



Transportation Competition

Transportation

Pacific Southwest Conference 2018

1.0 Event Description

A private developer within the City of Flagstaff has expressed interest in the establishment of a new restaurant and retail facility on Lot 9 of APN# 107-13-009 in Flagstaff, Arizona. Currently, the site is undeveloped, so the City of Flagstaff is concerned with the volume of generated traffic that will be accessing the site via the adjacent major and minor arterials. Consequently, careful planning and design of any site access driveways, proposed intersections, and on-site parking will be required for the proposed development. Refer to Figure 1 – Project Location and the attached Preliminary Plat for visual representation of the location of the site and identification of the parcel's lots.

Additional information about the site may be obtained through the Coconino Parcel Viewer, the City of Flagstaff Engineering Design Standard Specifications and Details, and the City of Flagstaff Zoning Code. Refer to the Suggested Reference section at the end of this report for the location of these references.

2.0 Participant Rules

Each university participating in this competition must abide by the following rules:

- Each university may enter only one team.
- Teams must consist of at least 4 members.
- Every member of the team must be a registered participant of PSWC 2018.
- The team must have at least one underclassman (freshman/sophomore).
- The team must have at least one female.
- All members must be present for the presentation of the final design on the day of competition.

3.0 Objective

The objective of the transportation project is to provide students with the ability to showcase their engineering capabilities through practice, competition, and professional presentation. Students are to complete standard traffic analyses and traffic related site design practices to fully project the functionality, efficiency, safety, and economics of the final proposed design. Required submittals for the competition are outlined within Section 4.0 (*Project Scope and Requirements*).

4.0 Project Scope and Requirements

In order to convey the functionality, efficiency, safety, and economy of the proposed design, each university must submit a written report, concept plan, cost estimate, site plan, and a poster. Each required submittal is to be completed per the information provided below.

4.1 Written Report:

The written report for this project shall be classified as a Traffic Impact Analysis (TIA). However, it is recommended that each team reference the Arizona Department of Transportation's and the City of Flagstaff's requirements for the generation of a full TIA in order to properly classify the document. Regardless of the classification of the report, the write-up must include the following items:

Cover Page

The cover page shall clearly provide the team's university name and names of all contributing members.

Table of Contents/List of Figures & Tables

An organized Table of Contents and List of Figures & Tables shall be provided in the written document. As a result of the scope of work associated with the proposed project, the document shall not exceed 12 pages in length. The Cover Page, Table of Contents, List of Figures & Tables, References, Tables, Figures, Plans, and Technical Appendices are not included in this page count.

Introduction

The submitted written document shall include an introductory description of the project, including description of the project location and the design constraints and parameters associated with it.

Trip Generation & Trip Distribution Analysis

Trip Generation and Distribution Analysis shall be completed for the proposed project. The written document shall provide an explanation as to what methods or practices were used to conduct the analysis. All relevant results shall be displayed. A Trip Generation table shall be prepared, and a trip distribution exhibit for the proposed project site is required to be included within the document as well. Trip distribution assumptions should account for locations of employment, residence, and commercial centers from which visitors of the project would be drawn. All results of calculation must be displayed through tables, figures, hand calculation, or software output with reference to the appropriately utilized manuals.

Level of Service Analysis

With respect to the location of the site, each university must determine the appropriate method of providing access to the site. It is recommended that each team reference the Arizona Department of Transportation's Signal Warrants throughout this process. Whether the team

chooses to design an intersection or site access driveway(s) for the final design, a Level of Service (LOS) Analysis shall be completed. Within the submitted written document, each team shall provide explanation of the process used to complete the LOS Analysis. Each team shall also provide description of the designed method of site access, as well as discussion on the decisions made to justify the implementation of the designed intersection or site access driveway(s). Additional discussion on the design's influence on various forms of transportation present in the area is recommended to be included as well. All results of calculation must be displayed through tables, figures, hand calculation, or software output with reference to the appropriately utilized manuals.

