer presented linework in Google Earth to illustrate the six alternatives. He explained that conceptual alternatives were developed using vertical rules of thumb. He provided the following information about the two DHOV Ramp Alternatives and the four 91st Avenue Access Alternatives:

**DHOV Ramp Alternatives** – Both DHOV alternatives create a "football" to provide the DHOV connection along both I-10 and SR-101L; ramp configurations vary.

- Alternative 1: This Alternative will begin widening SR-101L between McDowell Road and Thomas Road. It is anticipated it will stay within existing ADOT right-of-way and will utilize the existing bridges at McDowell Road. The DHOV ramp will be a level above the ramps over McDowell Road. The new fly-over structure will be approximately 25 feet above the existing east to north ramp (likely 70 to 80 feet above I-10). All existing structures will be salvaged in this alternative and one new, long bridge will be constructed as the highest level in the interchange. Mr. Lenzer noted that salvaging the existing structures would facilitate maintenance of traffic during construction. Mr. Hazlett stated the inside shoulders along I-10 are narrower than recommended by the AASHTO design guidelines and should be widened during construction to meet AASHTO requirements.

- Alternative 2: This alternative will remove and replace the existing east to north structure. The east to north movement will remain the highest level and will have a similar profile as the existing east to north ramp. The DHOV ramp profile will mirror the existing south to east ramp. Mr. Lenzer noted that the DHOV ramp bridge is shorter than the proposed bridge in Alternative 1, but the overall required bridge deck is more than Alternative 1. The existing structure carry 91st Avenue over I-10 appears to conflict with the proposed DHOV ramp and the eastbound I-10 lanes. This will require the replacement of the TIUP pier and south abutment. New right-of-way may be required.

  Steve Boschen requested a cost comparison of Alternative 1 to Alternative 2.

| **Table 1 – Differentiating DHOV Factors** | | |
|---|---|---|
| **Criteria** | **Alternative 1** | **Alternative 2** |
| **Highest level** | 70-80 feet | 70-80 feet |
| **Right-of-way requirement** | None | Approx. 0.5 acres |
| **Structure requirements** | Construct 3780' DHOV ramp | Construct 2650' DHOV ramp<br>Construct 2620' New E-N ramp<br>Replace 91st Ave TIUP pier and south abutment<br>Demolish ex. east to north structure |
| **MOT** | No unusual challenges | Demolish existing E-N ramp structure across I-10 |
| **Siphon impacts** | No impact | No impact |

**91st Avenue Access Alternatives –** All 91st Avenue Alternatives were developed to accommodate DHOV Alternative 1, and that most would accommodate Alternative 2. Mr. Lenzer noted that weave analysis had not been conducted for any of the alternatives and that they were all conceptual in nature.

- Alternative A: This Alternative will restripe the existing Thomas Road on-ramp as two lanes rather than the one lane. SR-101L will have a five-lane section. Lane 4 will exit to 91st Avenue and Lane 5 will exit to McDowell Road. This Alternative will make the travel way for 91st Avenue the highest level. Mr. Lenzer stated that a challenge associated with this alternative is the weave between Thomas Road and McDowell Road. Mr. Boschen stated he prefers this alternative due to merging, weaving, and signing requirements. Mr. Hazlett informed the attendees that SR-101L will be widened with a general-purpose lane. The concepts will be developed with this additional lane in mind, which may eliminate the two-lane on-ramp from Thomas Road.

- Alternative B: This Alternative was eliminated as the 91st Avenue ramp could not be connected to the existing ramp intersection south of I-10 without routing drivers through multiple signals.

- Alternative C: Mr. Lenzer stated that pier locations were not available for DHOV Alternative 2, but the design could likely be modified to accommodate the necessary pier locations. He also stated that this alternative does not require modifications to the exit ramp to McDowell Road. This alternative requires replacement of the southbound structure over McDowell Road. Mr. Lenzer stated that the broken back

curve along the proposed ramp could be optimized and potentially eliminated. Mr. Lenzer informed the planning partners that the center lane would be the decision lane for 91st Avenue Access. Mr. Lenzer stated that signing at the major ramp fork could be challenging. B&N will assess signing options. The attendees agreed that the broken back curve will need to be optimized. Mr. Hazlett noted that the current southbound structure over McDowell Road is wide enough to accommodate an additional lane.

