BRT Bus Station Location and Traffic Flow Enhancement Study
Project ID: CEEEn_2016CPST_009

by

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A Capstone Project Final Report

Submitted to

Andy Powell
AECOM

Department of Civil and Environmental Engineering
Brigham Young University

Submitted: 04/18/17
Executive Summary

PROJECT TITLE: BRT Bus Station Location and Traffic Flow Enhancement Study
PROJECT ID: CEEen-2016CPST-009
PROJECT SPONSOR: AECOM
TEAM NAME: Triple J Engineering

The vision of this project is to provide appropriate bus rapid transit (BRT) station locations on 900 North in Provo, Utah that will improve transit access at Brigham Young University (BYU), meet the needs of BYU, and follow the consistency of the rest of the Provo-Orem BRT system. Also, with the addition of the BRT stations, the intersection at 700 North and 900 East will be redesigned to favor the BRT route movements. AECOM is helping the Utah Transit Authority (UTA), in conjunction with other organizations such as the Utah Department of Transportation (UDOT) and the cities of Orem and Provo, design a BRT system that will provide improved public transportation between Orem and Provo. There will be several stations created along the route. The goal of this capstone project is to design the station on 900 North between 700 and 900 East in Provo, UT and improve traffic flow through this area.

Triple J Engineering recommends that the two BRT stations be located west of the 900 North / East Campus Drive intersection in order to provide easy BRT access to BYU campus. Also, building the stations at these locations will result in minimum impacts to parking lots and other properties. The 700 North / 900 East intersection to have direct traffic flow from 700 East to 900 North. This resulted in South Campus Drive teeing into the intersection with a stop control. It is recommended that the nearby crosswalks be left in their existing locations.

In order to determine the traffic impacts of the intersection redesign, a traffic study was completed on the study area. Delay and number of stops per vehicles were used as measures of intersection traffic performance. It is anticipated that the intersection redesign will not change the traffic performance at the 900 North / East Campus Drive and 900 North / 900 East intersections. However, it is anticipated that the intersection change will decrease the delay and number of stops by approximately 60% each. This will provide an even better travel experience for all who travel through this area.
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**Introduction**

PROJECT DESCRIPTION
AECOM is helping the Utah Transit Authority (UTA), in conjunction with the Utah Department of Transportation (UDOT) and the cities of Orem and Provo, to design a bus rapid transit (BRT) system that will provide improved public transportation between Orem and Provo. There will be several stations along the route. A map of the proposed Provo-Orem BRT route is shown in Figure 1. The purpose of this capstone project is to design a BRT station south of Brigham Young University (BYU) campus and to improve traffic flow through the area.

![Figure 1: Map of proposed Provo-Orem BRT route (UTA 2017).](image)

This project included the location of two BRT side stations south of BYU campus on 900 North. With the addition of the BRT stations, the intersection at 700 East and 900 North was designed to maintain a direct flow of traffic. Local bus stops were also included in the design. Consideration was taken so that the nearby private properties were not impacted physically by this project. A map of the study area is shown in Figure 2.
PROJECT REQUIREMENTS
There will be dedicated bus lanes in the outside lanes of 900 North from 700 East to 900 East. The redesign of the 700 East / 900 North intersection should accommodate a direct flow of traffic from 700 East to 900 North with Campus Drive (to the west) “teeing” into this reconfiguration. The design requires minimal impacts to existing BYU parking lots and no impacts to any private property.

The size of the stations is to be 12 feet wide by 60 feet long with a 13-inch platform height. Also, the redesign must meet the Americans with Disabilities Act (ADA) requirements for all sidewalks and accesses to the stations.

PROJECT DELIVERABLES
The required project deliverables included the following tasks:
- Prepare 3 concepts to meet the project requirements.
- Present the concepts in a review meeting where a preferred solution will be identified.
- Prepare final layout for the preferred alternative.
Schedule

A Gantt chart was created to assist the project team in following a schedule for the project. The team was on schedule throughout the proposed project timeline. That Gantt chart used by the project team is shown in Figure 3 and Figure 4.

