

SEWER SYSTEM CONSOLIDATION
Project ID: CEEEn_2018CPST_009

by

Team Invictus
John Jensen
Jordan Kersey
Christian Lundskog
Camille Lunt

A Capstone Statement of Work

Submitted to

Chad Coleman
Coleman Engineering

Department of Civil and Environmental Engineering
Brigham Young University

October 8, 2018

Introduction

PROJECT TITLE: SEWER SYSTEM CONSOLIDATION
PROJECT ID: CEEEn_2018CPST_009
PROJECT SPONSOR: Coleman Engineering
TEAM NAME: Team Invictus

Team Invictus will perform a preliminary design of sewer system infrastructure to consolidate two existing systems. The Castle City Mobile Home Park has its own collection system and treatment and disposal ponds, but these ponds are over 40 years old and have lost percolation capacity resulting in a loss of disposal capacity. The Sewer System Consolidation Project will evaluate multiple sewer force main pipe alignments, multiple existing sewer lift station upgrades, and multiple new sewer lift station options to determine the most economical project. A recommended option will be presented, with preliminary reports from Coleman Engineering advising towards consolidating the system to the neighboring South Placer Municipal Utility District system.

The team will consist of John Jensen, acting as team lead, with Jordan Kersey, Christian Lundskog, and Camille Lunt completing the team. Dr. Borup will act as the Faculty Advisor for Team Invictus. Analysis of the sewer system will be performed in WaterCAD by Bentley. Team Invictus plans to hold weekly team meetings to discuss the status of the project, and anticipates a 30% completion by December 2018. Much of the work will occur during the Winter Semester, with team members dedicating 8-10 hours of work each week to project completion in early April 2019.

This Statement of Work includes the team's proposed work plan, a preliminary schedule, summary of facilities, tools, data, and equipment to be used, the project budget (based on time), deliverables, performance standards, and statement of qualification.

Proposed Work Plan

Team Invictus plans to hold a weekly hour meeting each Wednesday to discuss the status of the consolidation of the Castle City Mobile Home Park sewer system to be part of the South Placer Municipal Utility District System project. As part of these meetings we will share what we are learning and questions we may have regarding WaterCAD by Bentley. These discussions will allow team Invictus to develop the skills necessary to evaluate multiple sewer force main pipeline alignments, multiple existing sewer lift station upgrades, and multiple new sewer lift station options to determine the most economical project alternative.

From the beginning of the fall semester up to December we plan to explore and practice using WaterCAD to be ready to do the necessary analysis. The scope of this project is to have 30% of the work accomplished by December 10th, 2018. The 30% of work will consist of weekly status reports on the work accomplished throughout each week.

At the beginning of the new semester, Team Invictus will evaluate the necessity to have more than one meeting per week to allow for the 70% remaining work to be accomplished from January 2019 to April 2019, culminating in the poster and presentation of our finding optimal economical project alternative. The work completed during the entire project will surmount to a final report, final presentation, and a poster each consummating our findings.

Schedule

A preliminary schedule has been made that outlines key tasks that will contribute to the completion of the Sewer System Consolidation Project. This schedule is subject to change and will be updated on an as needed basis with input from the sponsor, and as Winter Semester schedules become finalized.

Team Invictus Schedule	
Tasks	Date
Weekly Team Meetings (More meetings as needed)	Every Wednesday at 3:30pm
Weekly Status Reports	Submitted Weekly beginning the week of October 15, 2018
Bi-Monthly Sponsor Meetings (Conference Calls)	Bi-Monthly beginning the week of October 8, 2018
WaterCAD familiarity	December 3, 2018
30% Completion Report	December 10, 2018
Preliminary WaterCAD model for both Options	February 8, 2019
Fully Analyzed both Options and Recommendation Made (Includes Costs and Construction Schedule)	March 22, 2019
100% Completion Report, Presentation, and Poster	April 2, 2019

Facilities, Tools, Data and Equipment

Facilities Needed:

CAEDM Lab	BYU on-campus computer lab to perform both personal and group tasks and provide access to network drives
EB Team Rooms	Space to host weekly team meetings

Tools Needed:

WaterCAD	Hydraulic modeling application; will be used to model and analyze the different options for the new sewer pipeline system
ArcGIS Pro	Spatial modeling application; will be used to lay out the options for the new pipeline system
Citrix	Tool that allows for remote access into BYU-purchased applications such as WaterCAD
Google Drive	Cloud storage space to allow for easy sharing of and collaboration on project materials
Microsoft Office	Microsoft Tools such as Word, Excel, and PowerPoint that will be used for report writing, budget analysis, coordinate export, calculations, presentations, and other tasks
Google Earth	Geography database; will be used to obtain any land feature data that cannot be provided from Coleman Engineering

Data to be Provided by Coleman Engineering:

GIS Data	For land contours and existing pipeline locations and elevations
Flow Rates	For existing pipelines
Diameters	For existing pipelines

Equipment Needed:

Computers	Personal laptops/desktops or campus desktops
------------------	--

Project Budget

No monetary value will be accepted for the work performed. Each team member is expected to attend weekly meetings, and to be available for work during class hours. Since this class is combined throughout two semesters, work performed will be as follows, but is subject to change as needed.

