Bottom Line Series

Delineates Investment requirements for highways, bridges and transit;

prepared for AASHTO and APTA and;

presented to Congress to support five Surface Transportation Reauthorizations.
OUTLINE

I. PARALLELS TO THE COMMITTEE’S CHARGE
II. WHY A BOTTOM LINE?
III. BASIC STARTING POINTS
IV. NATIONAL INVESTMENT REQUIREMENTS
V. THE BACKLOG OF REQUIREMENTS
VI. INTEGRATION INTO OVERALL SCOPE
BOTTOM LINE PARALLELS TO COMMITTEE’S CHARGE

• Need for Independent Assessment
• Limited Time and Funding
• Need to Supplement Modeled Products
• Cover areas of Selected Focus
• Consider Demographic, Economic and Technological Trends
• Focus on Specific Interstate and NHS Needs
Why a Bottom Line?
It serves a different purpose than the C&P report employing many of the FHWA/FTA tools but with extensive supplementary research.

**C&P Goal**

- To respond to Congressionally mandated requirement for objective appraisal of highway, bridge and transit physical conditions, operational performance, and investment effects.
- Indicates scale of need but does not say how big the overall program should be!

**Bottom Line Goal**

- Congress looks to AASHTO for sound objective baseline for specific Reauthorization.
- Establish States’ position on investment requirements.
- Maintain consistency with the C&P data and methods.
- Indicates national investment requirements for the legislative period of interest.
Current Bottom Line Era

• AASHTO developed its own capability to run FHWA/FTA models with Cambridge Systematics
• Still dependent on annual State data sets
• But defined distinct policy scenarios – broader perspective, differing travel forecasts, focused time periods, higher employment, etc.
• Conducted special supplements and estimates

• AS STANDARD PRACTICE, ALWAYS TRACEABLE BACK TO CONSISTENCY WITH C&P PROCESSES – COULD EXPLAIN TO CONGRESS HOW AND WHY WE DIFFERED
Context in Updating the 2015 Executive Bottom Line

- **Highway VMT growth** had trended:
  - below the 2008 HPMS baseline of 1.8% VMT forecast,
  - below the 2009 BL baseline of 1.4% growth forecast, and
  - below the 1.0% BL policy scenario growth forecast
  - Since a bottom in 2011 it has grown rapidly (7% from 2011-2015)

- **Transit growth** had trended:
  - below the 2009 baseline BL forecast of 2.4% and
  - below the 3.5% AASHTO sustainability policy scenario forecast (double transit in 20 years)

- **ARRA one time funding** distorted the picture

- **Construction cost index** had declined during the recession, lowering the 2012 project costs for highways, bridges and some transit elements AND STILL LOW TODAY
### THE US – a VERY limited century – so far

**WE HAVE LIMITED**
- POP GROWTH
- WORKER GROWTH
- VEHICLE GROWTH
- ROADWAY GROWTH
- VMT GROWTH
- SLIGHT GROWTH IN CONGESTED ROADS

**Average travel time to work**
- **2000** 25.5 minutes
- **2011** 25.5 minutes

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2015</th>
<th>Change</th>
<th>% chg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (millions)</td>
<td>281.4</td>
<td>321.4</td>
<td>40</td>
<td>14.2%</td>
</tr>
<tr>
<td>Vehicles (millions)</td>
<td>221.4</td>
<td>260.4</td>
<td>39</td>
<td>17.6%</td>
</tr>
<tr>
<td>Road System miles*</td>
<td>3.936</td>
<td>4.177</td>
<td>0.241</td>
<td>6.1%</td>
</tr>
<tr>
<td>Lane Miles (millions)*</td>
<td>8.224</td>
<td>8.766</td>
<td>0.542</td>
<td>6.6%</td>
</tr>
<tr>
<td>Vehicle Miles of Travel</td>
<td>2.764</td>
<td>3.148</td>
<td>0.384</td>
<td>13.9%</td>
</tr>
<tr>
<td>VMT/ lane mile</td>
<td>336</td>
<td>359</td>
<td>23</td>
<td>6.8%</td>
</tr>
<tr>
<td>Average work travel time (minutes)</td>
<td>25.5</td>
<td>25.9</td>
<td>0.5</td>
<td>1.96%</td>
</tr>
</tbody>
</table>

* 2014 data

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Alan E. Pisarski
THE STORY OF HIGHWAY TRAVEL IN THIS CENTURY

• Range around 3 trillion

• Peaked in 2007 Just before the recession

• Hit bottom in 2011 down less than 2% from 3 trillion

• 2015 hit all time high

• Up 5% over 3 trillion

• 2016 up >3% so far
National Highway Construction Cost Index thru Mar 2016 ----
### 2015 vs. 2009 Bottom Line
Highway Investment Requirements

