RESOURCE TECHNOLOGIES CORPORATION
248 E Calder Way, Suite 305, State College, PA 16801 814-237-4009 f: 237-1769
PO Box 242, State College, PA 16804 www.resourcetec.com

TO: Office of State Procurement, State of Arkansas

FROM: Resource Technologies Corporation, State College, Pennsylvania

DATE: March 05, 2017

SUBJECT: Response to Invitation for Bid, Mineral Appraisal Study

Resource Technologies Corporation (RTC) is pleased to submit its response to IFB Number SP-17-0093 for the comprehensive examination of the procedures and resources used to:

- value mineral interests for ad valorem tax purposes
- value business equipment used in the production of minerals
- review the software systems and programs utilized for mineral interest valuation
- review the "Arkansas Guidelines for the Mass Appraisal of Minerals" including all components of the Guidelines.

Arkansas assesses hard minerals, oil and gas interests, and the machinery and equipment used to exploit and process these natural resources.

In order to comply with Article 16 § 5, the state must tax all real estate and tangible personal property in an equitable and uniform manner throughout the state. Arkansas currently completes ad valorem valuations using long-established procedures identified in “Guidelines For the Mass Appraisal of Minerals.” As specified in the IFB, the requested study has three major objectives:

- determine the accuracy of current mass appraisal system
- identify and recommend potential changes, if needed
- improve current system, as appropriate.

The contractor is expected to complete the examination of the processes, resources, and guidelines based on applicable Arkansas Law and Professional Standards. The Arkansas legal requirements are defined in various chapters of Arkansas Title 26. The professional standards are embodied in the Uniform Standards of Professional Appraisal Standards (USPAP) Standard Six and in the IAAO Standards pertaining to the Assessment of Real Property (IAAO, 2013) and the Valuation of Personal Property (IAAO, 2005).

Resource Technologies Corporation is uniquely qualified to undertake this study. Not only has RTC completed thousands of Oil and Gas and Mineral Appraisals throughout the United States but RTC has also provided Mineral and Mineral Property Assessment Support and Consultation in the implementation of mass appraisals which include those completed using CAMA systems developed by Harris Systems (Govern Software), Tyler Systems (CLT), Vision Systems, and Evaluator Services and Technologies (EST-CAMA). We have completed the mineral aspects of eight Countywide Mass Appraisals while working with CLT, EST, and 21st Century. RTC continues to support those efforts with annual updates, litigation support, training, and consultation. Most importantly, RTC provides continuous mass appraisal support for minerals (coal, oil, and gas) on a statewide basis to West Virginia and on a periodic basis to the Commonwealth of Kentucky as well as to three Virginia Counties and seven Pennsylvania Counties. In West Virginia, the effort has included the review and support of the valuation of personal property involved in mining and gas production.

A summary of RTC's projects relevant to the IFB follows:

- **Hard Mineral Appraisals for Collateral**: Since 1980, RTC has provided detailed appraisals of mineral reserves and mining and processing operations at sites throughout North America for banks including Wells Fargo, SunTrust, M&T, M&I, Bank of America, TD Bank, PNC, First Niagara, and Fifth Third Bank. Minerals assessed in these detailed appraisals include Industrial and Specialty Sands and Clays, Trona, Aggregates, Dimension Stone, Coal, Betonite, Manganese, Kaolin, and Pyrophyllite. It should be noted that we have completed appraisal reports concerning mining of limestone and other minerals for firms with operations in Arkansas.

- **Mineral Appraisals for Litigation Support**: RTC has served as Plaintiff's Expert, Defendant's Expert, and Court-appointed arbiter in cases involving condemnation, tax assessment, ownership disputes, and corporate dissolution. We have provided testimony in local, state, federal, and bankruptcy courts. These cases have involved the U.S. Department of Army, the U.S. Department of Air Force, the U.S. Department of Justice, the Internal Revenue Service, the Pennsylvania Department of Transportation, the Ohio Department of Environment Protection, the West Virginia Department of Revenue, and the Kentucky Revenue Cabinet.

  Additionally, RTC has worked with both condemnees and condemners in settlements as well as litigation involving minerals in numerous states including Arkansas, New Jersey, Connecticut, Pennsylvania, West Virginia, Virginia, Ohio, Indiana, Colorado, and Kentucky.

- **Oil and Gas and other Minerals for Estate Planning**: RTC has performed thousands of appraisals of oil and gas and other mineral reserves, properties, and operations for estate planning in Pennsylvania, Ohio, West Virginia, Texas, Colorado, and Arizona. We have completed reports concerning individual properties, regional oil and gas fields, regional oil and gas companies, individual operating wells, and interstate pipeline projects. Clients have included Sunoco, Transco, PapCo, and various banks and law firms.