Cost Estimates

An Engineers Opinion of Probable Cost shall be included within the report. Each team shall address the quantity of items needed for the construction of the final design. An explanation of how the cost estimates were derived and a concise summary of the results shall be provided within the body of the report.

Summary

A conclusive summary shall be provided in order to clearly and concisely state the results of the traffic analysis and design process. Within this section, teams shall discuss whether the generation of a full TIA is warranted. Additionally, teams should provide commentary of the functionality, efficiency, economy, and safety of the designed system in order to provide final justification for the design of choice.

References

All references utilized throughout the design and analysis processes shall be included within this section. Refer to Section 7.0 (*References*) within this document for a list of suggested references.

Tables

The resultant Trip Generation table, Cost Estimates table, and LOS table shall be included within this section. All tables shall be clear in providing the necessary data to the reviewer.

Figures & Plans

A vicinity map, trip distribution exhibit, and site plan shall be generated by each team and included in the report submittal. All site plan drawings shall be provided on an 11"x17" page, whereas the exhibit and vicinity map may be provided on an 8.5"x11" page.

Technical Appendices

All results of Trip Generation and Distribution, LOS, Parking, and Site Access Design calculations must be displayed through tables, figures, hand calculation, or software output with reference to the appropriately utilized manuals and included in the Technical Appendices of the report.

4.2 Concept Plan

Upon completion of the necessary traffic analysis, each team shall generate a Concept Plan for the proposed project site. As the developer is interested in the creating a restaurant and retail store on site, each engineering team must place the facilities in locations that optimize parking, provide for proper circulation on-site, and allow for appropriate site access. The developer requests the square footage of the restaurant and retail store be no less than 2,000 square feet and 4,000 square feet respectively. The number of employees at each facility may be assumed to be 10 at any given time. Furthermore, the developer is interested in creating site access with minimal ingress and egress restrictions. In order to provide sufficient access for the site, cross access easements are allowed with the adjacent Lot 10.

The City of Flagstaff Concept Plan Development Application Checklist is recommended for reference throughout this process. In respect to the checklist, teams are welcome to disregard requirements listed within sections I.2, II.1, II.3, and II.4. Additionally, any requirements associated with utilities, stormwater and drainage, resource protection (“Natural Features”), and on-site landscaping may be ignored for this submittal. Refer to Section 7.0 (*References*) for location of the Concept Plan Checklist.

Completed Concept Plans shall be submitted to pswc2018@gmail.com by the end-of-business (Arizona Time) on January 31st, 2018. The subject of the email shall be “[University Name] Transportation Project – Concept Plan Submittal”.

Despite the number of copies and size of paper specified within the checklist, each team is only required to submit one electronic copy to the provided email address by the given date with drawings formatted to 11”x17” paper.

4.3 Site Plan

After receiving comments regarding the team’s submitted Concept Plan, each team shall submit a Site Plan in accordance with the City of Flagstaff Site Plan Development Application Checklist. Comments will be provided to each team with respect to their specific Concept Plan by February 14th, 2018. To maintain the integrity of this event as a practice in Transportation Engineering, only subsection II.2 of Part II and subsection III.5 of Part III shall be considered during this process. Additionally, any requirements associated with utilities, stormwater and drainage, resource protection (“Natural Features”), and on-site landscaping may be ignored for this submittal. Subsection I.2 of Part I may also be dismissed. Refer to Section 7.0 (*References*) for location of the Site Plan Checklist.

Completed Site Plans shall be submitted to pswc2018@gmail.com by the end-of-business (Arizona Time) on March 14th, 2018. The subject of the email shall be “[University Name] Transportation Project – Site Plan Submittal”. It is important to note, subsection III.5 of Part III

accounts for the report aspect of this project. Consequently, the report shall be submitted on March 14th, 2018 as well.

Despite the number of copies and size of paper specified within the checklist, each team is only required to submit one electronic copy to the provided email address by the given date with drawings formatted to 11"x17" paper.

