Kendrick Street Bicycle Boulevard Project

Final Proposal

December 10, 2014

Proposed for:

Jeff Bauman, PE, City of Flagstaff | Martin Ince, PE, City of Flagstaff

Submitted by:

P.J. McKelvey | Christopher Sobie | Stephen Hirte | Yousef Alkandari

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Project Understanding

Project Purpose

The purpose of this project is to convert Kendrick Street into a bicycle boulevard providing a bicycle friendly alternative to Humphreys Street. Bicycle boulevards improve bicycle safety and circulation by having or creating low traffic volumes, discouraging of non-local motor vehicle traffic, and providing free-flow travel for bikes by assigning the right-of-way to the bicycles at intersections. In addition, bicycle boulevards have "a distinctive look or ambiance such that cyclists become aware of the existence of the bicycle boulevard and motorists are alerted that the roadway is a priority route for bicyclists" [1]. This is accomplished by increasing bike lane width, striping a continuous bike lane, eliminating stops along the bicycle boulevard, and designing the road so it is clear to all users that bicycles are welcome and encouraged. The extent of the work will be from US 180/ North Fort Valley Road to Birch Avenue along Kendrick Street. Currently, Kendrick Street does not have any of the above listed treatments intended for bicyclists. The City of Flagstaff is constantly seeking ways to improve its bikeways systems and this project will provide a crucial connection to the system. Completing this project will also connect the foot and bike trails of northern Flagstaff to the campus of Northern Arizona University (NAU). Current conditions make it technically possible for bikers to get from Northern Flagstaff to NAU, but it is not as safe, simple, or easy as a bicycle boulevard will provide.

Background Information

Kendrick Street is a local road that runs north-south in downtown Flagstaff, Arizona (Figure 1). The portion of Kendrick Street located in the project limits (N Kendrick Street) is approximately 0.5 miles long. It extends from US 180 to Birch Avenue parallel to Humphreys Street (one block west) (Figure 2). The north end of Kendrick Street is a one-way driveway allowing northbound Kendrick Street traffic access to US 180 / Fort Valley Road and not permitting US 180 / Fort Valley Road traffic access to

Figure 1: Project Location [2]

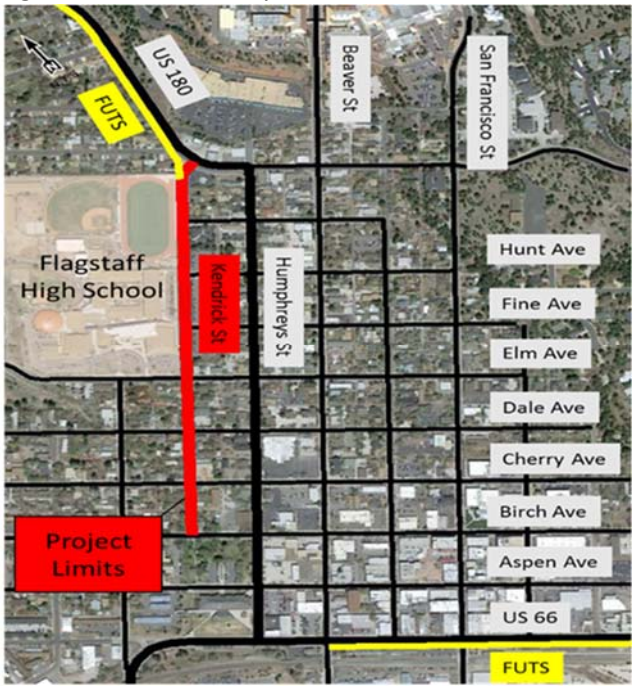


Figure 2: Project Limits [2]

Kendrick Street. Flagstaff High School is located along the northern portion of Kendrick Street between US 180 and Elm Avenue (Figure 2). The school building is on the west side of the street and student parking is on both sides of the street. The remainder of the project area, from Elm Ave to Birch Ave, consists of residential housing. The southernmost block from Cherry Avenue to Birch Avenue is a one-way street (north) with a separated pedestrian/ bicycle path. In addition to providing a mode of transportation to local and high school traffic, Kendrick St serves as a connection to the Flagstaff Urban Trails System (FUTS). FUTS "is a city-wide network of non-motorized shared-use pathways that are used by bicyclists, walkers, hikers, runners, and other users for both recreation and transportation." [3] FUTS serves north Flagstaff beginning at Schutlz Pass Road and runs parallel to US 180. Currently the trail terminates at Kendrick Street and resumes south at the intersection of Beaver Street and Route 66. Due to the large volume and lack of bicycle treatment on Humphreys Street, Kendrick Street is the ideal pathway for bicyclists traveling to and from north Flagstaff. The City of Flagstaff has begun to accommodate this preference by installing a paved pathway connecting the FUTS trail to Kendrick Street, however no bicycle treatments have been applied along Kendrick Street.