- **West Virginia Department of Tax and Revenue**: In 1997, RTC was engaged by Common Cause, West Virginia School Association, West Virginia Teachers Association, and others to provide an evaluation of the processes and information used by the state to assess the value of minerals and mineral operation across the state. The evaluation led to eventual litigation. The court ordered the state to revise its system. RTC was engaged by the state to develop a mass appraisal system to assess the value of minerals and mineral operations across the state.

  RTC, together with personnel from the University of West Virginia, completed a thorough audit of the system in-place – procedures, laws, personnel, information sources, etc. The team developed a new system which included active operations as well as reserves, presented the system to various stake-holders (taxpayers and taxing authorities), and successfully presented the system and its rationale to a joint session of the legislature and to various legislative committees.

  After its adoption, RTC has remained engaged as a consultant of the state, making annual changes to keep the system market-responsive, provide technical updates, supervise and implement ongoing staff training, and alter software to meet the requirements of the revised statewide CAMA System. RTC has also developed and installed mapping procedures, analysis systems, and presentation tools for department personnel. Furthermore, RTC provides ongoing litigation support for selective assessment appeals.

  The system developed and implemented by RTC in West Virginia is a multifaceted GIS and Valuation database system that determines the fair-market value of coal beds based on coal volume, coal quality, property rights, ownership interests, proximity to current mining, and coal prices derived from lease, FERC, and PSC data. RTC serves as the liaison between coal companies and the State Tax Department to aid in the transfer of data, and RTC appears at County Board of Review and Equalization hearings as the state representative in order to assist County Commissioners when addressing taxpayer questions and resolving disputes.

  RTC also assists in active and reserve oil and gas valuations for the state of West Virginia.

- **Commonwealth of Kentucky:** The Commonwealth of Kentucky was sued in the early 2000s because of unequal and inaccurate assessment of mineral properties and operations. RTC provided expert consulting to the plaintiffs. As the case progressed, the Commonwealth and the plaintiffs agreed to a settlement where RTC would review the procedures and information used to develop mineral values. RTC completed the review and provided an in-depth report concerning its findings. The Kentucky Revenue Cabinet adopted many of those findings.

In 2016, the Cabinet engaged RTC to provide an update which RTC is currently developing.

- **Various County Governments in Pennsylvania and Virginia:** RTC provides ongoing assistance to various Counties in Pennsylvania (Cambria, Centre, Fayette, Greene, Indiana, Schuylkill, and Washington Counties) and Virginia (Buchanan and Campbell Counties) concerning the ongoing assessment of mineral properties and operations. In Pennsylvania, RTC has written and employed CAMA software, performs annual field work, and completes the market research studies. In all counties, RTC provides litigation support, manages the fair-market valuation of mineral properties using a GIS-linked database, and serves as the County representative at County Commission appeal hearings and informal data sharing sessions.

- **CAMA and Reassessment Support**: RTC has been the mineral specialist of preference in numerous bids where Tyler Systems and Evaluator Services and Technologies have developed countywide reassessment. In that role, we have provided mass appraisal valuations and support in CAMA System Development and support in assessment appeals.

RTC has also provided training to Tax Assessors in Pennsylvania, Ohio, West Virginia, and Virginia, as well as for the Appraisal Institute, the Pennsylvania State University, and for the IAAO. In fact, we have been invited to teach a session in Mineral Property Assessment at the upcoming 2017 IAAO conference.

As specified in the IFB, during past efforts RTC has:

- Demonstrated and even developed appraisal laws, rules, and guidelines for mineral valuation.
    - In West Virginia, Kentucky, and Pennsylvania, RTC has developed, modified, proposed, edited, used, and provided testimony concerning appraisal rules, laws, and guidelines used by assessors and industry alike.

- Experience successfully completing a statewide analysis of methodologies used for the mass appraisal or fee appraisal of mineral interests and associated equipment for ad valorem valuation purposes for a state government entity.
    - RTC's major focus for the last 37 years has been the appraisal (either in fee appraisals or in mass appraisal settings) of mineral interests, mineral businesses, and mineral operations, including resources, reserves, mines and wells, as well as equipment and plants and intangible interests.

- Sample reports/presentations are included with this bid:
  - A copy of "Guidelines for Mineral Valuation for Banking Interests"
  - A copy of the original power point presentation provided to the West Virginia Legislature
  - A copy of the draft report currently being prepared for a coal mining state
  - A copy of a power point presentation used for a mineral assessment class for Assessors in Pennsylvania
  - A copy of a presentation concerning reserve coal valuation in West Virginia provided to stakeholders
  - A copy of a presentation to the APCOM convention in Calgary in 1999 based on the West Virginia efforts concerning the use of Geospatial modeling for mineral assessment
  - A copy of a power point presentation given at the St. Louis IAAO conference in 2005
  - A copy of a power point presentation used for a 2016 class in Mineral Valuation
  - A copy of a power point presentation used for an oil and gas short course for the Pennsylvania Bar Institute
  - A copy of the Buchanan County, VA 2013 Reassessment report
  - A redacted individual Oil and Gas report.