4.4 Poster Session

Each university is to prepare a 36" by 24" poster to adequately summarize their design for Thursday, April 12th, 2018. Each poster presentation will be given at the designated Transportation Competition venue, and all members of the team are required to be present. Judges will circle the poster presentation throughout the course of the event, so participating students will need to be present to answer any questions the judges may have. Each poster should include at least the following:

- University Name
- Trip Generation Table
- Trip Distribution Exhibit
- Intersection Level of Service Results
- Plans of the Designed Site
- Cost Estimates

5.0 Scoring

All final Site Plan Submittals will be scored using the following point system:

<u>Written Report</u>	100
Introduction	5
Trip Generation/Trip Distribution Analysis	15
Site Access LOS Analysis	15
Site Access Design Discussion/Justification	20
Parking Optimization	10
Cost Estimates	10
Summary	5
Tables	5
Figures	5
Technical Appendices	5
Clarity/Neatness	5

<u>Site Plan</u>	50
Cover Page	5
Inclusion of Comment Response Letter	5
Planning for Usage (<i>Bicycle, Pedestrian, Transit, Solid Waste Collection</i>)	5
Parking Compliance with COF Zoning Code	10
Site Access Design Compliance	15
Clarity/Neatness	10
<u>Poster Session</u>	50
Clarity/Neatness	10
Quality of Content	25
Quality of Answers	15
<u>Total Points</u>	200

6.0 References

The following references are recommended for the analysis and design of the transportation systems at the site. Teams may also utilize other resources if necessary under the condition that they are appropriately referenced.

Coconino County Parcel Viewer

Coconino County GIS

<https://gismaps.coconino.az.gov/parcelviewer/>

City of Flagstaff's Engineering Design Standards and Details, 2017

City of Flagstaff

<http://www.flagstaff.az.gov/482/Engineering-Design-Standards>

City of Flagstaff's Zoning Code, 2017

City of Flagstaff

<http://www.flagstaff.az.gov/2998/Downloading-the-Zoning-Code>

City of Flagstaff's Concept Site Plan Packet, 2017

City of Flagstaff

<http://www.flagstaff.az.gov/documentcenter/view/42850>

Trip Generation Manual, 9th Edition

Institute of Transportation Engineers

Highway Capacity Manual

Transportation Research Board

Roadway Design Guidelines, 2014

Arizona Department of Transportation

Traffic Engineering Guidelines and Processes, 2015

Arizona Department of Transportation

Manual on Uniform Traffic Control Devices (MUTCD), 2009

Federal Highway Administration

7.0 Background Data

7.1 Background Traffic

Figure 2 – 2017 Background Traffic showcases traffic counts recorded for the area in the year 2017 and shall be utilized for the analysis of the site access driveway(s) or intersection.

