

SANTAQUIN CITY TRAIL CORRIDOR AND RIGHT OF
WAY DESIGN

Project ID: CEEEn_2016CPST_010

by

Silverstone Engineering & Surveying
Savannah Keane
Joel Whitmer
Clay Hansen
Brandon Walker

A Capstone project submitted to

Norm Beagley
Santaquin City

Department of Civil and Environmental Engineering
Brigham Young University

12/20/16

Contained herein is a proposed plan to complete the trail corridor and right of way design requested by Santaquin City.

Members of the team who prepared this proposal can be contacted by the following means:

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Introduction

PROJECT TITLE: Trail and Right of Way Corridor Design for the City of Santaquin
PROJECT ID: CEEEn-2016CPST-010
PROJECT SPONSOR: The City of Santaquin
TEAM NAME: Silverstone Engineering and Surveying

The objective of this project is to complete a full functioning design of a trail and right of way corridor for the city of Santaquin. The purpose is to provide a safe, comfortable route for pedestrians to travel along the existing frontage road. This trail will also serve as a showpiece that will be visible from the Interstate 15 freeway. Our team will do a full engineering assessment for the trail and right of way corridor. Components of the project will include:

- Complete design of an 8 ft wide trail along Highland Drive from 120 East to approximately 130 South. Design aspects include:
 - Full cut and fill design for the corridor
 - Meandering curve trail as per Santaquin City Standards.
 - Full runoff and drainage analysis
 - Possible property acquisition to complete all Right-of-Way improvements
 - Rerouting or relocation of driveways directly connecting onto Highland Drive, as is practical.
 - Full curb & gutter design on the southeast side of the frontage road
 - Design of landscaping
 - Design of water/power lines along the corridor to supply sprinklers/drinking fountains
- Full design of storm drainage facilities to accommodate storm drain capture, collection & conveyance
- Financial analysis and cost calculations of the entire project

The project will begin in January 2017 and will be worked on by 3 undergraduate students for 8 to 10 hours per week. It will be fully completed by April 10th and will be ready for presentations after that date.

Proposed Work Plan

The trail corridor is to be located on the east side of Highland drive, from 120 East to 130 South.



Figure 1: Aerial view of Trail Corridor Design location on Highland Drive in Santaquin, Utah highlighted in yellow.

The purpose of the corridor is to provide a safe and comfortable route for pedestrians to travel along the existing frontage road, Highland drive. Our capstone team will provide full engineering analysis and design for the trail and right of way corridor. Not only will necessary calculations need to be made, but design aesthetics will also be a major factor in the trail and right of way

design. We anticipate a possible boardwalk structure spanning a large depression near the home at 255 South Highland Drive.



Figure 2: The depression requiring large fill or a possible boardwalk structure at 255 South Highland Drive.

The majority of the work will be completed on BYU campus, yet site visits will be required to understand project concepts and acquire data points as needed. Much of the surveying data has been completed by the city of Santaquin and will be used in the project, though we may be required to obtain additional data points using the University's survey equipment. Much of the design and analysis of the trail, curb and gutter, storm drain facilities, and cut and fill will be completed in ArcGIS and Civil 3D.



AUTODESK
CIVIL3D



ArcGIS®

Components and key tasks to be completed include:

- Complete design of an 8 foot wide trail along Highland Drive from 120 East to approximately 130 south. Design aspects include:
 - Full cut and fill design for the corridor
 - Meandering curve trail as per Santaquin City Standards.
- Full runoff and drainage analysis
- Full design of storm drainage facilities to accommodate storm drain capture, collection, and conveyance.
- Reroute or relocations of driveways to connect to Highland drive, as is practical.
- Possible property acquisition to complete all right of way improvements.
- Full curb and gutter design on the southeast side of Highland drive
- Preliminary landscape design
- Design of water/power lines along corridor to supply sprinkler systems and possible drinking fountains
- Financial analysis and cost calculations of the entire project

Portions of the project will be divided among team members to increase efficiency, yet much of the project will be conducted as a group. The capstone group will meet for approximately 6 hours throughout the week to work on the project. Because of the variable school and work schedules of the team, group meetings will be scheduled on a week to week basis, achieving a minimum of 6 group hours. Additional time will be spent individually each week to accomplish assigned member tasks. Meetings will be held once a month to evaluate progress, problems, and future assignments. The sponsor may attend these meetings if desired. A final meeting will

be held with the sponsor before the project deadline to discuss completed work. Site visits will occur monthly to maintain familiarity with the site.

