boulder county oil and gas roadway impact study

Oil & Gas Production Transportation Impact Study

Presentation to Boulder County Board of County Commissioners

December 6, 2012

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Study Objectives

boulder county oil and gas roadway impact study

- Identify potential impacts of oil and gas industry on Boulder County roads
- Estimate general magnitude of:
  - Oil & gas related truck traffic
  - Incremental road deterioration and safety costs
- Develop a cost recovery mechanism that allows the County to offset increased road deterioration and safety costs
- Integrate study results with forthcoming oil & gas land use regulations

FELSBURG HOLT & ULLEVIG

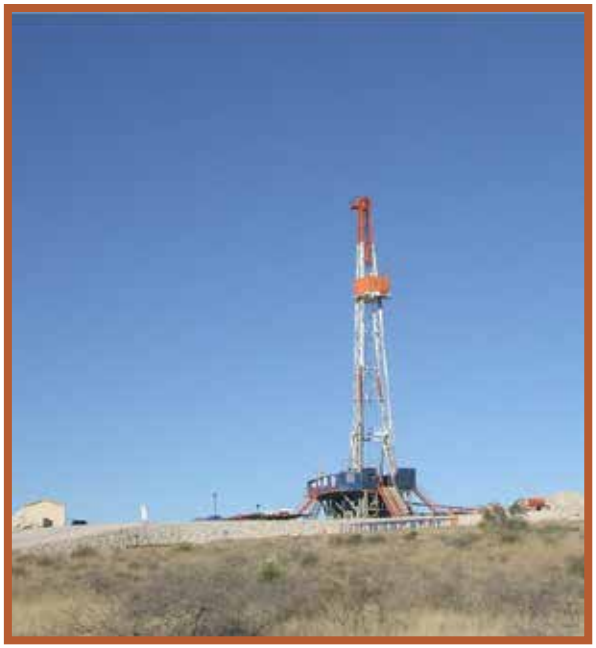
BBC RESEARCH & CONSULTING

Boulder County

Service Delivery Challenges

boulder county oil and gas roadway impact study

- **Oil & gas industry has unusual characteristics…**
  - **Dispersed**
  - **Road intensive**
  - **Migratory**
  - **Evolving: drilling to production**
  - **Uncertain pace and intensity of development**
  - **Uncertain traffic patterns**



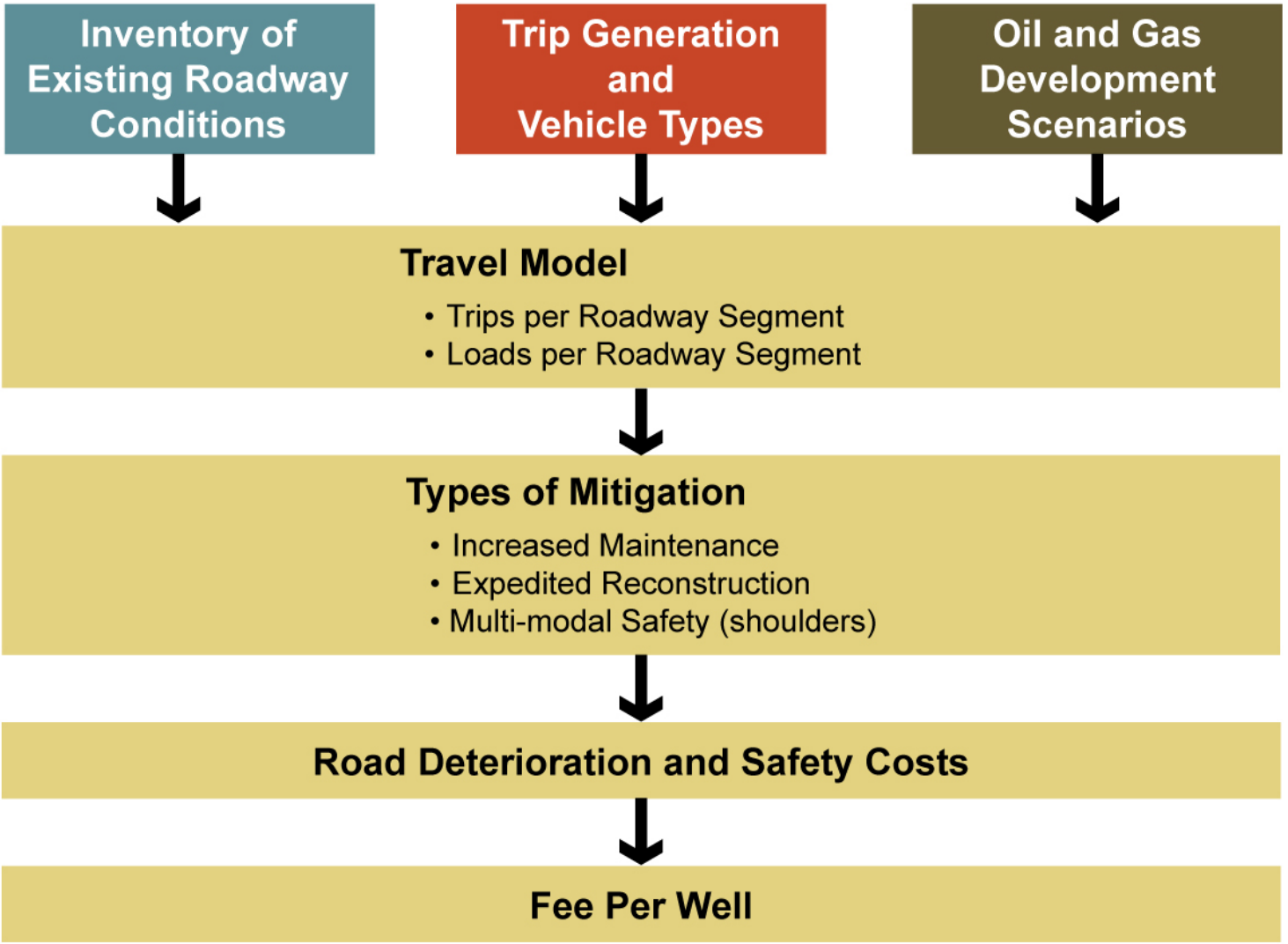
FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Study Process Diagram

