

**ENVIRONMENTAL STUDY FOR
ARROWHEAD PROJECT
Project ID: CEEEn-2017CPST-002**

by

**MWM Engineering
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A Capstone Project 50% Report

Submitted to

Bob Tandler

Fritzi Realty

**Department of Civil and Environmental Engineering
Brigham Young University**

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Executive Summary

PROJECT TITLE: Environmental Study for Arrowhead Project

PROJECT ID: CEEEn-2017CPST-002

PROJECT SPONSOR: Bob Tandler

TEAM NAME: MWM Engineering

The Arrowhead Center Development Project is a research endeavor for the Arrowhead building and surrounding site, owned by Fritzi Realty and located in Spanish Fork, Utah. The overall project has been broken up into various components, and MWM Engineering is researching and developing ideas regarding the environmental aspects of the site. The aspects being considered primarily include the environmental impact the project will have on the site and water resource needs. MWM Engineering is examining the site itself, existing documents/studies of the project, and public works information from Spanish Fork City and the federal government. Working with the knowledge gained from the research, input from the other research teams, and desires from the project sponsor, MWM Engineering will develop plans addressing the environmental factors.

MWM Engineering is committed to providing quality service to Fritzi Realty as we work with the other teams from BYU to develop creative and efficient solutions for the Arrowhead Center Development Project.



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Introduction

Purpose

The purpose of this report is to present MWM Engineering's findings regarding the environmental study and water resource needs of the project. It discusses potential environmental challenges and what further studies will need to be performed by qualified professionals. It also discusses the culinary water and sewage needs for both residential and commercial uses, and the storm water needs for the site.

Background

The Arrowhead site is split into 4 different parcels. Parcels 1,2, and 4 currently undeveloped. Parcel 3 currently occupied by a large warehouse and being rented out as industrial space. The Arrowhead project looks at using these parcels for both residential and commercial use. Our portion of the project looks at how these changes will affect the environment and the water resources.

Scope

For each of the four parcels, analyze what impact any development will have on the environment. In addition, determine the utility requirements of the development. These findings will be placed in a technical report that will be submitted to the sponsor.

Objectives

MWM Engineering seeks to fulfill their scope through the following objectives:

- Review and compile existing environmental documents.
- Determine which environmental documents need to be updated.
- Determine which environmental surveys need to be completed.
- Perform any environmental surveys within qualifications.
- Determine the utility requirements of the given land uses.
- Prepare a technical report and other presentation material with findings.



Schedule

Table 1: Schedule of Activities

DATE*	EVENT
10/20/17	Kickoff meeting
10/30/17	Submit proposal to BYU
11/15/17	Submit proposal to Fritzi Reality
11/20/17	Perform site visit; begin reviewing environmental and utility information
11/27/17	Brainstorm session
12/1/17	Submit monthly report
12/11/17	Review ideas, create action plan for further research
<i>12/22/17 - 1/5/18</i>	<i>Holiday break</i>
1/8/18	Submit monthly report
1/11/18	Team meeting
1/29/18	Submit monthly report
2/8/18	Meeting with Stanley Consultants
2/15/18	Team meeting
2/26/18	Submit monthly report
3/5/18	Submit 50% report
3/26/18	Submit monthly report
4/12/18	CEEn seminar presentation
4/12/18	Give final presentation and Submit electronic poster
4/18/18	Submit final report

Assumptions & Limitations

Some of the major assumptions made involve water resources. The first main assumption made was that an external sewer line will be added that can service the property. Whether this will be done by W.W. Clyde and their construction of a new subdivision adjacent to the property, by Spanish Fork City, or by the sponsor, it is assumed there will be a sewer line that will service the property. It is also assumed that culinary water lines will reach the project location and provide adequate water pressure. In other words, the Spanish Fork City will have the infrastructure needed to adequately cover the project's water resource needs.

Design, Analysis, & Results

As shown in Table 1, our team met with Stanley Consultants in their office on February 8, 2018. With Rick Black, Principal Environmental Planner and Greg S. Thomas, PE. They provided valuable direction for environmental and water resource needs for the project. Among their comments, they suggested we assume that the utilities outside our project were sufficient to handle any planned development. They suggested several environmental studies that could be conducted, including a wetlands survey, a federal NEPA analysis, and/or a cultural resource survey.