Schedule

Date	Project Status (Meetings)	Tasks for Following Week	Deliverables Completed
January 9, 2016	Project Begins (Preliminary Meeting)	Cut and Fill Design/Possible Solutions for Depression at 255 South	
January 16, 2017	Working on Cut and Fill Design	Cut and Fill Design/Possible Solutions for Depression at 255 South	
January 23, 2017	Cut and Fill Design Completed (including possible solutions for depression at 255 South)	Meandering Curve Design	
January 30, 2017	Meandering Curve Design Completed	Runoff and Drainage Analysis	
February 6, 2017	Runoff and Drainage Analysis Completed (Monthly Evaluation Meeting)	Storm Drain Design	Monthly Status Report
February 13, 2017	Storm Drain Design Completed	Driveway Rerouting/Relocation	
February 20, 2017	Summary of Necessary Rerouting/Relocation of Driveways Completed	Property Acquisition	
February 27, 2017	Summary of Necessary Property Acquisition Completed	Curb and Gutter Design	
March 6, 2017	Curb and Gutter Design Completed (Monthly Evaluation Meeting)	Preliminary Landscape Design	Monthly Status Report
March 13, 2017	Preliminary Landscape Design Completed	Water/Power Line Design for Sprinklers and Drinking Fountains	
March 20, 2017	Water/Power Line Design for Sprinklers and Drinking Fountains Completed	Financial Analysis	

March 27, 2017	Financial Analysis Completed	Final Project Report	
April 3, 2017	Compiling Final Project Report (Final Evaluation Meeting)	Final Project Report	Monthly Status Report
April 10, 2017	Project Completed	Final Project Presentation	Final Project Report and Presentation

Facilities, Tools, Data and Equipment

The engineering college has provided our group with all the necessary tools we will need to complete this project. Majority of work will be done in the Clyde building on campus utilizing the computer labs. The computers in these labs have all programs we will need in order to produce a high quality product. Programs like ArcGis and civil 3D. Our project will require a small amount of on site surveying, to fill in any gaps in any gaps that may exist in the data provided to us by the City of Santaquin. The Civil engineering department has all the necessary surveying equipment in order for us to do this.

Our group will be using the city of Santiquins website heavily not only to obtain data about the area but in order to make sure that our project is being designed in accordance with the City of Santaquin construction standards. We also will be using Lidar data provided that can be obtained from the Utah ARGC.

Project Budget

Date	Project Status	Total Hours Required for Current Task	Cumulative Total Hours
January 9, 2016	Project Begins		
January 16, 2017	Working on Cut and Fill Design	30	30
January 23, 2017	Cut and Fill Design Completed (including possible solutions for depression at 255 South)	30	60
January 30, 2017	Meandering Curve Design Completed	30	90
February 6, 2017	Runoff and Drainage Analysis Completed	30	120
February 13, 2017	Storm Drain Design Completed	30	150
February 20, 2017	Summary of Necessary Rerouting/Relocation of Driveways Completed	30	180
February 27, 2017	Summary of Necessary Property Acquisition Completed	30	210
March 6, 2017	Curb and Gutter Design Completed	30	240
March 13, 2017	Preliminary Landscape Design Completed	30	270
March 20, 2017	Water/Power Line Design for Sprinklers and Drinking	30	300

	Fountains Completed		
March 27, 2017	Financial Analysis Completed	30	330
April 3, 2017	Compiling Final Project Report	30	360
April 10, 2017	Project Completed	30	390

Deliverables

Once a month, a status report documenting challenges, questions, solutions, and progress will be provided. These status reports will answer the following questions.

- 1- What challenges have our team encountered in our Capstone project?
- 2- What actions did our team decide to take to overcome these challenges?
- 3- Was there any progress in overcoming these challenges?
- 4- Is the project on schedule?
 - a) A summary of progress and current status will be given.
 - b) A description of how challenges negatively impacted our progress and our plan to get back on schedule.