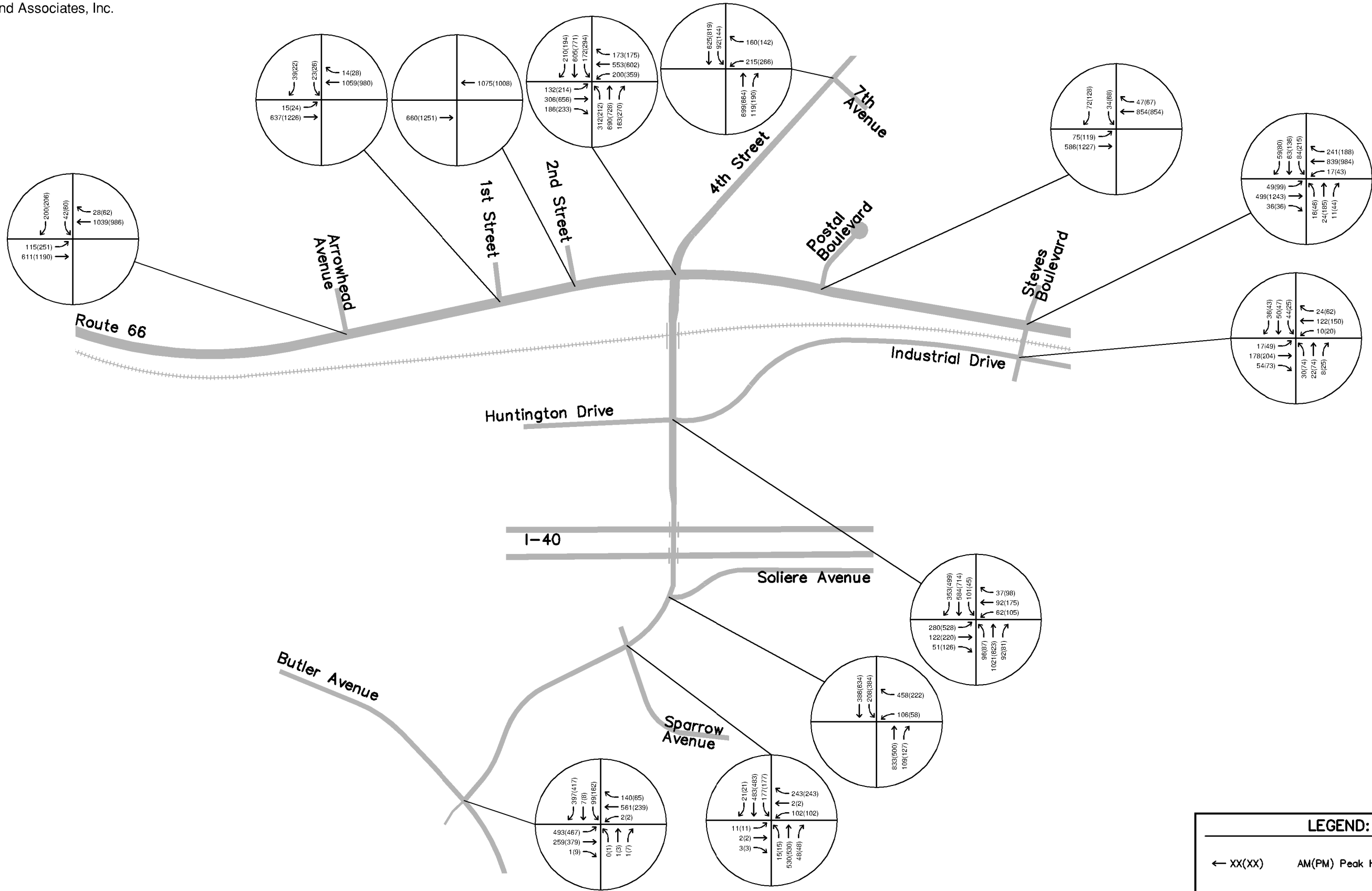
The area is reported to possess an annual traffic growth rate of 2%, and the project is slated for build-out by the year 2020.

7.2 Land Survey Data

An outside surveyor has provided a topographic survey file including information regarding the layout of existing transportation facilities, grades, and developed areas. The survey file will be sent to each team upon their request. Teams shall request the survey data by emailing pswc2018@gmail.com. The subject of the email shall be “[University Name] Transportation Project – Survey Data Request”.