boulder county oil and gas roadway impact study



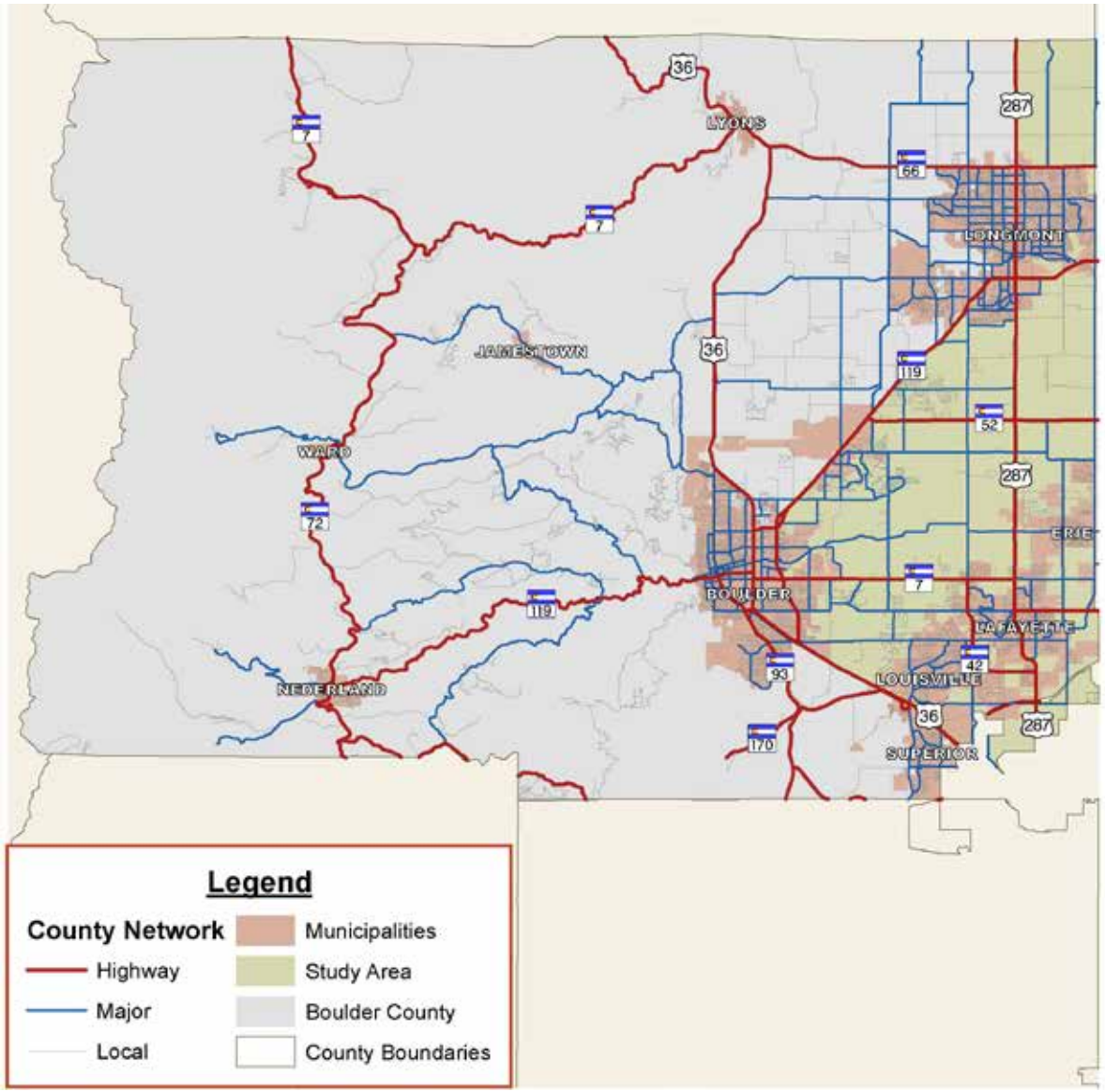
FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Study Area

boulder county oil and gas roadway impact study



FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Trip Generation – Clustered Development

boulder county oil and gas roadway impact study

- Sources include recent planning documents from:
  - Pennsylvania
  - New York
  - Utah
  - Texas
- Assumes clustered development, horizontal drilling, hydraulic fracturing
- Four wells, one pad
- National studies adapted to observed patterns in Wattenberg/Niobrara

Phase		Truck Trips 1 pad, 4 wells
Construction	Pad and Road Construction	87
Drilling	Drilling Rig	93
	Drilling Fluid and Materials	270
	Drilling Equipment (casing, drill pipe, etc)	453
Completion	Completion Rig	42
	Completion Fluid and Materials	170
	Completion Equipment (pipe, wellhead, etc)	10
	Fracturing Equipment (pump trucks, tanks, etc)	317
	Fracture Water	4,152
	Fracture Sand	191
	Flowback Water Disposal	1,400
Total Development Trips		**7,184**
Annual Production Trips Per Pad		**730**

Sources:

"Impacts on Community Character of Horizontal Drilling and High Volume Hydraulic Fracturing in Marcellus Shale and Other Low-Permeability Gas Reservoirs",
NTC Consultants, September 2009 and February 2011.

"Highway Freight Traffic Associated with the Development of Oil and Gas Wells",
Utah Department of Transportation, October 2006.

"Potential Development of the Natural Gas Resources in the Marcellus Shale",
National Park Service, December 2008

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Scenario Development

boulder county oil and gas roadway impact study

- Three scenarios
- Range of hypothetical outcomes
- Based on expected spacing (COGCC) and plausible rig allocations
- Accelerated Scenario
  - About 30 pads per year over 9 years (10 rigs)
  - 824 producing wells (2031)
- Steady Scenario
  - About 15 pads per year over 16 years (5 rigs)
  - 824 producing wells (2031)
- Low Scenario
  - About 3 pads per year over 16 years (1 rig)
  - 180 producing wells (2031)

