INTRODUCTION

The North Carolina Non–Motorized Volume Data Program aims to monitor statewide bicycle and pedestrian traffic, establish volume patterns that define bicycle & pedestrian factor groups, and develop protocol for calculating AADT estimates from short and continuous count stations.

- Eco-Counter Multi Nature and Multi Urban infrared and inductive loop systems were used for continuous count sites.

METHODOLOGY

- NCNMVDP is a statewide programmatic approach to continuous non-motorized data collection; count sites are located anywhere from a twenty minute to a five hour drive from the ITRE office.
- All trip types indicate a unique site visit.
- All sites are validated upon installation using video collection and processing. A revalidation cycle is triggered with the replacement of any part involved in the counting system or adjustment in sensitivity settings. Only revalidation costs are included in cost estimate.
- System visits conducted from October 2015 - October 2017 are included; all system maintenance before October 2015 is not included due to lack of documentation.

MOTIVATION

- While hardware replacements were covered by a two-year vendor warranty, maintenance costs incurred included significant employee time and travel expenses.
- A review of maintenance conducted in the NCNMVDP’s first two years can inform agencies that are establishing bicycle and pedestrian count program maintenance budget estimates.
- Recommendations on equipment installation procedure to avoid preventable maintenance needs are also provided to help agencies lower programmatic costs.

METHOD

- Survey of 18 Eco-Counter Multi Urban and Nature systems, 15-minute loggers; 18 pedestrian (pyro) sensors and 21 bicycle (zeb) sensors.
- Field techs required to log maintenance performed, time in the field, and system checks; used time in field when available and travel times to city centers in travel calculations.
- Maintenance needs were identified through identification of aberrant data during weekly visual inspection of data sent to vendor online software.

Part 1: Maintenance Trips

<table>
<thead>
<tr>
<th>Maintenance Issue by Trip Purpose</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery Replacements</td>
<td>16</td>
<td>0.43</td>
</tr>
<tr>
<td>Troubleshooting Settings</td>
<td>6</td>
<td>0.16</td>
</tr>
<tr>
<td>Unit Replacement</td>
<td>5</td>
<td>0.14</td>
</tr>
<tr>
<td>Settings Adjustment</td>
<td>3</td>
<td>0.08</td>
</tr>
<tr>
<td>Debris Removal</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Vandalism</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Corrosion</td>
<td>1</td>
<td>0.03</td>
</tr>
<tr>
<td>Resurfacing</td>
<td>1</td>
<td>0.03</td>
</tr>
<tr>
<td>Modem Failure</td>
<td>1</td>
<td>0.03</td>
</tr>
<tr>
<td>Visit by Maintenance Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routine</td>
<td>16</td>
<td>0.43</td>
</tr>
<tr>
<td>Non-Routine</td>
<td>23</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Part 2: Maintenance Cost Estimate

- Travel time was calculated as the average roundtrip travel time to sites part of NCNMVDP during 2015 - 2017 period
- Staff per hour salary compensation including fringe benefits assumed $39.90. Student per hour wage assumed $10.86.
- Processing of two days of validation video included in “Revalidation” category.

Part 3: Programmatic Recommendations

- Treat wooden post systems with insecticide to prevent infestation and subsequent pedestrian sensor blockage or damage.
- Install bicycle wires in asphalt gently as wire corrosion was common in systems. The corrosion originating from the asphalt indicates that the wire was cut by field staff during the installation or by the asphalt. Use soft/rubber tools to push bicycle wire into asphalt and consider using a soft insulating putty to protect wires from asphalt.
- Coordinate installation with local resurfacing team to ensure bicycle loops are not damaged or removed as a result of routine resurfacing.
- Some system bike loops were cut by lawncare crews; coordinate with property owners to avoid using lawn-mowers and weedwackers near systems.
- Monitor observe data for aberrant data trends which trigger maintenance trip at least once per month.
- Schedule routine hardware checks to ensure that issues like vandalism, corrosion, debris, or infestations minimally affect data collection.

CONCLUSIONS

- A conservative estimate of two years of labor and travel costs associated with counter maintenance is about $10,757 for the NCNMVDP.
- An estimate of maintenance costs per station was about $597.61; maintenance cost per sensor was about $275.
- Maintenance costs for local programs will likely be less due to high cost associated with travel time.

ACKNOWLEDGEMENTS

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