Stakeholders

There are numerous stakeholders for this project. The City of Flagstaff is the project owner. Therefore all design, specifications, and details will be done to Flagstaff standards. Bicycle users are also key stakeholders because this project is designed for their safety and comfort. Flagstaff High School will be largely impacted by this project given the close proximity to the project and the high number of students that use Kendrick Street to get to school. The Bicycle Advisory Committee oversees all planning and accommodations related to bicycles in Flagstaff. Therefore, they are an important stakeholder. In addition, the Transportation Commission will be interested in this project as they oversee anything traffic related in Flagstaff. [3] NAU is also a stakeholder as they will benefit from improved bicycle traffic flow. The Flagstaff community and nearby neighborhoods are also key stakeholders in this project as a bicycle boulevard influences the community as a whole. Finally, NATS and our technical advisor, Jeff Bauman are stakeholders; our professional reputations will be effected by the outcome of this project.

Existing Conditions

Currently there are no bicycle facilities on Kendrick Street. The FUTS trail parallels US 180 and terminates at Kendrick Street. However, the City of Flagstaff has installed a FUTS connection at the north end of Kendrick Street. The connection has a wide pathway, ADA approved ramps, and is aesthetically appealing (Figure 3). The north end of Kendrick Street is a one-way driveway for northbound traffic. Once on Kendrick Street, bicyclists are forced to ride on an unstriped road or on the

Figure 3 FUTS Connection [4]

Figure 4 West Side Sidewalk [4]

Figure 5 Kendrick St and Elm St [4]

Figure 6 Parking Lot and Bus Access [4]

Figure 7 FUTS between Cherry Ave and Birch Ave [4]

Figure 9 Eastside sidewalk conditions [4]

Figure 10 Pavement conditions [4]

west side sidewalk given no pedestrian traffic (Figure 4). Near Flagstaff High School, street parking is permitted and there are parking lots and bus traffic only driveways on both sides of the street (Figure 5). Elm Avenue (south side of high school) serves as a main bus route for Flagstaff High School and has priority over Kendrick Street traffic (Figure 6). Beginning at this street there are 2-way stop signs on Kendrick Street at the next four intersections. Between Cherry Avenue and Birch Avenue there is a one block segment of the FUTS which has a barrier from one-way northbound traffic (Figure 7). The south end of the project and Kendrick Street terminate at Wheeler Park. South of Flagstaff High School Kendrick Street serves as a local road for residential housing. Figure 8 is a summary of the existing traffic control along the entire segment in the project area. The sidewalk on the west side of Kendrick Street is continuous, 5 feet wide, and well maintained. The sidewalk on the east side of the street has discontinuities, overgrowth and/or rubble, and is very narrow (Figure 9). In addition, the pavement conditions are average to poor. Many age and weather induced cracks are evident throughout the length of the street (Figure 10).

Figure 8 Existing traffic control and overview map [2]

Technical Methods

There will be a number of technical requirements for this project. Traffic counts, bike counts, and pedestrian counts will be conducted to assess how frequently Kendrick Street is used by vehicles, bikes, and pedestrians. Northern Arizona University will provide JAMAR counting boards to conduct this volume count analysis. In addition, speed studies need to be conducted to determine the average and 85th percentile speeds. This will be done using radar devices or traffic hoses placed on the pavement. The City of Flagstaff has agreed to provide these devices. The Manual on Uniform Traffic Control Devices (MUTCD) will be used for warrant analyses for stop signs. These will also be obtained from the City of Flagstaff. In addition to traffic counts and warrant studies, crash data will be utilized when determining proper traffic control. Programs such as VISSIM and Synchro may be used to model the road as it is now and how the proposed improvements will affect the project area. Other technical needs and guidance for bicycle boulevards will be taken from the American Association of State Highway and Transportation Officials (AASHTO) manual and previously installed projects from other cities. Signing and striping plans will be completed using a computer aided drafting (i.e. AutoCAD) program.

Project Challenges

There are a number of potential challenges that are anticipated during the extent of this project. Poor weather conditions, such as snow fall, frequently occur in Flagstaff resulting in decreased bicycle riding during the winter months. Therefore, existing traffic and bicycle volumes will be collected at peak hours during ideal bicycle use weather. Challenges also include driveway access along the entire segment of Kendrick Street. Flagstaff High School may have issues with any geometry or access changes. Challenges of the same nature may be incurred from local residents. However, bicycle boulevards typically increase pedestrian and bicycle mobility thereby improving the overall quality of the corridor. Giving priority to bicycles along Kendrick Street may result in diverting traffic to other roads possibly decreasing their level of service. Finally, contacting all stakeholders and providing notification of the proposed project will require significant coordination and planning.

