



CHMURA ECONOMICS & ANALYTICS

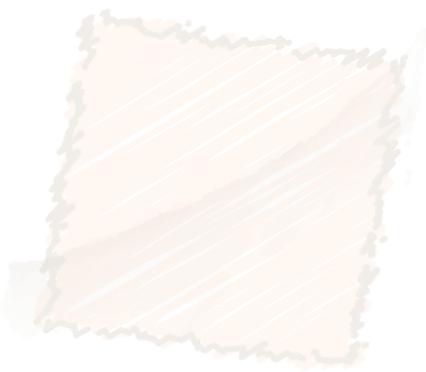
The Socioeconomic Impact of Uranium Mining & Milling in the Chatham Labor Shed

6-Dec-2011

Virginia Coal & Energy
Commission Public Hearing,
Chatham, Virginia

Acknowledgements

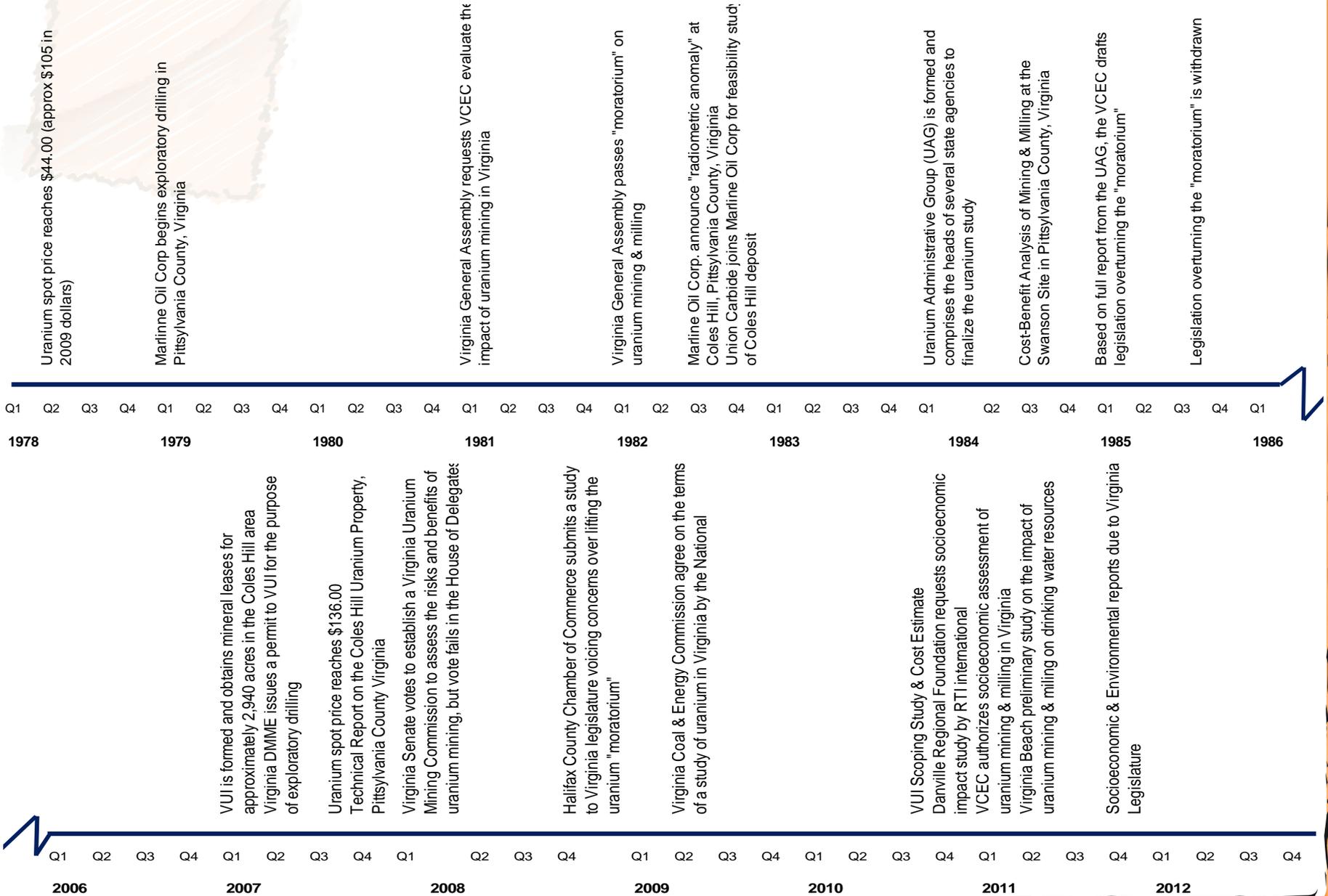
- One goal: to help the legislature (& public) make a more informed decision
- We have been tasked as an honest broker
 - No pre-conceived ideas
 - No conflicts of interest
- We would like to thank:
 - VCEC and numerous other state agencies
 - VDOT, DMME, DCR, VDH, & DEQ
 - The citizens of Pittsylvania County and neighboring communities