- References are listed below:
  - Ruth Horn, Commissioner of Revenue, County of Buchanan, Virginia
    - ruth.horn@buchanancounty-va.gov
    - 276-935-6503
  - Lou Lewis, Chief Assessor, County of Greene, Pennsylvania
    - llewis@co.greene.pa.us
    - 724-852-5241
  - Jeff Amburgey, West Virginia Department of Tax and Revenue
    - jeff.a.amburgey@wv.gov
    - 304-558-0792
  - Brian Iannarone, Wells Fargo RETECHS
    - *brian.iannarone@wellsfargo.com*
    - 908-598-3680
  - Margery Harrill Stuart, MAI, SRA, M&T Bank
    - *mstuart@mtb.com*
    - 302-651-1322
  - Lori Detwiler, Kentucky Revenue Cabinet, Minerals Taxation and GIS Services Division
    - LoriDetwiler@ky.gov
    - 502-564-6959
  - Charlie Wodehouse, Blue Grass Materials, LLC
    - cwodehouse@bluegrassmaterials.com
    - 904-701-6550

- Approximately 50% of RTC's business is providing services to various state, federal, and local governments

As defined by the scope of work, RTC will:

- Attend meetings and telephone conferences upon agency request
  - These meetings may be in person, by way of video conference or by way of teleconference
  - RTC suggests that the initial meetings be in person

- Perform preliminary assessment of current appraisal processes, resources, and guidelines
  - RTC will spend time interviewing and observing key personnel concerning procedures and soliciting opinions and evidence concerning both positive and negative aspects of the current system
  - RTC will interview key stakeholders in the system

- Conduct research and analysis to include all appraisal guideline requirements
  - RTC will thoroughly review the existing Arkansas Guidelines
  - RTC will examine systems used by other states that tax hard, gaseous, and liquid mineral resources and operations including but not limited to Oklahoma, Texas, California, West Virginia, etc.

- Provide monthly status reports to the agency
  - The report will cover work completed, work planned, issues or problems encountered, schedule updates, and budgetary information

- Produce a written report of all findings and provide recommendations

- Conduct oral presentations accompanied by a PowerPoint.

RTC will address the Scope of Work as stated in the IFB as follows:

- Preliminary Assessment
  - RTC will assess the current processes, resources, and guidelines.
  - At a minimum, the assessment will include the following:
    - Review of current processes such as how values are determined and applied to oil, natural gas, hard minerals (gravel, sand, stone, coal, etc.), and equipment used for such operations
    - Review of resources used to determine fair-market values for ad valorem valuation purposes
    - Review of mathematical driven data such as formulas, tables, calculations and all other mathematical factors within the guidelines
    - Review guidelines to ensure compliance with Arkansas law and rules relating to mineral ad valorem valuation
    - Review any other items as requested by ACD

  - RTC will collect documentation and other research material containing assessment information. Agency will further define requirements prior to commencement of work
  - An introductory discussion will be scheduled by ACD at a meeting or a conference call with the vendor immediately after contract award Any travel or meeting-related expenses incurred by the vendor shall be borne by the vendor
  - RTC will provide a status report to the agency thirty (30) days after the introductory discussion
  - RTC will provide monthly status reports thereafter due to the agency on the first business day of each month.

- Analysis:
  - RTC will conduct an in-depth analysis and field work including appraisal work on each field in the state including:
    - Arkoma, Fayetteville Shale, South Arkansas, and major sub-fields within those geographic areas.
    - Specific fields will be determined by agency during introductory discussions; the vendor will have the opportunity to identity relevant sub-fields.
  - RTC will identify industry standard techniques for mineral interest appraisals and assigning valuations.
  - RTC will identify potential changes in processes, resources, and guidelines to ensure compliance.
  - RTC will identify reliable and credible data sources such as publications, manuals, etc. to estimate value.
  - RTC will verify and provide supporting documentation on all estimates of value for itemized equipment not valued as part of the lease. At a minimum, supporting documentation must include sales of similar equipment purchased in an open market transaction in sufficient quantity.
  - RTC will compare values for oil and gas mineral interests based on the guidelines to values represented by comparable market-based sales or exchanges for oil and gas leases sufficient to establish a pattern or lack thereof for value determination.
  - RTC will determine whether guidelines are suitable to achieve the purposes intended.
  - RTC will identify any deficiencies and determine the extent or variance.
  - RTC will conduct an in-depth analysis to determine whether Computer Assistance Mass Appraisal (CAMA) software, being used by counties, calculates and applies mineral interest value properly under current guidelines and applicable laws.