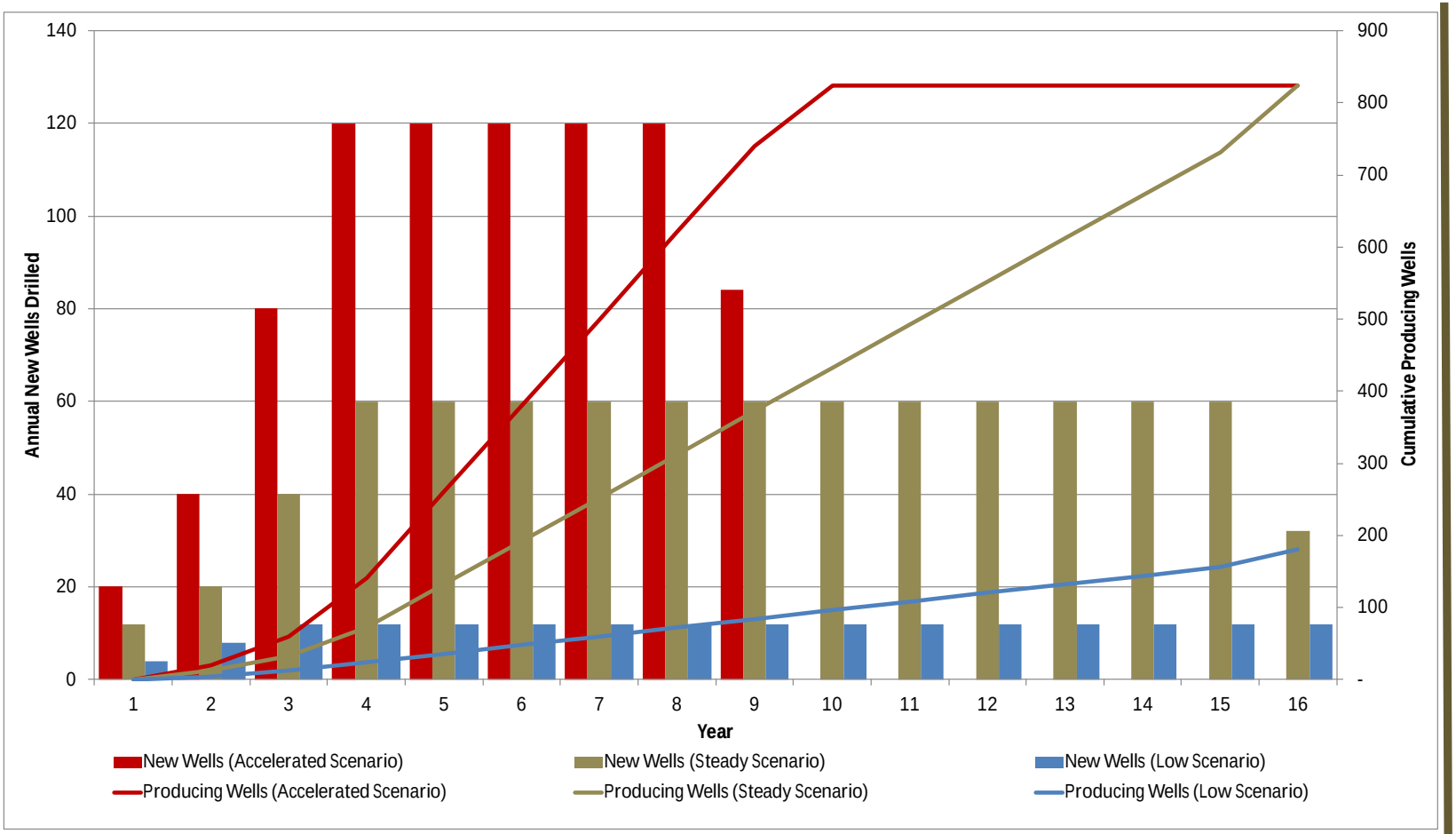
FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Scenario Development
New and Producing Wells

boulder county oil and gas roadway impact study



Annual producing wells build over time as new wells are drilled and completed

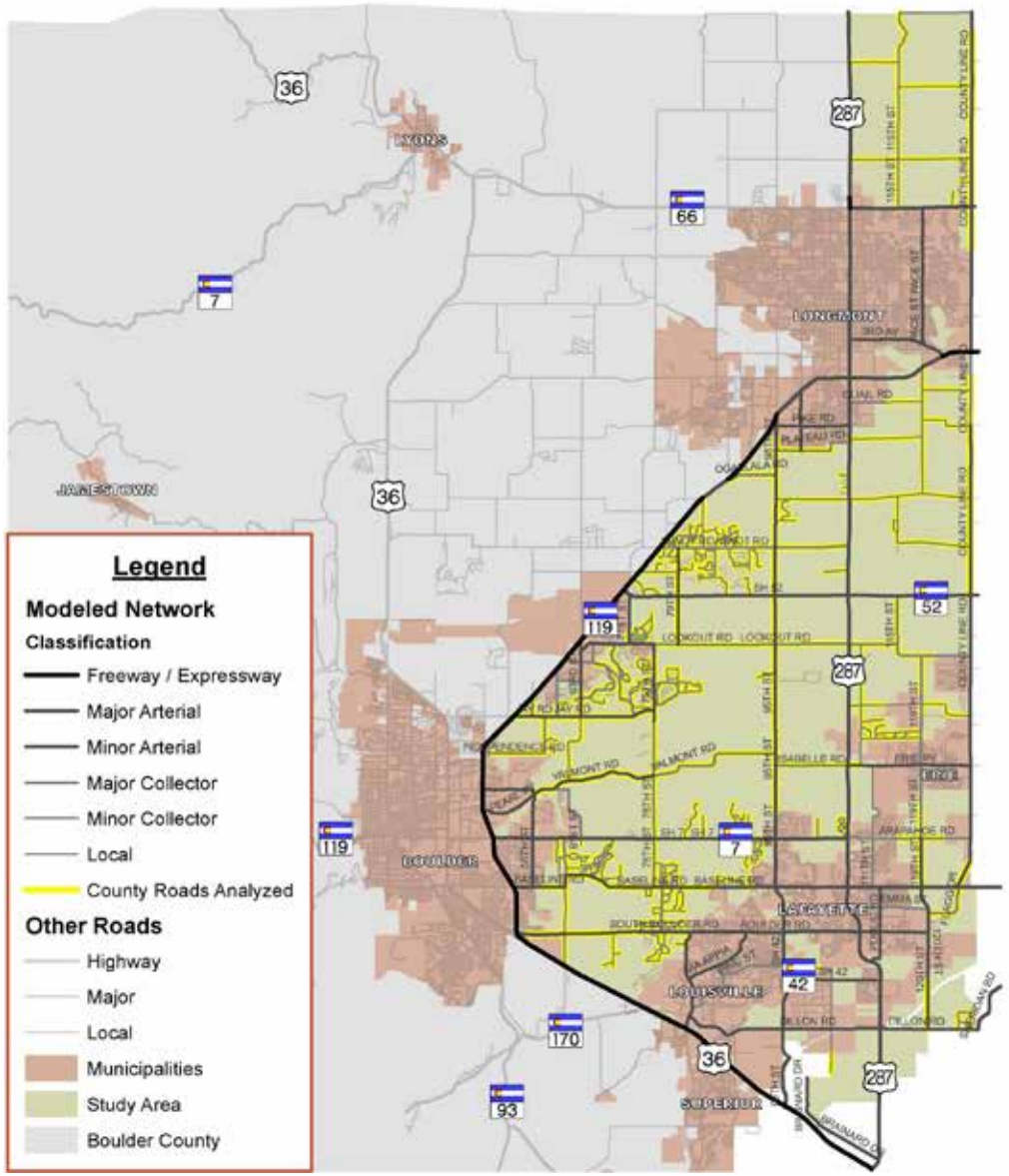
FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Travel Model Roadway Network