Project Scope and Tasks

Project Purpose

The purpose of this project is to assess the feasibility of a bicycle boulevard and then convert Kendrick Street into a bicycle boulevard and provide a bicycle friendly alternative to Humphreys Street. Bicycle boulevards improve bicycle safety and circulation by hosting low traffic volumes, discouraging non-local motor vehicle traffic, and providing free-flow travel for bikes by assigning the right-of-way to the bicycles at intersections. In addition, bicycle boulevards have a distinctive look or ambiance such that cyclists become aware of the existence of the bicycle boulevard and motorists are alerted that the roadway is a priority route for cyclists. This is accomplished by increasing bike lane width, striping a continuous bike lane, eliminating stops along the bicycle boulevard, and designing the road so it is clear to all users that bicycles are welcome and encouraged. The extent of the work will be from US 180/ North Fort Valley Road to Birch Avenue along Kendrick Street. Currently, Kendrick Street does not have any of the above listed treatments intended for cyclists. The City of Flagstaff is constantly seeking ways to improve its Flagstaff Urban Trails System (FUTS) and this project will provide a crucial connection to the system. Completing this project will also connect the foot and bike trails of northern Flagstaff to the campus of Northern Arizona University (NAU). Current conditions make it technically possible for cyclists to get from northern Flagstaff to NAU, but it is not as safe, simple, or easy as what a bicycle boulevard would provide.

Scope of Services

The following is the task and subtask list for the project encompassing the scope of services.

1 Project Management

The following section will outline all billable tasks related to the Kendrick Street project that are not listed and discussed elsewhere in this memo. In addition, NATS will conduct weekly meetings and can provide meeting agendas and minutes at the clients request. An example meeting agenda and minutes are provided in Appendix A.

1.1 Project Roles

Throughout the course of the project, four main roles will need to be filled: Team Lead/Client Contact (Chris Sobie), Analysis Lead (P.J. McKelvey), Traffic Code Lead (Stephen Hirte), and Site Lead (Yousef Alkandari).

1.2 Staffing and Fees

A determination of the staffing of the project, their work hours spent on the project, and their respective fees must be determined to determine design costs.

1.2.1 Project Staff

The project staffing for this project will consist of Chris Sobie, PJ McKelvey, Stephen Hirte, and Yousef Alkandari. Their work capacities will be primarily relevant to their project roles discussed in 1.1.

1.2.2 Hourly Breakdown

The hourly breakdown for each staff member on the project is outlined further in this report, and accurately represents the amount of time necessary to complete the project.

1.2.3 Fees

Fees for each staff member on the project is an hourly rate that is outlined further in this report. Total costs of the design are in line with typical competitive rates for such a project.

1.3 Website

NATS will produce a website which contains pertinent project information such as updates, community information, and FAQ. Additionally, all project updates and progress will be archived. It will include the project description, sponsors/clients name and contact information, NATS employee's resumes and identifications. Further, the technical advisor responsible for the project contact information will be included. The written reports and presentations from the beginning of the project process to the end will be provided as a PDF files to help the observers to navigate and understand the project more clearly. Finally, there will be a Gantt chart that gives the browsers a resource to keep up with the progress of the project.

1.4 Project Management Exclusions

Exclusions of project management for the Kendrick Street Bicycle Boulevard project include:

- NATS will not have any employees not listed in 1.1

2 Background Research

Research into both the existing conditions of Kendrick St. and all available relevant codes, warrants, and precedence for design of a Bicycle Boulevard will be necessary for this project.

2.1 Existing Conditions

In recent years, bicycle travel has significantly risen. Due to this rise, a concurrent rise has occurred in the prevalence of bicycle boulevards. Portland, Oregon, and Berkley, California, are two cities on the forefront of installing and utilizing bicycle boulevards. Cities such as these are ideal examples of the tasks, design, and challenges of bicycle boulevards. Analysis and review of previously installed projects will play a key role in the outline for the Kendrick Street project.

2.1.1 Site Visit

An initial site visit is necessary for the team to develop an initial impression of the current conditions such as vehicle traffic, bicycle traffic, and pedestrian traffic. Additionally, rudimentary right of way can be determined for future consideration in design.

2.1.2 Client Meeting

An initial meeting with the clients of the project, Jeff Bauman (Flagstaff City Traffic Engineer) and Martin Ince (Flagstaff Multi-Modal Planner), is necessary to get an idea of project purpose, expectations, and scope.

2.1.3 Crash History Data

Crash data will be used to deduce how safe the existing conditions are. If there are significant safety problems at any point along Kendrick Street, these problems will be addressed. Safety is of the utmost importance when designing a bike boulevard. If it is not safe, no one will or should use it. Crashes should not be a problem on Kendrick. The speeds are low, the lanes are large and there are no blocked sightlines.

2.2 Literature Review

NATS will provide a state of the art literature review. The review will include, but will not be limited to: study of previous bicycle boulevard projects, bicycle infrastructure guidelines at the state and national level, and existing conditions. This review is crucial in the project development phase as the findings will provide the framework for the current project. All relevant research will be explained and discussed in the Background Research Memo.

2.2.1 Flagstaff Codes

The City of Flagstaff is a bicycle friendly community with established bicycle facilities. These policies and guidelines must be considered and followed for this bicycle boulevard. Any discrepancies will be directed to Jeff Bauman or Martin Ince. Flagstaff is located in Coconino County which has its own respective design manual. These two policies will be reviewed prior to the implementation of any design work.

2.2.2 ADOT Codes

The Arizona Department of Transportation (ADOT) has installed several bicycle boulevards, primarily in the Phoenix metropolitan area. Although bicycle boulevards are still in their early stages in Arizona, reports and guidelines will be obtained and considered. These guidelines will be compared to national standards and applied toward the Kendrick Street project.