- Alternative D: This Alternative uses a slip ramp with a tapered exit and a short weave. The slip ramp would use the existing system ramp, therefore requiring no modification to the existing structure. Mr. Lenzer noted weave challenges were present whether the ramp was shifted east or west due to the existing structure and off-ramp. Mr. Boschen expressed safety concerns with Alternative D. This alternative will not be advanced.

**Table 2 – Differentiating 91st Avenue Ramp Factors**

| Criteria | Alternative A | Alternative B | Alternative C | Alternative D |
|---|---|---|---|---|
| **Accommodates either DHOV Alternative** | Yes | Yes | Yes | Yes |
| **Right-of-way requirement** | None | Approx. 4.6 acres | None | None |
| **Structure requirements** | Construct 2000' ramp | Construct 3600' ramp | Construct 1020' ramp | Development of alternative stopped before determination |
| **Driver convenience** | Good | Poor | Good | Good |
| **Safety** | - | - | - | Poor |

City of Tolleson staff did not have a preference and expressed flexibility with choosing an alternative for the 91st Avenue access; however, the City reemphasized the importance of SR-101L access to 91st Avenue. Pilar Sinawi asked if access to 91st Avenue was independent of DHOV ramp construction; Mr. Lenzer stated it was. Jason Earp indicated that safety is an important factor for the City of Tolleson. Mr. Hazlett stated that both projects, DHOV Ramp and 91st Avenue Access, could be constructed at the same time if funding permitted.

4. Evaluation Criteria

The attendees held a brief discussion regarding potential Alternative Evaluation Criteria. The following criteria surfaced:

- Safety;
- Operations (merge/weave/signage/safety);
- Value (as opposed to cost); and
- Constructability.

Burgess & Niple will provide examples of evaluation criteria used on similar projects to the City of Tolleson by June 29th, 2018. City staff will review and provide tiered criteria preferences to the project partners.

Jason Pagnard asked the City to consider potential grant applications when selecting the evaluation criteria. Mr. Boschen offered to provide a checklist developed by ADOT to the group for use.

5. Next Steps

The next meeting as decided by the attendees will take place on **September 6th at 11:30 a.m.** at the City of Tolleson.

**I-10/SR-101L**
**System Traffic Interchange**
Ramp Feasibility Analysis

# SIGN-IN SHEET

**Follow-Up Meeting**
Tuesday, June 19, 2018
2:30 p.m.
City of Tolleson
City Hall Conference Room

| Present | Name | Agency |
|---|---|---|
| | | |
| SB | Steve Boschen | ADOT |
| | Steve O'Brien | ADOT |
| | Rimpal Shah | ADOT |
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| | | |
| | Bob Hazlett | MAG |
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| | | |
| | | |
| | | |
| | | |
| | Marisabel Delgado | City of Tolleson |
| | Jason Earp | City of Tolleson |
| | Paul Gilmore | City of Tolleson |
| | Reyes Medrano, Jr. | City of Tolleson |
| | Pilar Sinawi | City of Tolleson |
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| | | |
| | | |
| | | |
| DB | Dana Biscan | Burgess & Niple |
| DL | David Lenzer | Burgess & Niple |
| | Olivier Mirza | Burgess & Niple |
| JP | Jason Pagnard | Burgess & Niple |
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# Progress Meeting Two

# I-10/SR-101L
# System Traffic Interchange
Ramp Feasibility Analysis

# SUMMARY

## Progress Meeting 2

Tuesday, September 25, 2018
11:30 a.m.
City of Tolleson
City Hall Conference Room

Meeting Purpose – Present roll plots and cost estimates for Alternative 1 (DHOV Ramp) and Alternative E (Braided Ramp) to ADOT, MAG, and the City of Tolleson.

Attendees:
Steve Boschen – ADOT
Bob Hazlett – MAG
Pilar Sinawi – Tolleson
Jason Earp – Tolleson
Paul Gilmore – Tolleson
Reyes Medrano, Jr. – Tolleson
Jason Pagnard – B&N
Wesley Scatena – B&N

1. Introductions

A scan of the sign-in sheet is attached.