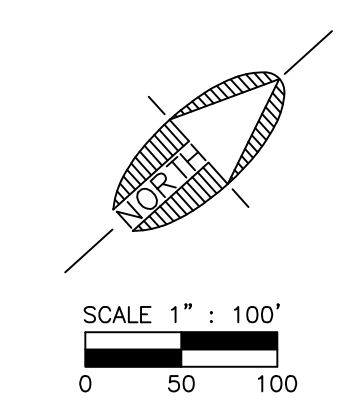
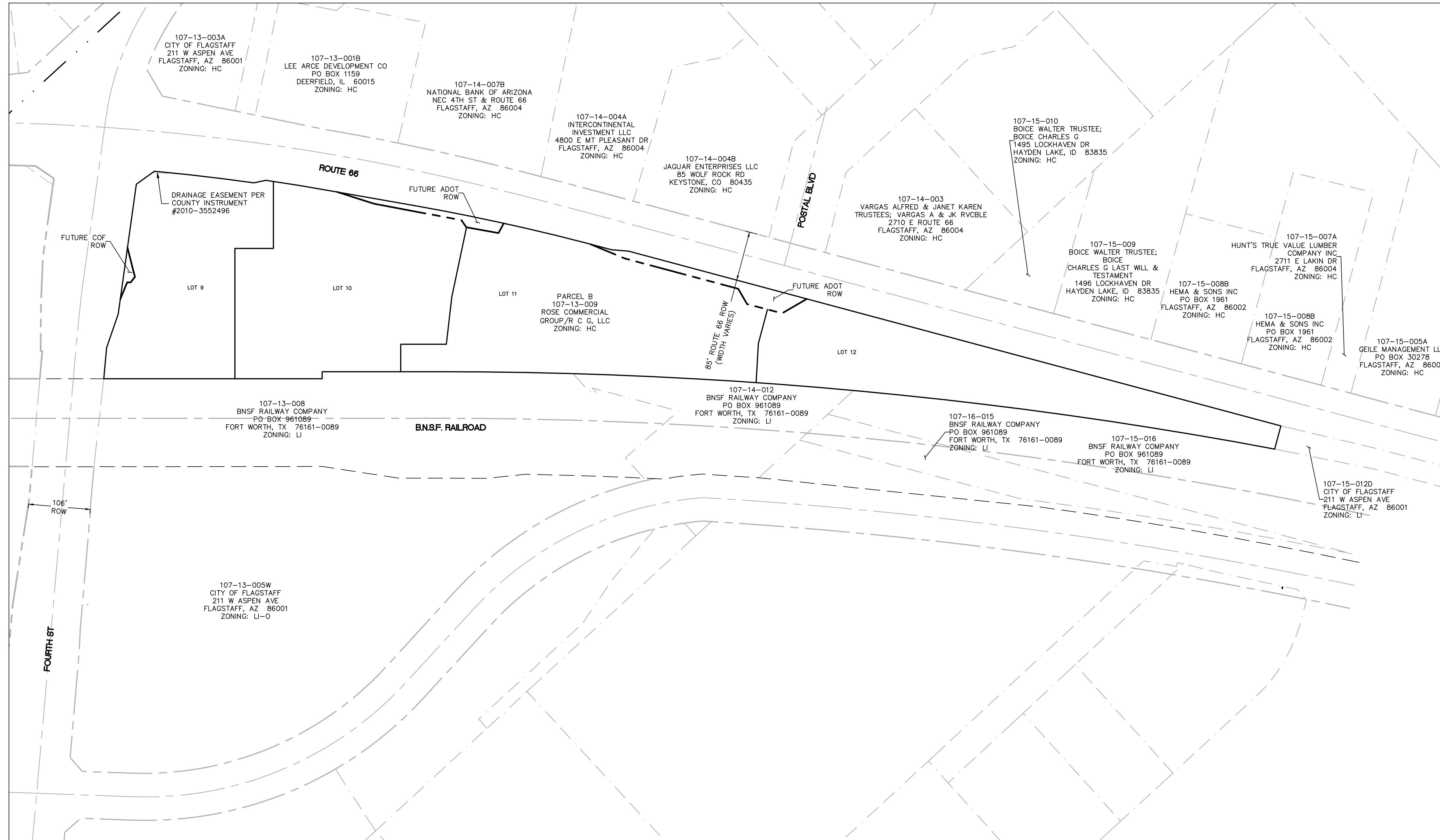
Additionally, the following figures and preliminary plat have been attached for each team’s conceptual understanding of the site location and lot configuration.