boulder county oil and gas roadway impact study



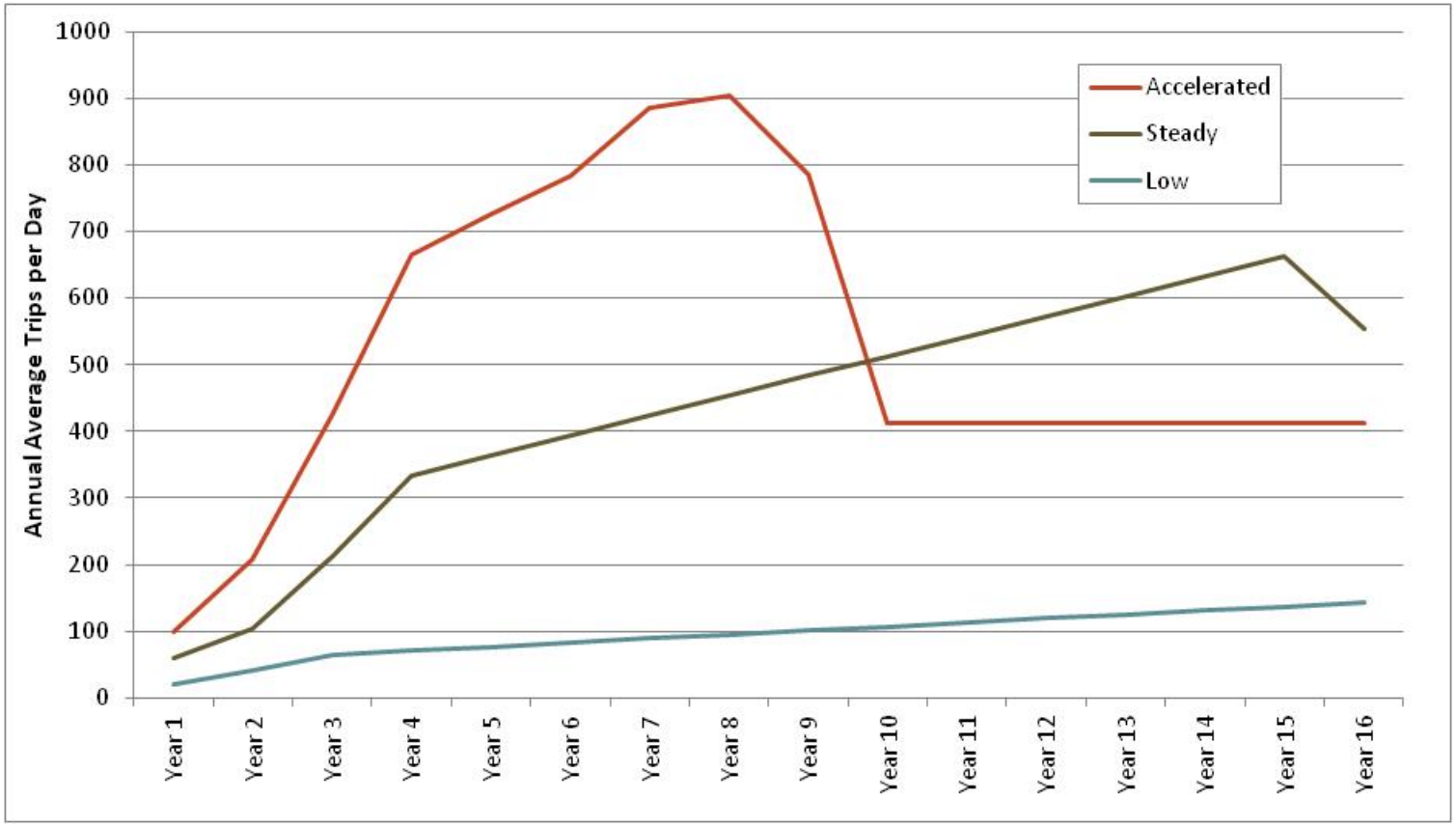
FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

TRIPS PER DAY (ANNUAL AVERAGE)

boulder county oil and gas roadway impact study



No Boulder County-maintained road is expected to exceed the existing capacity threshold due to added oil and gas trips