<table>
<thead>
<tr>
<th>MAXIMUM ECONOMIC INVESTMENT SCENARIO ESTIMATES  B/C &gt; 1.0</th>
<th>State of Good Repair</th>
<th>2009 BL (Billions of $2006)</th>
<th>2015 BL (Billions of 2012$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMT Growth 1.6% (highest growth rate examined)</td>
<td>88.3</td>
<td>Not included</td>
<td>$156.0</td>
</tr>
<tr>
<td>VMT Growth 1.4 % (base case in 2009 Bottom Line)</td>
<td>88.3</td>
<td>$166</td>
<td>$144.4</td>
</tr>
<tr>
<td>VMT Growth 1.0 % (AASHTO Policy Scenario in 2009 Bottom Line)</td>
<td>88.3</td>
<td>$132</td>
<td>$120.2</td>
</tr>
</tbody>
</table>

Note:
A full employment scenario would increase each 2015 estimate by at least $4 billion
Special Selected Focus Areas in 2015
AASHTO Bottom Line

• Economic Development Implications
• Freight Logistics Demands
• Tourism Implications
• Rural Participation in the Economy

Limited because of short lead time to legislation
Past Special Studies to Assess Further Investment Requirements in the Bottom Line

- Environmental Impact Mitigation Costs
- Extended Safety Costs Coverage
- Expanded System Operations Effects
- Security and Emergency Management 9/11
- Infrastructure Reconstruction

These ranged from $7 to $11 billion per year in 2009 – WITHOUT RECONSTRUCTION
Understanding the Nature of Investment Needs

- Future growth has an important effect on investment needs.
- Substantial benefits to be obtained from increased highway, bridge, capital investment.
- In both the long and near term.
- Even with limited growth, or no growth.
## BACKLOG estimates from 2013 C&P employed in 2015 Bottom Line

<table>
<thead>
<tr>
<th>2012 BACKLOG</th>
<th>System Rehabilitation</th>
<th>System Expansion</th>
<th>Total Backlog</th>
<th>Share of Rehabilitation Needs</th>
<th>Share of System Expansion Needs</th>
<th>Share of Total Backlog</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate Highway System</td>
<td>62.43</td>
<td>90.81</td>
<td>153.24</td>
<td>15.94%</td>
<td>38.23%</td>
<td>24.35%</td>
</tr>
<tr>
<td>Remainder of National Highway System</td>
<td>138.63</td>
<td>70.42</td>
<td>209.04</td>
<td>35.39%</td>
<td>29.65%</td>
<td>33.22%</td>
</tr>
<tr>
<td><strong>Total National Highway System</strong></td>
<td>201.06</td>
<td>161.22</td>
<td>362.28</td>
<td>51.30%</td>
<td>67.90%</td>
<td>57.60%</td>
</tr>
<tr>
<td>Other Fed-Aid Highways</td>
<td>107.73</td>
<td>41.51</td>
<td>149.24</td>
<td>27.50%</td>
<td>17.50%</td>
<td>23.70%</td>
</tr>
<tr>
<td>Non-Fed-Aid Highways</td>
<td>82.92</td>
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<td>21.20%</td>
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<td>18.70%</td>
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<td>391.71</td>
<td>237.53</td>
<td>629.23</td>
<td>100.00%</td>
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</tbody>
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*estimated for prospective complete NHS; effects of ARRA unclear at time of estimate
Reduced costs most likely reduces Backlog

Because dollar gain in successful projects due to reduced cost is less than reduction in costs for already successful full projects, total program cost drops. Change will be function of distribution of projects costs and benefits.
Benefit Growth with Increased Investment

User Cost Savings per $ of increase in Investment

Increment of Investment

Increment of User Cost Savings 2028

<table>
<thead>
<tr>
<th>Billions $</th>
<th>Increment of Investment</th>
<th>Increment of User Cost Savings 2028</th>
</tr>
</thead>
<tbody>
<tr>
<td>54.7 (baseline)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>58</td>
<td>3.3</td>
<td>12.6</td>
</tr>
<tr>
<td>62.9</td>
<td>8.2</td>
<td>29.9</td>
</tr>
<tr>
<td>74.7</td>
<td>20</td>
<td>66</td>
</tr>
<tr>
<td>80.1</td>
<td>25.4</td>
<td>79.7</td>
</tr>
<tr>
<td>93.4</td>
<td>38.7</td>
<td>109.5</td>
</tr>
<tr>
<td>105.4</td>
<td>50.7</td>
<td>132</td>
</tr>
</tbody>
</table>
# User Cost Impacts of Federal Aid Highways “HERS” Investments as Estimated for the 2010 C&P

<table>
<thead>
<tr>
<th>Level of Investment as Modeled by HERS (Billions$ Annual)</th>
<th>Increment of Investment</th>
<th>Increment of User Cost Savings 2028</th>
<th>Ratio of 2028 User Cost Savings to Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>$54.7 (baseline)</td>
<td>0.0</td>
<td>NA</td>
<td>NA</td>
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THE BOTTOM LINE PARALLELS AND THE COMMITTEE’S CHARGE