Figure 2 - 2017 Background Traffic



December 2013

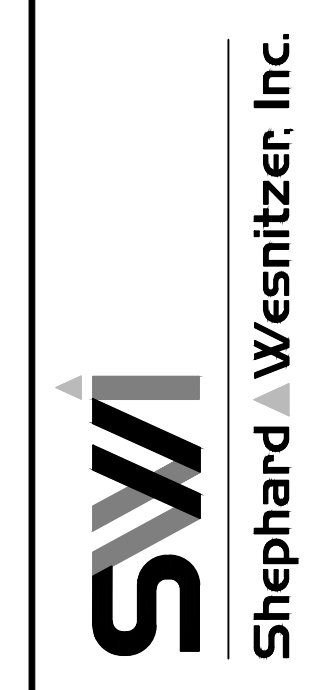
2017 Background Traffic
 The Trax - Traffic Impact Analysis



THE TRAX AMENDED PRELIMINARY PLAT
PROJECT BOUNDARY,
EXISTING PROPERTY EASEMENT,
AND RIGHT OF WAY INFORMATION

JOB NO:	15030
DATE:	FEB 16
SCALE:	SHOWN
DRAWN:	TRL
DESIGN:	SCI
CHECKED:	GEC

110 W. Dole Avenue
Flagstaff, AZ 86001