Figure 3: Gantt chart of project schedule, page 1.
Figure 4: Gantt chart of project schedule, page 2.
Design, Analysis & Results

INTERSECTION AND STATION DESIGN

Vehicle Turning Radii
In order to create an appropriate roadway geometry at the 700 East / 900 North intersection, the turning radii of bus vehicles were researched. The American Association of State Highway and Transportation Officials (AASHTO) gives turning radii information in A Policy on Geometric Design of Highways and Streets (AASHTO 2011). The following information was considered in the design:

- The Minimum Design Turning Radius for the Articulated Bus found in Table 2-2b is 39.4 feet and 41.6 feet for the City Transit Bus.
- The Minimum Inside Radius for the Articulated Bus and the City Transit Bus are 21.3 feet and 24.5 feet, respectively.
- Because the City Transit Bus has an overall larger turning radius, those distances governed.

Intersection Geometry and BRT Station Design
As mentioned previously, the main purpose of this project was to redesign the intersection of 700 East and 900 North to allow direct flow of traffic between the two streets. In addition, the location of two BRT stations, one on the north and one on the south, were to be specified. There were many factors to consider with this design. BYU did not want any intrusion in the parking lots to the south of 900 North. Thus, the area of the new design had to remain largely within the existing street limits.

The site plan of the intersection redesign is shown in Figure 5. Detailed site and striping plans are shown in Appendix A. The redesign respects all conditions set forth by the City of Provo and BYU to complete the project. The traffic flow from 700 East and 900 North is direct in both directions. This means that the outflow from South Campus Drive is restricted, due to lack of use, by a standard stop sign.

The two BRT stations are located to the west of the intersection of 900 North and East Campus Drive, with the south BRT stations intruding into said intersection to allow for the turning radius of the BRT bus. The cross hatch lanes along the north and south of 900 North and along the east portion of 700 East indicate the BRT dedicated lanes. These will continue easterly along 900 North.

One thing to note is that the westbound through/turn lane on 900 North is designated as a Business Access and Transit (BAT) lane. This lane is a dedicated BRT lane but will along travelers along 900 North to turn north onto East Campus Drive most efficiently.
Along with the redesign the sidewalk to the south of the 900 North and East Campus Drive intersection was redesigned to comply with ADA ramp laws. The existing ramps were not ADA approved due to their pitch. The current design meets ADA specifications.

Figure 5: Site plan of 700 East / 900 North intersection redesign.

**Pedestrian Crosswalks**
With the redesign of the 700 East / 900 North intersection, it is important to consider how pedestrians will travel in the area. Pedestrian crosswalks are currently located on South Campus Drive approximately 100 feet west of the 700 East / 900 North intersection and on 700 East near the 700 East / 820 North intersection. There are also crosswalks at the 900 North / East Campus Drive intersection. As mentioned previously, there is a unique pedestrian-only phase in the signal timing of that intersection.

The new alignment of the 700 East / 900 North intersection will result in easier flow of vehicles to and from the south and east legs of the intersection. These movements have heavy traffic throughout that day. It would be unsafe to place a west-to-east crosswalk at this intersection. Also the north-to-south cross walk west of the intersection is in a good location of the low-volume roadway. Therefore, it is recommended that existing crosswalks remain in their current locations. It is anticipated that this design will be the best option for pedestrian safety.

**TRAFFIC FLOW STUDY**
A traffic study was completed for the 700 East / 900 North intersection to determine how traffic performance would change with the redesign of the intersection. This analysis was done using the
traffic modeling software Synchro 9. This software was used to create a computer model of the roadways and intersections in the study area. One model was created to represent the study area in existing conditions, and another model was created to represent the study area with the BRT and intersection redesign completed, or “plus project” conditions. Due to limitations in Synchro 9, only the normal vehicle traffic was analyzed without additional bus or BRT traffic.