2.2.3 AASHTO Codes

The American Association of State and Highway and Transportation Officials (AASHTO) provides standards and guidelines which are used in highway design and construction throughout the United States. Their publication, A Policy on Geometric Design of Highways and Streets (The Green Book), covers the functional design of roads and highways. The latest addition of the Green Book offers technical guidance for bicycle boulevards including, but not limited to, traffic volume and speed, arterial crossings, bicycle priority and advantage, traffic calming strategies for local streets, and traffic reduction strategies.

2.2.4 MUTCD Codes

The Manual on Uniform Traffic Control Devices (MUTCD) does not directly discuss bicycle boulevards as a bicycle boulevard is not a traffic control device. However, the standardized devices used to sign, mark, and operate a bicycle boulevard are pertinent to this project. As a result, changing any of these devices just to attract distinct attention, educate the community or marque a bicycle boulevard will be covered in MUTCD guidelines. Therefore, the MUTCD will be utilized for the signage and marking plans associated with the Kendrick Street project.

2.2.5 Relevant Literature

Bicycle Boulevard precedence set by existing boulevard designs will be researched for both guidance and ideas on how to correctly design for and implement a Bicycle Boulevard.

2.3 Background Research Exclusions

Exclusions of background research for the Kendrick Street Bicycle Boulevard project include:

- Any literature that is not peer-reviewed or a part of a standardized code set

3 Data Collection

The first step in the project design is to collect data that will aid in creating a complete solution for the problems on Kendrick Street. Data collection for this project includes volume counts, speed analysis, and turning movement counts. The data collected will be analyzed to provide solutions for the proposed bike boulevard.

3.1 Volume Counts

Four sets of hoses will be installed at numerous locations on and around Kendrick Street to collect volume counts. These tubes are one of two ways that volume counts will be collected, the other being turning movement counts. The main advantage of using hoses for volume counts is that traffic counts can be collected without the continuous presence of a human.

3.2 Speed Analysis

The speed differential between cyclists and vehicles is a crucial component to the safety of cyclists. The previously mentioned hoses will also be set to record the speed of cyclists and vehicles. This information will also be useful in attaining a design speed and will give insight into whether the speed limit is being followed or not. These hoses will not be used to count volumes or analyze vehicles on any streets other than Kendrick Street and east/west side streets that are directly connected to it.

3.3 Turning Movement Counts

In addition to counts collected by the hoses, JAMAR boards will be used by team members to count volumes and turning movements of vehicles and bicycles. These counts will be taken simultaneously in some areas. In these areas, precautions will be taken so that double counts do not occur.

3.4 Data Collection Exclusions

Exclusions of data collection for the Kendrick Street Bicycle Boulevard project include:

- The consistent collection of non-intersection based pedestrian cross traffic
- Use of data collected on Mondays, Fridays, Saturdays, and Sundays

4 Data Analysis

Data analysis is a very important part of this project. It bridges the gap between what is going on out in the world (Data Collection) and what needs to be done to improve the existing conditions (Design). Analysis for this project will include evaluating the current condition, a study of crash history, software analysis, and warrant analysis.

4.1 Software Analysis

Software can be a powerful tool when properly applied to a problem. The software analysis of Kendrick Street will include TRAXPro and PetraPro. These were selected because this is the software that works best with the JAMAR boards and counters that will be used for this project. Modelling software for large traffics systems like PVT VISSIM are extremely useful when simulating how traffic will flow, but will not be used in this project.

4.2 Warrant Analysis

Warrant analysis plays an important part in any traffics project, whether it be a signal warrant, a stop sign warrant, or a crosswalk warrant. Signal warrants will not be looked at for this project, as there is not nearly enough traffic to consider putting a signal in. Stop sign warrants and crosswalk warrants will be explored as possible enhancements to Kendrick Street.

4.3 Data Analysis Exclusions

Exclusions of data analysis for the Kendrick Street Bicycle Boulevard project include:

- Traffic simulation and optimization software such as VISSIM and Synchro will not be used in this project
- Busses are not considered double vehicles in this project

5 Design

The primary purpose of this project is to convert Kendrick Street into a bicycle boulevard providing a safer and more accessible alternative for cyclists. This section outlines the expected work that NATS will provide in the Final Proposal upon project completion.

5.1 Community Input

Input from the community will be necessary in determining the feasibility of proposed changes in the eyes of the public. Their concerns and needs will be instrumental in determining the correct course of action for the proposal. NATS will attend relevant meetings and gather input from the local community near Kendrick Street, Flagstaff High School commuters, and bicycle commuters in regards to potential changes NATS may propose, such as signage changes and the inclusion of an exclusive bike boulevard on Kendrick Street. This feedback will be useful in further determining the correct course of action. All data must be collected and analyzed before proposed changes can be made available for community input.