Introductions

- About the socioeconomic study
- Background on the Coles Hill site

Timeline for Uranium Mining & Milling in Southern Virginia





Roadmap

- Overview of executive summary/key findings
- In depth look at the baseline scenario
- Discussion of alternate scenarios
- Summary and conclusions

Executive Summary

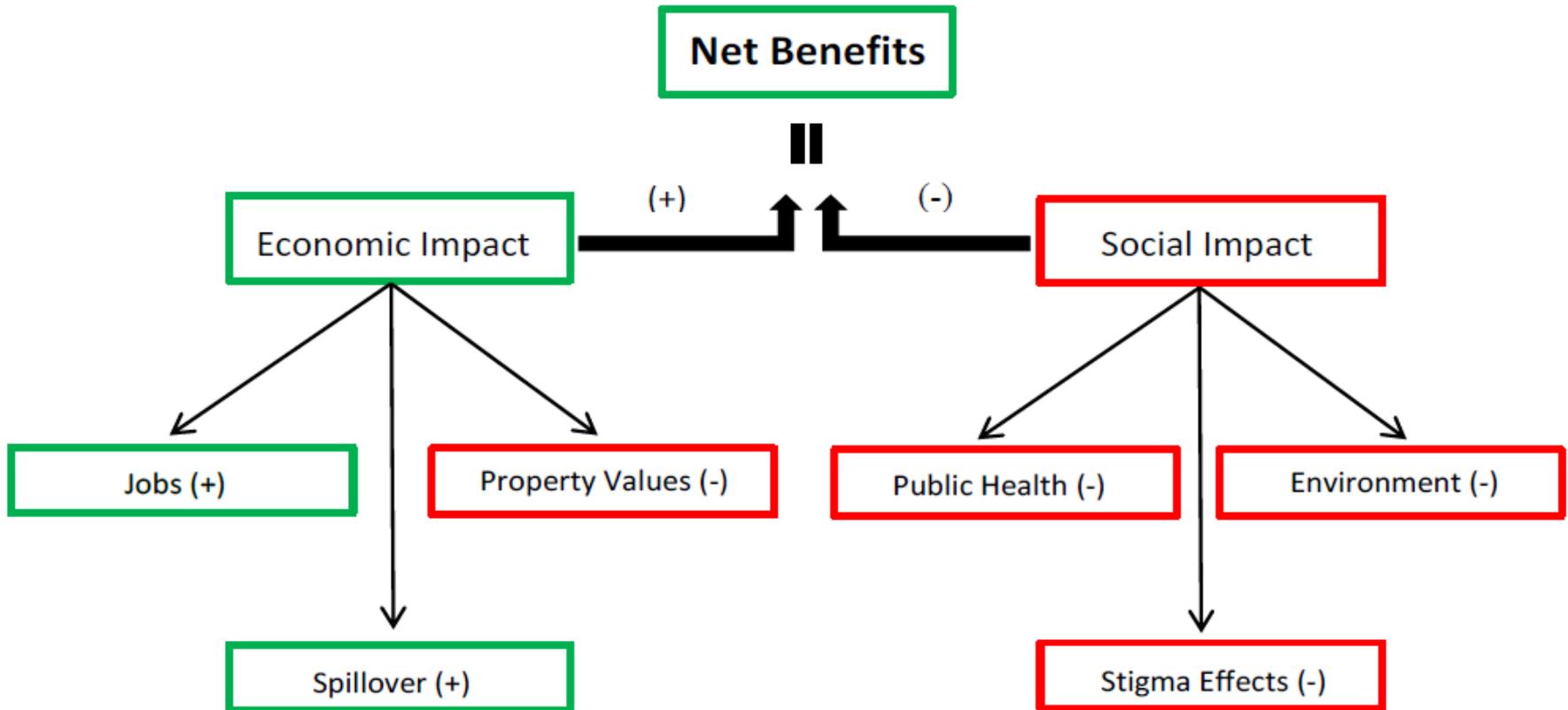
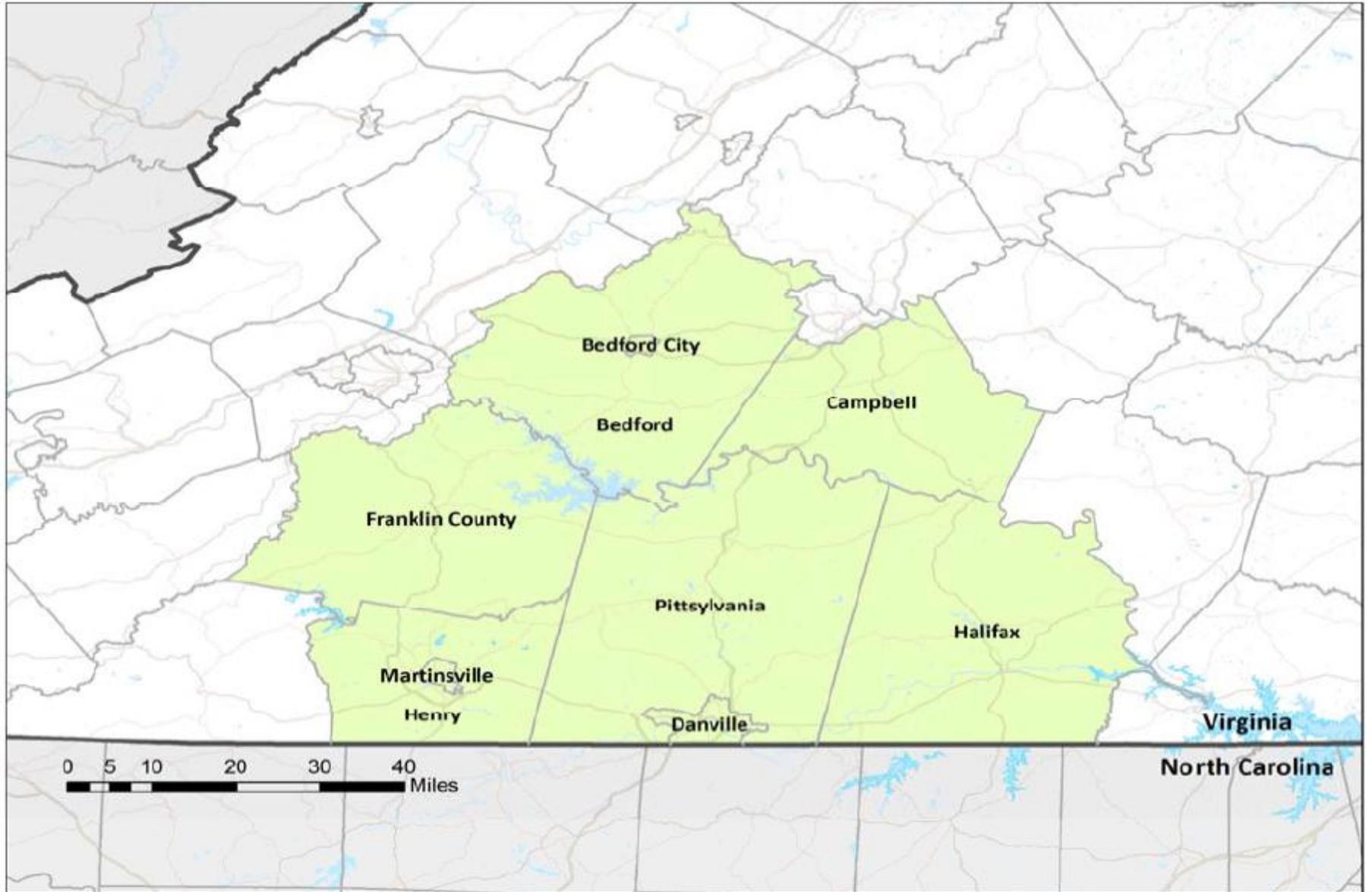