• Provide a Sound, Credible Assessment
• Focus on Specific Interstate and NHS Needs
• Responsive to Congressional Charge
• Recognize Time and Funding Constraints
• Respond to Areas of Selected Focus
• Produce Supplements to Modeled Products
• Incorporate Demographic, Economic and Technological Trends
THE CONTEXT - SHORT VERSION

• Levels of growth out into future are modest by historical standards
• A stable funding capability can probably respond to the ongoing investment requirements
• But, there is a substantial backlog of needs to be overcome, before that steady-state is reached
• The present low-cost operating environment has been the ideal time to spend down the backlog
• Once overcome, the ongoing demands of system growth and maintenance should be quite feasible
• Future full reconstruction needs are unclear
A BROADER VISION

• ALL OF THIS IS OCCURRING IN A DRAMATICALLY CHANGING TECHNOLOGICAL, DEMOGRAPHIC AND POLITICAL ENVIRONMENT

• WE ARE IN A CHALLENGED ECONOMY IN WHICH ENHANCED PRODUCTIVITY WILL BE KEY

• A SMALLER LABOR FORCE AGE GROUP WILL NEED THAT ENHANCED PRODUCTIVITY TO SUPPORT A LARGE AND GROWING DEPENDENT POPULATION

• AN IMPROVED INTERSTATE SYSTEM PROVIDING GREATER ACCESS TO WORKERS, TO JOBS, TO RESOURCES, TO CONSUMERS WILL BE A MAJOR CONTRIBUTOR TO THAT ENHANCED PRODUCTIVITY
THANK YOU

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AVAILABLE AS BACKGROUND FOR Q&A
The central fact of the future in the U.S.A. (and for many other countries) is the dramatic declines in the work force age group.

**IN THE FUTURE**

- Skilled workers will be at a premium
- With higher dependency on them
- Greater PRODUCTIVITY will be essential
- Attracting workers and holding them will be key
- Larger “Market Sheds” WIN

Time period focus

Amber = past w data; orange = past w no data; dk blue = our reauth period; lit blue = remainder of 20 year investment period
LONG TERM TRANSPORTATION SPENDING TRENDS

Transportation share of spending
The Influence of Affluence
help stamp out affluence – we can do it if with we work together

Annual Trips per Household by Household Income - 2009
Transportation Spending by Income Decile 2015

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Spending ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All consumer units</td>
<td>$9,503</td>
</tr>
<tr>
<td>Lowest 10 percent</td>
<td>$19,178</td>
</tr>
<tr>
<td>Second 10 percent</td>
<td>$9,558</td>
</tr>
<tr>
<td>Third 10 percent</td>
<td>$9,558</td>
</tr>
<tr>
<td>Fourth 10 percent</td>
<td>$9,558</td>
</tr>
<tr>
<td>Fifth 10 percent</td>
<td>$9,558</td>
</tr>
<tr>
<td>Sixth 10 percent</td>
<td>$9,558</td>
</tr>
<tr>
<td>Seventh 10 percent</td>
<td>$9,558</td>
</tr>
<tr>
<td>Eighth 10 percent</td>
<td>$9,558</td>
</tr>
<tr>
<td>Ninth 10 percent</td>
<td>$9,558</td>
</tr>
<tr>
<td>Highest 10 percent</td>
<td>$9,558</td>
</tr>
</tbody>
</table>
A nation of immigrants .....again

ARRIVALS PER DECADE

18.2 million
2000 to 2014
“NORMAL” TRANSPORTATION SHARE IS 18-20% - NOT SEEN SINCE 2005

2013 CEX TRANSPORTATION SPENDING RISES TO 17.6%
GAS DOWN; CAR PURCHASES UP
–POP, EARNERS, VEHICLES per HH CONSTANT 2011-2013
Share of households without vehicles is declining

When will they converge?

Will that be a bad thing?

2014 Nat avg 9.1% ; Af-Am 19.9%; Hisp. 11.8%

Alan E. Pisarski
The long term national trend is clear national commuting patterns by mode.
LARGE METRO GROWTH

Share of Pop in Metros
1950  56%
2010  85%

Share of Pop in Metros over a Million
1950  14 areas at 29%
2010  52 areas at 63%

Share of Pop in Metros over 5 million
1950  2 areas at 12%
2010  12 areas at 36%

BUT DENSITIES DOWN

WE ARE A LARGE METRO NATION

Share of National Population

- 5 million plus
- 1 million to 4,999,999
- 250,000  999,000
- less than 250,000

1950
- 12.2
- 17.3
- 17.9
- 8.7
- 36.2

2010
- 17.1
- 16
- 5.7
Percent of Workers Leaving their Home County to Work USA

- 1960: 9.4%
- 1970: 14.8%
- 1980: 20.1%
- 1990: 27.5%
- 2000: 34.2%
- 2010: 37.5%