We have learned some very important things about these specific parcels of land from an Information for Planning and Consultation location explorer provided by the U.S. Fish and Wildlife Service, also known as an IPaC resource list. This area has some probability to be home to some endangered wildlife most concerning are the birds. It is okay to build on the area if there are none of these birds presently calling the area home when construction starts. If there are signs of the birds already living there then building in the area will possibly be stalled until the nest become vacated. Figure 1 shows the breeding season and probability of presence for some of the possible endangered birds that may be found.



Figure 1: IPaC Bird List.

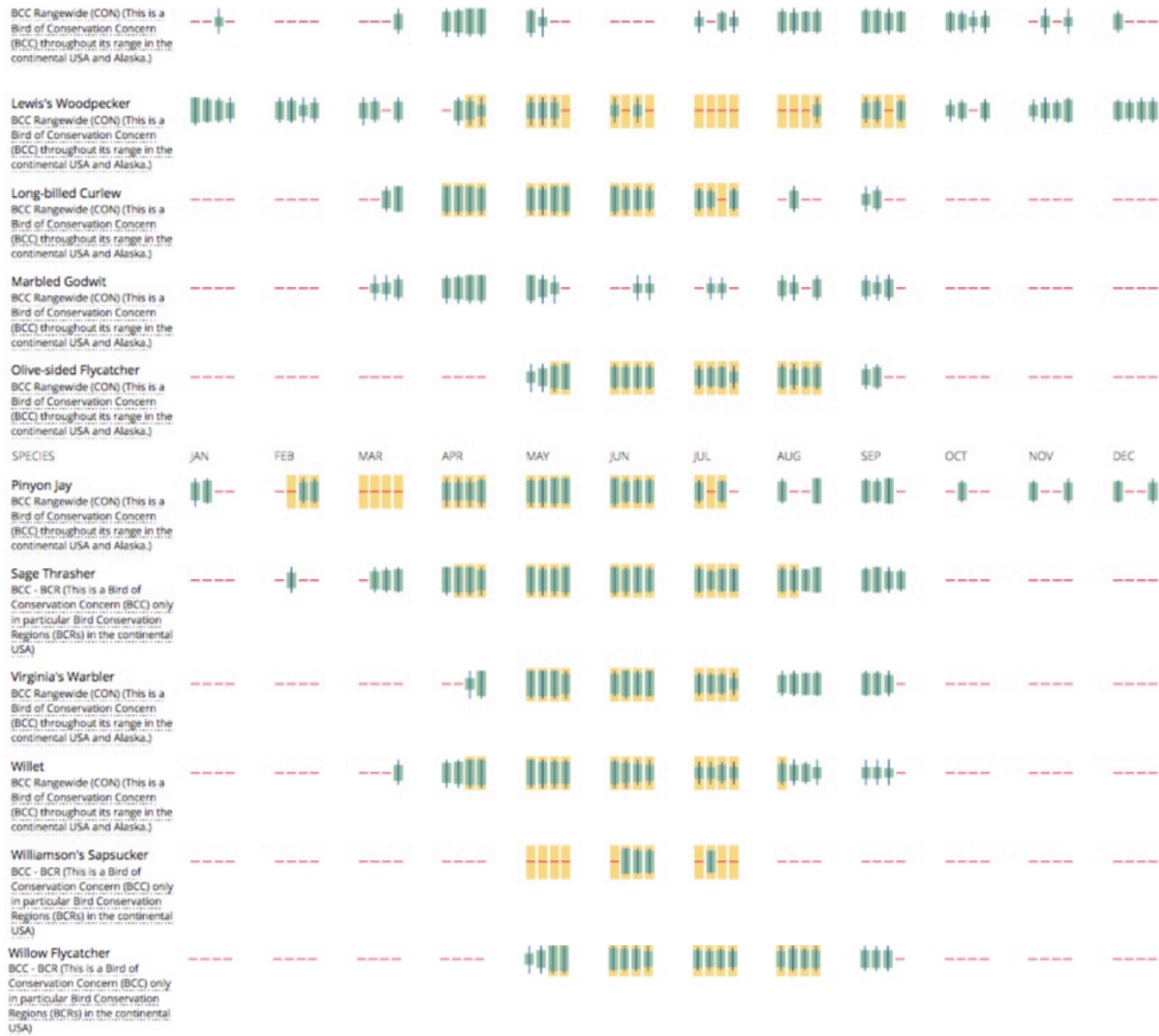


Figure 1: IPaC Bird List (continued).