Figure 4.1: Chatham Labor Shed



Executive Summary

- Under specific circumstances (baseline scenario) the Coles Hill site produces impressive economic benefits:
 - \$135 million in net-positive economic impact
 - Over 1,000 in jobs in total; half to the region
 - Minimal socioeconomic costs

But is the baseline scenario realistic, plausible, reasonable?

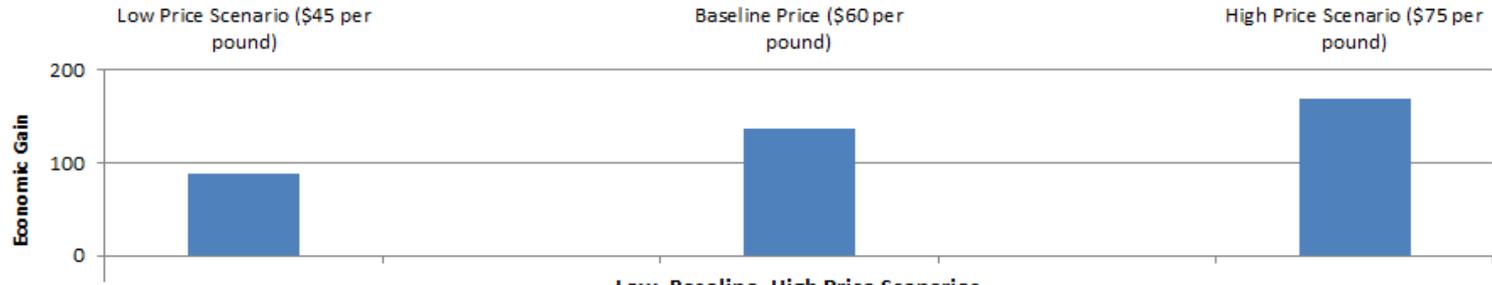
Executive Summary

- The baseline scenario is reasonable and plausible.
- We judge it is ***more likely*** to occur than the other three scenarios; this is **NOT** the same as saying it has a high likelihood to occur.
- And there is ***uncertainty*** as to whether the baseline assumptions will hold true over centuries.
- So we defined the other scenarios:
 - Magnitude of more adverse contamination
 - Context to think through risks and rewards