5.2 Pedestrian Accessibility

One of the primary objectives of a bicycle boulevard is creating degrees of separation between travel modes. For this project the travel modes are pedestrian, cyclists, and vehicles. Currently the pedestrian accessibility is average (east side of the street has discontinuous sidewalk). As part of the bicycle boulevard project NATS will develop and provide a pedestrian accessibility plan. This will be achieved by using various treatments including pavement markings, standard sidewalk widths and ADA compliancy, and signage.

5.3 Traffic and Bike Right of Way

Bicycle boulevards result in giving the priority right-of-way to cyclists at most, if not all, intersections. Currently, there are four stop signs installed along Kendrick Street within the project limits. The orientation of these stop signs may be revised to give priority to cyclists along the reach of the installed bicycle boulevard. Therefore, NATS will provide an analysis of changing stop control to a “cyclist priority” system and the effects on vehicular traffic. The design will be optimized to ensure achieving the desired characteristics for a safe and comfortable boulevard for the cyclists while maintaining the lowest possible impact on the vehicles delay times.

5.4 Roadway and Striping Design

NATS will produce and provide the city of Flagstaff with a set of draft striping plans and roadway plans. Upon submittal, the client will have a period to review and make changes to the plans. The plans will convey information about traffic control devices required for the installation of the bicycle boulevard. Plans will include regulatory, warning, and guide signs and on-pavement striping and other markings. In addition, the plans will take into account on-street parking, bicycle and traffic lanes, pedestrian crossings, visibility, and other related components. This step needs to comply with the guidelines set forth by AASHTO, MUTCD, and local guidelines.

5.5 Other Recommendations

The Kendrick Street project includes recommendations beyond pedestrian, cyclists, and vehicle travel. For example, a traffic calming system should not be disruptive to the point that it would affect fire and emergency services. Building a bike boulevard can create insufficient width in the road for emergency vehicles and might intersect with emergency services standards. Also, due to the nature of winter weather experienced in Flagstaff, NATS will consider snow plow accessibility. Other recommendations may include Flagstaff High School traffic control, bus routes, parking lot access, on street parking, and future FUTS connectivity. Therefore, components such as these will be taken into consideration in the process design.

5.6 Broad Impacts of Design

Considerations for impacts from the design that fall outside the immediate service scope must be considered for this project. This project is also part of the bikeway system and will be incorporated into it when completed.

5.7 Exclusions of Design

Exclusions of design for the Kendrick Street Bicycle Boulevard project include:

- Any potential roadway or striping plans for any street not named Kendrick Street
- Any warrant analysis or determination for any street not named Kendrick Street
- Inclusion or consideration of unsolicited input on the project.
- Providing tangible roadway

6 Deliverables

Deliverables that will be submitted throughout the project duration during the fall semester of 2014 include, in order of completion:

1. Project Understanding Memo
2. Scope & Schedule Memo
3. Background Research
4. Interim Presentation
5. Staffing & Cost of Engineering Services Memo
6. Final Presentation
7. Final Proposal
8. Website

Project Schedule

Gantt Chart

Attached in Appendix A is a current gantt chart containing all tasks outlined in this memo. All exclusion sections and the Deliverable section from the "Project Scope and Tasks" section are not included in the gantt chart.

Cost of Engineering Services

Introduction

This memo addresses the administrative components of the Kendrick Street Bicycle Boulevard Project Proposal. It includes Northern Arizona Transportation Services' staffing and qualifications, hourly breakdown for this project, and the cost of the services that will be performed.

Staffing and Qualifications

Christopher Sobie – Project Manager

Christopher Sobie is a senior student studying civil engineering at Northern Arizona University in Flagstaff, Arizona. Throughout his academic career he has taken courses related to transportation engineering including Surveying, Computer Aided Drafting, Traffic Study and Signal Systems, Transportation Engineering, Advanced Traffic Signal Systems, and Highway Transportation. Christopher has worked for Lee Engineering in Phoenix, Arizona, and the Minnesota Department of Transportation (MnDOT). During his time with the MnDOT he worked on highway reconstruction projects, roundabout projects, and became familiar with the general highway engineering process including working with various government agencies. While working for Lee Engineering, Christopher worked on traffic impact analyses, road safety assessments, AASTHO United States Bicycle Route project, and other various transportation projects.

Yousef Alkandari – Project Engineer (Site Lead)

Yousef Alkandari is a senior student studying civil engineering at Northern Arizona University in Flagstaff, Arizona. Throughout his academic career he has taken several courses related to transportation engineering including Surveying, Computer Aided Drafting, Traffic Study and Signal Systems, and Highway Engineering. Yousef has worked on civil engineering projects in the past including designing a compost system for the United States Geological Survey river rafts and an environmental assessment and restoration in his native country of Kuwait. In addition, Yousef has prior experience with data collection using JAMAR technology including turning movement counts and tube counters.