Graph showing the increase in the percent of workers leaving their home county to work from 1960 to 2010.
Federal-Aid Highway and Bridge Investment Backlog Trend (billions of $) by C&P report year

![Graph showing Federal-Aid Highway and Bridge Investment Backlog Trend](image-url)
Continuing Progress in Bridges

In 2015 we were down to 58,791 Structurally Deficient Bridges
Less than 10% of all bridges

2012-2013 5% reduction
2013-2014 3.4% reduction
2014-2015 4.2% reduction

The 2013 C&P estimated that at a $20 billion per year spending level for all bridges (17.1B$ actual in 2010) the 2012 backlog of about $112 billion would be below $8 billion in 20 years

Trend in Bridge Deficiencies – almost cut in half over 20 years
STRENGTHS WEAKNESSES

• INTERSTATE STRONGEST DATA AND MODELED
• NBIAS STRONG ON INTERSTATE
• SOME ERRORS BY COARSE ASSUMPTIONS
• NEW THINGS COMING ONLINE AASHTOWARE SOFTWARE
• HAS RIGOR AND CONSISTENCY IN HISTORY
THE C&P MODELS ARE TOOLS TO AN END

• THREE KEY FUNCTIONS

• 1. DESCRIBE AND UNDERSTAND PAST TRENDS AND CURRENT PATTERNS

• 2. ASSESS HOW FUTURE INVESTMENT REQUIREMENTS WOULD CHANGE IN A RELATIVELY STABLE ENVIRONMENT

• 3. HELP ASSESS HOW INVESTMENT REQUIREMENTS COULD CHANGE IN A CHANGED AND CHANGING ENVIRONMENT
2015 Executive Bottom Line

Our Fifth Bottom Line
2015 Executive Bottom Line
because time, data and resources were short the 2015 was an update rather than a full scale analyses

• Updates and reassesses the Bottom Line (BL) estimates for highways, bridges and transit
• Uses sensitivity analysis for Highways, Bridges and Transit rather than new model runs
• Incorporates recent research, with a particular focus on emerging economic development implications
• Assessments of Freight, Tourism and Rural roles
• Recognizes potential additional research needs
2015 Executive Bottom Line Steps

- Embed product in context of the 2010 and 2013 C&P reports, and the 2009 Bottom Line
- Present relevant research emphasizing the economic effects of investment
- Define revised inputs and forecasts and methods for adjusting the needs values
- Finalize estimates and the report to assist in 2015 reauthorization
Early Bottom Lines
1988, 1996

• Accepted C&P report as base and adapted it
• Used C&P data and made adjustments
• Therefore, needed release of C&P from OMB to function; if OMB decided to withhold the report (which it often did) then AASHTO was naked
• C&P covers 20 years with no recommendations re needed funds; starting point based on data availability and continuity with past reports
• AASHTO needed explicit estimates for explicit years usually 5 or 6 years keyed to Congressional legislated period
### The Backlog

#### Doesn’t fit w trend chart

<table>
<thead>
<tr>
<th>Description</th>
<th>2009 Bottom Line</th>
<th>2013 Bottom Line</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIGHWAYS</strong></td>
<td></td>
<td>$629.1B</td>
</tr>
<tr>
<td><strong>BRIDGES</strong></td>
<td></td>
<td>$111.8B</td>
</tr>
<tr>
<td><strong>TOTAL HIGHWAYS AND BRIDGES</strong></td>
<td>$490B</td>
<td>$740.9B</td>
</tr>
<tr>
<td><strong>TRANSIT</strong></td>
<td>Not included</td>
<td>$77.7B</td>
</tr>
</tbody>
</table>

Note: FHWA’s definition of highway backlog changed between 2009 and 2013, so numbers do not show trend.

Note: 2009 and 2013 Highways backlog includes capacity projects which should have already been implemented.

Note: 2013 Transit backlog does not include capacity projects which should have already been implemented.
Continuing Progress in Bridges

Trend in Bridge Deficiencies – almost cut in half over 20 years

2012-2013  5% reduction
2013-2014  3.4% reduction
2014-2015  4.2% reduction
2015  58,791 under 10%
Bottom Line New Economic Focus

• New focus by AASHTO, APTA, TRB & others on the economic benefits of highway and transit investments
• The C&P Report demonstrates that increased investment is highly justified on the basis of user cost savings, even before considering broader impacts
• Returns are 2.6 to 3.8 times annual additional costs for the various incremental investment levels
Bottom Line New Economic Focus

• Major new research for ASCE*:
• Costs to average household if current (2010) investments were made in surface transportation versus the “improve scenarios” of the USDOT
  – $22,300 per household cumulative 2012 to 2020
  – $103,700 per household cumulative 2012 to 2040

NOTE: median household income in 2010: $49,800; so the 8 year totals are about half of median income and the 28 year totals are more than twice annual income

(*“Failure To Act: The Impact of Current Infrastructure Investment On America’s Economic Future (2013)” by EDRG)
Bottom Line New Economic Focus

• A 2009 TCRP Report and an update in 2013 on the economic impact of public transportation investment provided an estimate that for every additional billion dollars of annual transit capital investment, total annual net benefits by 2028 would be $3.5 billion dollars per year.