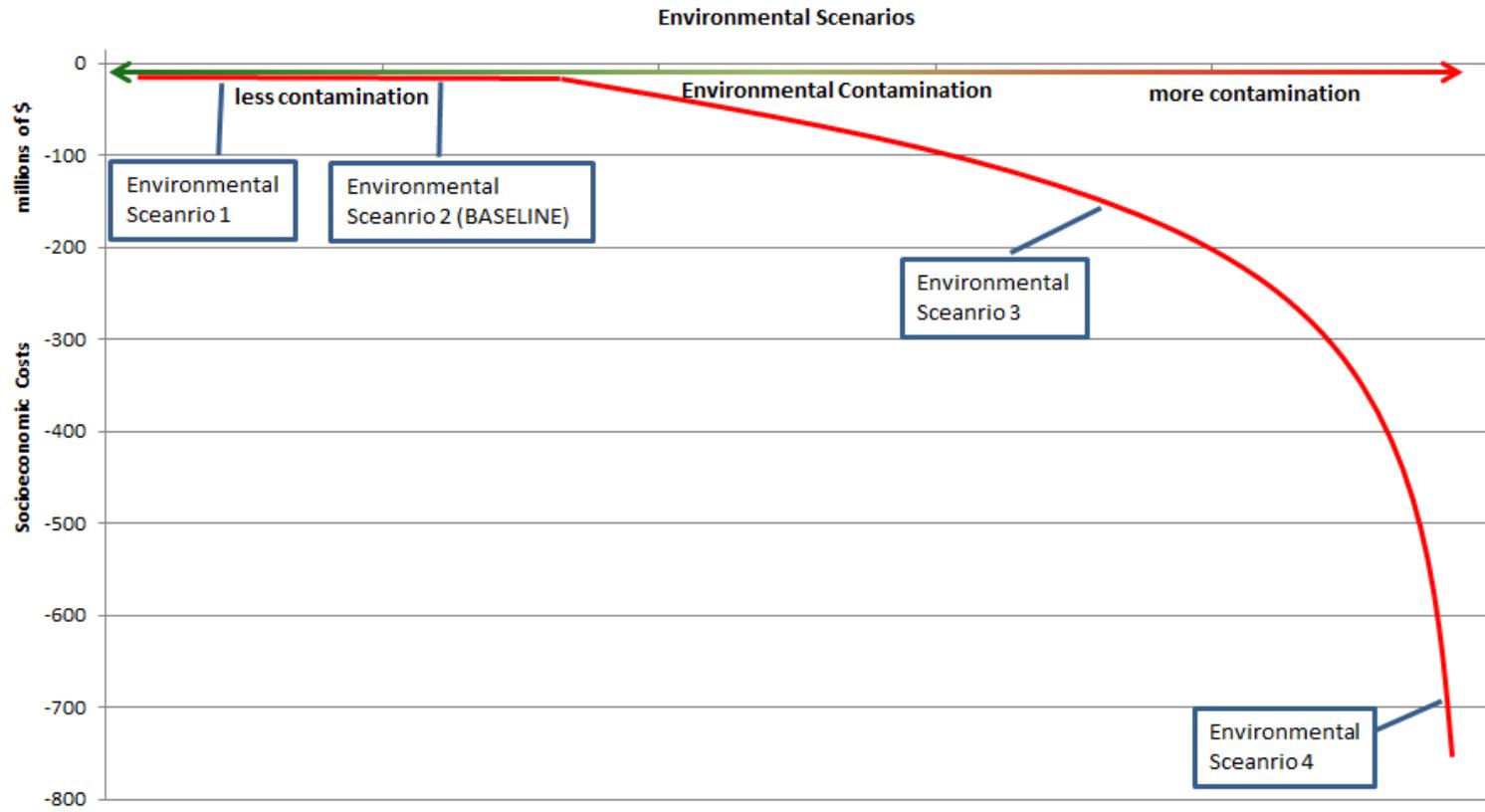
Executive Summary

- Scenario 1: Negligible environmental impact. The qualities of air, water, noise, and soil are not materially altered from today's existing conditions.
- Scenario 2: (BASELINE) Moderate environmental impact in terms of the qualities of air, water, noise, and soil—all contamination remains within limits set by current federal standards.
- Scenario 3: Significant environmental impact in terms of the qualities of air, noise, or soil (but not water). At least in one of these three areas, (air, soil, or noise, but not water) contamination exceeds the limits set by current federal standards.
- Scenario 4: Severe environmental impact in terms of the qualities of air, water, noise, and soil. Contamination of both water and at least one other area (air, soil, or noise) exceeds the limits set by current federal standards.

Summary Socioeconomic Benefit (Peak Year Impact)



Low, Baseline, High Price Scenarios



Executive Summary

- The preponderance of the socioeconomic costs are driven by “stigma” effects (worst-case):
 - Loss of a large manufacturer (\$10 billion)
 - Loss of a private school (\$870 million)
 - Decline in tourism & agriculture (\$530 million)
 - Real estate values (\$234 million)

Executive Summary

- We judge the risks unbalanced to the downside:
 - Goldilocks scenario (high uranium price & no environmental impact) = benefit of \approx \$6 billion
 - Worst-worst-case scenario (low uranium price & severe environmental impact) = loss of \approx \$11 billion

Key Findings: Jobs

- Approximately 323 jobs created during the majority of the construction phase in VA
 - 247 of these jobs will be in the Chatham Labor Shed
 - (176 construction, 32 indirect, 40 induced)
 - An additional 76 jobs will be created in VA
 - (13 construction, 22 indirect, 40 induced)

Key Findings: Jobs

- Approximately 1,052 jobs created in VA while the Coles Hill Site is operational.
 - 510 of these jobs will be in the Chatham Labor Shed
 - (297 direct, 42 indirect, 171 induced)
 - An additional 542 jobs will be created in VA
 - (306 indirect, 236 induced)
 - The industry pays more than 40% higher wages than average nationally.

