# I-40/CC ON RAMP

Maxxwell Townsend, Mohammed Alshaiban,
Zach Johnson, Ramon Lopez

CENE 476

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# Project Purpose

- One Southbound entrance onto I-40 westbound
- Detention basin on north side
- Adding an additional right turn lane to the on ramp to increase capacity
- Expand existing on ramp from 1 to 2 lanes to reduce congestion


Figure 1-1: Zoomed in Project Location (Google Maps, NTS)

# Stakeholders

- Arizona Department of Transportation
  - *Nate Reisner, P.E., Development Engineer*
- City of Flagstaff
  - *Daily users of this facility*


(Source: Wikipedia)

# Project Location

- The On-Ramp is located on N Country Club Drive and is adjacent to Interstate 40 in Flagstaff, AZ

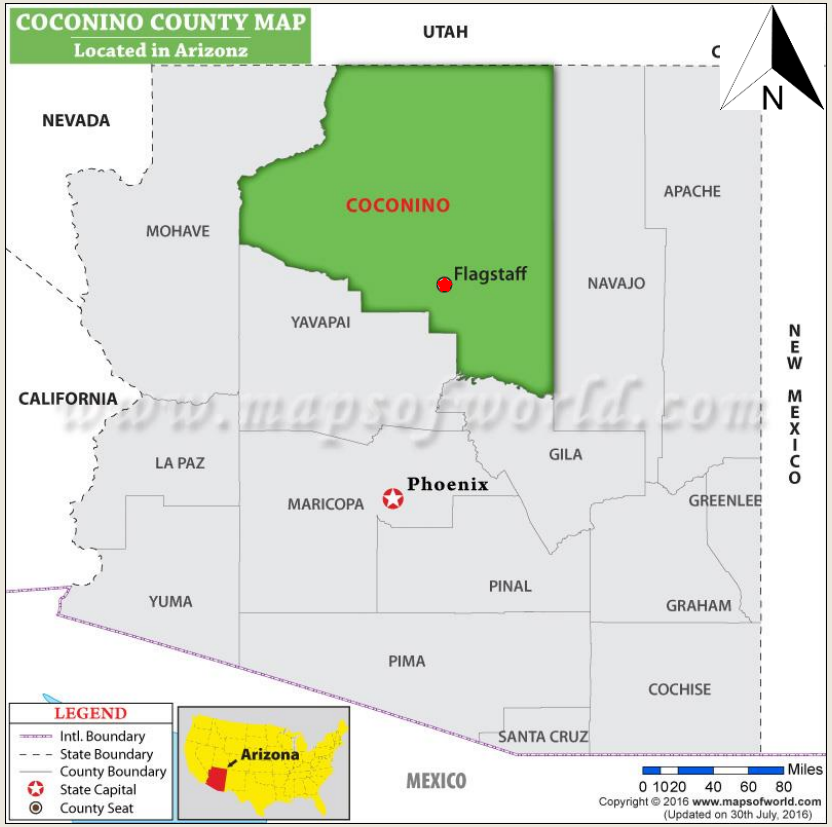



Figure 1-2: State of Arizona with Project Location (www.mapsoftheworld.com, 1” = 80 miles)

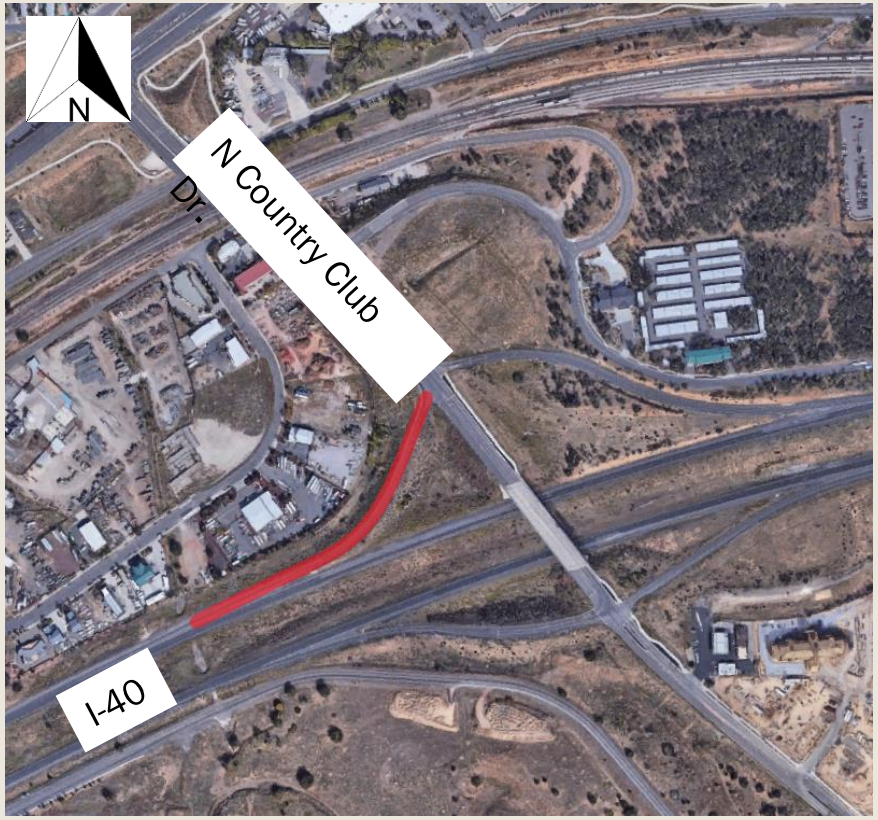



Figure 1-3: Zoomed in Project Location (Google Maps, NTS)