2. Conceptual Alternatives Update and Observations

The conceptual alternatives for the ramp connection between SR-101L and 91st Avenue and the DHOV ramp between I-10 and SR-101L were reviewed. Design team observations were discussed.

**91st Avenue Access Alternatives –** Weave analysis was conducted on Alternatives A and C. The results of this analysis were that all of these alternatives failed. A braided ramp alternative (Alternative E) was developed as an alternative that passes weave analysis. This analysis also discovered a weaving issue that exists today given the current lane configuration for SB SR-101L. Alternative E was developed to accommodate DHOV Alternative 1.

- Alternative E:

**Table 1 –91st Avenue Ramp Factors**

| Criteria | Alternative E |
|---|---|
| **Accommodates either DHOV Alternative** | Yes |
| **Right-of-way requirement** | *1/10 acre |
| **Structure requirements** | Structures over Thomas and I-10 |
| **Driver convenience** | Good |
| **Safety** | - |

**Right-of way impacts may be increased or decreased by constructing fill vs. structure along the alignment near Thomas Ave.*

There is a ROW pinch-point located just south of the structure over the Thomas Ave entrance ramp. This is the only location of ROW concern. Constructing a longer stretch of structure or placing fill would impact the amount of ROW needed. City of Tolleson staff expressed encouragement for this alternative to connect to 91st Avenue. Bob Hazlett indicated the braided ramp could potentially become a part of the future SR-101L general purpose lane widening project. Pilar Sinawi asked if ADOT or MAG could write a letter of support for this project. Steve Boschen said that would be something for MAG to consider; Bob Hazlett stated MAG would not write a letter, but could accept the project as feasible by decision of the MAG Regional Council.

Steve Boschen informed the meeting he is pushing ADOT towards performance-based practical design. He stated he sees this corridor as a cost-savings opportunity through the implementation of performance-based practical design.

It was discussed by all that since the braided ramp would fix the current weaving issue, its construction would benefit the region as a whole. This could create an opportunity for cost-sharing. Pilar Sinawi shared that USDOT made her aware of the option of applying for grant money, since the project has regional significance. Bob Hazlett said that investigation into the federal grant is not something that would be undertaken during this study. Alternative E is estimated to cost between $60-70 million.

**DHOV Ramp Alternatives** – Both DHOV alternatives create a "football" to provide the DHOV connection along both I-10 and SR-101L; ramp configurations vary.

- Alternative 1: This Alternative will begin widening SR-101L between McDowell Road and Thomas Road. It is anticipated it will stay within existing ADOT right-of-way and will utilize the existing bridges at McDowell Road. The DHOV ramp will be a level above the ramps over McDowell Road. The new fly-over structure will be elevated approximately 80 to 100 feet above ground level. All existing structures will be salvaged in this alternative and one new, long bridge will be constructed as the highest level in the interchange. Alternative 1 is compatible with Alternative E and is estimated to cost approximately $100-110 million.

- Alternative 2: This Alternative was developed by a previous study in 2007. It will remove and replace the existing east to north structure. The east to north movement will remain the highest level and will have a similar profile as the existing east to north ramp. The existing structure carry 91st Avenue over I-10 appears to conflict with the proposed DHOV ramp and the eastbound I-10 lanes. This will require the replacement of the TIUP pier and south abutment. New right-of-way may be required. Alternative 2 is estimated to cost approximately $140 million.

The meeting consensus was that Alternative 1 is the preferred alternative for a DHOV ramp.

3. Next Steps

The draft report is due to the study team on **October 15th**. Burgess & Niple is to submit a KMZ file in conjunction with the draft report. A Council Briefing with the City of Tolleson City Council is scheduled to take place on **November 27th**.