- Written Report & Recommendations:
  - RTC will compile findings from the assessment and analysis and must produce a report on results and recommendations.
  - Vendor report must be due to the agency by October 2, 2017.

- The report must be in an electronic format as a PDF file type sent to Bear.Chaney@acd.state.ar.us.
- Upon review of the report, should the agency determine that revisions are necessary, RTC will make those revisions and submit the updated report to the same email address using the same file type.
- The revised report must be due to the agency ten (10) business days after the vendor receives the agency's comments, questions, and/or directives. At the discretion of the agency, an alternate due date for the revisions may be assigned.
- RTC will provide revisions of the report as required by the agency until the agency approvals a final document.
- RTC will provide both a hard copy and an electronic copy of the final report within five (5) business days after the final approval is received. The electronic copy must be a PDF file on a flash drive unless otherwise directed by the agency.
- RTC will provide recommendations for modifying the existing processes, resources, and guidelines to ensure compliance with statutory requirements.
- RTC will base recommendations on findings.
- RTC will provide alternatives available to correct or modify guidelines.

- Presentation:
    - RTC will conduct two (2) presentations, each accompanied by a PowerPoint, which highlights the mineral study findings and recommendations. The duration of each presentation will be agreed upon by agency and vendor.
    - The initial presentation must address an estimated audience of up to thirty (30) attendees such as agency personnel, Arkansas Assessors Association members, and/or government officials as selected by ACD.
    - The initial presentation must be on a date determined by the agency, and must be conducted fifteen (15) days after the final report is approved.
    - The second presentation must address an estimated audience of up to 150 attendees such as agency personnel, state/county government officials, members of the oil and gas producers industry, and/or the general public as selected by ACD.
    - The second presentation must be on a date determined by the agency, and must be conducted within fifteen (15) days after initial presentation.
    - Each presentation must be conducted onsite in Little Rock, Arkansas at the location and time specified by the agency.
    - RTC will provide ACD with a flash drive of the PowerPoint for use at each presentation.
    - RTC will provide thirty (30) hard copies of the report to all attendees at the initial presentation. The agency will provide hard copies of the report to all attendees at the second presentation.

- All other presentation preparation (supplies, scheduling, venue, etc.) will be the responsibility of the agency.

A copy of the sample documents previously cited are on the following pages as well as a copy of our Arkansas Certified General Appraiser license held by RTC's Senior Appraiser.

RESOURCE TECHNOLOGIES CORPORATION
248 E Calder Way, Suite 305, State College, PA 16801 814-237-4009 f: 237-1769
PO Box 242, State College, PA 16804 www.resourcetec.com

Valuation of Operating Aggregate Operations for Banking Purposes
(Sand and Gravel and Crushed Stone)

Aggregate consists of sand and gravel and crushed stone. The principal consumers of sand and gravel and crushed stone materials are the highway and building construction industries. The principal construction uses include:

- Structural products - used in horizontal layer applications such as pavement construction for highways, parking lots, and other paved areas
- Drainage, filtration, and erosion control - used in construction of highways and parking lots, earth dams and building foundations, for treatment of wastewater, and for erosion control on slopes, channel protection, and shoreline protection
- Component of Portland cement concrete - used in the building construction industry
- Component of Asphalt concrete - used in highway construction

The basic qualities that are considered to represent the suitability of aggregate for specific use include resistance to abrasion and impact, absorption, and soundness. Basic specifications for aggregate include:

- Base material - The material placed between the compacted sub-grade below and the overlying asphalt cement or Portland cement concrete course(s).
- Asphalt concrete - Because aggregate comprises around 95% by weight of asphalt concrete, the characteristics of the aggregate have a significant effect on the properties and the performance of the resulting material. Important physical and mechanical characteristics of aggregate used in asphalt concrete include grading, particle size, angularity, and a generally low porosity.
- Portland cement concrete - Aggregate strength is important in the creation of Portland cement materials. Surface texture is not as important for Portland cement concrete as it is for asphalt concrete, although it can affect bonding to a degree.

Aggregate is typically divided into two components:

- Fine aggregate including sand – material passing a 3/8-inch screen sieve, essentially all passing a # 4 sieve (i.e., a 0.187-inch square opening).
- Coarse aggregate including gravel – generally considered being crushed stone or gravel, almost all of which is retained on a No. 4 sieve.