FELSBURG HOLT & ULLEVIG

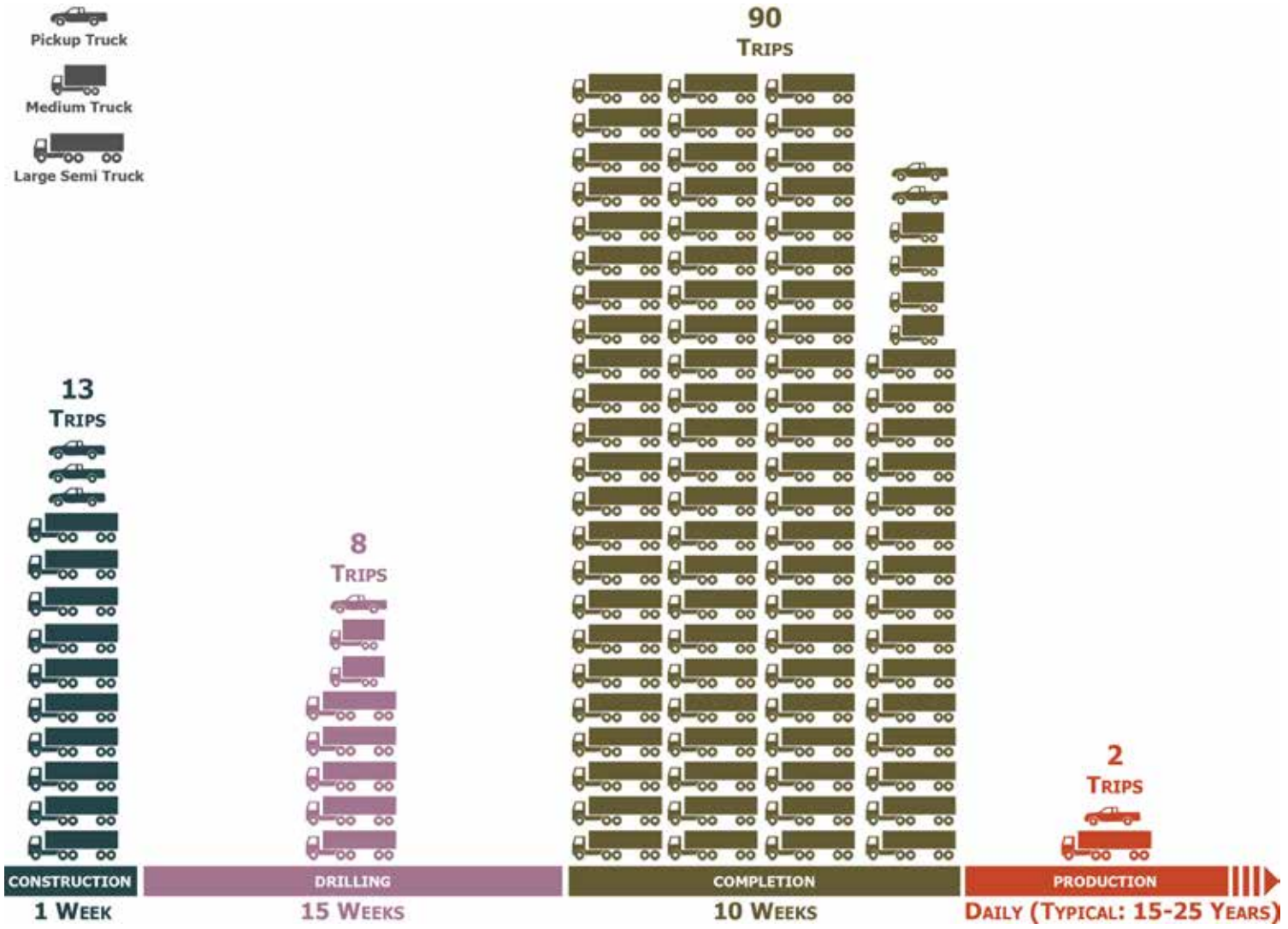
BBC RESEARCH & CONSULTING

Boulder County

Average Daily Trips by Stage

boulder county oil and gas roadway impact study

For one pad with four wells



Approximate Duration

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Heavy Vehicle Impacts

boulder county oil and gas roadway impact study

- **Loaded water truck**
  - **6,500 - 11,000 times the load impact of a passenger car**
- **Rig truck**
  - **20,000 - 30,000 times the load impact of a passenger car**

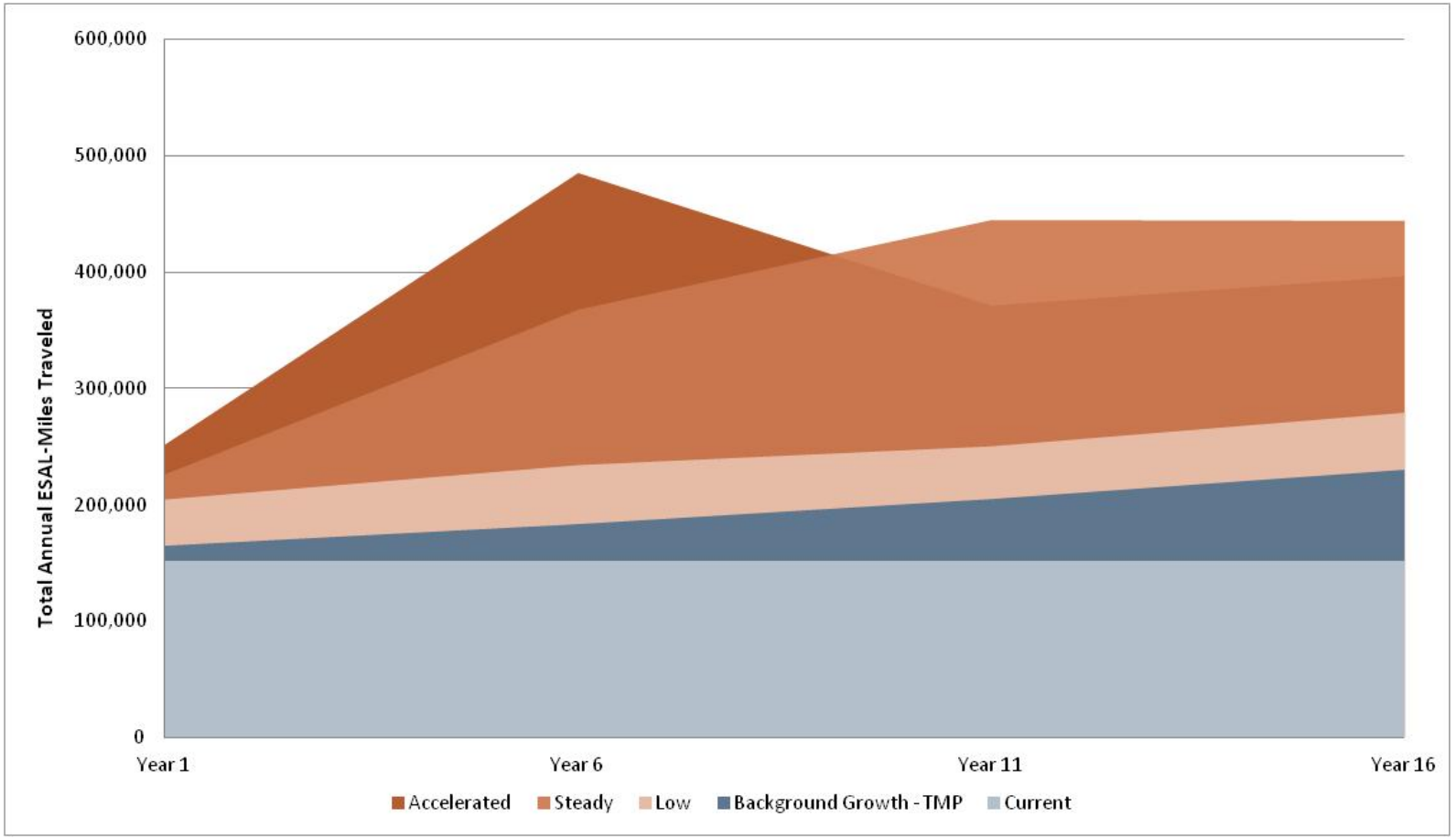
FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

