Abstract

This project implements a risk measurement associated with the transportation of hazardous materials (hazmat). The risk measure was applied to two routes located in the city of New Haven, Connecticut. The factors contributing to the risk measurement are population and the vehicle accident rate.

Objective

Identify an optimal route that minimizes trip length and provides public safety for hazmat transportation through New Haven. The hazardous material transportation originates on either side of the mouth of the Quinnipiac River. The point of origin for the hazmat routes considered is Exit 47 on Interstate 95 South.

The current westward route for Hazmat transportation is via Route 34, which travels East to West on North Frontage Road. Route 34 is being reconstructed into an urban boulevard. The boulevard is projected to contain stores, increase pedestrian & bicycle accessibility, and increase the population density. The City of New Haven wants to determine a viable substitute to Rt. 34 for hazmat transportation. The alternative is a combination of Interstate 95 South and Route 10 North. Both routes will be quantitatively analyzed to determine if I-95 South and Rt. 10 are viable Hazmat routes.

Data Collection

Vehicle accident data along routes was provided by the Connecticut DOT data base: www.ctcrash.uconn.edu. The time span of the study was from 1/1/2006 to 12/31/2011. The number of vehicle accidents were counted along each segment (section of road between two intersections).

<table>
<thead>
<tr>
<th>Crash ID</th>
<th>Crash Location</th>
<th>Nearest Intersection</th>
<th>Crash Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>101488</td>
<td>CONN ROUTE 010</td>
<td>CHERRY AVE</td>
<td>AT RTE 34</td>
</tr>
<tr>
<td>101356</td>
<td>CONN ROUTE 010</td>
<td>CTY ST 706 NO PINTO RD</td>
<td>AT RTE 34</td>
</tr>
<tr>
<td>101246</td>
<td>CONN ROUTE 010</td>
<td>CTY ST 706 NO PINTO RD</td>
<td>AT RTE 34</td>
</tr>
<tr>
<td>101374</td>
<td>CONN ROUTE 010</td>
<td>CTY ST 706 NO PINTO RD</td>
<td>AT RTE 34</td>
</tr>
<tr>
<td>101636</td>
<td>CONN ROUTE 010</td>
<td>BOB CHANNELIZATION (PAINT)</td>
<td>AT LONGHORN LANE</td>
</tr>
</tbody>
</table>

Figure 1. Route 34 and proposed hazmat route in New Haven, CT.

Figure 2. White tanks that contain the hazmat to be transported.

The Federal Highway Administration presents a route accident rate calculation:

\[
R = \frac{C \times 100,000,000}{V \times 365 \times N \times L}
\]

Where:
- \(R\) = Roadway Departure Crash Rate for the Road Segment
- \(C\) = Total Number of Vehicle Accidents along Route
- \(V\) = Annual Average Daily Traffic
- \(N\) = Number of Years
- \(L\) = Length of Route

\(\text{Note: Annual Average Daily Traffic for the I-95 and Rt 10 calculation is expressed as the average daily traffic for the combined segments.}\)

Accident Rate Equation

The crash report data shows that I-95 & Rt. 10 have a greater quantity of accidents, higher total population, longer route length, and travel time compared to Rt. 34. Greater daily traffic along I-95 and Rt. 10 results in a crash rate that is less than Rt. 34’s crash rate. The population factor resulted in a greater route risk for Rt. 34 in comparison with I-95 and Rt. 10.

Concluding that I-95 and Rt. 10 has a longer travel time than the Rt. 34 path. However, I-95 & Rt. 10 has a risk factor that is 70% of the risk factor for Route 34. The research suggests that I-95 and Rt. 10 is a viable hazmat transportation route.

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