According to the United States Geologic Survey (USGS)[1], in 2012 nearly 6.5 tons of aggregate (construction-grade crushed stone and sand and gravel) was produced for every person in the United States. There are nearly 10,700 construction materials quarries and mines in the United States (4,000 crushed stone operations and 6,700 sand and gravel operations). Together, they produced more than nearly 2.2 billion tons of material (1.25 billion tons of crushed stone and 850 million tons of sand and gravel). As a result of the 2007/2008 recession, total aggregate production has fallen to its present levels from a high of nearly three billion annual tons in 2006.

In 2012, the national average selling price of construction aggregate was approximately $8.90 per ton FOB (freight on board - loaded on trucks at the mine):

- Crushed stone was $9.78 per ton – varying from roughly $4.00 per ton to nearly $20.00 per ton depending on location and grade of material
- Sand and gravel was $7.65 per ton - varying depending on location and grade from $3.50 per ton to more than $15.00 per ton loaded on trucks at the mine.

The average mine produces approximately 200,000 tons per year, with crushed stone mines producing an average of 350,000 tons per year and the average sand and gravel operation producing approximately 150,000 tons per year. There are mines in nearly every state; some states host large hard rock mines, and others host small sand and gravel sites. Larger operations may produce more than four million tons per year with sophisticated large scale mining and processing operations. The smaller operations may operate intermittently and use small scale or portable machinery and equipment. Many sites are coupled with heavy construction operations and may also host concrete (ready mix) and asphalt production facilities. Some sites may also accept demolition and other construction waste as fill for mined out areas and as enticement to attract customers.

Based on searches through various publications, more than 100 aggregate operations have exchanged hands during the last three years. Some of the operations involved one pit; some were reserves with no ongoing operations; and some involved multiple pits together with asphalts and concrete plants. Of the transactions noted only 25 actually published considerations; these amounted to more than $9 billion. It is difficult to use these or any mineral transactions as direct comparisons for valuation purposes. The best that can be done is to use them to get a feel for trends in the market.

As a low per unit value commodity, aggregate is typically mined and processed as close to the end user as possible. As an example:

> If the two largest aggregate quarries in the Chicago area were shut down, the $100 million worth of stone produced and sold annually within the area would have to be obtained from other mines located 50 miles farther away. Because of the cost of shipping, this would raise the cost at the point-of-use to nearly $225 million – a $125 million increase.

While the quality of aggregate is important, it is obvious that the value of aggregate

[1] http://minerals.usgs.gov/minerals/pubs/commodity.

material is tied closely to its proximity to the end user. Generally, aggregate is not shipped more than 35 - 50 miles from the excavation site to end users.

Because of the investment required for modern aggregate operations (time and capital), companies typically require a minimum of 15 to 25 years of reserves to open a quarry. In contrast, since sand and gravel operations do not usually require sophisticated and expensive crushing equipment, these sites may offer fewer years of reserves and still be attractive (7 to 15 years).

Establishing new mines has become exceedingly difficult. In general, proposed mine development generally engenders local opposition. This opposition usually increases where there is significant residential development. Opposition can delay or cancel mining or can result in additional restrictions being placed in the operating plans. Delays and restrictions raise the cost of mining. Cancellations raise the value of deposits that can be, or are, developed.

In short, mine and site value is determined by:

- Quantity of accessible material that meet specific engineering specifications
- Location of the site with respect to end users – highly densely populated areas use more material per square mile and per person
- Time and cost related to obtaining permission to operate
- Cost to produce saleable material
- Local competition.

For banking purposes, most mineral properties are valued as an active industrial property that contain raw minerals (coal, limestone, sandstone, gravel, etc.). Typically, the properties being appraised for banking purposes are being exploited or are planned to be mined for the ore. In addition, the sites generally include or have access to various facilities for crushing, sorting, and washing the stone products, as well as for weighing and loading the products and for testing product quality. A Highest and Best Use analysis is used to establish the basis for valuation and whether subjects are situated in an exploitable location allowing it to profitably serve local, regional, or national markets. In some cases, all or a portion of the site may not be suitable or profitable to initiate or continue mining. In this case, the site may contain excess land – land which offers more value for other legal uses.