Stephen Hirte – Project Engineer (Research Lead)

Stephen Hirte is a senior civil engineering student at Northern Arizona University in Flagstaff, Arizona. The courses throughout his academic career pertaining to transportation engineering include Surveying, Computer Aided Drafting, Traffic Study and Signal Systems, Advanced Traffic Signal Systems, and Highway Engineering. Stephen has previously worked for the City of Visalia, California, performing warrant analysis, compiling traffic related reports and research, and operating GIS software. In addition, Stephen worked on a signal timing analysis and design for the Milton Road corridor in Flagstaff, Arizona. Throughout this project he utilized various traffic analysis tools and methods including, AutoCAD, MUTCD and AASHTO guidelines, and turning movement and traffic volume analysis.

Pierce-John McKelvey – Project Engineer (Software Lead)

Pierce-John McKelvey (PJ) is a senior civil engineering student at Northern Arizona University in Flagstaff, Arizona. Throughout his academic career PJ has taken several courses related to transportation engineering including Surveying, Computer Aided Drafting, Traffic Study and Signal Systems, Advanced Traffic Signal Systems, and Highway Engineering. PJ has previously worked for Northern Arizona University as a teacher assistant for Surveying and Statics courses. In addition, PJ worked on a signal timing analysis and design for the Milton Road corridor in Flagstaff, Arizona. Throughout this project he utilized various traffic analysis tools and methods including, AutoCAD, MUTCD and AASHTO guidelines, and turning movement and traffic volume analysis.

Hourly Breakdown

The following table (Table 1) displays the hourly breakdown by personnel and task description. The breakdown of each task into subtasks and their corresponding man hours can be found in Appendix A. Task 1, task 2, and task 6 are ongoing throughout the entire project. The project manager, Christopher Sobie, will handle the majority of the project management tasks except for the website, which will be the responsibility of Yousef Alkandari. To become familiar with this type of work, NATS pursued a rigorous background research at the onset of the project and will continue to reference design manuals

Table 1 Hours by Personnel and Task Description

PRIME CONSULTANT	HOURS BY PERSONNEL AND TASK DESCRIPTION							
	Task 1 Project Management	Task 2 Background Research	Task 3 Data Collection	Task 4 Data Analysis	Task 5 Design	Task 6 Meetings	Task 7 Deliverables	Total Hours / Employee
Pierce-Jon McKelvey, Software Lead	0.00	10.00	20.00	40.00	70.00	36.00	30.00	206.00
Yousef Alkandari, Site Lead	30.00	10.00	40.00	6.00	50.00	36.00	30.00	202.00
Chris Sobie, Project Manager	60.00	10.00	10.00	8.00	60.00	36.00	30.00	214.00
Stephen Hirte, Research Lead	0.00	50.00	20.00	4.00	42.00	36.00	30.00	182.00
Total Hours per Task	90.00	80.00	90.00	58.00	222.00	144.00	120.00	804.00

and previous work as the project continues. Data analysis was calculated to take the least amount of the project as it is requires easy software methods and incorporates previous project models. Deliverables will be equally spread out among the team. As seen in Table 1, the total project is forecasted to take 804 hours.

Cost of Engineering Services

The following table shows the method for calculating Northern Arizona Transportation Service's overhead rate. Currently the overhead rate is 1.81. This was calculated by dividing indirect expenses by direct expenses. The indirect expenses incurred by NATS are a summation of rent, utilities, insurance, software licensing, and supplies. The software licenses that are incorporated into this project include AutoCAD Civil 3D, TRAXpro, and PetraPro. To calculate the costs absorbed by NATS for these software licenses for this project the software was priced out for 60 months and a monthly price of $55.89 per employee was calculated. The monthly costs to determine total indirect costs are shown in Table 2. The total indirect cost incurred by NATS is $11,125.

Billable rates are determined by multiplying each employee's direct hourly rate by the overhead rate. Table 4 shows the current billable rates NATS uses to charge for their project. Direct hourly rates were determined by the project manager's previous experience with transportation engineering firms.

Table 2 Billable Rates

NATS Billable Rates	
Pierce-Jon McKelvey, Software Lead	$82.00
Yousef Alkandari, Site Lead	$72.00
Chris Sobie, Project Manager	$100.00
Stephen Hirte, Research Lead	$82.00

Northern Arizona Transportation Services projects the total cost of the Kendrick Street Bicycle Boulevard Project to be $115,882. Table 5 shows the project cost broken down by task. The majority of the costs are associated with task 5 and task 6. The project cost includes a 10% NATS fee that NATS includes with all projects.

Table 3 Project Cost by Task

Task 1	*Project Management*	*$13,960*
Task 2	*Background Research*	*$11,780*
Task 3	*Data Collection*	*$12,210*
Task 4	*Data Analysis*	*$8,225*
Task 5	*Design*	*$31,961*
Task 6	*Meetings*	*$20,586*
Task 7	*Deliverables*	*$17,160*
Project Grand Total		**$115,882**

References

[1] Cosin, W., Haney-Owens, K., & Wheeler, R. (2000). Bicycle Boulevard Design Tools and Guidelines (Rep.). Berkeley, CA: Wilbur Smith Associates.