LOADS ON ROADWAY NETWORK

boulder county oil and gas roadway impact study



- Vehicle Miles of Travel (VMT) increase is less than 1% over background
- Load increase is 20 – 160% over background

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Types of Mitigation

boulder county oil and gas roadway impact study

Road Type	Mitigation Activity	Road Deterioration	Roadway Safety
Unpaved/Gravel	Increased frequency of: • Grading • Gravel application • Dust suppression	 X X X	
Asphalt Roads • Good/Fair condition • Poor condition • Sub-standard shoulders	 • Increased overlay frequency • Expedited reconstruction • Shoulder widening	 X X	 X
Concrete Roads	• Incremental reduction in service life – expedited reconstruction	X	

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Cumulative Costs by Scenario

boulder county oil and gas roadway impact study

Scenario	Road Deterioration Costs	Safety Costs	Total Costs	Average Annual Costs (Range)
Low	$5,980,000	$2,110,000	$8,090,000	$0.5M ($0.1M – $0.9M)
Steady	$24,760,000	$2,830,000	$27,590,000	$1.7M ($0.7M – $2.6M)
Accelerated	$24,460,000	$2,840,000	$27,300,000	$1.7M ($0.4M – $4.0M)

Costs are 16-year cumulative figures in current year dollars.

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Road Deterioration and Safety Fee

boulder county oil and gas roadway impact study

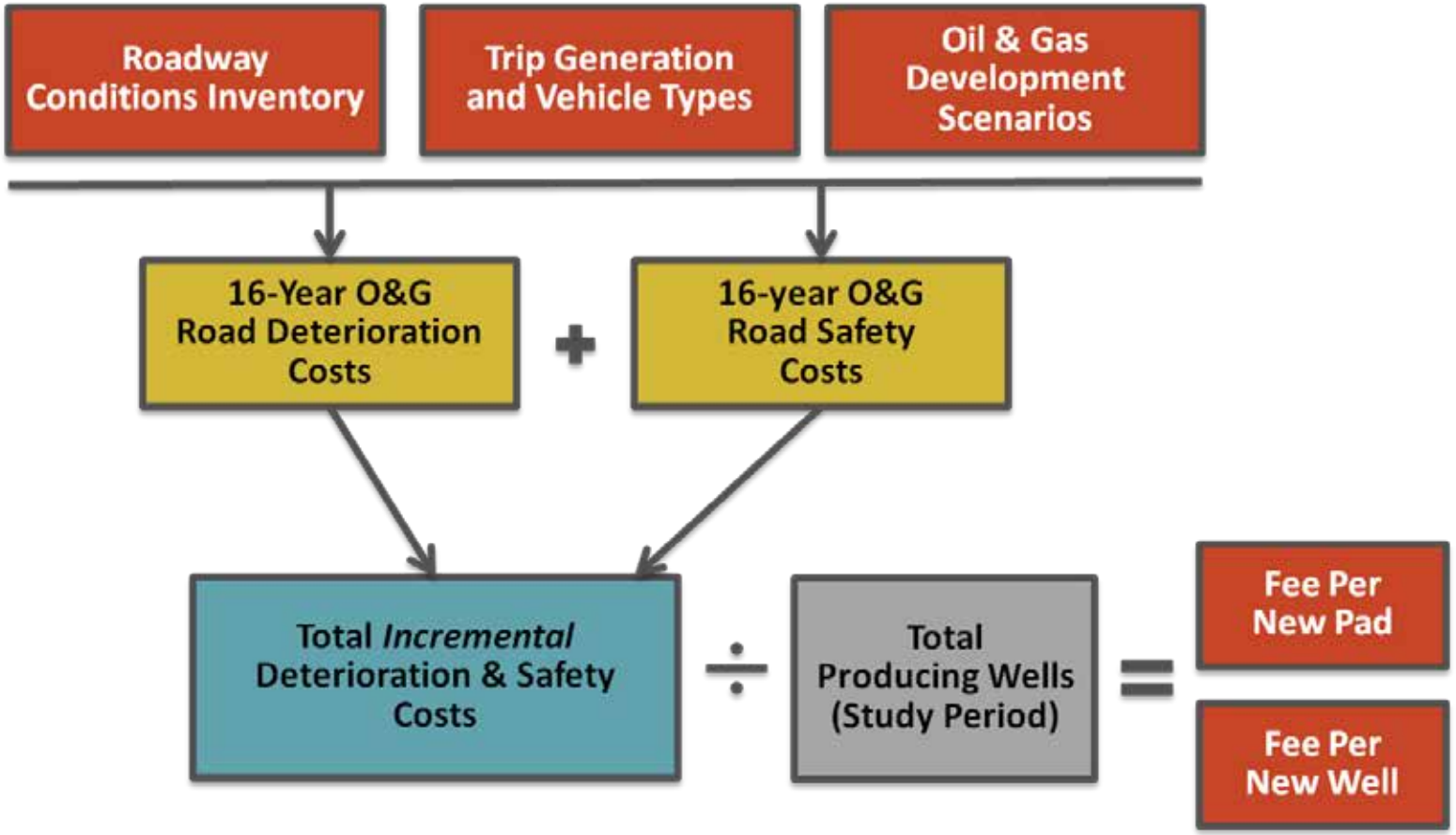
- Isolates oil & gas impacts on county roads
- Designed to recoup the *incremental* county cost associated with road deterioration and safety
- Based on blend of the three scenarios and average trip lengths
- Fee designed to be applied in the oil and gas land use application process

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Fee Calculation Methodology



Fees per pad and well are averaged across the three scenarios

Oil & Gas Roadway Fees

boulder county oil and gas roadway impact study

	Road Deterioration Fee	Safety Fee	Total Fee
Pad	$1,200	-	**$1,200**
Well	$30,700	$6,200	**$36,900**

Fees are in current year dollars.