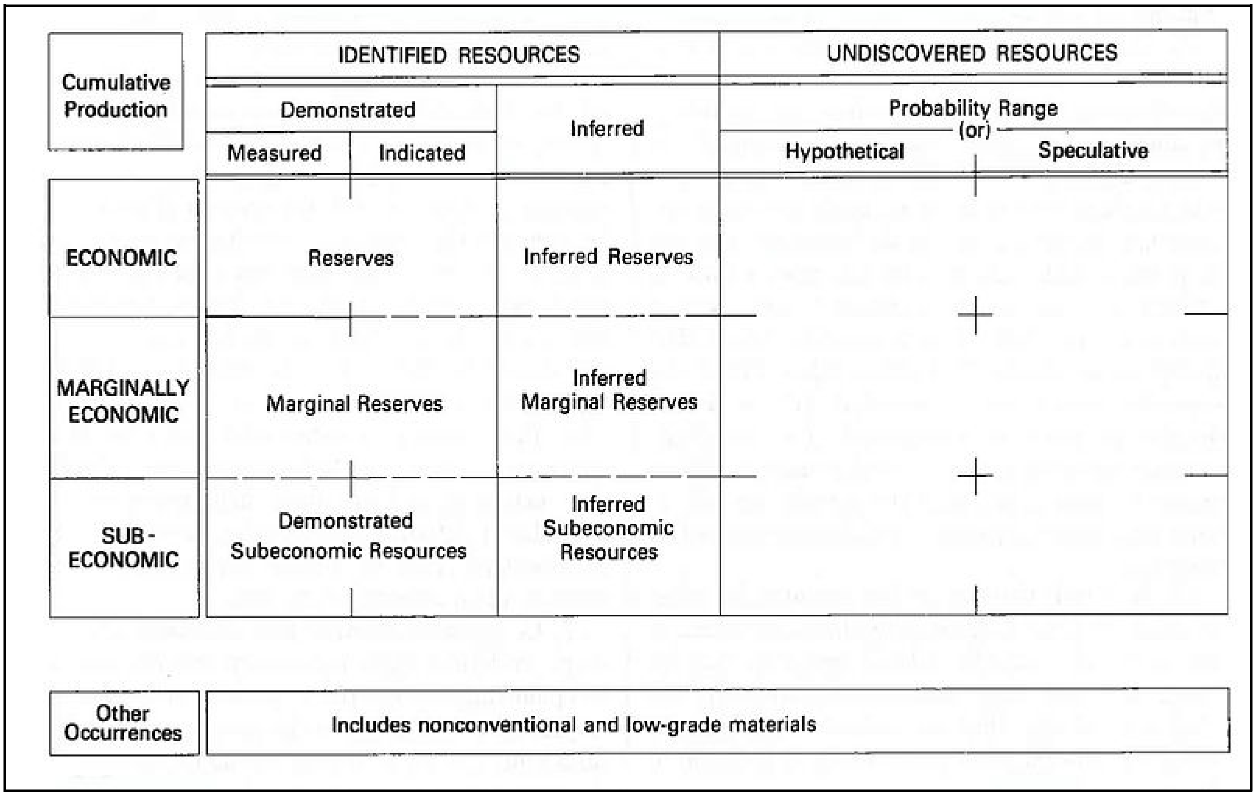
In all cases, it must be determined if the subject's mineral reserves are an integral part of the subject value – like good soil is important to farming and frontage is important to a commercial land use, profitable access and use of the mineral is the key to the value of a mine. This determination can only be accomplished by completing a reasonable Highest and Best Use analysis:

- Is the mineral present in sufficient quantity to initiate and sustain production?
- Is it technically feasible to extract or to continue to extract the mineral? How thick is it? How deep is it?
- Is it legal to mine, continue to mine, or to expand the mine at its location? Are there mining restrictions which affect the efficiency of mining?
- Is it economically feasible to exploit the mineral at this location? What will it

cost to mine, process, and market the mineral? What can it be sold for? Is the market large enough to warrant investment? What are future capital requirements?

- Is this the most profitable use of the land? Is there excess land associated with the mine?

The quantity of reserves themselves are estimated based on the Standard USGS classification system shown below.



Generally, unless otherwise prominently noted in a report, only those resources that can be classified as economic are considered to be proven and thus included in the valuation. These reserves can be "demonstrated" by local mining history or drill core data or inferred from less densely organized by credible drilling information. Both the Internal Revenue Serve (IRS) and the Security and Exchange Commission (SEC) apply this information to depletion and other valuation requirements as shown below:

IRS	GEOPHYSICAL
Proven Reserves	Proven Reserves
Probable Reserves	Probable Reserves
Possible Reserves	Possible Reserves
	Speculative
Property	
Recoverable Reserves	

For most mineral related valuation it is useful to consider the classification scheme set forth by the SEC:

- Proven Reserves
  - "Reasonably Certain" to be producible:
    - current technology
    - current prices
    - current commercial terms
    - current government consent

- Probable Reserves
  - Reasonably Probable" of being produced:
  - current or likely technology
  - current prices
  - current commercial terms
  - government consent

- Possible Reserves :
  - "having a chance of being developed" under favorable circumstances

A mineral deposit has virtually no value if it cannot be economically (profitably) developed. The only appropriate analysis available to estimate a deposit's (mineral properties) value is to figure out if the deposit can be economically exploited. Generally, this requires analysis of:

- Potential cash flows
- Previous cash flows on the property and similarly situated properties
- Actual and/or hypothetical royalties
- Market conditions
- Physical attributes of the deposit and the site.