The following intersections were included in the existing and plus project analysis:

- 700 East / 900 North
- 900 North / East Campus Drive
- 900 East / 900 North

The 700 East / 900 North intersection is currently a stop-controlled intersection, with a stop sign on the north movements. The 900 North / Campus Drive intersection is signal-controlled with a unique pedestrian-only phase due to the close proximity to BYU campus. The 900 East / 900 North intersection is signal-controlled.

Traffic counts for the study intersections were obtained from the project sponsor, AECOM. The traffic counts were completed by L2 Data Collection on June 24, 2015. These traffic counts were included in the Synchro models as volumes for each intersection movement in the study area. The same traffic volumes were used for the existing and plus project conditions. The counts provided from L2 Data Collection are found in Appendix B. Signal timing data was obtained via a connection to the UDOT signal timing database available in the BYU traffic lab on campus.

Intersection traffic performance is generally measured by level of service (LOS), which is a letter grade A to F. LOS is usually based on the time delay per vehicle for all vehicles that pass through the intersection. Due to the complexity of the signal at the 900 North / Campus Drive intersection, LOS was not used as a measure of traffic performance for the study area. Instead, the Synchro 9 software was used to calculate the time delay and number of stops per vehicle. These measurements were used to analyze the traffic performance in the existing and plus project conditions.

**Existing Conditions**

The roadway geometry and traffic volumes in existing conditions are shown in Figure 6. The results of the existing conditions traffic analysis are shown in Table 1. More detailed results of all the measures of effectiveness are shown in Appendix C. As shown in Table 1, the average delay per vehicle at the 700 East / 900 North intersection was 5 seconds per vehicle. This is an acceptable delay. On average, however, approximately half of the vehicles traveling through the 700 East / 900 North intersection stop. This seems like too many stops per vehicle for a low volume intersection, especially compared to the other two intersections.
Figure 6: Existing conditions roadways and volumes.

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<th>Stops / Veh</th>
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*Plus Project Conditions*

As mentioned, the proposed project conditions include changing the geometry of the 700 East / 900 North intersection with the installation of the BRT stations. It is proposed that the main traffic flow be made from 700 East to 900 North. By doing this, Campus Drive from the west will then tee into the 700 East / 900 North intersection.

The roadway geometry and traffic volumes in plus project conditions are shown in Figure 6. The results of the plus project conditions traffic analysis are shown in Table 2. More detailed results of all the measures of effectiveness are shown in Appendix C. As shown in Table 2, the average delay per vehicle at the 700 East / 900 North intersection was 2 seconds per vehicle. This is also an acceptable delay and an improvement on the existing conditions. On average, however, approximately half of the vehicles traveling through the 700 East / 900 North intersection stop. This seems like too many stops per vehicle for a low volume intersection, especially compared to the other two intersections.
Table 2: Plus Project Traffic Performance

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Comparison Analysis
The purpose of the comparison analysis is to determine how the implementation of the new roadway geometry at the 700 East / 900 North intersection impacts traffic performance. As shown in Table 1 and Table 2 previously, there was little to no change in the traffic performance of the 900 North / Campus Drive and 900 East / 900 North intersections from existing to plus project conditions. Therefore, this comparison will focus mainly on the 700 East / 900 North intersection.

A comparison of the delay and stops per vehicle at the 700 East / 900 North intersection in existing and plus project conditions is shown in Table 3. As shown in the table, there is an increase in the delay and stops on the eastbound leg of the intersection. However, there is a significant improvement in delay and stops per vehicle on the northbound leg. Overall, the delay and stops for all intersection legs improves. This is due to the high volumes on the northbound and westbound legs. While the eastbound leg is worse in plus project conditions, the volume is relatively low. Therefore, its delay impacts the intersection less as a whole.
Table 3: 700 East / 900 North Comparison Analysis

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Overall, it is anticipated the traffic performance of the 700 East / 900 North intersection would improve with the implementation of the proposed roadway geometry. The overall delay at the intersection would decrease. This is because the northbound right and westbound left legs movements have the highest volumes in the intersection. It is anticipated that such a design will work well with the designed BRT route.
Lessons Learned

This project was a great experience for the project team to learn about BRT systems and intersection design. The following are some of the lessons that were learned during the process:

During a design review with the sponsor, the project team learned that we were using the wrong width for the side BRT stations. However, there was enough space on the side of the road for the project team to quickly alter the plans. The lesson learned was to be sure all information is known to complete the design, even the smallest details. It is important to meet with the sponsor regularly so they can see potential problems before it's too late.