There has also been some concern about building close to a possible wetland. It is safe to assume that the immediate area surrounding the river along the eastern parcels could possibly be protected wetlands. The following figure details this possibility.



Figure 2: Possible Wetland.

During our meeting Mr. Thomas gave us direction on where to look for our water resource needs. The Utah Division of Drinking Water provided us with information on culinary water requirements and how much is needed. For the residential areas 800 gallons per day (gpd) is required for each household. For the commercial portion of the project 500 gpd is needed for each public restroom. Once these amounts were known it was relatively easy to determine the amount of sewage that would be created. The sewage created is assumed to be 80% of the amount of culinary water needed. This number came from our meeting with the Stanley Consultants engineers. This means that the residential areas create 640 gpd per household and the commercial areas create 400 gpd per public restroom.

Lessons Learned

The biggest challenge we faced was our lack of knowledge in the areas of environmental and water resource engineering. None of us plan on specializing in either of these areas of civil engineering, so our experience and number of classes we've taken are extremely limited. What helped us most in overcoming this was meeting with Rick Black and Greg Thomas of Stanley Consultants. They both gave us direction and an outline of what we needed to do. Engineers, especially young and inexperienced ones like us, can seek help from engineers with more experience.

In the learning process, we discovered multiple resources available for quickly identifying potential environmental concerns. These include the sources listed above, such as the IPaC resource list and preliminary wetland survey.

Conclusions

Our preliminary conclusion is that if the right precautions are taken to avoid disturbing any possible wildlife already in the area the land is suitable for construction to begin. The new structures should be able to be fully serviced with culinary and sewer lines if the assumptions made were correct.

Recommendations

None of the findings in this report are official or in any way binding, meaning all the information provided needs to be reviewed and stamped by a professional environmental engineer with the correct qualifications to perform the studies. The final decision on impacts to the wetlands may be subject to regulations under Section 404 of the Clean Water Act and must be studied by the U.S. Army Corps of Engineers District.

Appendix A

Josh Gibbons

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- EDUCATION** Master of Science, Brigham Young University; Provo, UT – April 2018
- Performing research with Utah DOT regarding intersection safety
 - Serving as President of BYU ITE student chapter

- Bachelor of Science, Brigham Young University; Provo, UT – April 2017
- 3.77 GPA
 - Civil Engineering; ACTFL Spanish Certificate
 - Member of ASCE and ITE

- 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 the development of transportation master plans and estimating travel demand using QRS II modeling software
 - 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

- SKILLS & ABILITIES** Proficient in Synchro/SimTraffic, AutoCAD, Microstation, and Bluebeam Revu
Highly skilled in VBA coding in Microsoft Excel
Trained in Cube and QRS II travel demand modeling software
Strong problem-solving and analytical skills
Spanish Language – Read, write, and speak fluently

- OTHER EXPERIENCE** BYU ITE Student Chapter Officer
- Secretary: April 2016 – April 2017
 - Chapter President: April 2017 – Present
- LDS Church Mission to Oaxaca, Mexico – March 2011-April 2013
- Led up to 20 other missionaries at a time in leadership positions
 - Worked in mission office organizing dozens of new member records
- Extra-curricular Activities
- Team captain of high school cross country team
 - Taught piano lessons to 10 students and performed in several piano concerts

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Provo, Utah 84606

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Summary of Qualifications

- Bachelor of Science degree – Civil and Environmental Engineering
- Internship – 16 months with BYU Physical Facilities Planning Department
- Member / officer in two civil engineering student societies

Education

Bachelor of Science – Civil and Environmental Engineering <i>Brigham Young University – Provo, UT</i>	Expected December 2018
<ul style="list-style-type: none">• Minor – Mathematics• Notable classes: Introduction to Transportation Engineering, Computational Methods, Structural Analysis	
Associate of Arts – General Education <i>Pierce College – Puyallup, WA</i>	June 2012
<ul style="list-style-type: none">• Graduated top 5%	