The Fall 2018 semester will include the two hours of class time, weekly hour-long team meetings, and another one to two hours to complete assigned tasks. The assigned tasks will vary from project status reports, report writing, practice with WaterCAD, etc. Work input is expected to result in a project completion of 30% by December 10th, 2018.

The Winter 2019 semester will see a heavy increase in workload, as it is now expected that each team member will dedicate 8-10 hours on the project per week. Work input will include analysis and design in WaterCAD, report writing, presentations and poster summarizing findings, team and sponsor meetings, and various assigned tasks as the project outline permits.

Refer to the Table given under “Schedule” for a more detailed timeline of work.

Deliverables

- Brief near-weekly status reports documenting challenges, solutions & progress as answers to the following 4 questions:
 - What challenges has the team encountered in the Capstone project?
 - What actions did the team decided to do to overcome these challenges?
 - Any progress in overcoming these challenges?
 - Is project on schedule?
- A final report with design alternatives for the project that include economic and environmental considerations
 - Will weigh the options between the presented Option 1 and Option 2
 - Will recommend one of the options and give reasoning for its selection
- A poster reflecting a summary of the project to be presented to student, faculty and other interested individuals in the final undergraduate seminar (will be coordinated by faculty)
- A presentation summarizing the project to be presented to your sponsor (will also be coordinated by faculty, unless otherwise stated)

Performance Standards

Team Invictus 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.

As established on September 4, 2018, all reports and presentations for this project will follow CEEEn Capstone’s standard reporting guidelines used by all CEEEn Capstone teams, instead of the more detailed and time-consuming USDA Preliminary Engineering Report guidelines provided in the Appendix of the project description. Templates for all CEEEn Capstone reports and presentations are located in Learning Suites. All deliverables sent to sponsor will be in standard CEEEn Capstone formats.

Statement of Qualification

John Jensen - Team Lead

John Jensen is a Senior at BYU, and interned this past summer at Sunrise Engineering Inc. in Washington, Utah; where he worked on Irrigation Master Plans for both Washington and Santa Clara City. He is familiar with a similar app to WaterCAD, called H2ONet, and will be able to transition these skills to help analyze both wastewater options.

Jordan Kersey

Jordan is a Senior at BYU, and his experience as a Sprinkler Technician for BYU has helped him better understand water systems. He is currently interning on campus expanding the Lify App, and is also a Teacher's Assistant for Statics. Jordan is also the Secretary of BYU'S American Society of Civil Engineers (ASCE) Chapter.

Christian Lundskog

Christian Lundskog is a Senior at BYU, currently working as a Teacher's Assistant for Dr. Hotchkiss's Fluid Mechanics class. Over the past summer Christian worked for Berg Engineering in Midway city, Utah; where he gained experience working on utility layout projects. Christian currently works as a Teacher's Assistant for Fluid Mechanics

Camille Lunt

Camille Lunt is a Senior at BYU and has taken Fluid Mechanics in a previous semester. She is currently working as a research assistant in transportation safety and has worked as an intern at Arizona DOT, both of which have taught her how to think critically about different options when many factors are involved.

Dr. Borup

Dr. M. Brett Borup will operate as the faculty advisor for Team Invictus. He graduated from Clemson University with a Ph.D. in 1985, and has been working as an Associate Professor at BYU since 1995. Dr. Borup has played a big role in expanding BYU's ASCE Chapter, and is current the Chapter's Faculty Advisor.

Overall, Team Invictus is a well-rounded team with different levels and backgrounds of experience. They have taken the required classes to help them understand the problems that face this project. Team Invictus strives to be professional and adhere to the highest order of work at all times.

