

PAVEMENT MANAGEMENT RESEARCH PROJECT

Project ID: CEEEn_2017CPST_008

by

DTR Engineering

Kaylee Bateman: Graduate Mentor

Derek Linford: Team Lead

Trenton Parks / Data Analyst

Robert Thompson / City Coordinator

A Capstone project submitted to

Mark Christensen, PE

J-U-B Engineers, Inc.

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

October 30, 2017

Introduction

PROJECT TITLE: Pavement Management Research Project
PROJECT ID: CEEEn-2017CPST-008
PROJECT SPONSOR: J-U-B Engineers, Inc.
TEAM NAME: DTR Engineering

Executive Summary

J-U-B Engineers, Inc. would like us to conduct a Research of literature and local pavement managers to gather data on pavement treatments and PCI ranges in which they are appropriate and effective as well as how long they last. J-U-B Engineers, Inc. is specifically interested in pavement management in Utah Valley. As well as research in pavement treatments and preventative measures, they are interested in pavement deterioration rates considering the condition of the pavement as well as the subgrade.

The desired outcome of the project is as follows:

- a. PCI ranges in which treatments are appropriate and effective
- b. How various treatments can increase the PCI
- c. How the PCI decreases as time passes after treatment
- d. Database of costs of treatments, with variations in time, quantity and location
- e. Relationship of pavement deterioration rates in Utah Valley with physical characteristics of pavement and subgrade

DTR Engineering has reviewed the requirements of J-U-B Engineers, Inc. We are committed to providing J-U-B Engineers, Inc. with the necessary information and data to meet their needs.

Schedule:

January 2018 – February 2018 Scheduling and meeting with street superintendents

March 2018 – Analyzing data collected from street superintendents to create appropriate tables and graphs

April 2018 – Presentation of results

Key Deliverables:

A poster presentation and a final report with the tables and information requested by J-U-B Engineers, Inc. (See deliverables section for more detail).

Proposed Work Plan

In order to provide accurate information on PCI differences through pavement treatments, we will create a questionnaire. This questionnaire will be given to various road superintendents in Utah County to help us understand what treatments would best suit certain pavement issues. We will provide a list of treatments and descriptions of each treatment, the types of distresses they are used to treat, the PCI ranges in which each is used, and the effect each has on PCI. We will also provide a database of the cost of each, with variations in time, quantity, and location. We will analyze this data using curves and scatter plots showing the relationship between pavement condition (in PCI) and time (in years), accounting for differences such as treatments received, pavement section, subgrade soil and functional classification of roadway.

Schedule

The final report and analysis for J-U-B Engineers, Inc. will be completed by April 10, 2018. The following are intermediate deadlines for various portions of the project:

- January 15, 2018: Create final questionnaire for street superintendents.
- February 1, 2018: Contact Street Superintendents and set up appointments.
- February 21, 2018: Met with all Street Superintendents
- March 5, 2018: Compile questionnaire information gathered from Street Superintendents and begin analyzing data.
- April 6, 2018 Analysis of raw data from the Questionnaire. This includes creating a table of appropriate treatments for specific PCI ranges

Team members will meet weekly at the designated class period, every Tuesday and Thursday, for a three-hour time period. The team meetings will be held during this class period in order to establish weekly goals and deadlines. Team members will also use these meetings to discuss any challenges to their work. We will contact the sponsor as necessary during these meetings. Our Schedule is subject to changes.

Facilities, Tools, Data and Equipment

The primary tool we will use for this project is a questionnaire that we will bring to our meetings with Street Superintendents. The questionnaire will be completed by January 15, 2018

The data we expect to collect from the questionnaire includes the following:

- PCI ranges in which treatments are appropriate and effective
- The types of treatments specific cities use for certain road deteriorations
- How various treatments can increase the PCI
- The experience that the cities in Utah County have found about how the PCI decreases as time passes after treatment

We do not expect to use any BYU facilities outside of computers to perform the necessary tasks of this project.

Project Budget

Number of hours needed to complete each task:

1. Create questionnaire for superintendents: 6 hours
2. Schedule meetings with superintendents: 6 hours
3. Meeting with superintendents: 20 hours
4. Compiling data from questionnaires: 4 hours
5. Analyzing data collected: 25 hours
6. Creating final presentation and report: 15 hours

Total hours expected to complete this project is 76 hours. This is an estimate of the time needed to complete the project.

Deliverables

- Short monthly status reports documenting challenges, solutions & progress
- A final report on the following:
 1. Examination of treatments used by roadway managers in Utah Valley including:
 - a. List of treatments and description of each, including they types of distresses they are used to treat
 - b. The PCI ranges in which each is used
 - c. The effect each has on PCI
 - d. A database of the cost of each, with variations in time, quantity, and location

These results will include the economic, environmental, geographical considerations.

2. The following deliverables will be included in the final report to the extend data ` is available:
 - a. Curves and scatter plots showing the relationship between pavement condition (in PCI) and time (in years), accounting for differences such as treatments received, pavement section, subgrade soil, functional classification of roadway, etc.
- A poster reflecting a summary of our project to be presented to student, faculty and other interested individuals in the final undergraduate seminar
 - A presentation summarizing our project to be presented J-U-B Engineers, Inc.

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

Key personnel

- Sponsor: J-U-B Engineers, INC.
- Sponsor Representatives: Mark L. Christensen and Kenneth Clark
- Faculty Advisor: Dr. W Spencer Guthrie
- Graduate Student Advisor: Kaylee Bateman
- Capstone Instructors: Dr. Wayne Lee and Dr. M. Brett Borrup

Background and Qualifications

The following are individual skills that team members bring to the group:

Derek Linford – Team Leader

Experience:

- Managed all Revit and AutoCAD files for BYU
- Performed Structural Analysis of custom homes for Redwood Engineering
- Completed classes for Intro to transportation Engineering, Concrete, Masonry & Asphalt and Elementary Soil Mechanics.

Trenton Parks – Data Analyst

Experience:

- Experienced in making graphs in Excel regarding material properties
- Good communication skills from TA experience
- Proficient in writing professional reports
- Completed classes for Intro to transportation Engineering, Concrete, Masonry & Asphalt and Elementary Soil Mechanics.

Robert Thompson – City Coordinator

Experience:

- Undergraduate in Civil Engineering with emphasis in Structural Engineering
- 3 years of experience as a research assistant including leadership roles at BYU.
- Strong communication skills developed by working with Business owners and executives while employed at a Computer Repair company and through leading team projects at BYU.
- Completed classes for Intro to transportation Engineering, Concrete, Masonry & Asphalt and Elementary Soil Mechanics.

Team Collaboration Plan:

Each team objective that is listed on our schedule will be accomplished by working as a team and collaborating during our designated times on Tuesday and Thursday during the Winter Semester. As individual team members we will spend time outside of our group meeting times to coordinate with the city Street Superintendents to collect the necessary data to complete our project. The data will be analyzed as a team and compiled into the appropriate graphs and tables by the times listed on our schedule.

Appendix A