[2] Google Earth Pro (2011), Version 6.1 (Software), Available from http://www.google.com/enterprise/earthmaps/earthpro.html

[3] Welcome to an Engaged Community. (n.d.). Retrieved September 18, 2014, from https://az-flagstaff3.civicplus.com/index.aspx?nid=1379

[4] Pictures taken by Christopher Sobie and PJ McKelvey

Appendix A – Meeting Agenda and Minutes

MEETING AGENDA

Topic: CENE 476 Capstone Kickoff

September 12, 2014
11:30 AM – 12:30 PM
Engineering Room 114 / TBD

Meeting called by: Christopher Sobie

Attendees: Chris Sobie, Yousef Alkandari, Stephen Hirte, PJ McKelvy, Jeff Bauman

Please bring: CENE 476 Project Description, Notes, Additional Questions

11:30 pm – 11:45 pm	• **Team Member Introductions / Project Definition** Designate note taker for meeting minutes • Introduction of each team member and client • Define project description as defined by CENE 476
12:45 pm – 1:15 pm	**Project Specification Review** • Define specific corridor for project • Define the need/purpose of the project (Why needed?) • Identify scope and objectives of project (Background info) • Identify key stakeholders • Discussion of existing conditions • Define technical work needed for project o Vehicle / Bike / Pedestrian Count? o VISSIM? o Others? • Identify challenges and methods to address them
1:15 pm – 1:30 pm	**Request for Materials / Information** • Possible key material / information needed: o Crash Reports o Traffic Counts o Previous Flagstaff work that applies o Land use projections o TMS o Other software? **Open Discussion**

Comments

MEETING MINUTES

Topic: Project Definition, Meet with Client/Tech Advisor

Friday, September 12, 2014
11:35 pm – 12:50 pm
Engineering Room 114

Minutes recorded by Stephen Hirte

Meeting called by Chris Sobie

Attendees: Chris Sobie, Yousef Alkandari, PJ McKelvey, Stephen Hirte

Please bring: Notes, Questions for Jeff

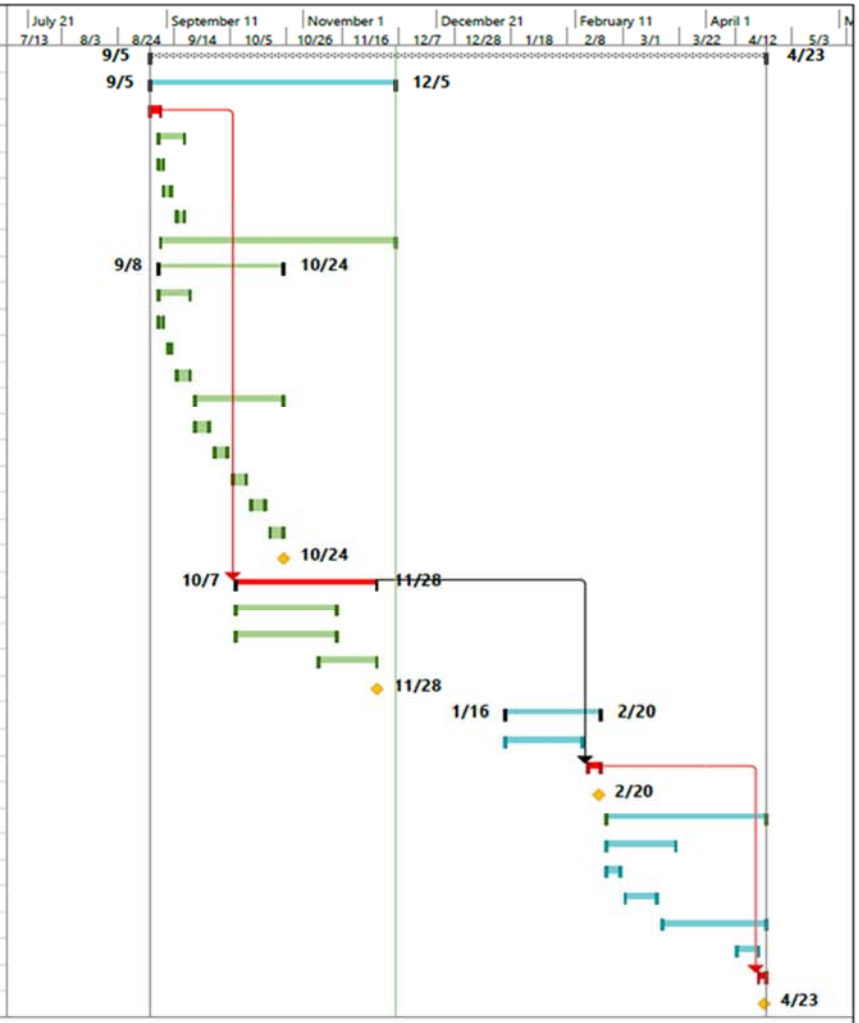
Table 2. Meeting Outline.