Key Findings: Jobs

- Reclamation and decommissioning will also add jobs in the Chatham Labor Shed and in VA
 - Over the life of the operation this spending would support 5 additional jobs in the Chatham Labor Shed and 2 additional jobs in VA

OR

- If this spending is concentrated in the final years of the Coles Hill site it would support a total of 9 jobs per year in the region and another 4 in VA

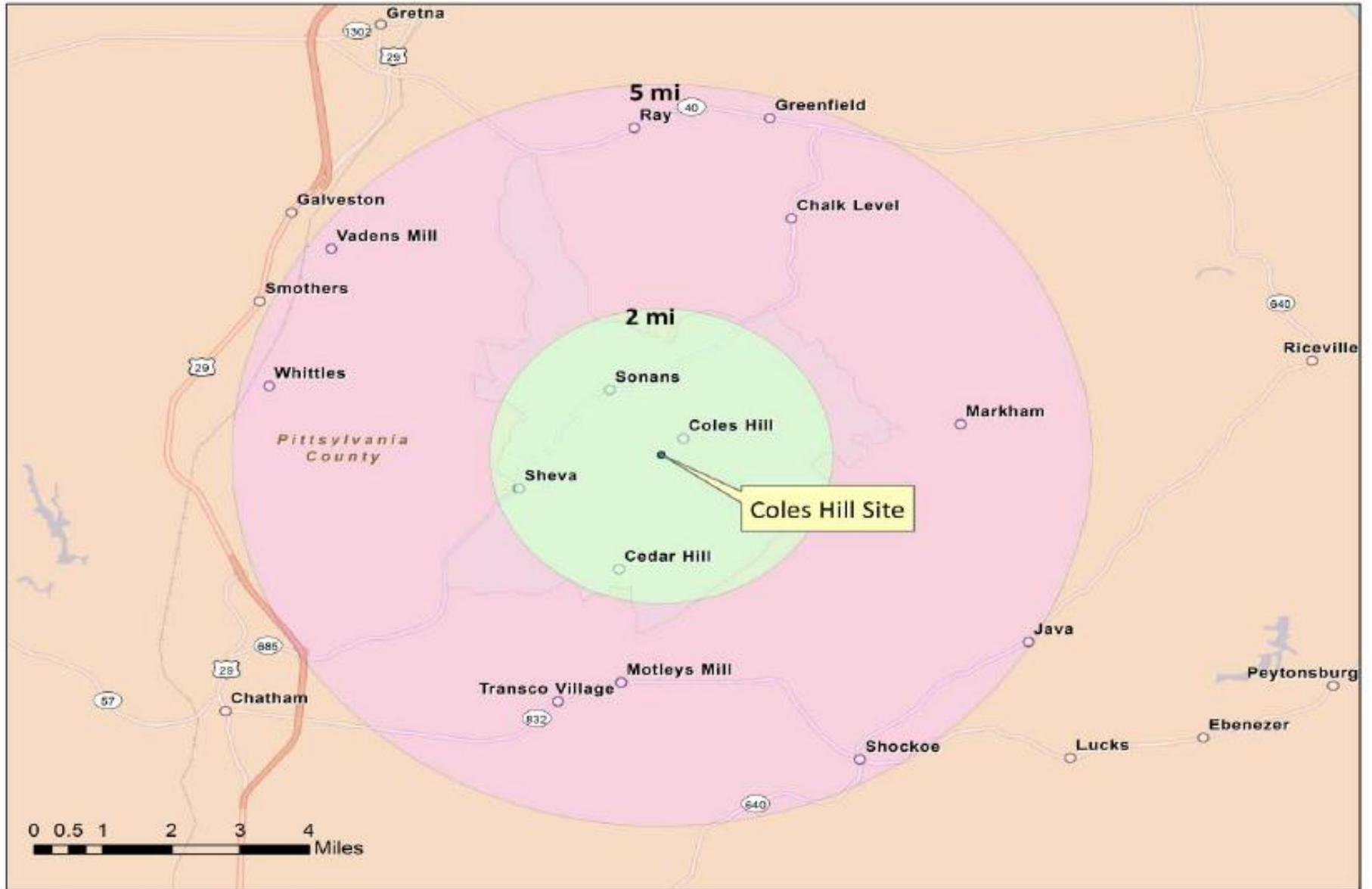
Key Finding: Stigma Costs

- Analyzed “potential” stigma costs across five key sectors—real estate, tourism, agriculture, education, and other manufacturing.
- There is no easy apples to apples comparison or case study.
- Intuition and “similar” cases tell us stigma is real, but estimating its magnitude is open to different techniques.

