I will be presenting today, along with Kelly Laustsen, on the topic of *Pedestrian and Bicycle Volume Counts*.  

I will first speak to the topic of: why pedestrian and bicycle volume counts. Why pedestrian and bicycle volume data is important. Why we should be thinking about ped and bike volume data collection... and why this should be a part of your data collection plan for your projects and for your transportation management plans.

Kelly will speak on the topic of how pedestrian and bicycle volume counts may be performed. Kittelson recently complete National Cooperative Research Program (NCHRP) Project 7-19: *Methods and Technologies for Pedestrian and Bicycle Volume Data Collection*. 
Why ped and bike volume counts

NCHRP 7-19 Statement of Need

...the lack of pedestrian and bicycle volume data is a barrier to transportation agencies efforts to plan more effective facilities and to improve safety for pedestrians and bicyclists.

...the lack of system-wide pedestrian and bicycle volume data limits the ability of transportation agencies to provide or improve pedestrian and bicycle facilities where the need is greatest and an impediment to developing better predictive methods for pedestrian and bicycle crashes.

While Kelly will speak about methods and technologies for data collection, the NCHRP 7-19 statement of need goes more directly toward my topic: Why Ped and Bike volume counts.

I would add that the lack of ped and bike data severely limits our ability to understand the effect of the things we do to enhance ped and bike mobility and safety. And therefore it limits our ability understand how our outputs contribute to our primary mission: Making the best use of available resources to provide greater mobility and safety for the people of AZ.
Why ped and bike volume counts

Arizona 2013 crash statistics

- 844 traffic fatalities
- 158 pedestrian fatalities (18.7% of total)
- 30 pedalcyclist fatalities (3.6% of total)
- Over 50,000 traffic injuries
- 1356 pedestrian injuries (2.7% of total)
- 1679 pedalcyclist injuries (3.3% of total)

Source: Arizona Crash Facts
Ezra Hauer - the father of modern traffic safety analysis

The Road Ahead was ASCE 2005 paper of the year.

Everyone involved in transportation should take the time to read this paper

As well as his 1999 paper: Safety in Geometric Design.
From this perspective, I suppose it is fair to say that everyone in this room today will influence the road safety future of AZ.
Basic construct for objective evaluation of risk in transportation safety established by Ezra Hauer in 1982.

Add in discussion:
Relationship not necessarily linear, in many cases is not.

Critical:
The objective evaluation of risk is based on the observed measures of safety: such as number of crashes, number of fatalities
And observed measures of exposure, such as MV volumes, bicycle volumes or number of pedestrian crossings.
I think it is fair to say that there is no one best measure of safety or exposure. The measures used depends on the question you are trying to answer.

If you are trying to assess the safety of a particular section of roadway, then one should look at crashes and vehicle miles of travel.

If you are trying to assess the effect of a particular change in the seat belt law, it may be best to look at the number of victims and passenger miles of travel.

<table>
<thead>
<tr>
<th>Common Measures of Safety:</th>
<th>Common Measures of Exposure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Number of Fatalities</td>
<td>• Motor Vehicle Miles of Travel</td>
</tr>
<tr>
<td>• Number of Injuries</td>
<td>• Entering Motor Vehicles</td>
</tr>
<tr>
<td>• Number of Crashes</td>
<td>• Population</td>
</tr>
<tr>
<td>• Number of Fatal Crashes</td>
<td>• Licensed Drivers by Age and Gender</td>
</tr>
<tr>
<td>• Number of Injury Crashes</td>
<td><strong>Less Common but Important:</strong></td>
</tr>
<tr>
<td>• Number of Fatal + Injury Crashes</td>
<td>• Number of Pedestrian Crossings</td>
</tr>
<tr>
<td></td>
<td>• Bicycle Miles of Travel</td>
</tr>
<tr>
<td></td>
<td>• Exposure to Inclement Weather</td>
</tr>
<tr>
<td></td>
<td>• Exposure to Animals</td>
</tr>
<tr>
<td></td>
<td>• VMT by Age and Gender</td>
</tr>
</tbody>
</table>
Complete Streets Project

Before:
- 1000 MV crashes/year
- 50 Ped and Bike crashes/year

After:
- 850 MV crashes/year (-15%)
- 100 Ped and Bike crashes/year (+100%)

Net result:
- Reduction of 100 crashes/year

But would this project be considered a ped and bike safety success?

Also known:
- MV volume decreased by 15%
- Ped and bike volume increased by 400%
This graph shows the change in the number of fatalities in AZ from 1984 – 2011 (in pink). It also shows the change in VMT 9 (in blue).

There could be a great deal of discussion of the trends in fatalities and MVT over the past 25 plus years. What is notable is the general increase in both from about 1997 – 2006, at about the same slope. The trend really changed in 2006.

This graph was presented to Director Halikowski in 2011.
It did not include the 2011 data at that time.