928.774.0354
928.774.8934 fax
www.swibz.com



NO.	DESCRIPTION	DATE	BY

CALL TWO WORKING DAYS BEFORE YOU DIG
1-800-STAKE-IT

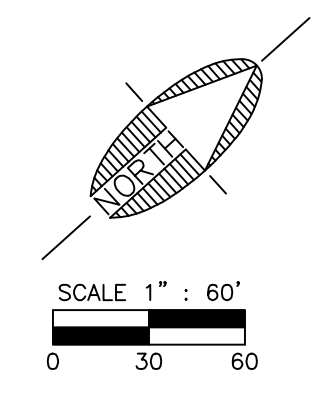
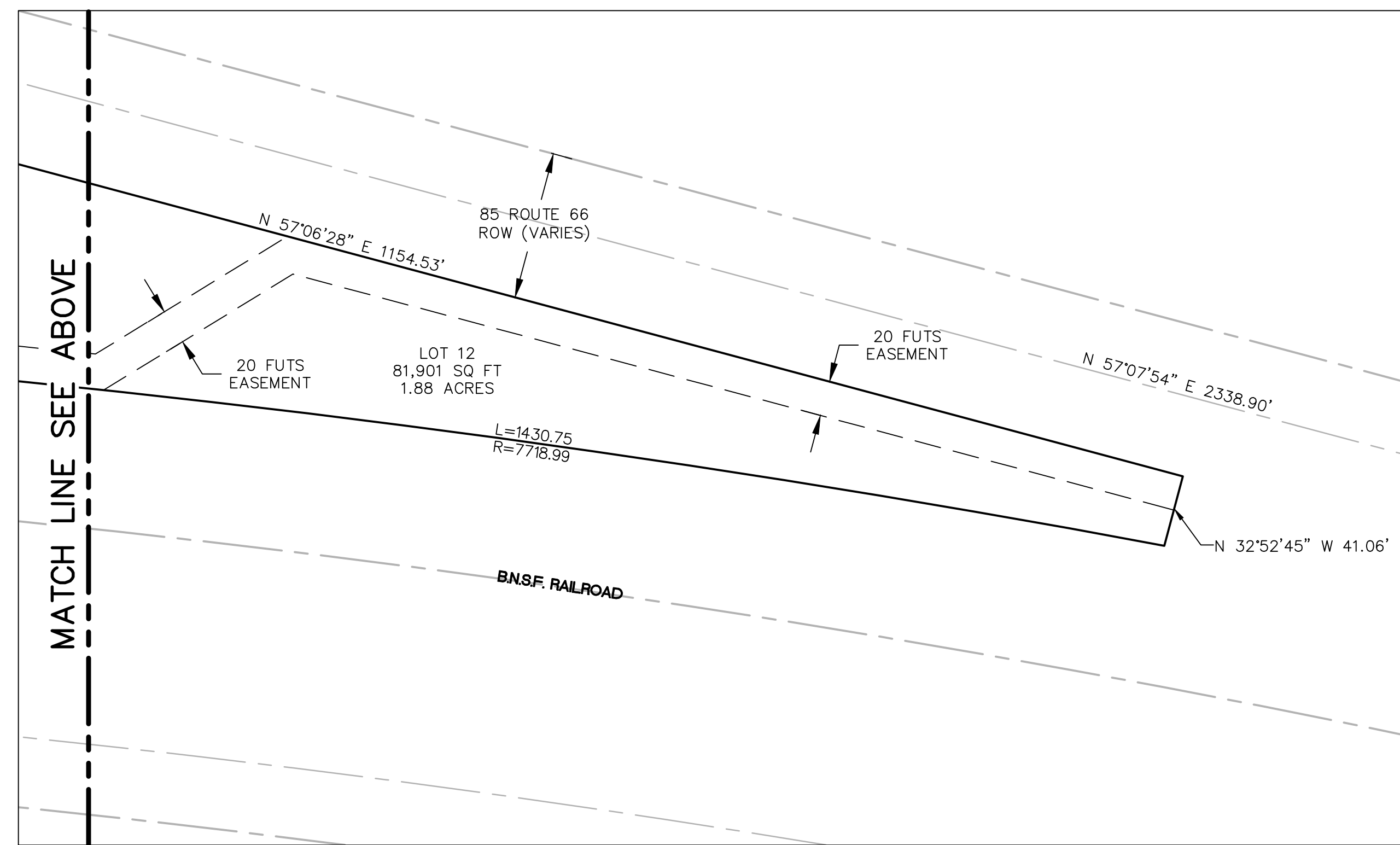
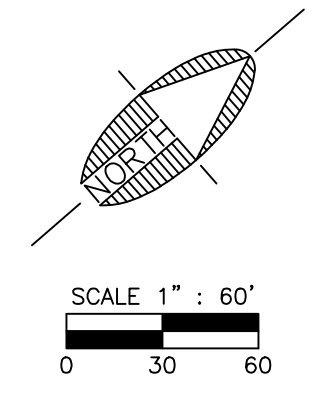
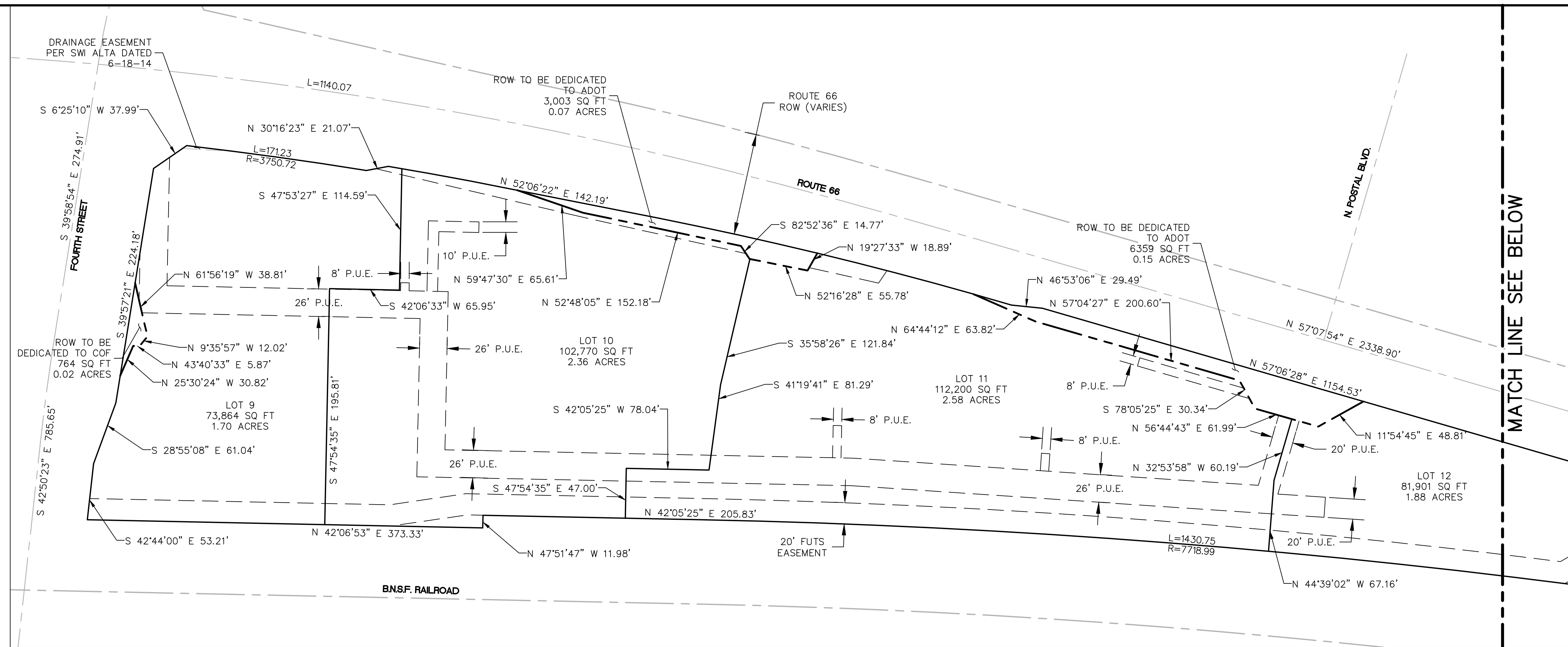
Professional Engineer and Surveyor stamps for Aaron D. Borling and Stephen C. Irwin, dated 2/12/16.