A preliminary design that the project team created had the South Campus Drive roadway teeing into the 700 East / 900 North intersection at a steep angle towards the south. However, in a meeting with the sponsor, it was pointed out that South Campus Drive should tee into the intersection at a right angle if possible. This orientation provides better sight distance. With a steep angle tee, it would be more difficult for eastbound vehicles to see westbound vehicles. Therefore, a right-angle tee orientation was used in the final design.

The project team learned the value of making team assignments based on the strength of each team member. For example, the assignment of doing the AutoCAD design work was given to Jordan Williams based on his previous experience with AutoCAD design. This was valuable for the project team because it allowed the rest of the team to focus on other details including reports and the traffic study.
**Conclusions and Recommendations**

Based on the research and analysis results presented above, Triple J Engineering recommends the proposed design. It is recommended that the BRT stations be placed just west of the 900 North / East Campus Drive intersection. This will provide easy access to the BRT system from BYU campus. It is also recommended that the 700 East / 900 North intersection be redesigned to favor the major flow from 700 East to 900 North. This will cause South Campus Drive to tee into the intersection with a stop control. It is anticipated that with the proposed design, traffic flow will improve in the area and BYU will have easy access to the new BRT system without greatly affecting parking on campus. It is also recommended that the existing crosswalks be left in their existing locations.

It is recommended that the signal timing of the 900 North / East Campus Drive intersection be investigated to see if improvement can be made. With the change to the 700 East / 900 North intersection, it is possible that another signal timing option would improve traffic in the area even more.

In conclusion, it is anticipated that with the proposed design, traffic flow will improve in the area and BYU will have easy access to the new BRT system without greatly affecting parking on campus. The design conforms to all the limitations and requirements given in the project description. The design of this BRT station will be consistent with the quality of the innovative design of the BRT system as a whole.
References

Appendix A – Design Plans
Appendix B – Traffic Count Data
## L2 Data Collection

**L2DataCollection.com**  
Idaho (208) 860-7554  Utah (801) 413-2993

**Study:** AECC00003  
**Intersection:** 900 North / 700 East  
**City:** Orem, Utah  
**Control:** Stop Sign

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## L2 Data Collection

L2DataCollection.com  
Idaho (208) 860-7554  
Utah (801) 413-2993

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**Grand Total**  
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Approx %  66 14.6 19.5 16.2 158 25.6 40.3 37.7 22  
Total %  10.5 3.6 4.9 25 4.2 15 6.7 25.9 19.8 18.5 10.8 49.1  
**General Traffic**  
417 92 102 611 106 379 161 646 499 467 223 1189 2446  
**% General Traffic**  
100 100 82.9 96.7 100 100 95.5 98.8 100 100 81.7 96.8 36.6  
**% U-Turn / Bikes**  
0 0 17.1 3.3 0 0 4.7 1.2 0 0 18.3 5 79  
**% U-Turn / Bikes**  
0 0 17.1 3.3 0 0 4.7 1.2 0 0 18.3 4 3.1
L2 Data Collection
L2DataCollection.com

Study: AEC00003
Intersection: 900 North / 900 East
City: Orem, Utah
Control: Signalized