**I-10/SR-101L**
**System Traffic Interchange**
Ramp Feasibility Analysis

# SIGN-IN SHEET

**Progress Meeting 2**
Tuesday, September 25, 2018
11:30 a.m.
City of Tolleson
City Hall Conference Room

| Present | Name | Agency |
|---|---|---|
| | | |
| SB | Steve Boschen | ADOT |
| | Steve O'Brien | ADOT |
| | Rimpal Shah | ADOT |
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| BH | Bob Hazlett | MAG |
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| | | |
| | Marisabel Delgado | City of Tolleson |
| | Jason Earp | City of Tolleson |
| | Paul Gilmore | City of Tolleson |
| | Reyes Medrano, Jr. | City of Tolleson |
| PS. | Pilar Sinawi | City of Tolleson |
| | | |
| | | |
| | Ana Ma | Nexxus Consulting |
| | Bob Holmes | Nexxus Consulting |
| | | |
| | | |
| | | |
| JP | Jason Pagnard | Burgess & Niple |
| WS | Wes Scatena | Burgess & Niple |
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# Appendix B

| | NAME | DATE |
|---|---|---|
| DESIGN | WWS | 9/18 |
| DRAWN | WWS | 9/18 |
| CHECKED | DCL | 9/18 |

100 0 100 200
SCALE (FEET)

**BURGESS & NIPLE**
1999 S. BASCOM AVENUE, SUITE 700
CAMPBELL, CA 95008

ALTERNATIVES I AND E
BRAIDED RAMP WITH DHOV RAMP

ROUTE: 0000
LOCATION: I-10/SR-101L SYSTEM TI RAMP FEASIBILITY STUDY

TRACS NO.

10/15/2018

PRELIMINARY
CONCEPTUAL
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO.

___ OF ___

Note: Existing linework depicts programmed SR-101L improvements.

N

Thomas Rd

To McDowell Rd and 91st Ave

Thomas Road Entrance Ramp

SR-101L SB

SR-101L NB

SR-101L SB

SR-101L NB

McDowell Rd

S-W Ramp

S-E Ramp

W-N Ramp

E-N Ramp

I-10 Drainage Channel

I-10 Frontage Rd WB

To 99th Ave

I-10 WB

I-10 EB

From I-10 Frontage Rd EB

From I-10 EB

91st Ave

| | NAME | DATE |
|---|---|---|
| DESIGN | WWS | 9/18 |
| DRAWN | WWS | 9/18 |
| CHECKED | DCL | 9/18 |

100 0 100 200
SCALE (FEET)

**BURGESS & NIPLE**
1999 W. RITTER, SUITE 101
PHOENIX, AZ

ALTERNATIVES I AND E
BRAIDED RAMP WITH DHOV RAMP

| ROUTE | LOCATION |
|---|---|
| 0000 | I-10/SR-101L SYSTEM TI RAMP FEASIBILITY STUDY |

TRACS NO. | | 10/15/2018

PRELIMINARY
CONCEPTUAL
Review
NOT FOR CONSTRUCTION OR RECORDING

DWG NO.

___ OF ___

N

LEGEND
- Alternative I: DHOV Ramp
- Alternative E: Braided Ramp to 91st Avenue

Note: Existing linework depicts programmed SR-101L improvements.

Thomas Rd
To McDowell Rd and 91st Ave
SR-101L SB
SR-101L NB
McDowell Rd
SR-101L SB
SR-101L NB
S-W Ramp
S-E Ramp
W-N Ramp
I-10 Drainage Channel
I-10 Frontage Rd WB
To 99th Ave
I-10 WB
I-10 EB
E-N Ramp
From I-10 Frontage Rd EB
From I-10 EB
91st Ave