The appraisal of a mineral operation involves the analysis of a fairly complex set of components all oriented toward profitably of exploiting the site. The appraised value is generally broken out among the following integrated components:

- Fee Estate
  - Mineral/Land
    - Quarry mineral and land
      - Including support and buffer land
      - Reversionary or post mining land uses
    - Excess Land
  - Site Improvements
    - Structures
    - Fixed Equipment, such as Crushing and Screening Plants, Hot Mix Asphalt Plants, Concrete Plants, etc.
    - As permitted and improved for mineral extraction
- Machinery and Equipment
  - Hauling Trucks
  - Front-end Loaders
  - Excavators

  - Portable or Semi-Portable Plants, such as Crushing and Screening
  - Other types of equipment
- Working Capital
  - Inventory
  - Cash and Other Liquid Assets
- Intangible Assets
  - Business Value
  - Synergistic Values - Considered, but can't be calculated.
  - Other

Frequently, the fee estate (land and mineral) represents a smaller proportion of the total value, as calculated by the Discounted Cash Flow analysis, than the total of the machinery and equipment, working capital, business, and goodwill assets.

To complete the appraisal in accordance with the Uniform Standards of Professional Appraisal Practice, the appraiser needs to review financial, operational, and market information. The appraiser will likely review the following:

- At the quarry:
  - Development or confirmation of the estimate of volume of remaining material in-place that can be mined and sold in the market
  - A review of the quality of the material at the site
  - Estimation of the probable profitability of the operation given the location of the mine, the local land use, and the environmental situation – in short, determining the highest and best use of the site
  - Examination of the local/regional real estate market in order to understand the most likely post mining land use, timing, and value
  - Examination of the mining operation for efficiency and potential conflicts
  - A review of existing equipment concerning adequacy for continued operation and total expected life
  - Examination of liabilities such as reclamation and landfill maintenance

- Concerning the operation:
  - A review of the current and likely future market for construction materials within the market radius of the site/plant
  - Examination of the transportation advantages and impediments to the site
  - Comparison of the local/regional competitive sources of similar materials
  - Estimation of the likely profitability of the operation

To complete the appraisal, the appraiser should have access to various records including:

- Site maps/mine plans
- Pro forma(s), if available
- Income and expense statements (three years)
- Equipment lists and maintenance schedules, by operation

- Copies of geologic studies previously completed including records of drill cores completed, if any
- Copies of mine permits and permit applications
- Copies of union/labor agreements, if applicable
- Lists of major environmental or operational violations
- Copies of zoning and land use synergistic/agreements/consent orders
- Copies of chemical or physical tests completed of materials in-place, if any
- Copies of land deeds, agreements of sale, & previous appraisals, if available
- Lists of major customers (three to five years).

In general, three approaches – cost, market, and income – are available to estimate the value of any property. In one form or another, these approaches are based on the "principle of substitution." That is, a purchaser of a property would typically pay no more for one property than for another of similar utility. Utility and all aspects related to it are defined by the Highest and Best Use of the property being appraised.

However, unlike other properties, mineral operations are a depleting asset, i.e., the act of mining and generating cash flow results in the removal of the valuable asset. In fact, even the "land" itself at quarry sites is literally consumed (mined) by the income production process.

Mineral properties are purchased for the production of future income. In the marketplace for mineral properties, the "comparative sales approach" is given only limited credence. It is nearly impossible to directly compare one mine to another – deposits differ, ore grades differ, cost to mine and process differ, markets differ, etc. Adjustment to the sale price nearly always requires a detailed analysis of the income production of each property and the amount of the adjustment can vary widely. Instead, typical market participants use some form of an income approach to assess any potential development of a mine or determine a value of an existing operating mineral property or entity. In short, the reliance on the income approach is based on two factors:

- A mineral property is only useful to the owner if it can generate current or anticipated future income. The potential amount of that income, its duration, and its likelihood are typically measured in the market.
- Mineral properties are unique – each serving a differing market, each possessing differing mineral peculiarities, and each capable of supporting differing levels of development and production. The income approach to valuation provides for the examination of the unique characteristics of a site or operation.

In Mineral Deposit Evaluation, A.E. Annels, 1991, states succinctly that "In all but a few exceptional cases, an adequate financial return from a mining project is the essential criterion which must be fulfilled before an affirmative decision to exploit is taken . . . The vast majority of mineral exploitation projects are therefore undertaken for financial gain and the geological characteristics of the deposit are but one factor of many which collectively determine a project's profitability."[2]

[2]Annels, Alwyn, E., Mineral Deposit Evaluation, Chapman & Hall, London, 1991, pages 306-322.