Groups Printed- General Traffic - Turn / Bikes

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| 04:30 PM   | 21    | 189 | 1    | 4    | 215      | 1     | 1   | 1    | 3    | 6       | 1     | 159  | 7    | 6   | 173     | 21    | 0   | 28   | 9    | 58      |
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| Total      | 84    | 812 | 4    | 14   | 914      | 2     | 4   | 3    | 9    | 18      | 2     | 610  | 27   | 15  | 654     | 64    | 4   | 93   | 30   | 191     |

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| 05:15 PM   | 27    | 266 | 1    | 4    | 288      | 1     | 0   | 0    | 5    | 6       | 2     | 205  | 5    | 4   | 216     | 15    | 1   | 44   | 15   | 75      |
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| 05:45 PM   | 15    | 242 | 1    | 5    | 263      | 2     | 1   | 0    | 1    | 4       | 1     | 184  | 4    | 4   | 193     | 10    | 1   | 31   | 3    | 45      |
| Total      | 62    | 1051| 7    | 20   | 1170     | 4     | 3   | 5    | 18   | 30      | 8     | 756  | 24   | 18  | 806     | 58    | 2   | 143  | 40   | 243     |

Grand Total | 313   | 2432| 12   | 79   | 2836     | 9     | 11  | 10   | 89   | 119     | 11    | 2846 | 150  | 61  | 3067     | 168   | 6   | 437  | 147  | 748     |

Approch %   | 11    | 85.8| 0.4  | 2.8  | 7.6      | 7.6   | 9.2 | 6.4  | 74.8 | 0.4     | 0.4   | 92.8 | 4.9  | 2   | 21.1     | 21.1  | 0   | 58.4 | 19.7 |

Total %     | 4.6   | 35.9| 0.2  | 1.2  | 41.9     | 0.1   | 0.2 | 0.1  | 1.3  | 1.8     | 0.2   | 42   | 2.2  | 0.9 | 45.3     | 2.3   | 0.1 | 6.5  | 2.2  | 11      |

% General Traffic | 100 | 100 | 100 | 100 | 99.9 | 100 | 100 | 100 | 74.2 | 80.7 | 100 | 100 | 100 | 100 | 99.9 | 100 | 100 | 100 | 65.3 | 93.2 | 98.8 |

U-Turn / Bikes | 0    | 0    | 0    | 8    | 8       | 0    | 0   | 0    | 23   | 23      | 0    | 0    | 0    | 11  | 11      | 0    | 0   | 0    | 51   | 51      |

S-L-Turn / Bikes | 0    | 0    | 0    | 10.1| 0.3     | 0    | 0   | 0    | 25.8| 19.3     | 0    | 0    | 0    | 18  | 0.4     | 0    | 0   | 0    | 34.7 | 6.8     | 1.4 |
Appendix C – Intersection Traffic Performance Results
Existing Conditions Traffic Performance Report:

**Measures of Effectiveness**

4/7/2017

### 1: 700 East & 900 North

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Plus Project Conditions Traffic Performance Report:

Measures of Effectiveness

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Appendix D – Project Team Resumes
JENNY LEE BLONQUIST, EIT

1269 North Riverside Avenue #24 • Provo, UT 84604 • (801) 592-5665 • jenny@blonquist.com

EDUCATION

COLLEGE OF ENGINEERING, BRIGHAM YOUNG UNIVERSITY

Bachelor of Science in Civil and Environmental Engineering

* FE exam passed: August 2016

EXPERIENCE

YORK ENGINEERING

Structural Engineering Intern

* Perform structural analysis and design of light framed construction projects.

CENTER FOR UNMANNED AERIAL SYSTEMS (C-UAS) AT BYU

Research Assistant

* Participate in progressing research of UAV applications in the Civil Engineering field.
* Generate and analyze data from 3D models that is used for technical papers using various modeling software.

CIVIL ENGINEERING DEPARTMENT, BYU

Teaching Assistant for CE EN 341: Soil Mechanics

* Instruct students how to perform various geotechnical laboratory tests.