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

SUMMARY

boulder county oil and gas roadway impact study

- **Average-based methodology recognizes current uncertainties:**
  - **Location of drilling is unknown**
  - **Traffic patterns unknown**
  - **Pace of field development uncertain**
  - **Water sources are unknown**
- **Fees based on apportionment of expected *incremental* road costs per pad and per well**
- **Major impact is road deterioration**
- **Fees are a tool to recover costs during period when transportation impacts are most intense– well development**

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

QUESTIONS

Cumulative Costs by Scenario

Alternative Methodology for Poor Condition Asphalt Roads*

boulder county oil and gas roadway impact study

Scenario	Road Deterioration Costs	Safety Costs	Total Costs	Average Annual Costs (Range)
Low	$3,120,000	$2,110,000	$5,230,000	$0.3M ($0.1M – $0.4M)
Steady	$13,990,000	$2,830,000	$16,820,000	$1.1M ($0.6M – $1.3M)
Accelerated	$15,860,000	$2,840,000	$18,700,000	$1.2M ($0.7M – $2.0M)

Costs are 16-year cumulative figures in current year dollars.

* Methodology for poor condition asphalt roads the same as for good/fair condition roads; based on overlay depth required to offset O&G truck impacts.

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Oil & Gas Roadway Fees

Alternative Methodology for Poor Condition Asphalt Roads*

boulder county oil and gas roadway impact study

	Road Deterioration Fee	Safety Fee	Total Fee
Pad	$700	-	**$700**
Well	$17,700	$6,200	**$23,900**

Fees are in current year dollars.

* Methodology for poor condition asphalt roads the same as for good/fair condition roads; based on overlay depth required to offset O&G truck impacts.

FELSBURG HOLT & ULLEVIG

BBC RESEARCH & CONSULTING

Boulder County

Poor Condition Asphalt Replacement Costs

boulder county oil and gas roadway impact study

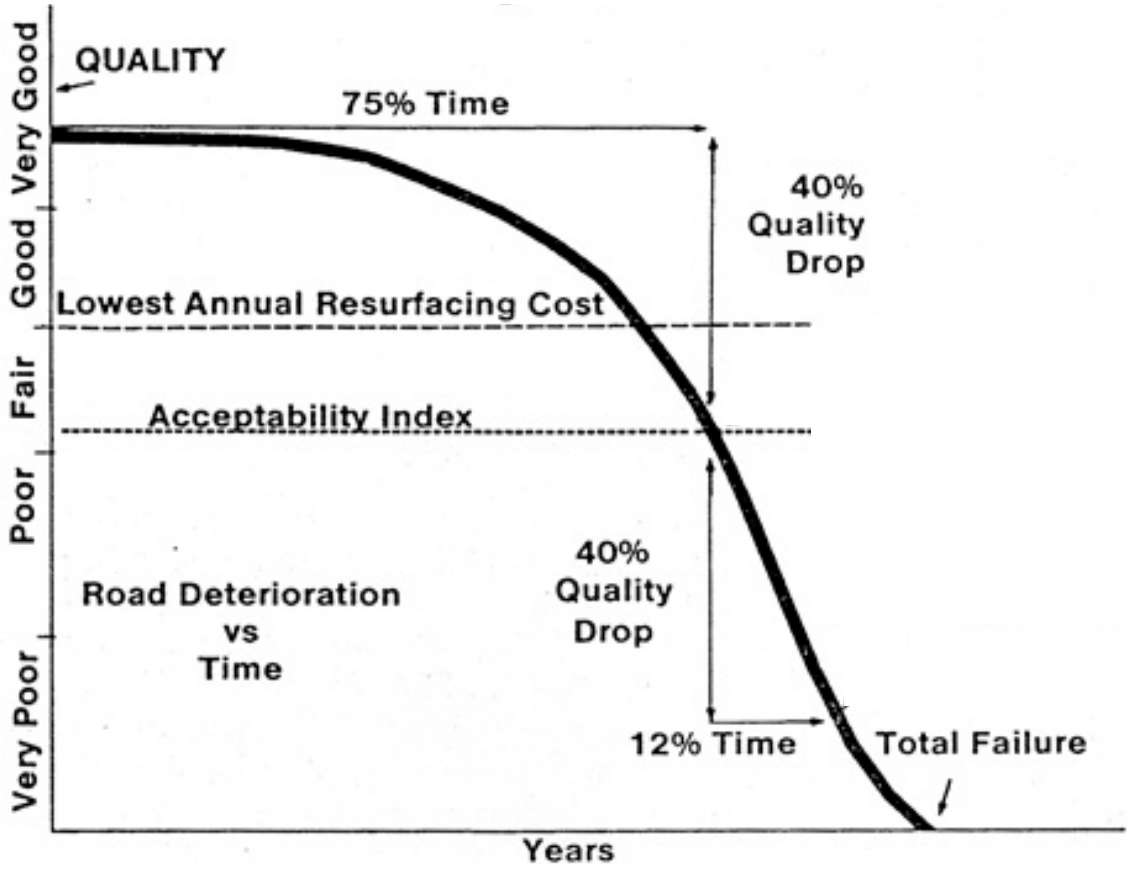
- **Construction Items included in Poor Asphalt Road Deterioration Fee:**
  - **Removal of Existing Asphalt**
  - **Placement of New Asphalt**
- **Construction Items NOT included in Poor Asphalt Road Deterioration Fee:**
  - **Removals / Resets / Utility Relocations**
  - **Earthwork / Subgrade Re-stabilization**
  - **Drainage Modifications / Erosion Control / Water Quality**
  - **Pavement Striping**
  - **Construction Traffic Control**
  - **Mobilization**
  - **Engineering / Construction Management / Material Testing**