Stigma & Real Estate

- Overall, a body of studies suggest that stigma's impact on real estate is temporary, localized, and minimal
- The range is 2% to 8% "loss"
 - Typically confined to a 2-mile radius
 - Typically manifest is slower price appreciation rather than an actual drop in price
- We utilized a 5% loss estimate for a 2-mile radius, approximately 175 houses
- We DID NOT consider the value, if any, of sub-surface mineral rights

Figure 5.8: Communities around Coles Hill



Stigma & Tourism

- Under the conditions of the baseline assessment—no adverse consequences should be realized.
- Several additional considerations:
 - No documented stigma impacts on tourism from uranium mining.
 - Colorado study largely determined no impact on tourism.
 - Nevada’s fears are largely based on extrapolating from survey results, not any actual decrease in tourism.

Stigma & Agriculture

- Under the conditions of the baseline assessment—no adverse consequences should be realized.
 - However, we also assume a transparent and well publicized food quality program is in place.
 - French example indicates this is both possible and effective.
 - Credibility is key!

Stigma & Private Schools

- Under the conditions of the baseline assessment—no private school should be harmed.
 - Private schools business model are tied to general perceptions about the area.
 - Credible and transparent information about water, air, and soil quality should dispel any potential negative stigma.
 - Minimizing uncertainty is the key determinant!

Stigma & Manufacturing

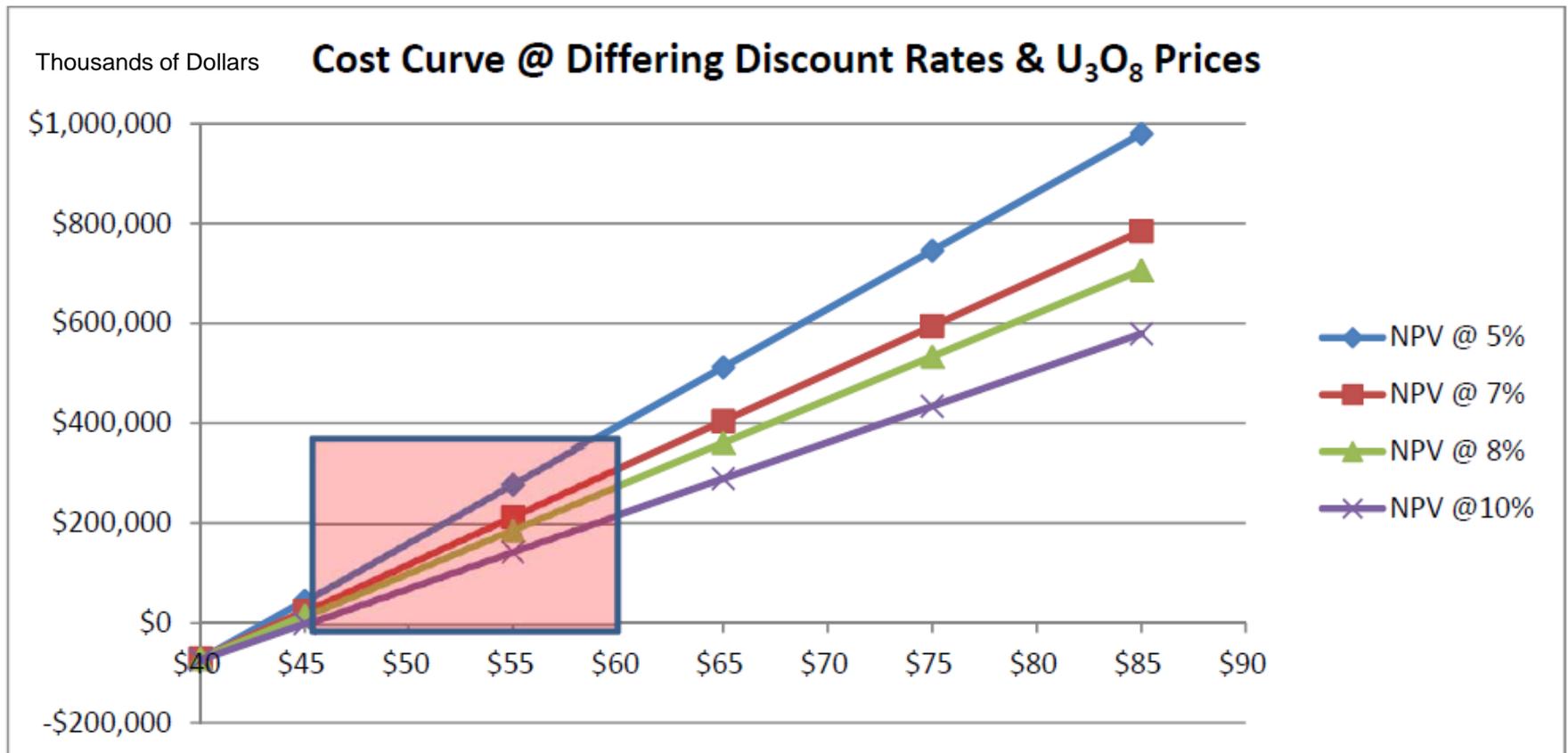
- Under the conditions of the baseline assessment—no manufacturer should close or be harmed.
 - Stigma impact is the least direct in this case
 - Severe environmental might trigger a closure
 - We estimated the impact of a closure of large manufacturer (400 employees)
 - A similar impact if four smaller (100 employee) firms closed