• Transit and highway scenarios thus both show benefit returns compared to added investment for twenty years of near or over 3 to one for increases over current levels.

## DO FOR I STATE Highway Backlog Estimate 2012 by Fed-Aid Category (Billions of $)

<table>
<thead>
<tr>
<th></th>
<th>System Rehabilitation Highway</th>
<th>System Expansion</th>
<th>Total Backlog</th>
<th>Share of Rehabilitation Needs</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Fed-Aid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highways—Rural</td>
<td>60.22</td>
<td>9.25</td>
<td>69.47</td>
<td>15.4%</td>
<td>3.9%</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highways—Urban</td>
<td>248.56</td>
<td>193.38</td>
<td>441.95</td>
<td>63.5%</td>
<td>81.5%</td>
<td>70.2%</td>
</tr>
<tr>
<td>Fed-Aid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highways—Total</td>
<td>308.78</td>
<td>202.74</td>
<td>511.52</td>
<td>78.8%</td>
<td>85.4%</td>
<td>81.3%</td>
</tr>
<tr>
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<td></td>
<td></td>
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NHS requirements are based on current FHWA estimates of system extent.
## Highway Backlog Estimate 2012

**billions of $ P 63 BL**

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</tbody>
</table>

|                         | 62.43                          | 90.81            | 153.24        | 51.3%                          | 67.9%                           | 57.6%                  |

| **Interstate Highway System** | 62.43                          | 90.81            | 153.24        | 51.3%                          | 67.9%                           | 57.6%                  |
| **Remainder of National Highway System** | 138.63                         | 70.42            | 209.04        |                                |                                |                        |
| **Total National Highway System** | 201.06                         | 161.22           | 362.28        | 51.3%                          | 67.9%                           | 57.6%                  |
| **Other Fed-Aid Highways**    | 107.73                         | 41.51            | 149.24        | 27.5%                          | 17.5%                           | 23.7%                  |
| **Non-Fed-Aid Highways**      | 82.92                          | 34.79            | 117.71        | 21.2%                          | 14.6%                           | 18.7%                  |
| **All Roads**                 | 391.71                         | 237.53           | 629.23        | 100.0%                         | 100.0%                          | 100.0%                 |

NHS requirements are based on current FHWA estimates of system extent
### Latest data?

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Calendar Year</td>
<td>2002</td>
<td>2004</td>
<td>2006</td>
<td>2008</td>
<td>2010</td>
</tr>
<tr>
<td>Fiscal Year</td>
<td>2003</td>
<td>2005</td>
<td>2007</td>
<td>2009</td>
<td>2011</td>
</tr>
<tr>
<td>Good (IRI &lt;95)</td>
<td>50%</td>
<td>52%</td>
<td>57%</td>
<td>57%</td>
<td>60%</td>
</tr>
<tr>
<td>Acceptable (IRI&lt;170)</td>
<td>91%</td>
<td>91%</td>
<td>93%</td>
<td>92%</td>
<td>93%</td>
</tr>
</tbody>
</table>
Bottom Line New Economic Focus

• The 2010 Condition and Performance Report modeled the specific impacts of alternative levels of annual highway investments on future user costs, future delays, and future VMT by pavement quality for the users of the Federal Aid Highway System.

• The C&P Report demonstrates that increased investment is highly justified on the basis of user cost savings, even before considering broader impacts.

• Returns are 2.6 to 3.8 times annual additional costs for the various incremental investment levels.
Bottom Line New Economic Focus

- New focus by AASHTO, APTA, TRB & others on economic benefits of highway and transit investments


- Provides new quantitative estimates of the economic impacts of the USDOT’s “Improve Scenarios” – the traditional C&P and BL scenarios -compared to “Current Spending Scenarios” for highways and public transportation
Bottom Line New Economic Focus

• Major new research: “Failure To Act: The Impact of Current Infrastructure Investment On America’s Economic Future (2013)” for ASCE by EDRG

• Costs to average household if current (2010) investments were made in surface transportation versus the “improve scenarios” of the USDOT
  – $22,300 per household cumulative 2012 to 2020
  – $103,700 per household cumulative 2012 to 2040

NOTE: median household income in 2010: $49,800; so the 8 year totals are about half of median income and the 28 year totals are more than twice annual income
# 2015 vs. 2009 Bottom Line