MISSIONARY TRAINING CENTER INFORMATION TECHNOLOGY

Information Technology Desk Analyst

* Worked efficiently with Active Directory, computer imaging processes; managed inventory; fixed hardware of Dell computers, laptops, iPads, and managed MTC applications.
* Provided 1st tier technical computer support for over 2,500 employees and service volunteers.
* Created trusting relationships by quickly responding to and fixing each individual's tech problems.

NEW YORK NORTH MISSION

Volunteer for the Church of Jesus Christ of Latter-day Saints

* Trained new individuals to work effectively using Mandarin and/or English.
* Created strong relationships of trust with the community.

OTHER

GLOBAL ENGINEERING OUTREACH

Member of Tea Packaging Process team

* Worked with a team consisting of different engineering disciplines to create and develop designs to increase the profitability of a Peruvian Community’s business.

* Fluent in English and Mandarin.
* Experience in NX, Visual Basics, ArcGIS, Adobe Photoshop, Agisoft PhotoScan, Maptek I-Site, Cloud Compare, and AutoCad Civil 3D.
Josh Gibbons

876 N University Ave
Apt. 2
Provo, UT 84604

801-889-4218
jdgibbons19@gmail.com

EDUCATION
Bachelor of Science, Brigham Young University; Provo, UT – April 2017
- 3.78 GPA
- Civil Engineering; ACTFL Spanish Certificate
- Member of ASCE and ITE
- Planning to complete a Master’s degree after graduation

WORK EXPERIENCE
Transportation Engineer Intern, Hales Engineering; Lehi, UT – April 2016-Present
- Complete traffic impact studies, parking studies, and safety studies for clients in both the private and public sector
- Assist in development of transportation master plans
- Participate in data collection processes using Jamar technology
- Create a new company website to improve marketing efforts

Research Assistant, Brigham Young University; Provo, UT – July 2015-Present
- Work with a team of students and faculty researching traffic and safety for the Utah Department of Transportation
- Use VBA code in Microsoft Excel to automate data manipulation processes to save client several hours of time
- Write a manual with clear instructions of how to use the Excel spreadsheets

Project Engineer Intern, Okland Construction; Lehi, UT – August 2014-August 2015
- Managed the digital plans of over 10 projects on site including hyperlinks, revision updates, and historical plan sets
- Lead a structural and architectural takeoff worth over $250,000
- Prepared and submitted RFI’s and submittals daily to the design team and owner
- Created several Excel spreadsheets using VBA code to automate data entry processes

SKILLS & ABILITIES
- Proficient in Synchro/SimTraffic, Bluebeam Revu and AutoCAD
- Highly skilled in VBA coding in Microsoft Excel
- Trained in surveying techniques and 3D scanning
- Strong problem-solving and analytical skills
- Spanish Language – Read, write, and speak fluently

OTHER EXPERIENCE
LDS Mission to Oaxaca, Mexico – March 2011-April 2013
- Led up to 20 other missionaries at a time in leadership positions
- Trained fellow missionaries on a weekly basis
- Worked in mission office organizing dozens of new member records

Extra-curricular Activities
- Team captain of high school cross country team
- Music
  - Performed in 2 large concerts accompanied by an orchestra
  - Taught piano lessons to 10 students at a time
Jordan Williams

210 S. 200 E.                               480-993-4527
Provo, UT 84606                             Jordan@rbwilliams.com

Education

Bachelor of Science in Civil Engineering, Brigham Young University
- GPA 3.5

April 2017

Relevant Work Experience

Civil AutoCAD Designer, R.B. Williams & Assoc., Inc.

January 2015 - Present

- Grading and Drainage Plans
  Designed and prepared more than two dozen Grading and Drainage plans, eight of which were preliminary plans that required revision after initial review.

- ALTA/NSPS Land Survey Plans
  Prepared ten ALTA/NSPS Land Survey Plans which have been submitted and approved or by the appropriate city.

- Construction Drawings
  Designed and prepared both residential and commercial construction drawings for multiple clients. The projects included grading/drainage, paving, and utility design and plan preparation.