FELSBURG HOLT & ULLEVIG

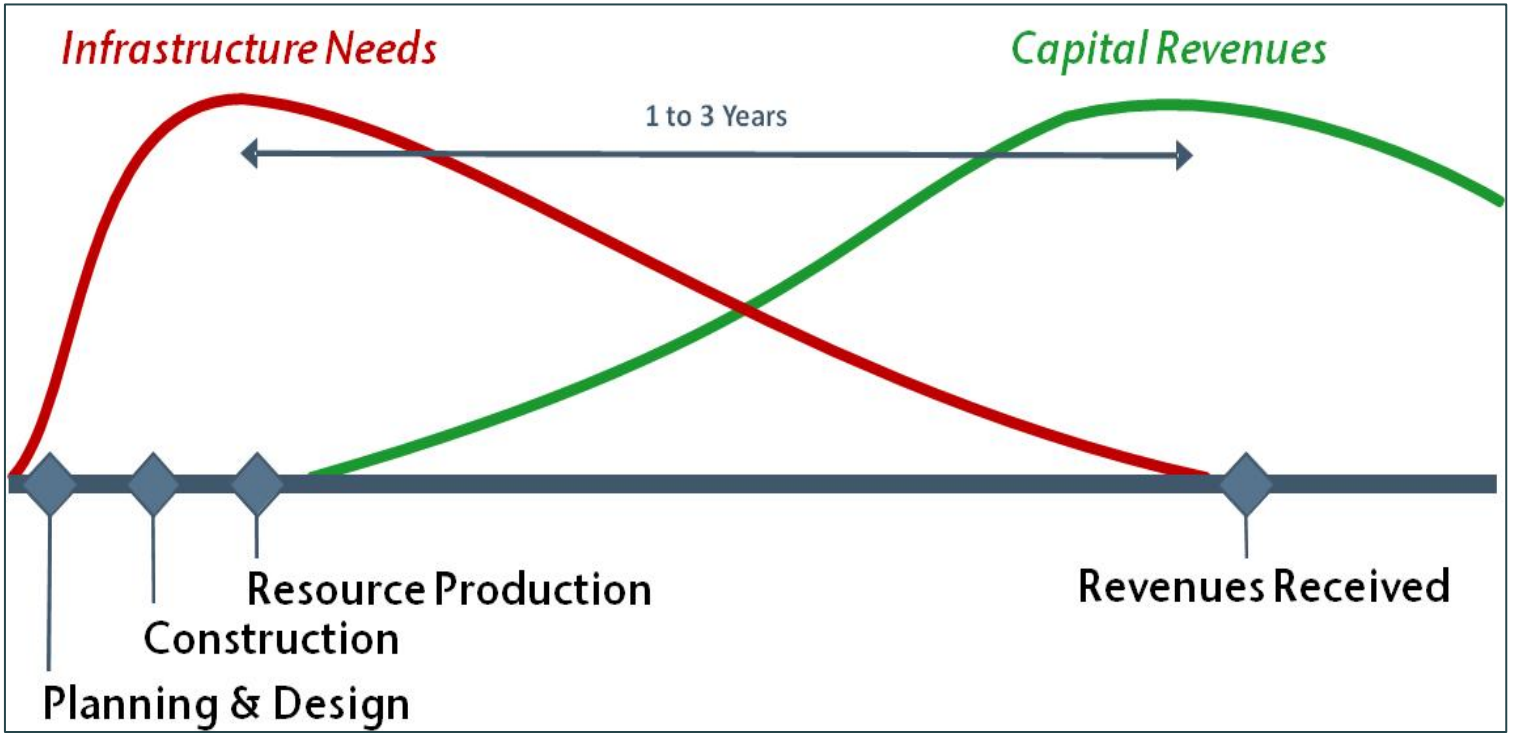
BBC RESEARCH & CONSULTING

Boulder County

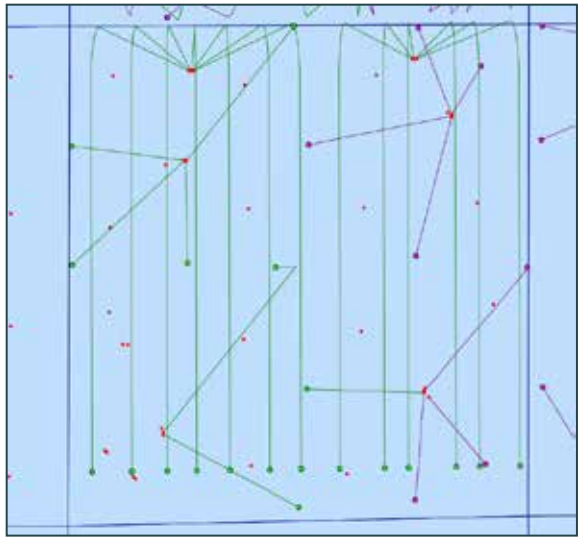
Pavement Deterioration Curve

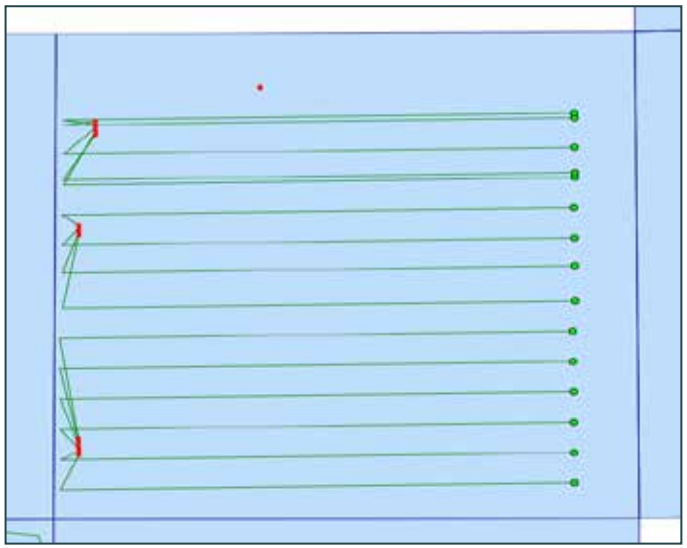


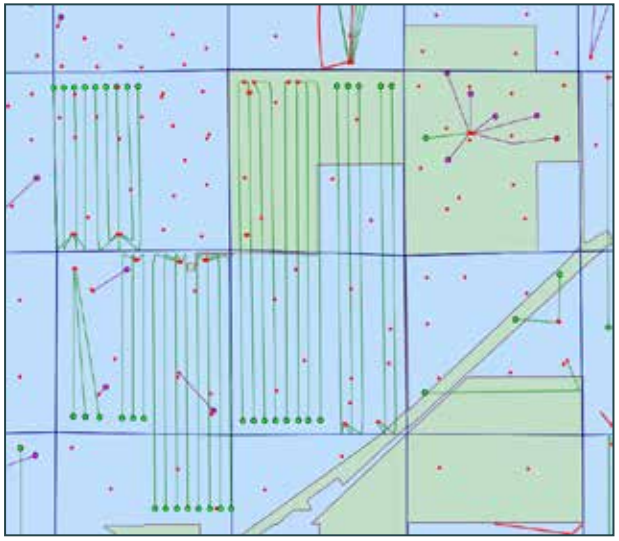
Public Investment Timing



Weld County
Well Development Patterns







Source: COGCC