Appendix A

John Henry Jensen

2960 Chippewa Way, Provo, UT 84604 | 385.421.1901 | jensen.h.john@gmail.com

Objective

- Eager to learn more and gain valuable experience in Civil Engineering

Education

BACHELOR OF SCIENCE | ANTICIPATED APRIL 2019 | BRIGHAM YOUNG UNIVERSITY

- Major: Civil and Environmental Engineering
- Minor: Mathematics
- Related coursework: Reinforced Concrete Design, Fluid Mechanics, Structural Steel Design, Auto CAD, Introduction to Earthquake Engineering, Soil Mechanics and Structural Analysis
- Special interests: Geo-Technical, Transportation and Structural Civil Engineering

Skills & Abilities

CREATIVE

- Used Excel to develop inventory tracking spreadsheet for a small local business
- Created spreadsheet to predict outcome of NCAA March Madness Bracket based on the outcome of every tournament since 1975 using VBA (Virtual Basic)

PROBLEM-SOLVING

- Investigated problems with decreased BYU Engineering student attendance at Devotionals
- Increased attendance by over 400% through collaborative work

COMMUNICATION

- As a Latter-day Saint Missionary in Chile, developed effective communication and presentation skills through community service and teaching daily which included weekly English lessons and tutoring children in Mathematics

LEADERSHIP

- Researched and constructed surveys sent to BYU's College of Engineering to increase Devotional attendance

Experience

ENGINEERING INTERN | SUNRISE ENGINEERING INC. | WASHINGTON, UTAH

- Wrote Master Plans for both Secondary Irrigation Water and Transportation
- Surveyed under the direction of Project Engineers' at job-site locations

STUDENT EMPLOYEE | BYU GROUNDS

- Performed daily tasks in landscaping and maintenance
- Promoted to student lead position after one year of work
- Supervised tasks for 6-10 students and oversaw completion

Jordan M. Kersey

450 N 1065 E, Provo, UT 84606

267-625-3530

jordanmkersey@gmail.com

EDUCATION

B.S. in Civil Engineering

Brigham Young University

April 2019

Provo, UT

- Elected as Secretary in the student chapter of the American Society of Civil Engineers (ASCE)
- Skills: AutoCAD, WaterCAD, ArcGIS Pro, Microsoft Office
- GPA: 3.17

WORK EXPERIENCE

BYU Civil Engineering

Statics Teaching Assistant

Sept. 2018-Present

Provo, UT

- Mentor & teach 50+ students daily in basic Statics & Physics concepts
- Correct & provide constructive feedback for 50+ homework sheets bi-weekly
- Collaborate with faculty & other TA's weekly on facilitating class

Aptive Environmental

Pest Control Applicant

May 2017-Aug. 2018

Livermore, CA; Trooper, PA

- Operated & performed safety inspections on company vehicle and equipment for 200+ business days
- Negotiated with 1600+ clients in English, Spanish, and Chinese

BYU Sprinkler Shop

Sprinkler Technician

July 2016-Apr. 2018

Provo, UT

- Renovated 10+ irrigation systems weekly through digging, removal and installation of PVC pipe
- Participated in a variety of weekly team projects that included pipes, controllers, and wires

BYU Physical Facilities

Custodian

Aug. 2015-Jun. 2016

Provo, UT

- Learned to be self-driven and work independently on weeklong projects
- Actively identified problems and utilized available solutions to resolve them

Dreamscapes, Lawn Care Specialists

Maintenance Technician

Apr. 2012-Aug. 2015

Dixon, CA

- Analyzed and performed improvements needed for 100+ lawns to become beautiful landscapes
- Maintained & operated 4 large machines daily

VOLUNTEER EXPERIENCE

Coleman Engineering

Capstone Team Member

Sept. 2018-Present

Provo, UT

- Comparing three options for replacing an old wastewater system in Newcastle, CA
- Utilizing WaterCAD to analyze potential wastewater pipelines to improve flow in system
- Collaborating on a team to consult company on potential options

Lifey App

On-Campus Intern

Sept. 2018-Present

Provo, UT

- Expanding the usage of a new educational video-help app to 1000+ users

Church of Jesus Christ of Latter-Day Saints

Full-Time Representative

Oct. 2012-Oct. 2014

Managua, Nicaragua

- Oversaw online purchases, postal services, and delivery routes for 170+ members of the organization
- Organized an essential storage facility that held 1000+ items of significance



Christian Lundskog

linkedin.com/in/christian-lundskog

435-671-7294

middleskogs@gmail.com

Education

Brigham Young University

B.S. of Civil and Environmental Engineering

Anticipated Graduation: *December 2019*

Current Member of BYU ASCE Student Chapter

Capstone Project to Consolidate two Sewer Systems

GPA: 3.27

Utah Valley University

Received Generals Associates in 2015

GPA: 3.59

Experience

Teachers Assistant – *Fluid Mechanics*

August 2018 - Current

- Assist 35 students in understanding and applying challenging fluid mechanics concepts *Provo, Utah*
- Complete 3 to 5 tasks for professor as assigned on a weekly basis
- Coordinate with fellow teacher assistants daily to discuss effective teaching methods and tasks to be completed