11:00 am - 12:45 pm	» Introductions » Project Description: Turn Kendrick into a bike boulevard add sidewalk when needed. Calm traffic. Generally make more bike friendly. » Project Corridor: Kendrick St, from US 180/North Fort Valley Rd. to Birch Ave. » Why: Help bikes along Kendrick, provide alternate road to Humphreys (less busy), fills in Foot Trails » Technical Data: traffics counts, crash data, sight triangles » Stakeholders: City of Flagstaff, bike users, Flagstaff High School, Bike Advisory Committee, Transportation Commission » Design Standards: Green Book, MUTCD, AASHTO Guide for Bike Facilities, NACTO Bike » Existing Conditions: Go look » Challenges: School district, neighborhood, diversion for Snowbowl traffic, adjusting vehicle traffic » Other Information: No previous work. Discuss the bigger picture. They aren't too worried about following Flagstaff CAD standards. » We should be receiving information from them in the coming days. » Jeff would like our meeting notes every week.
12:45 pm – 12:50 pm	Other topics not covered above. Discuss next meeting time.

Next formal meeting: 09/16/2014, Engineering Room 100, at 1:00pm.

Appendix B – Gantt Chart

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
0		**KendrickProjectSchedule**	**165 days**	**Fri 9/5/14**	**Thu 4/23/15**	
1		**1 Project Management**	**66 days**	**Fri 9/5/14**	**Fri 12/5/14**	
2		*1.1 Project Roles*	*2 days*	*Fri 9/5/14*	*Mon 9/8/14*	
3		*1.2 Staffing and Fees*	*8 days*	*Mon 9/8/14*	*Wed 9/17/14*	
4		1.2.1 Project Staff	2 days	Mon 9/8/14	Tue 9/9/14	
5		1.2.2 Hourly Breakdown	3 days	Wed 9/10/14	Fri 9/12/14	
6		1.2.3 Fees	3 days	Mon 9/15/14	Wed 9/17/14	
7		*1.3 Website*	*64 days*	*Tue 9/9/14*	*Fri 12/5/14*	
8		**2 Background Research**	**35 days**	**Mon 9/8/14**	**Fri 10/24/14**	
9		*2.1 Existing Conditions*	*10 days*	*Mon 9/8/14*	*Fri 9/19/14*	
10		2.1.1 Site Visit	2 days	Mon 9/8/14	Tue 9/9/14	
11		2.1.2 Client Meeting	1 day	Fri 9/12/14	Fri 9/12/14	
12		2.1.3 Crash History Data	5 days	Mon 9/15/14	Fri 9/19/14	
13		*2.2 Literature Review*	*25 days*	*Mon 9/22/14*	*Fri 10/24/14*	
14		2.2.1 Flagstaff Codes	5 days	Mon 9/22/14	Fri 9/26/14	
15		2.2.2 ADOT Codes	5 days	Mon 9/29/14	Fri 10/3/14	
16		2.2.3 AASHTO Codes	5 days	Mon 10/6/14	Fri 10/10/14	
17		2.2.4 MUTCD Codes	5 days	Mon 10/13/14	Fri 10/17/14	
18		2.2.5 Relevant Literature	5 days	Mon 10/20/14	Fri 10/24/14	
19		*2.3 Research Completed*	*0 days*	*Fri 10/24/14*	*Fri 10/24/14*	
20		**3 Data Collection**	**39 days**	**Tue 10/7/14**	**Fri 11/28/14**	2
21		*3.1 Volume Counts*	*28 days*	*Tue 10/7/14*	*Thu 11/13/14*	
22		*3.2 Speed Analysis*	*28 days*	*Tue 10/7/14*	*Thu 11/13/14*	
23		*3.3 Turning Movement Counts*	*16 days*	*Fri 11/7/14*	*Fri 11/28/14*	
24		*3.4 Data Collection Completed*	*0 days*	*Fri 11/28/14*	*Fri 11/28/14*	
25		**4 Data Analysis**	**26 days**	**Fri 1/16/15**	**Fri 2/20/15**	
26		*4.1 Software Analysis*	21 days	Fri 1/16/15	Fri 2/13/15	
27		*4.2 Warrant Analysis*	5 days	Mon 2/16/15	Fri 2/20/15	20
28		*4.3 Data Analysis Completed*	*0 days*	*Fri 2/20/15*	*Fri 2/20/15*	
29		**5 Design**	**44 days**	**Mon 2/23/15**	**Thu 4/23/15**	
30		*5.1 Community Input*	20 days	Mon 2/23/15	Fri 3/20/15	
31		*5.2 Pedestrian Accessibility*	5 days	Mon 2/23/15	Fri 2/27/15	
32		*5.3 Traffic and Bike Right of Way*	10 days	Mon 3/2/15	Fri 3/13/15	
33		*5.4 Roadway and Striping Design*	29 days	Mon 3/16/15	Thu 4/23/15	
34		*5.5 Other Recommendations*	6 days	Mon 4/13/15	Mon 4/20/15	
35		5.6 Broad Impacts of Design	3 days	Tue 4/21/15	Thu 4/23/15	27
36		*5.7 Design Complete*	*0 days*	*Thu 4/23/15*	*Thu 4/23/15*	



Project: KendrickProjectSchedu
Date: Sat 12/6/14

Completed Tasks to Date
Uncompleted Tasks to Date
Critical Tasks
Project Summary
Task Summary Format
Subtask Summary Format
Subsubtask Summary Format
Milestone