Continuous Operation

- It is unlikely that the Coles Hill site will be a “low-cost” producer
- VUI estimates their breakeven to be about \$43 to \$45 per pound
 - Some testing suggests that VUI may realize greater efficiencies (lower costs)
 - On balance, more factors could push their break-even point higher (higher costs)
 - Taxes, regulations, poor projections, tentative designs

Break-even Analysis

Figure 6.0: VUI Profitability (Net Present Value-NPV) at Different Prices for Yellowcake and Discount Rates



Source: Lyntek Scoping Study 2010

Key Finding: Regulation Costs

- Assuming VA becomes a full “agreement” state:

Table 6.1: Estimated Annual Expense to Virginia Departments and Agencies to Regulate the Uranium Industry

Virginia Governmental Department	Additional Personnel Expenses	Additional Operating Expenses	Offsetting Revenue from Industry
DEQ	\$200,000	\$200,000	unknown
DMME	\$300,000	\$300,000	unknown
VDH	\$500,000	\$500,000	-\$1,000,000
DCR	\$0	\$0	\$0
VDACS	\$500,000	\$500,000	unknown
Other	\$0	\$500,000	\$0
<i>Subtotal</i>	<i>\$1,500,000</i>	<i>\$2,000,000</i>	<i>-\$1,000,000</i>
Total Cost		\$2,500,000	

Key Findings: Public Services

- Given a very small influx of people from the outside, we judge little strain on school enrollments and other public services

Table 6.3: Data on Select Health and Safety Service Providers

Emergency Resources Available	Number of Non-Administrative Personnel
Chatham Police Department	4
Chatham Fire Department	33
Gretna Police Department	3
Gretna Fire Department	22
Pittsylvania County Sherriff's Office	115
Health Centers of the Piedmont	3
Chatham Family Medical Center	3
Danville Regional Medical Center-Gretna Clinic	3

Source: local websites and direct discussion with service providers

Roads, Electricity, & Water

- Some roads will need to be upgraded, mostly funded by VUI.
- New electrical substation and power lines to the Coles Hill site, funded by VUI.
 - Adequate supply should exist
- New water infrastructure to the Coles Hill site, funded by VUI.
 - Adequate supply should exist
 - Start-up phase would strain resources the most

Severance Taxes

- Severance taxes could be used to plus of state and local coffers.

Table 6.4: Select States Severance Tax Rates

State	Tax Rate
Colorado	2.25%
New Mexico	3.50%
Arizona	2.50%
Utah	2.60%
Wyoming	4.00%
South Dakota	4.50%
Nebraska	2.00%

Source: North Dakota Legislative Tax Committee & various state websites

Key Findings: Public Health

- Our judgments and findings are stated with caution:
 - Science and research is inconclusive
 - Risks are unambiguously to the downside
 - Debate as to the adequacy of current standards for protecting health and the environment
 - Analysis required numerous assumptions

Pathways of Exposure

- Exposure to toxic, mildly radioactive, and carcinogenic substances via:
 - Inhalation/breathing (typically radon)
 - Drinking (ground and surface) water (uranium, daughters, and heavy metals)
 - Ingestion/eating (uranium, daughters, and heavy metals)
 - Contact with exposed skin (uranium)

Sampling of Key Standards

- The maximum dose to an individual from uranium in the air is 10 millirem.
- The uranium limit is 30 $\mu\text{g/l}$ (micrograms per liter) in drinking water.
- Maximum concentration of arsenic in sludge is 75 ppm.
- Radon-222 emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 1.9 pCi/ft²-sec (picocurie per square foot per second) of radon-222.
- Mill tailings containment systems (including liners) must be effective up to 1,000, to the extent reasonably achievable, and in any case, for at least 200 years.
- EPA's site cleanup standards limit a person's increased chance of developing cancer to between 1 in 10,000 to 1 in 1,000,000 from residual uranium on the ground.

Public Health & Environment

- Given the assumptions in our baseline scenario:
 - We judge minimal risk to public health and the environment
 - Any “contamination” is with federal guidelines/standards
 - No increased cancer rates or other serious ailments
 - Potential for an increase in asthma-related symptoms for those sensitive to air quality (dust)

Environmental Justice

- We spoke to wide range of stakeholders:
 - Citizens, businesses, schools, civic groups, environmental groups, NAACP.
- We heard several common themes among all—the region needs jobs, but we have worries regarding worker safety, the environment, & public health.
- We judge the African American community is unlikely to be disproportionately impacted by the Coles Hill site.