## Highway Investment Needs

### Maximum Economic Investment Scenario Estimates

<table>
<thead>
<tr>
<th>Scenario Description</th>
<th>2009 BL (Billions of $2006)</th>
<th>2015 BL (Billions of 2012$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMT Growth 1.6% (highest growth rate examined)</td>
<td>Not included</td>
<td>$156.0</td>
</tr>
<tr>
<td>VMT Growth 1.4 % (base case in 2009 Bottom Line)</td>
<td>$166</td>
<td>$144.4</td>
</tr>
<tr>
<td>VMT Growth 1.0 % (AASHTO Policy in 2009 Bottom Line)</td>
<td>$132</td>
<td>$120.2</td>
</tr>
</tbody>
</table>

**Note:**
A full employment scenario would increase each 2015 estimate by at least $4 billion.
## Highways and Bridges

### State of Good Repair Estimate

<table>
<thead>
<tr>
<th>Growth Rate of VMT per Year</th>
<th>Current Spending</th>
<th>State of Good Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Highway Scenarios</td>
<td>$88.3 billion</td>
<td>$83.1</td>
</tr>
</tbody>
</table>

adjusted using the cost index changes from the C&P report of 2013
# Highways and Bridges

## State of Good Repair Estimate

<table>
<thead>
<tr>
<th>Growth Rate of VMT per Year</th>
<th>Current Spending</th>
<th>State of Good Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modal Comparison Scenario -- 1.6 Percent Annual Growth</strong></td>
<td>$88.3 billion</td>
<td>$83.1</td>
</tr>
<tr>
<td><strong>Mid Level Scenario – 1.4 Percent Annual Growth</strong></td>
<td>$88.3 billion</td>
<td>$83.1</td>
</tr>
<tr>
<td><strong>2009 BL Policy Scenario - 1.0 Percent Annual Growth</strong></td>
<td>$88.3 billion</td>
<td>$83.1</td>
</tr>
</tbody>
</table>

*adjusted using the cost index changes from the C&P report of 2013*
## Bottom Line 2015 Suggested Scenarios

<table>
<thead>
<tr>
<th>HIGHWAY SCENARIO</th>
<th>GROWTH RATES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.6%</td>
</tr>
<tr>
<td></td>
<td>1.0%</td>
</tr>
<tr>
<td></td>
<td>1.4%</td>
</tr>
<tr>
<td></td>
<td>1.6%</td>
</tr>
<tr>
<td>BASE SPENDING ESTIMATED 2012</td>
<td></td>
</tr>
<tr>
<td>BACKLOG/STATE OF GOOD REPAIR</td>
<td></td>
</tr>
<tr>
<td>MAINTAIN CONDITIONS</td>
<td></td>
</tr>
<tr>
<td>IMPROVE CONDITIONS</td>
<td></td>
</tr>
<tr>
<td>FULL EMPLOYMENT LEVEL</td>
<td></td>
</tr>
</tbody>
</table>
## FHWA Estimates of the Highway Needs Effects of Cost Index Changes

<table>
<thead>
<tr>
<th>Year of C&amp;P</th>
<th>2004</th>
<th>2006</th>
<th>2008</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Delta for Example</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>32.6%</td>
</tr>
<tr>
<td>Needs Delta for Example</td>
<td>6.6%</td>
<td>11.2%</td>
<td>6.1%</td>
<td>11.1%</td>
</tr>
<tr>
<td>Ratio of the Change % for Needs vs. Costs (* this was used in the 2009 BL)</td>
<td>.264*</td>
<td>.448</td>
<td>.244</td>
<td>.340</td>
</tr>
</tbody>
</table>
### MAXIMUM ECONOMIC INVESTMENT SCENARIO ESTIMATES

<table>
<thead>
<tr>
<th>Scenario</th>
<th>2009 BL (Billions of $2006)</th>
<th>2015 BL (Billions of 2012$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMT Growth 1.6% (likely to be base case in 2014/2015 C&amp;P)</td>
<td>Not included</td>
<td>$156</td>
</tr>
<tr>
<td>VMT Growth 1.4% (base case in 2009 Bottom Line)</td>
<td>$166</td>
<td>$144.4</td>
</tr>
<tr>
<td>VMT Growth 1.0% (AASHTO Policy in 2009 Bottom Line)</td>
<td>$132</td>
<td>$120.2</td>
</tr>
<tr>
<td>VMT Growth 0.6% (Lowest growth analyzed in 2010 C&amp;P)</td>
<td>Not included</td>
<td>$- drop?</td>
</tr>
</tbody>
</table>
FHWA Estimates of the Highway Needs
Effects of Cost Index Changes

A change in costs is offset by more or fewer projects passing the b/c test and the sensitivity analyses of the 2010 C&P showed that highway needs changed .34 per 1.00 cost change