Berg Engineering – *Civil Engineering Intern*

May 2018 – August 2018

- Prepared concept designs for clients seeking preliminary subdivision property plans *Midway, Utah*
- Compiled site plans for clients to be submitted to city and contractors for construction
- Updated engineering plans to match installed utilities for city records asbuilts plans

Stein Eriksen Lodge (5 Star Hotel) – *Grounds Tech*

May 2017- August 2017

- Interacted with hotel guests, assisting them to navigate the property *Park City, Utah*
- Maintained grounds and landscaping of flowerbeds, grass, watering systems, etc.
- Translator and leader for Spanish speaking team members

Vinyl Fence Installation – *Client Contracted*

September 2016

- Independently planned and implemented installation of vinyl fence *Heber City, Utah*

Vivint Solar – *CAD Technician*

June 2014 - January 2016

- Mass produced custom roof top solar array designs in a timely manner *Provo, Utah*
- Verified design quality for fellow designers to ensure quality designs for customers
- Collaborated with Sales Representatives on an individual basis to meet customer expectations

Skills

- Fluent in Spanish
- Proficient in computer aided drafting (Autodesk CAD and Revit)
- Proficient in Photoshop, Microsoft Word, Excel, Publisher, and PowerPoint
- Experienced in basic residential construction and landscaping (roof layout, framing, grounds maintenance)

Volunteer Service

Church Mission, Neuquén Argentina

BSA Eagle Scout

BYU ASCE

Camille Lunt

480-643-9330 lunt.camille@gmail.com 725 N 800 E #11 Provo UT 84606

EDUCATION

Pursuing BS in Civil Engineering, Brigham Young University

Anticipated Graduation: December 2019

- Cumulative GPA of 3.99
- Member of ASCE, ITE, and AREMA BYU student chapters
- Relevant coursework: geometric design of highways, basics of transportation engineering, VBA
- Successfully qualified for and retained a university academic scholarship for 3 years in a row

INTERNSHIP

Traffic Safety Intern, Arizona Department of Transportation

May 2018 - August 2018

- Analyzed 2 large data sets to assess the effectiveness of ITS implementations
 - Presented findings to upper-level management
 - Created a nearly-automated process to update travel time analyses with new data
 - Wrote informal instruction manual on how to repeat analysis of speed feedback sign data
- Performed a variety of crash analyses including:
 - Statewide highway pedestrian crash review
 - Holiday weekend interstate travel crash analysis
 - Disabled highway vehicles crash review
- Performed a Road Safety Assessment (RSA) with a team
- Improved time required to create crash summary reports from 60 minutes to 10 minutes by writing macros

RESEARCH

Intersection Safety Research Assistant, Grant G. Schultz Ph.D., P.E., PTOE

September 2017 - present

- Performs virtual site visits and analyzes crash data to complete reports for 60 identified hotspot segments
- Analyzes over 200 Utah state road junctions via Google Earth to improve an intersection safety analysis model
- Prepares ideas for the next section of research: a segment safety analysis model
- Coordinates with fellow research students on a weekly basis

LEADERSHIP EXPERIENCE

Treasurer, ASCE BYU student chapter

January 2018 - present

- Oversees income and outcome of club funds
- Participates in planning events for the club

Field Trip Coordinator Assistant, ASCE BYU student chapter

September 2014 - April 2015

- Contacted professional engineers via email and phone calls to ask to tour their firms
- Coordinated transportation and times to visit and reported the organized tour information to my department

New Student Orientation Leader, Brigham Young University

August 2015 and August 2018

- Led 30 new BYU students for 2 days in their orientation to the university
- Gave tours, answered questions, and counseled students on study habits
- Encouraged the students throughout the semesters that followed

Religious Volunteer in Taiwan, The Church of Jesus Christ of Latter-day Saints

April 2016 - August 2017

- Trained 2 new volunteers one-on-one for extended periods of time
- Taught weekly English class
- Learned 2,000 Chinese characters with no formal training, could comfortably communicate with natives

SKILLS

- Visual Basic for Application (Excel VBA)
- ArcGIS
- Microsoft Office; Adobe PDF
- Some familiarity with Civil 3D and Microstation
- Mandarin Chinese: conversationally fluent, intermediate Chinese reading and writing