FHWA’s Vision

“Create the best transportation system in the world for the American people through proactive leadership, innovation and excellence in service.”
FHWA’s Goals

- Mobility
- Productivity
- Human and Natural Environment
- National Security
- Safety
Highway Safety Elements

Driver
Vehicle
Roadway
National Crash Trends

Fatality Rate (per 100 Million Vehicle Miles)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>10.9</td>
</tr>
<tr>
<td>1950</td>
<td>7.2</td>
</tr>
<tr>
<td>1960</td>
<td>5.1</td>
</tr>
<tr>
<td>1970</td>
<td>4.7</td>
</tr>
<tr>
<td>1980</td>
<td>3.3</td>
</tr>
<tr>
<td>1990</td>
<td>2.1</td>
</tr>
<tr>
<td>1995</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Indiana Crash Trends

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatality Rate (per 100 Million Vehicle Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>3</td>
</tr>
<tr>
<td>1980</td>
<td>3</td>
</tr>
<tr>
<td>1985</td>
<td>2.4</td>
</tr>
<tr>
<td>1990</td>
<td>2</td>
</tr>
<tr>
<td>1995</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Safety Opportunities

★ Educate
★ Promote Safety Belt and Air Bag Use
★ Reduce Impaired Driving
★ Manage Speed
★ Develop Safer Vehicles

Design Safer Roadway Environments
Roadside Obstacles

Nearly 30% of all traffic fatalities are caused by collisions with fixed objects.

- Trees/Shrubs
- Guardrail
- Embankments
- Utility Poles
Why Drivers Leave the Roadway

- Forced Off By Other Drivers
- Inattention
- Excessive Speed
- Fatigue
- To Avoid An Obstacle
- Driving Impaired
- Vehicle Failure
- Weather Conditions
“Forgiving Roadside” Concept

- Recognizes that good drivers can make mistakes and stray from the roadway.
- Provides a recovery opportunity for drivers.
Clear Zone

The total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles.
Design Options

- Remove Obstacles
- Relocate Obstacles
- Redesign Obstacles (Breakaway Devices)
- Shield Obstacles
Cost Effective Analysis
Cost Effective Analysis Uses

★ Evaluate Need For Barriers
★ Evaluate Best Treatment
★ Prioritize
★ Establish Policy
Agency Cost

- Installation
- Accident Repair
- Routine Maintenance
- Salvage
User Costs (Annual Accident Cost)

- Collision
- Severity
- Accident Type Costs
Need a Common Comparison for Different Investments over Time
Discounting

- Time Value of Money
- Low - Current Investments
- High - Future Investments
**Accident Costs**

- Property Damage Only Accident Level 1 = $625
- Property Damage Only Accident Level 2 = $3,125
- Slight Injury Accident = $3,750
- Moderate Injury Accident = $12,500
- Severe Injury Accident = $200,000
- Fatal Accident = $1,000,000
Fatal Accidents

★ FHWA - $1,500,000
★ ROADSIDE - $1,000,000
★ Agency Policy - ?
Severity Index

★ 0-10 Scale
★ Proportion of Accident Types
Total Accident Cost = (Cost of Severity Index)(Probability of Severity Index)
### Suggested Severity Indexes

<table>
<thead>
<tr>
<th></th>
<th>60 Km/h</th>
<th>80 Km/h</th>
<th>100 Km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree (150 mm)</td>
<td>2.6</td>
<td>2.7</td>
<td>3.0</td>
</tr>
<tr>
<td>1:2 Foreslope (2 meter height)</td>
<td>3.2</td>
<td>3.8</td>
<td>4.3</td>
</tr>
<tr>
<td>Longitudinal Barrier</td>
<td>2.0</td>
<td>2.3</td>
<td>2.7</td>
</tr>
<tr>
<td>CAT</td>
<td>2.2</td>
<td>2.6</td>
<td>3.2</td>
</tr>
</tbody>
</table>
Cost Effective Analysis System

Results with ROADSIDE

- Present Worth and Annual Cost for both Total and Agency Costs
Cost Effective Analysis Example

Highway
- Two-way, Two-lane Undivided
- Lane Width = 3.3 meters
- No Shoulder

Traffic
- Design Year (20 years) Traffic = 1,806 VPD
- Traffic Growth = 3.0%
- Design Speed = 100 km/h
Cost Effective Analysis Example
Continued

Feature

- 3.0 meter x 3.0 meter Concrete Box Culvert
- 0.3 meter Protruding Headwall
- 1:2 Taper Wingwalls
Cost Effective Analysis Example

Continued - Design Options

- Do Nothing
- Extend Concrete Box Culvert to Clear Zone (9 meters)
- Extend Concrete Box Culvert; Lane Width and Shoulder (3.6 meter and 1.2 meter respectively)
- Eliminate Headwall, Rebuild Wingwalls (1:4), and Install Pipe Grates
### Cost Effective Analysis

<table>
<thead>
<tr>
<th>Option</th>
<th>Annual Accident Cost</th>
<th>Annual Highway Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1 (Do Nothing)</td>
<td>$980</td>
<td>$0</td>
</tr>
<tr>
<td>Option 2 (Extend to Clear Zone)</td>
<td>$184</td>
<td>$736</td>
</tr>
<tr>
<td>Option 3 (3.6 m lane and 1.2 m shoulder)</td>
<td>$765</td>
<td>$589</td>
</tr>
<tr>
<td>Option 4 (1:4 Foreslope)</td>
<td>$89</td>
<td>$441</td>
</tr>
</tbody>
</table>
## Benefit/Cost Analysis Comparisons

<table>
<thead>
<tr>
<th>Option</th>
<th>Benefit/Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 2 (Extend to Clear Zone)</td>
<td>1.1</td>
</tr>
<tr>
<td>Option 3 (3.6 meter lane and 1.2 meter shoulder)</td>
<td>0.4</td>
</tr>
<tr>
<td>Option 4 (1:4 Foreslope)</td>
<td>2.0</td>
</tr>
</tbody>
</table>
Cost Effective Analysis

Tool

NOT THE ANSWER
Cost Effective Analysis Benefits

- Compare Alternatives
- Prioritize for "Best Treatment"
- Establish Policy
- AND...
IT CAN SAVE YOU MONEY