# Appendix C

I-10 / SR-101L System TI
Ramp Feasibility Analysis
**COST OPINION**

| | | | | Alternative 1: DHOV | | Alternative E: Braided Ramp | |
|---|---|---|---|---|---|---|---|
| **Series** | **Items** | **Unit** | **Unit Cost** | **Qty** | **Segment Cost** | **Qty** | **Segment Cost** |
| 200 | Bridge Removal | EA | $ 4,000,000 | | $ - | | $ - |
| | Pavement Removal | SY | $ 20 | 50,000 | $ 1,000,000 | | $ - |
| | Earthwork | CY | $ 15 | 60,000 | $ 900,000 | 40,000 | $ 600,000 |
| | Contingency and Unidentified Items | LS | 30% | | $ 570,000 | | $ 180,000 |
| 300 / 400 | New PCCP w/base & AR | SY | $ 60 | 30,651 | $ 1,839,040 | 27,006 | $ 1,620,387 |
| | New AC w/ base | SY | $ 35 | | $ - | | $ - |
| | Rehab Pavement (ACFC-AR Overlay) | SY | $ 35 | 134,495 | $ 4,707,321 | | $ - |
| | Contingency and Unidentified Items | LS | 15% | | $ 981,954 | | $ 243,058 |
| 500 | Drainage on-site (Reconstruct) | LS | $ 2,000,000 | 1 | $ 2,000,000 | 1 | $ 2,000,000 |
| | Drainage on-site (Retrofit) | LS | $ 1,000,000 | 1 | $ 1,000,000 | | $ - |
| | Contingency and Unidentified Items | LS | 30% | | $ 900,000 | | $ 600,000 |
| 600 | New/Widen Bridges | SF | $ 175 | 216,704 | $ 37,923,200 | 114,983 | $ 20,122,025 |
| | Rehab Bridges | LS | Varies | | $ - | | $ - |
| | Contingency and Unidentified Items | LS | 10% | | $ 3,792,320 | | $ 2,012,203 |
| 700 | MOT (high) | LS | $ 7,000,000 | 1 | $ 7,000,000 | | $ - |
| | MOT (low) | LS | $ 5,000,000 | | $ - | 1 | $ 5,000,000 |
| | Sign/Stripe/Light (Reconstruct) | LS | $ 3,000,000 | 1 | $ 3,000,000 | | $ - |
| | Sign/Stripe/Light (Retrofit) | LS | $ 1,000,000 | | $ - | 1 | $ 1,000,000 |
| | Existing FMS Modifications | LS | $ 500,000 | 1 | $ 500,000 | 1 | $ 500,000 |
| | New ITS | LS | $ 3,500,000 | | $ - | | $ - |
| | Contingency and Unidentified Items | LS | 30% | | $ 3,150,000 | | $ 1,950,000 |
| 800 | Landscaping | LS | Varies | | | | $ - |
| | Utilities | LS | $ 1,000,000 | | $ - | | $ - |
| | Contingency and Unidentified Items | LS | $ 500,000 | 1 | $ 500,000 | 1 | $ 500,000 |
| 900 | Retaining Walls (Assume H(avg)=15') | LF | $ 500 | 3,250 | $ 1,625,000 | 5,000 | $ 2,500,000 |
| | Sound Walls (Assume H(avg)=15') | LF | $ 525 | | $ - | | $ - |
| | Roadway Appurtenance (High) | LS | $ 1,500,000 | 1 | $ 1,500,000 | 1 | $ 1,500,000 |
| | Roadway Appurtenance (Low) | LS | $ 750,000 | | $ - | | $ - |
| | Contingency and Unidentified Items | LS | 40% | | $ 1,250,000 | | $ 1,600,000 |
| | | | | **Subtotal:** | **$ 74,138,835** | **Subtotal:** | **$ 41,927,672** |
| Other | Mobilization | LS | 8% | | $ 5,931,107 | | $ 3,354,214 |
| | Construction Engineering | LS | 10% | | $ 7,413,884 | | $ 4,192,767 |
| | Contractor Quality/Survey | LS | 3% | | $ 1,853,471 | | $ 1,048,192 |
| | Construction Contingency | LS | 5% | | $ 3,706,942 | | $ 2,096,384 |
| | Enviromental Mitigation | LS | $ 1,000,000 | 1 | $ 1,000,000 | 1 | $ 1,000,000 |
| | Design | LS | 8% | | $ 5,931,107 | | $ 3,354,214 |
| | ROW | Acre | $ 100,000 | | $ - | 0.1 | $ 10,000 |
| | | | | **Subtotal:** | $ 99,975,345 | **Subtotal:** | $ 56,983,442 |
| ICAP | | LS | 10.02% | 1 | $ 10,017,530 | 1 | $ 5,709,741 |
| | | | | **Total:** | **$ 109,992,875** | **Total:** | **$ 62,693,183** |