# Task 1: Analyze/Review Existing Studies

- 1.1 Site Visit
- 1.2 Process Survey Data from GIS
- 1.3 Analyze Existing Drainage Studies/Obtain As-Built Information
- 1.4 Existing Runoff Calculations
- 1.5 Obtain and Analyze Geotechnical data from ADOT
- 1.6 Input and Process Existing Geometry into Civil 3D
- 1.7 Create Existing Cross Sections
- 1.8 Create Roadway Alignments/Base Files

# Task 2: Design

- 2.1 Design/Create Proposed Cross-Sections
- 2.2 Initial Design
  - 2.2.1 Intersection Design
  - 2.2.2 On-Ramp Design
- 2.3 Final Design Geometry/Cross-Sections
- 2.4 Final Drainage Design
- 2.5 Stormwater Pollution Prevention Control Plan
- 2.6 Construction Plan Set
- 2.7 Synchro Analysis and Traffic Analysis Recommendation

# Task 3 & 4: Deliverables and Project Impacts

- 3.1 30% Submittal (Task 1)
- 3.2 60% Submittal (Task 2)
- 3.3 90% Submittal (Tasks 2-4)
- 3.4 Final Design Concept Report Submittal (Tasks 2-4)
- 3.5 Website

- 4.1 Economic Impacts
- 4.2 Environmental Impacts
- 4.3 Social Impacts

# Task 5: Project Management

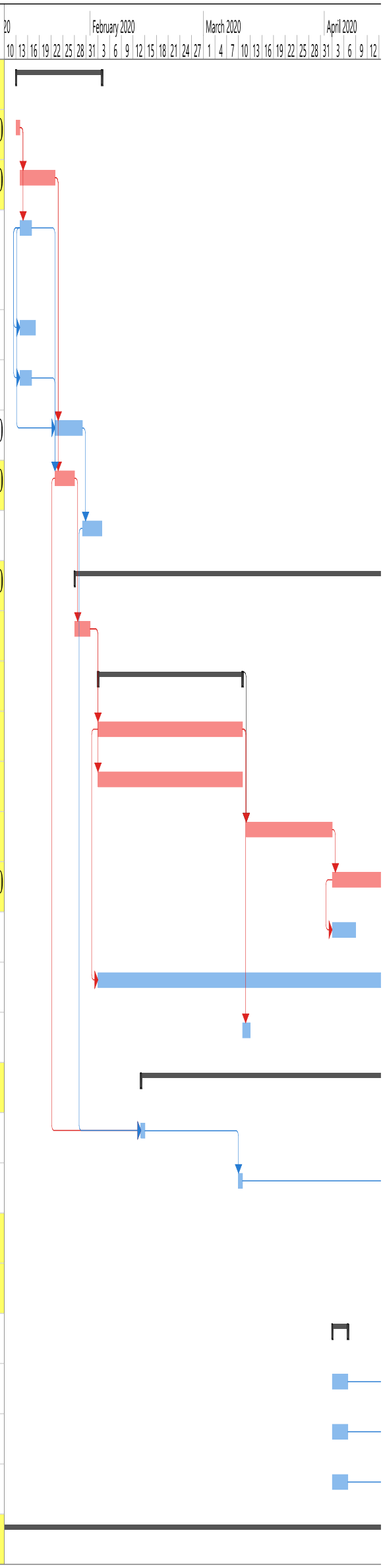
- 5.1 Grading Instructor Meetings
- 5.2 Client Meetings
- 5.3 Technical Advisor Meetings
- 5.4 Team Meetings
- 5.5 Schedule Management
- 5.6 Cost/Resource Management

# Exclusions

- Full Survey
- Geotechnical Analysis
- Collection of Traffic Data
- Traffic Signal Planning
- Environmental Permits / Mitigation Measures
- Bridge Design
- New Drainage Infrastructure Design

| | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 1 | Task 1: Existing Studies | 16 days | Mon 1/13/20 | Mon 2/3/20 |
| 2 | 1.1: Site Visit | 1 day | Mon 1/13/20 | Mon 1/13/20 |
| 3 | 1.2: Process Survey Data from GIS | 7 days | Tue 1/14/20 | Wed 1/22/20 |
| 4 | 1.3: Studying/Analyzing Existing Drainage Studies/As-Built Information | 3 days | Tue 1/14/20 | Thu 1/16/20 |
| 5 | 1.4: Runoff Calculation | 4 days | Tue 1/14/20 | Fri 1/17/20 |
| 6 | 1.5: Analyze Existing Geotechnical Information | 3 days | Tue 1/14/20 | Thu 1/16/20 |
| 7 | 1.6: Input and Process Existing Geometry into Civil3D | 5 days | Thu 1/23/20 | Wed 1/29/20 |
| 8 | 1.7: Create Existing Cross-Sections | 3 days | Thu 1/23/20 | Mon 1/27/20 |
| 9 | 1.8: Create Roadway Alignments/Base Files | 3 days | Thu 1/30/20 | Mon 2/3/20 |
| 10 | Task 2: Design | 56 days | Tue 1/28/20 | Mon 4/20/20 |
| 11 | 2.1: Create Proposed Cross-Sections | 4 days | Tue 1/28/20 | Fri 1/31/20 |
| 12 | 2.2: Initial Design | 27 days | Mon 2/3/20 | Tue 3/10/20 |
| 13 | 2.2.1: Intersection Design | 27 days | Mon 2/3/20 | Tue 3/10/20 |
| 14 | 2.2.1: On-Ramp Design | 27 days | Mon 2/3/20 | Tue 3/10/20 |
| 15 | 2.3: Final Design Geometry/Cross-Sections | 12 days | Thu 3/12/20 | Thu 4/2/20 |
| 16 | 2.4: Final Drainage Design | 12 days | Fri 4/3/20 | Mon 4/20/20 |
| 17 | 2.5: Stormwater Pollution Prevention Control Plan | 4 days | Fri 4/3/20 | Wed 4/8/20 |
| 18 | 2.6: Construction Plan Set | 50 days | Mon 2/3/20 | Thu 4/16/20 |
| 19 | 2.7 Synchro Analysis and Traffic Analysis Recommendation | 2 days | Wed 3/11/20 | Thu 3/12/20 |
| 20 | Task 3: Deliverables | 47 days | Fri 2/14/20 | Fri 4/24/20 |
| 21 | 3.1: 30% Submittal | 1 day | Fri 2/14/20 | Fri 2/14/20 |
| 22 | 3.2: 60% Submittal | 1 day | Tue 3/10/20 | Tue 3/10/20 |
| 23 | 3.3: 90% Submittal | 1 day | Tue 4/21/20 | Tue 4/21/20 |
| 24 | 3.4: Final Design Report | 1 day | Fri 4/24/20 | Fri 4/24/20 |
| 25 | Task 4: Impacts | 2 days | Fri 4/3/20 | Mon 4/6/20 |
| 26 | 4.1: Social Impacts Assessment | 2 days | Fri 4/3/20 | Mon 4/6/20 |
| 27 | 4.2: Economic Impacts Assessment | 2 days | Fri 4/3/20 | Mon 4/6/20 |
| 28 | 4.3: Environmental Impacts Assessment | 2 days | Fri 4/3/20 | Mon 4/6/20 |
| 29 | Task 5 Project Management | 70.5 days | Mon 12/16/1 | Thu 4/23/20 |

Critical Path shown in Red



# Staffing

- **612** Total estimated hours for this project
- PE will lead Design Work
- PM will review work and ensure QA/QC

| Tasks | PM | PE | EIT | TECH | Total |
|---|---|---|---|---|---|
| **2.1 Task 1: Existing Studies** | 6 | 18 | 40 | 52 | 116 |
| **2.2 Task 2: Design** | 17 | 38 | 98 | 74 | 227 |
| **2.3 Task 3: Deliverables** | 9 | 16 | 42 | 30 | 97 |
| **2.4 Task 4: Impacts** | 3 | 3 | 6 | 0 | 12 |
| **2.5 Task 5 Project Management** | 42 | 42 | 38 | 38 | 160 |
| **Total** | 77 | 117 | 224 | 194 | 612 |

# Cost Estimate

- Total Estimated Cost of Engineering Services is **$72,369**
- Travel Cost is Minimal, but was Included for Accuracy

| 1.0 Team Members | Billing Rate | Hours | Cost |
|---|---|---|---|
| PM | $195.00 | 77 | $15,015.00 |
| PE | $155.00 | 117 | $18,135.00 |
| EIT | $110.00 | 224 | $24,640.00 |
| TECH | $75.00 | 194 | $14,550.00 |
| **Total** | | | $72,340.00 |
| **2.0 Travel** | | | |
| 8 Meetings @ 4 mi/meeting | $0.58 mi/meeting | | 19 |
| 5 Meetings @ 2.5 mi/meeting | $0.58 mi/meeting | | 10 |
| **Total** | | | 29 |
| **Total Cost of Engineering Services** | | | $72,369.00 |

# References


[1] "AASHTO-Roadside-Design-Guidelines," American Association of State Highway and Transportation Officials, vol. 4th, 2011

[2] "ADOT Roadway Design Guidelines," *Arizona Department of Transportation*, May 2012

[3] "*Coconino County Map*" (2016). [Image] Available at: www.mapsoftheworld.com [Accessed 4 Dec. 2019].

# Questions?