Upon completion on April 10th, the following will be provided to the sponsor:

- A full trail corridor and right of way analysis and design including plans and design description.
- A final report completed in Word, including the full analysis and details of all the work completed.
- A poster containing a summary of the project to be presented to student, faculty, and other interested individuals in the final undergraduate seminar.
- A powerpoint presentation summarizing the project.
- An excel spreadsheet detailing the financial analysis.

Performance Standards

Team will provide work for this Capstone project “as is” using best practices and with best effort. Project results cannot be construed as work performed by licensed professionals and cannot be used as “stamped deliverables” without first being reviewed, approved and stamped by a qualified and relevant license professional engineer.

Statement of Qualification

Team Background: Each of the 3 team members are pursuing bachelor's degrees in civil and environmental engineering from Brigham Young University. Because all 3 members are in their junior or senior years of study, there are many courses that will provide valuable knowledge to the progress of this project. Some of these courses include Drafting with CAD Applications, Elementary Soil Mechanics, Introduction to Transportation, Computational Methods, and Hydraulics and Fluid Flow Theory.

Team Organization:

Graduate Mentor- Savannah Keane

Team Leader- Joel Whitmer

Team Member- Brandon Walker

Team Member- Clay Hansen

Related Work: As a site civil design intern, experience in site grading, alignments, and storm drain design will help us in this grading, cut and fill, and alignment of this trail corridor design project. Experience as an inspector over curb and gutter, storm drain, sidewalk, ADA ramp, and road construction will help as we design the curb and gutter, crosswalk, and ADA ramps for this project.

Key Personnel/Outside Consultants

Graduate student Savannah Keane

All civil and environmental engineering professor at Brigham Young University

Jason Barker, Site Civil Design Manager at Focus Engineering

Collaboration Plan: 6 hours of weekly group work will be required to ensure effective project progress. These group hours will allow for project work, creative ideas to be shared, and group problem solving. Monthly site visits as a team will also help us to remain familiar with the site and to visualize necessary changes.

Appendix A

BRANDON WALKER

SKILLS & ABILITIES	<ul style="list-style-type: none"> • Fluent in Spanish (read and write)- nine years of experience, lived for two years in Argentina • Computer skills (type 70+ wpm, proficient in Microsoft Office including VBA programming) • Data analysis (1.5 years of experience compiling sales reports for national homeopathics company) • Basic knowledge of engineering mechanics, CAD, and environmental, structural, geotechnical and materials engineering
WORK EXPERIENCE	<p>ASSISTANT TO V.P. OF SALES, DESERET BIOLOGICALS March 2014 – March 2016 Managed salesforce account. Compiled quarterly sales reports finding deficiencies in sales reps, customers, etc. Mass email clients.</p> <p>ALARM TECHNICIAN, MOUNTAIN WEST SECURITY June - September 2011, February - July 2014, July – September 2015 Installed residential and commercial security, fire, and surveillance systems. Provided customer service.</p> <p>BRIDGE BUILDING COMPETITION COORDINATOR, BYU CIVIL ENGINEERING DEPARTMENT November 2014 – March 2015 Coordinated bridge building competition among nine local schools. Maintained contact with teachers/administrators during process of ordering, preparing and delivering materials, and organized and carried out the competition at each school.</p>
EDUCATION	<p>BRIGHAM YOUNG UNIVERSITY Currently in third of four year Civil Engineering Degree along with Spanish Minor and university honors program. Maintain 3.81 GPA. Member of Tau Beta Pi (engineering honors society).</p> <p>AMERICAN FORK HIGH SHCOOL Graduated with honors and 4.0 GPA. Participated in Track and Field and Spanish club.</p>
LEADERSHIP/SERVICE	<ul style="list-style-type: none"> • Eagle Scout • Held leadership positions in church over groups ranging from 6-200 over the past 10 years • Two-year religious mission in Argentina • Supervisor of two employees (Mountain West Security) • Held volunteer position in BYU ASCE student chapter organizing field trips with local engineering companies for first-year engineering students
REFERENCES	<p>KEVIN BRADBURN , ORCHARD SECURITIES (801) 361-3564</p> <p>JACOB CARTER, DESERET BIOLOGICALS (801) 361-1655</p>