<table>
<thead>
<tr>
<th>Year of C&amp;P</th>
<th>2004</th>
<th>2006</th>
<th>2008</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Delta for Example</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
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<tr>
<td>Needs Delta for Example</td>
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<tr>
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<td>.264*</td>
<td>.448</td>
<td>.244</td>
<td>.340</td>
</tr>
</tbody>
</table>
Major Considerations in Updating the 2015 Executive Bottom Line

- **Highway VMT growth** has trended below the 2008 HPMS baseline of 1.8% VMT forecast, below the 2009 BL baseline of 1.4% growth forecast, and below the 1.0% BL policy scenario growth forecast.
- **Transit growth** has trended below the 2009 baseline BL forecast of 2.4% and below the 3.5% AASHTO sustainability policy scenario forecast.
- **Construction costs** have declined since the recession began, lowering the 2012 project costs for highways, bridges and some transit elements.
- **Base year capital investment levels** differ from the 2006 or 2008 base levels used in latest BL or C&P, but a current base level is uncertain.
- **The highway capital needs** for the 2015 Bottom Line use the 2013 C&P highway capital needs for a baseline.
- **The transit capital needs** for the 2015 Bottom Line use the 2009 Bottom Line transit capital needs for a baseline.
Bottom Line 2015 Highway Adjustments

- Adjust for years already elapsed 2008-2012
- Adjust for highway cost index changes to 2012 vs. 2010 or 2008
- Adjust for needs effect of cost index changes for both losses and gains to needs
- Adjust for alternative VMT growth rates

---

- No adjustment made to base for actual spending in interim period: regular + ARRA + TIGER
BRIDGE BACKLOG YES CONSISTENT WITH CHART FOR HWY AND BRIDGES

BRIDGE INVESTMENT BACKLOG TRENDS (BILLIONS OF $)

- Present bridge spending levels are reducing structurally deficient and functionally obsolete bridges (slowly)
- Backlog should be declining
- Policy question will be what rate of spending down the backlog should be chosen?
3 approaches in C&P to spendout

- **Ramped** fits a scenario of high growth
- **Flat** fits a scenario with constant needs
- **BCR** fits a scenario with large backlog

= our case
NATIONAL HIGHWAY CONSTRUCTION COST INDEX

CURRENT TRENDS

END OF 2012: 1.1148
END OF 2013: 1.0827
MID JUNE 2014: 1.1007
Looked at HS tables and LM increase was all in Urban areas; declines in Rural
ADJUST FOR FULL EMPLOYMENT = NO LOSS IN VMT USE NEW
DATA 2000-2012 OR 13 FROM ADC?

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2012</th>
<th>% CHG</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANE MILES</td>
<td>8,338,821</td>
<td>8,606,003</td>
<td>103%</td>
</tr>
<tr>
<td>VMT</td>
<td>3,049,027</td>
<td>2,968,815</td>
<td>97%</td>
</tr>
<tr>
<td>VMT/LM/DAY</td>
<td>989</td>
<td>945</td>
<td>96%</td>
</tr>
</tbody>
</table>
Need to validate this w FHWA still!
HIGHWAY AND BRIDGE BACKLOG TRENDS

HIGHWAY AND BRIDGE INVESTMENT BACKLOG TRENDS (BILLIONS $)

don’t use   Bottom Line has revised values  get the figure

![Chart showing highway and bridge backlog trends from 1999 to 2010.](chart.png)
REVISE Bridges – good data shape for description – needs approach update?

- Update – have data
- Yrbuilt 1906 to 2011?
- Bridge count x owner and by condition 2012
- Bridge count x constr type x condition
- Have tunnel inventory x state 366!
- How Update needs?
- Run download model?
• Bridge backlog needs update pg 66
• Bottom Line has 111.8 for 2012 contrasted to 2010 C&P of 106.4 shows 2013 = Report year
• Redo fed hwy and bridge blog to match fig pg 62 of Bottom Line
• Use table detail from pg 63 pg has type 629.23 is correct not .13

• SUMMARY SLIDIES

• ADD WORKERS 2000 – 2012

• Need bridge needs vs chart ???
Major Considerations in Updating the 2015 Executive Bottom Line

• **Base year capital investment levels differ from the base levels used in latest BL or C&P, but a current base level is uncertain**

• **The highway capital needs for the 2015 Bottom Line use the 2013 C&P highway capital needs for a baseline**

• **The transit capital needs for the 2015 Bottom Line use the 2009 Bottom Line transit capital needs for a baseline**
SOME POSITIVE SIGNS

THE VARIATION AROUND 3 TRILLION VMT FROM 2004 TO 2014 IS REALLY MINOR = 1-1½% SHIFTS

MAY - JUNE UP 1.4%; JULY 1.5%
IF WE FINISH THE YEAR AT THAT RATE TOTAL VMT WILL BE BACK TO HIGH OF 2007 –POSSIBLE?  (AUG WEAKER)

EXPECTED GROWTH RATES OUT TO THE FUTURE (WITHOUT AUTONOMOUS VEHICLES) circa 1.0%-1.4%

ROUGHLY, CONSTANT VMT/CAPITA VMT/WORKER IS MAIN FACTOR

IF WE HAD THE SAME SHARE OF WORKERS PER POP AS IN 2007 WE ARE BACK AT 2007 VMT

KEEP ASKING – IS IT CYCLICAL OR STRUCTURAL?
= a long slow miserable economic recovery or a new normal?