Work / Volunteer Experience

Civil Engineering Intern <i>BYU Physical Facilities Planning Dept.</i> Provo, UT	Apr 2016 – Present
<ul style="list-style-type: none">• Preserved AutoCAD Civil 3D 560-acre campus maps• Assisted with design and survey of over 2 dozen projects• Used Trimble survey equipment to shoot over 7500 points	
Conference / Community Service Assistant <i>BYU Residence Life</i> Provo, UT	Apr 2015 – Apr 2016
<ul style="list-style-type: none">• Performed secretarial duties, night security roves, building / room preparations, student / guest relations	
Hired Hand Summerville, SC	Oct 2014 – Dec 2014
<ul style="list-style-type: none">• Maintained 48,000 sq. ft. property with manual labor	
Volunteer Representative <i>The Church of Jesus Christ of Latter-day Saints</i> Nashville, TN	Oct 2012 – Oct 2014
<ul style="list-style-type: none">• Coordinated with local church and community leaders• Trained new volunteers; managed teams of 6–8 volunteers	

Community Involvement

BYU ITE Student Chapter – Member / Officer	2016 – Present
BYU ASCE Student Chapter – Member / Committee Person	2015 – Present
BYU A Cappella Club – Tenor	2015 – 2016

Kyle Moncur

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Education:

- BRIGHAM YOUNG UNIVERSITY, 2011 – 2012, 2014 – Present
Civil Engineering (B.S. Completion Date: 2018)
Provo, UT 84602
GPA: 3.0
Field specific classes included those in Auto-Cad, Revit, transportation and structural design courses.
- DAVIS HIGH SCHOOL
High Honors Graduate, 2011

Experience:

- Undergraduate Research Assistant (September 2017-Present)
Brigham Young University – Civil Engineering
- Jacobsen Construction Company (May 2014 – September 2017)
Skilled Laborer
Have been in charge and managed up to 10 other workers on job sites. Directed them to completion of the tasks required that day. Organized everyone into great working teams so time was never wasted and the work was done as quickly and efficiently as possible.
- Served a 2-year mission for the Church of Jesus Christ of Latter-day Saints in Washington from May 2012 - May 2014.
- Jakes Radiator and Air Conditioning (Summer 2010)
Handy Man, Cleaned and replaced radiators.
Began learning and shadowing the lead technicians but by the end of my time I was working alone. I was able to do this because of my quick learning skills and ability to cope with changing surroundings and new situations.

Interests:

- Triathlons, cycling, basketball, golf
Through all sports I have learned to work well with others to help each other achieve goals.

Awards/achievements:

- Completed multiple triathlons including the St. George half ironman
Compete on the BYU Triathlon Team. The experiences I have had on the team have allowed me to manage the growth in myself and even in some ways the growth of the team. This sport has positively affected my character in many areas such as drive, passion, dedication, work ethic, responsibility, hitting deadlines/goals, etc.
- Eagle Scout, Boy Scouts of America (February 2009)

References upon request

Braxton Kurt Miller

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Education

2013/Present **Student-** Brigham Young University

- Major: Civil and Environmental Engineering

Certifications

- WAQTC (Concrete)
- Soil Reduction and Density Testing
- Level 1 Inspector

Work History

Aug. 2014/Present **Stanley Consultants**

I have worked as a Level one inspector on various job locations throughout the state of Utah. I have worked on High Risk Rural Road jobs overseeing traffic sign installation, intersection widening projects, mill and fill projects, and virgin roads requiring large amounts of earthwork.

- Quality Assurance/Quality Control
- Review Plans and Standard Drawings
- Monitoring Progress

June 2013/Aug. 2013 **Landmark Engineering and Testing**

At Landmark I work as a lab technician. I ran tests on soils and concrete in order to determine if certain soils are acceptable for use in construction and whether or not the concrete is strong enough for its intended purpose. I am also a runner, which requires me to occasionally visit the job sites and pick up asphalt, soil, and concrete samples.

- Quality Assurance/Quality Control

Summer/Fall 2010 **Stanley Consultants**

While working for Stanley Consultants I had the opportunity to work on multiple job sites testing and inspecting concrete, soils, and asphalt. I had to work whenever the contractor worked causing me to work long hours and in adverse conditions.

- Quality Assurance/Quality Control

Extra Curricular

Dec. 2010/Dec. 2012 **LDS Mission, Lyon France Mission**

I had the opportunity to go on a proselyting mission to the south of France. While there I was able to serve the people, learn how to speak the French language, and gained valuable leadership experiences.

- Leadership Experience

References : Available Upon Request