Post-Closure & Remediation

- Remediation costs can vary widely by site.
- In the past, remediation costs were generally under-estimated.
- VUI estimates that this will cost \approx \$15 million:
 - This amount seems on the low-side.
 - There is a lack of data to make a more credible estimate.
- Alternative scenarios have larger estimates

Alternate Scenarios

Environmental Scenario 3

Contamination: Significant

- Real Estate: 8% loss 5-mile radius
- Private School: Closure of a private school
- Tourism: 10% decline
- Agriculture: 10% decline
- Public Health: 5.5 additional cancer cases

Remediation costs: \$46 million

Environmental Scenario 4

Contamination: Severe

- Real Estate: 30% loss in 5-mile radius
- Private School: Closure of a private school
- Tourism: 20% decline
- Agriculture: 20% decline
- Public Health: 45 additional cancer cases
- Other: Large closure of a manufacturer

Remediation costs: \$77 million

Uranium Mill Sites Under the UMTRA Project

(Mill Site Name, State)	Ore (Million Short Tons)	Uranium Production (Million Pounds U ₃ O ₈)	Remediated Material Volume (Million Cubic Yards)	<u>Total Cost A</u> (Thousand U.S. Dollars)	Conversion to 2011 Costs (Million of U.S. Dollars)
Ambrosia Lake (Phillips), NM ^B	3.05	13.02	5.2	39,961	52
Belfield, ND	0.05	0.34	<u>C</u>	<u>C</u>	
Bowman, NM	0.08	0.61	<u>C</u>	<u>C</u>	
Burrell, PA	<u>D</u>	<u>D</u>	0.07	<u>D</u>	
Canonsburg, PA	<u>E</u>	<u>E</u>	0.19	47,591	62
Durango, CO	1.61	7.85	2.53	67,618	88
Edgemont, SD	1.98	6.86	3	5,411	7
Falls City, TX	2.72	8.66	5.8	56,254	73
Grand Junction, CO	2.28	11.69	4.43	504,048	655
Green River, UT	0.18	0.83	0.38	23,633	31
Gunnison, CO	0.54	1.45	0.74	58,917	77
Lakeview, OR	0.13	0.34	0.94	33,325	43
Lowman, ID	0.2	0.37	0.13	18,434	24
Maybell, CO	1.76	4.03	3.5	63,528	83
Mexican Hat, UT	2.2	11.38	3.48	54,482	71
Monument Valley, AZ	1.1	0.77	0.93	24,126	31
Naturita, CO	0.7	3.18	0.79	86,332	112
Rifle, CO ^H	2.7	16.54	3.76	119,165	155
Riverton, WY	1.06	3.89	1.79	49,664	65
Salt Lake City, UT	1.69	9.57	2.8	94,165	122
Shiprock, NM	1.53	7.42	2.8	24,771	32
Slick Rock, CO ^J	0.63	2.68	0.86	50,428	66
Spook, WY	0.19	0.35	0.32	10,106	13
Tuba City, AZ	0.8	4.7	1.4	34,143	44
Total and Averages:	27.17	116.53	46.07	1,476,340	

Source: U.S. Energy Information Administration; Cost for Remediation as of December 31, 1999

Key Finding: Quality of Life

- We thought about a broad array of quality of life factors:
 - Climate, cost of living, leisure and culture, and freedom are unaffected
 - Economy and infrastructure are positively impacted
 - Health, risk and safety, and the environment are adversely impacted to a small degree
- Quality of life should, on balance, go up

Noise, Lights, Trucks, & Vistas

- So long as mitigating steps (technological and process) are taken at the Coles Hill site:
 - Minimal disturbance due to noise
 - Minimal disturbance due to lights at night
 - Natural vistas within 1-mile radius negatively altered
 - Minimal impact on hunting, fishing, and boating
 - Coles Hill site must be devoid of all animals as much as possible



Watershed

- Water management systems, water protection regulations, and the local water networks need more study.
- The groundwater system is “complex”.
- Coles Hill site is wetter than any other uranium site in the U.S.
- Extreme weather events are real factors to consider.



Public Perception

- In general, people are of mixed views toward uranium.
 - Some feel the economic benefit offset the risk.
 - Some feel the risks far outstripped the benefit.
 - Only a small percentage had entrenched positions (positive or negative).
- All wanted more information.



Recommendations

- Impact-Benefit Agreement negotiated between Pittsylvania County & VUI
- Permanent Environmental Quality Committees
- Adaptive Management Techniques
- Wait to get more details about the Coles Hill site operation

Summary & Conclusions

- If things are managed well, we would expect the region to reap a substantial economic benefit.
- There **are** risks. They are unbalanced to the downside.
- Potential stigma costs are the driver of the most negative economic repercussions.

Figure 9.1: Annual Net Economic Value under different Environmental Scenarios

Price Scenario	Environmental Scenario			
	Benign (Scenario 1)	Baseline (Scenario 2)	Substantial (Scenario 3)	Severe (Scenario 4)
Low (\$45 per pound)	Light Green	Light Green	Red	Dark Red
Baseline (\$60 per pound)	Green	Green	Yellow	Dark Red
High (\$75 per pound)	Blue	Blue	Light Green	Dark Red

Net Annual Economic Impact Estimate	
Dark Blue	Immensely Positive (> \$ 300 million)
Light Blue	Very Positive (> \$ 150 million)
Green	Positive
Light Green	Mildly Positive (< \$50 million)
Yellow	Neutral (+/- \$5 million)
Light Yellow	Mildly Negative (<-\$50 million)
Red	Negative
Dark Red	Very Negative (> -\$150 million)
Dark Red	Immensely Negative (> -\$300 million)



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Thank You!

Questions?