Annual VMT Estimates - millions
## Highway Backlog Estimate 2012 by System (Billions of $)

<table>
<thead>
<tr>
<th></th>
<th>System Rehabilitation Highway</th>
<th>System Expansion</th>
<th>Total Backlog</th>
<th>Share of Rehabilitation Needs</th>
<th>Share of System Expansion Needs</th>
<th>Share of Total Backlog</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate Highway System</td>
<td>62.43</td>
<td>90.81</td>
<td>153.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NHS Remainder</td>
<td>138.63</td>
<td>70.42</td>
<td>209.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total National Highway System*</td>
<td>201.06</td>
<td>161.22</td>
<td>362.28</td>
<td>51.3%</td>
<td>67.9%</td>
<td>57.6%</td>
</tr>
<tr>
<td>Other Fed-Aid Highways</td>
<td>107.73</td>
<td>41.51</td>
<td>149.24</td>
<td>27.5%</td>
<td>17.5%</td>
<td>23.7%</td>
</tr>
<tr>
<td>Non-Fed-Aid Highways</td>
<td>82.92</td>
<td>34.79</td>
<td>117.71</td>
<td>21.2%</td>
<td>14.6%</td>
<td>18.7%</td>
</tr>
<tr>
<td>All Roads</td>
<td>391.71</td>
<td>237.53</td>
<td>629.23</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

*NHS requirements are based on current FHWA estimates of system extent*
# Bridge Backlog - 2012

by Fed-Aid Category (Billions of $)

<table>
<thead>
<tr>
<th>ROAD SYSTEM</th>
<th>BACKLOG</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fed-Aid Rural Highways</td>
<td>29.9</td>
<td>26.7%</td>
</tr>
<tr>
<td>Fed-Aid Urban Highways</td>
<td>61.5</td>
<td>55.0%</td>
</tr>
<tr>
<td>Non-Federal Aid Highways</td>
<td>20.6</td>
<td>18.4%</td>
</tr>
<tr>
<td>All Roads</td>
<td>111.8</td>
<td>100.0%</td>
</tr>
<tr>
<td>Interstate Highway System Share</td>
<td>32.0</td>
<td>28.6%</td>
</tr>
<tr>
<td>Overall National Highway System Share</td>
<td>62.2</td>
<td>55.6%</td>
</tr>
</tbody>
</table>
MORE BRIDGES

• USE SD UPDATE TO 2015
• BRIDGE BACKLOG FROM US OR C&P
MOD THIS W NEWER A Very Limited Century For Change So Far

Summary Table of Key Factors

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2012</th>
<th>Change</th>
<th>% chg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (millions)</td>
<td>281.4</td>
<td>313.9</td>
<td>32.5</td>
<td>11.6%</td>
</tr>
<tr>
<td>Workers (millions)</td>
<td>128.3</td>
<td>140.9</td>
<td>12.6</td>
<td>9.8%</td>
</tr>
<tr>
<td>Vehicles (millions)</td>
<td>221.4</td>
<td>245.2</td>
<td>23.7</td>
<td>10.7%</td>
</tr>
<tr>
<td>Road System miles (millions)</td>
<td>3.936</td>
<td>4.092</td>
<td>.156</td>
<td>4.0%</td>
</tr>
<tr>
<td>Lane Miles (millions)</td>
<td>8.224</td>
<td>8.606</td>
<td>.381</td>
<td>4.6%</td>
</tr>
<tr>
<td>Vehicle Miles of Travel (trillions)</td>
<td>2.764</td>
<td>2.968</td>
<td>.204</td>
<td>7.4%</td>
</tr>
<tr>
<td>VMT/ lane mile (thousands)</td>
<td>336</td>
<td>345</td>
<td>8.8</td>
<td>2.6%</td>
</tr>
</tbody>
</table>
2014 HIGHWAY VMT IS BACK AT 3 TRILLION
FIRST TIME SINCE 2007
Updates of the Inputs – VMT/PMT

• **Trends in Highway Vehicle Miles of Travel (VMT)**
  Annual Growth through 2011
  – 20 Year 1.64 %
  – 10 Year 0.72 %
  – 6 Year 0.00%

  – 2013 0.7%
  – 2014 1.25% prelim est

• **Trends in Transit Passenger Miles of Travel (PMT)**
  Annual Growth through 2011
  – 20 Year 1.62%
  – 10 Year 1.34%
  – 6 Year 2.04%

  – 2013 1.09%
  – 2014 0.91% prelim est