C.O.F. FILE NO: DEV 13-040, PPPL2014-0006

DRAWING NO.
EX02
SHT NO. 3 OF 5

PLOTTED: Feb 12, 2016 - 4:09pm

FILE: P:\2015\15030\Drawings\Preliminary Plats\PP01-15030.dwg SCI-C3D14

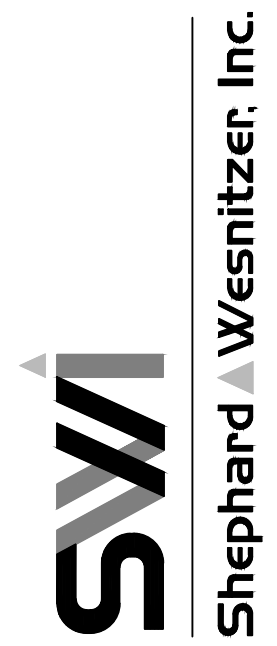


MATCH LINE SEE BELOW

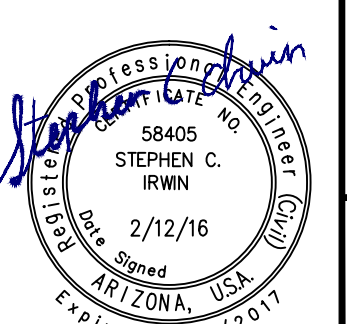
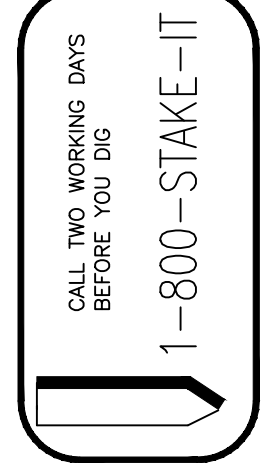
MATCH LINE SEE ABOVE

JOB NO:	15030
DATE:	FEB 16
SCALE:	SHOWN
DRAWN:	TRL
DESIGN:	SCI
CHECKED:	GEC

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NO.	DESCRIPTION	DATE	BY



DRAWING NO.
PP01

C.O.F. FILE NO: DEV 13-040, PPPL2014-0006

SHT NO. OF
4 OF 5