- Utility and Paving drawings

- Knowledge of Construction Equipment and Techniques
  Made many site visits to verify that the construction and excavation was being performed correctly and with the proper equipment.

- Survey Crew member
  Opportunity to understand process by which plans are designed, prepared, implemented and inspected.

Other Work Experience

Sales Representative, Finchem

April 2014 - December 2015

- Was head member of many projects, one of which the whole team traveled to San Francisco for a sales event in which we were successful in obtaining many new clients.

Real Estate Agent, Rock Canyon Real Estate

March 2013 - March 2015

- Had success finding properties for prospective clients and helped them purchase said properties.

Other Experience

- Eagle Scout
- National Honor Society (BYU and High School)
- Two year service mission in Brazil (Fluent in Portuguese & basic knowledge of Spanish)
- Grew up working in construction and have a firm understanding of the construction process
RYAN JAMES EGBERT
ryanegbert12@gmail.com (801)518-8895

Current Address: 466 North 750 East, Provo, UT 84606
Permanent Address: 10363 Calla Lily Way, Sandy, UT 84092

OBJECTIVE
Employment in the field of civil/construction engineering that utilizes my problem solving and leadership skills.

EDUCATION
Brigham Young University, Provo, UT
Major in Civil Engineering with Minor in Spanish, Magna Cum Laude April 2016 GPA: 3.96/4.0
Hillcrest High School, Midvale, UT
High School Diploma June 2009 GPA: 3.94/4.0

WORK EXPERIENCE
Engineering Intern
- Working with senior engineers to create designs for buildings and water projects.
- Preparing bid forms, receiving bids, and overseeing contractors during construction.
- Performing site inspections and working with management to negotiate change orders.

Brigham Young University, Provo, UT
Research Assistant
- Assisted Dr. Rollin Hotchkiss with Civil Engineering grant funded projects.
- Actively contributed on a research team comprised of professor, and graduate and undergraduate students.

Teaching Assistant
- Assisted with curriculum and learning activity development, graded papers, and held review sessions.

Spanish Fork City Engineering Department, Spanish Fork City, UT
Engineering/Surveying Intern
- Worked on a team for water, sewer, roadway, and construction projects.
- Designed and drafted plans for projects using AutoCAD Civil 3D and ArcGIS.
- Performed surveying for projects, collected points and then loaded them in AutoCAD.

PROJECTS
BLM Project
- Researched potential use of abandoned coal mines as underground reservoirs in Utah.
- Collaborated with Bureau of Land Management, a private engineering firm, and site community.
- Coauthored User of Wasatch Plateau and Book Cliffs Mine Water for Beneficial Purposes: Case Study for Emery Utah by David Merrell, Ryan Egbert, Rollin H. Hotchkiss, Ph.D., P.E., D.WRE, F.ASCE Department of Civil and Environmental Engineering BYU
- Presented project report at Coal Symposium in Castle Dale, UT on October 24, 2013.

Maya Water Project
- Preliminary research and planning for exploration of ancient Maya water systems found in Northern Guatemala and Southern Mexico.

Dominican Republic Capstone Project
- Collaborated with INDRHI (National Hydraulic Resources Institute) and local engineering students from INTEC
- Performed site visits and investigated potential locations for building a dam.

LEADERSHIP AND SKILLS
Golden Key International Honour Society
Honorary Members Chair (1/13 to 6/13) and Interclub Liaison (7/13 to present)
Language: Fluent in Spanish
Software: Microsoft Office, AutoCAD, REVIT, ArcGIS, HydroDesktop, JobView Accounting

ACTIVITIES & HONORS
Student Speaker at Fulton College School of Engineering Graduation, April 22, 2016
Authored BYU ASCE Ridgeway Award Winning Report, 2015-2016
Tau Beta Pi Honor Society, 2014-2015
Centro Hispano, Volunteer ESL Teacher, 2013-2015
Weidman Center Global Student Scholar, 2013-2014
Eagle Scout, 2007