He had one basic question: Why? Why the drop in fatalities?
Of course this was exactly the question that should be asked. Why? Is it something we are doing or is the drop due to other factors?
The fact is, I have spent a good amount of time trying to answer this question. Some of what I have found I will present today, as I believe it is directly related to the issue of ped and bicycle volumes. But as you will see, I have more questions than answers at this point in time.

Using 2007 as the base year:
MV fatalities dropped by 29% from 2007 to 2010
Traffic volume decreased by only 5% over this period. Why? And What happened in 2011?
In order to answer the Director’s question: A series of graphs were generated to examine trends based on a percent change from the base year of 2007, the base year for the 2007 SHSP.

Percent change was used to normalize the data to the same scale.

We looked at the various emphasis areas in our 2007 SHSP and found that young drivers was showing the largest drop.

Blue line: total fatalities plotted as a percent change from base year, 2007.
2006 = 1301 Peak
2007 base year = 1071
2010 low = 759 (29% drop from base year)

Red line: young driver involved fatalities – again plotted as a percent change from 2007 base year. This method of plotting based on percent change allows for direct comparison of total a various emphasis areas.
2005 peak = 434
2007 base = 354
2010 low = 160 fatalities
55% drop over this three year period. This compares to 42% decrease for speed related, second best performing emphasis area.

2010 to 2011 +69 is more than 100% of the increase in total fatalities (+66) over this period.
Ped
Peak: 172 in 2006
Low: 122 in 2009 but close to same values in 2003 (126) and 2008 (125)
In 2013 we are almost exactly where we were in 2007

This data indicates very little change in ped fatalities from 2001 to 2013. The variation is up and down, basically random change.
The trend is generally speaking flat.
Young Drivers in the Netherlands

- Why did the accident involvement of young (male) drivers drop about 50% (Twisk – SWOV)

Based on data from 1985 to 1997, likely factors:
- The introduction of Free Public Transport Pass (FPTP) for young students
- Economic recession and international instability (Gulf War)

“It is likely that the FPTP was a significant factor in this (reduction). A measure that was not intended to be a traffic safety measure, by reducing exposure, showed to be one.”
Young Drivers and the Economy

After Long Downturn, Beer Sales are Back

“Beer has struggled in recent years partly because its key customers, blue collar males in their 20’s were battered by an economic downturn that hammered industries such as construction.”

“Job numbers are still much worse than before the downturn, but improving. The unemployment rate for males 20 to 24 stood at 15.2% in August.”
Teen Crashes & Employment

F+II Crashes Involving Teen Drivers and Teen Employment

<table>
<thead>
<tr>
<th>Year</th>
<th>Employment</th>
<th>Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>14.4%</td>
<td>36.5%</td>
</tr>
<tr>
<td>2002</td>
<td>1.7%</td>
<td>29.4%</td>
</tr>
<tr>
<td>2003</td>
<td>-3.4%</td>
<td>11.2%</td>
</tr>
<tr>
<td>2004</td>
<td>-12.7%</td>
<td>18.0%</td>
</tr>
<tr>
<td>2005</td>
<td>2.5%</td>
<td>12.1%</td>
</tr>
<tr>
<td>2006</td>
<td>26.3%</td>
<td>8.4%</td>
</tr>
<tr>
<td>2007</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>2008</td>
<td>-7.6%</td>
<td>-22.3%</td>
</tr>
<tr>
<td>2009</td>
<td>-32.2%</td>
<td>-42.0%</td>
</tr>
<tr>
<td>2010</td>
<td>-38.1%</td>
<td>-44.6%</td>
</tr>
<tr>
<td>2011</td>
<td>-29.7%</td>
<td>-43.9%</td>
</tr>
</tbody>
</table>
Valley Metro has an excellent research and data on their website.

It should be noted, this increase of 20 million transit related walking trips is not a piece of data you will find in the Valley Metro data.

It is a value that I calculated using Valley Metro data on the increase in number of transit trips and mode of travel to and from transit.
New Zealand is using VMT and household travel survey data to estimate VMT by age and gender.

**Males**

Based on VKT

15-19 = 230

55-59 = 25

\[
\frac{230}{25} = \text{approximate 9}
\]

Based on licensed drivers

15-19 = 660

55-59 = 200

\[
\frac{660}{200} = 3.3
\]
New Zealand Crash Fact Sheet

- Male drivers in the 15-19 year age group are approximately nine times more likely to crash (per kilometer driven) than male drivers 55-59 years of age.

- Female drivers aged 15-19 have a lower crash risk than males of the same age, but are still seven times more likely to crash (per kilometer driven) than female drivers 55-59 years of age.

- Drivers in the 20-24 year-old age group are approximately three to five times more likely to crash than 55-59 year-olds of the same gender.

It the same type of relative risk values hold for AZ it could explain why a relatively small change in VMT could result in such a large change in the number of fatalities.
This information leads me to ask many questions.