Clay Hansen

(801) 400-2325 • clay.handsome@gmail.com • 421 N 800 E Provo, UT 84606

EDUCATION

BS, Civil and Environmental Engineering expected graduation: April 2017
Brigham Young University, Provo, UT

- 3.17 GPA
- Relevant coursework: Fluid Mechanics, Surveying, Environmental Engineering, Public Speaking

PROFESSIONAL EXPERIENCE

Lab Tech November 2015 - Current
Civil Engineering Department: BYU, Provo

- Used critical thinking skills to help on over four graduate level research projects

Student Laborer October 2013 - November 2015
Site Development Hard Surface Team: BYU, Provo

- Maintained a self-motivated, high-quality of workmanship
- Acted as the student lead on a variety of projects

Construction Laborer and Equipment Operator June 2008 - August 2015
Porter Tanner Associates: Barnwell, AB

- Worked with varying sizes of teams on multiple major excavation projects, including: Sewer lift stations, irrigation pipelines, and a water treatment plant

Ranch Hand June 2010 - August 2015
Eagle Ag. Corporation: Barnwell, AB

- Coordinated with a team during harvest, often spending long hours to meet deadlines
- Worked independently taking care of a cattle

VOLUNTEER AND LEADERSHIP

BYU Concrete Canoe Project Leader September 2013 - Current

- Organized supplies and volunteers for projects
- Designed and built automatic curing system

ASCE Student Chapter Officer August 2014 - April 2015

- Supervised up to six volunteers to coordinate social events
- Gathered information and helped put together an annual club report

Full-time Volunteer March 2011 - March 2013
Church of Jesus Christ of Latter-day Saints, San Diego, CA

- Taught monthly trainings to 10-20 fellow volunteers
- Worked with one other volunteer to effectively schedule time and carry out plans

SKILLS

- Heavy Equipment Operator, Street Sweeper, Valid Canadian Class A Driver's License
- Horse Training, Ranch Roping
- Microsoft Excel

Joel Whitmer

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West Valley City, Utah 84119
joel7whitmer@gmail.com
801-836-2320



Hometown: West Valley City, Utah
College Class: Senior

EXPERIENCE

Focus Engineering and Surveying Midvale, Utah April 2016 - Current
Site Civil CAD Designer/Structural Engineering Designer-Intern

- Structural Engineering of residential homes, detached garages and small commercial buildings using StruCalc, Hilti Profis, and Forte. Create site grading plans using Civil 3D according to my own judgement. Maintain deadlines of projects while working under a heavy influx of new projects.

West Valley City Public Works West Valley City, Utah May 2015 - August 2015
Inspector-Intern

- Performed regular concrete, compaction, and other constructions site tests. Oversaw the construction and maintenance of many sidewalks, roads, and storm drain systems. Took GPS points in the field for use in mapping programs. Stormwater quality checks. Regularly worked unsupervised to accomplish assignments.

Romney Pest Control San Antonio, Texas April 2014 - August 2014
Route Manager

- Managed routes and accounts for customers. Performed door to door interactions to sell the product. Overcame concerns and to acquire a feeling of trust in a short amount of time.

Marshall Industries West Valley City, Utah April 2013 - August 2013
Audio Data Installer

- Installed audio and data lines in existing, newly constructed, and under construction buildings. Major problem solving to find best ways to connect the electronics, while making it quick and efficient.

EDUCATION

Brigham Young University Provo, Utah **Graduation-June 2017**
Civil and Environmental Engineering, Structural Emphasis GPA 3.48

SKILLS

- AutoCAD, Civil 3D, StruCalc, Forte, Hilti Profis, RetainPro
- Visual Basic Spreadsheets
- Moldable and easy to work with
- Quick learner and efficient worker.

Accomplishments and Life Experience

- Leadership experience while serving LDS mission
- Leadership experience through sports
- Leadership experience through Eagle Scout
- Navigated college debt free, supporting myself.

INTERESTS

- Member of BYU Steel Bridge Team
- Camping
- Backpacking
- Rock Climbing/Canyoneering
- Reading Fiction