5/4/2012

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VILLAGE OF ESSEX JUNCTION

MAIN STREET ROADWAY AND BOX CULVERT ASSESSMENT

Executive Summary:

This report details an analysis of the transportation infrastructure of Main Street (Vermont Route 15) in the Village of Essex Junction, in the area between Educational Drive and Densmore Drive. The main impetus of this analysis was to provide a viable option for replacement of the current box culvert spanning Indian Brook. The culvert currently narrows the width of the road over the bridge compared to the adjacent roadway, and limits pedestrian activity by providing minimal shoulder and sidewalk space.

A survey of the area was done to determine the grade of the road, the widths of the lanes, and the specifications of the box culvert; including its height, span length and orientation with the roadway. A traffic study was conducted at the intersections of Main Street and Educational Drive, as well as the intersections of Main Street and Densmore Drive, to determine hourly volume during peak times. This information was gathered so that this corridor of Main Street could be modeled with a traffic modeling software. Using the traffic data warrant analyses were carried out for proposed turning lanes; one a right turn lane from Main Street onto Educational Drive, and the other a left hand turning lane from Main Street onto Densmore Drive. Several signal timing options were designed for the intersection of Educational Drive and Main Street using the data gathered from the traffic study, and the most optimal timing scenario was incorporated into one of the design options.

Research was also conducted into the best way to replace the current culvert over Indian Brook. It is common practice to purchase pre-cast culverts for projects of this size which are manufactured by a company and delivered to a job site for installation. After contacting several companies and inquiring about box culverts, a company from upstate New York, Fort Miller Inc, was selected. The new culvert will allow for larger shoulders on either side of the roadway as well as sidewalk space in both directions, unlike the current culvert.

Three design options are proposed in the following report, and the specific engineering details of which can be found in the design options section. The first design option offers no change in the area, and the second design option suggests the replacement of the current box culvert with the one selected, the addition of two turning lanes (a right turn onto Educational Drive and a left turn onto Densmore Drive), as well as the implementation of an actuated traffic signal at the intersection of Main Street and Educational Drive. The third design option also

calls for the replacement of the box culvert and the addition of turning lanes, but does not suggest the addition of an actuated signal at the intersection of Main Street and Educational Drive.

The third option is recommended by this study as the addition of the turning lanes and the extra width of the new box culvert will improve the safety of the road for all users, including pedestrians and bicyclists. The implementation of an actuated traffic signal does not significantly improve the efficiency of the intersection of Main Street and Educational Drive enough to warrant the added costs associated with construction. The costs associated with the proposed third option are approximately $550,000, and this total is given in more detail in the cost analysis section of this report.

In conclusion this report recommends the replacement of the current culvert over Indian Brook with the pre-cast culvert selected, as well as the implementation of a left hand turning lane from Main Street onto Densmore Drive and a right hand turning lane from Main Street onto Educational Drive.

Limitations

The intent of this report is to present the data collected, evaluations, analysis, design and cost estimates for the Indian Brooke Box Culvert Redesign project. The work presented here was performed as a 15-week long project as a part of the course CE 175 Senior Capstone Design instructed by Professors Mandar Dewoolkar and Nancy Hayden. Although we have exercised utmost care while working on all components of this project, the reader should be aware that the work was performed within a short time period and with limited resources. This work was directed and reviewed by Professors Dewoolkar and Hayden, other UVM faculty and external evaluators; however, has not been formally reviewed by an engineer with a professional licensure from Vermont. The reader is advised that before using any part of this report, the work presented here must be independently evaluated by a qualified Professional Engineer licensed in Vermont.