Since it is the object of the appraisal to mimic or model the behavior of the marketplace, it is appropriate to focus on the income approach to determine the value of the mineral property. Paschall, in the Appraisal of Mineral Producing Properties[3], states that "a mineral properties' appraiser is first, last, and always, a mineral industries' economist." Similarly, in the Appraisal of Construction Rocks[4], he concludes:

> "If the appraisal of an active pit or quarry is at issue, and the appraiser is told that local law permits appraisal only by reference to sales comparison, the appraiser should refuse the assignment."
>
> "The capitalized income method is the only method appropriate to appraise an active construction-rock operation."

According to Gentry and O̖Neil, a basic text in mineral property appraisals, "the preferred method for mining property valuation and the one universally used in the commercial practice is the income approach."[5] They go on to state:

> "Because mines have limited operating horizons and because there are well-established markets for mineral commodities, the income approach is widely used in valuing mineral properties. The approach is used commonly by the mining industry in assessing investment rates of return and determining appropriate **purchase prices for mines or mineral prospects**."[6]

The income approach is also referred to as the present worth of future benefits or the discount method. In this approach, an annual amount (net profit or annual royalty) is capitalized into a present value estimate. The approach assumes that a dollar in the future is worth less than a dollar in hand today. The assumption is based on the principle that money can earn income, that is, a dollar invested today can increase (i.e., interest) in value over time. The rate of the discount is based on estimates of:

- Expected inflation - Can be incorporated but the appraiser should generally use constant dollars. (If inflation is incorporated, the discount rate should also include inflation.) Incorporating inflation can artificially increase net income. Real growth should be identifiable.
- Opportunity costs – cost of money (i.e., What could an equal sum earn in other investments as debt and/or equity?)
- Risk (the chance that this investment will succeed as expected or fail).

---

[3] Paschall H. Robert, ASA, The Appraisal of Mineral Producing Properties, ASA VALUATION, American Society of Appraisers, 1974.

[4] Paschall, Robert, H. CPG-00118, Appraisal of Construction Rocks, 2nd, American Institute of Professional Geologists, Arvada, Colorado, 1998.

[5] Gentry, Donald W. Dr. and O' Neil, Thomas J. Dr. Mine Investment Analysis, Society of Mining Engineers, American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. New York, New York, 1986, page 14.

[6] Ibid.

The key factor in evaluating mining operations is that, unlike most other real estate investments, at the conclusion of mining, the asset will be gone. In the typical real estate investment cycle, at the conclusion of the investment period, the asset remains, there exists a reversionary value. In a quarry, there is a hole in the ground surrounded by a relatively small amount of buffer land. Frequently, quarries are located in rural areas, where the residual land exhibits little if any reversionary value. For the most part, the fixed equipment is used beyond normal depreciation and may exhibit only modest scrap value. Mining machinery is generally rubber-tired or track-machines that are moved from job-site to job-site. The investment cycle must therefore capture both the return of and the return on investment with expectation of significant reversionary or residual value.

It is imperative that the appraisal is based on a detailed Discounted Cash Flow (DCF) rather than a simple capitalization of net income. Capitalizing net income, a technique used in some commercial appraisals, presumes constant or stable incomes and regular and predictable expenses and is based on the assumption of a near-infinite cash flow. Mining and mineral deposits do not follow that stable or predictable pattern. Mines will deplete, sometimes in the distant future and other times in a very short time frame. The DCF allows the appraiser to forecast future incomes and expenses which are not stable or annual such as capital equipment needs, changes in mining requirements, necessary site development costs, and major or unique demands for material, etc. Only the discounted cash flow can reflect this situation.

The appraiser is seeking a measure of market value, that is, the value which could be expected to be obtained if the subject of the appraisal were exposed to the open market. The appraisal is not simply the calculation of the unique investment value of the particular operation and management at this location. The financial statements examined should be detailed enough to allow comparison to industry statistics and they should represent a long enough time period to avoid the typical boom and bust cycles of national, regional, and/or local construction events. For example:

- Major regional construction projects, like highways or a large institutional or commercial projects, may temporarily inflate production volumes and prices. Ideally, the analyst should view five or more years of performance but in any case, no less than three years of data. Given the recent national construction boom from 2005 through 2007 and severe recession through 2013, a ten-year financial picture may be necessary.

- The appraiser may compare the subject mine to other similar operations known to the appraiser and to industry statistics such as those published by "Bizminer[7]" and "OneMine.[8]" It is essential to see if an operation, mine, or deposit is more or less expensive than other mining operations in regard to blasting, mining, crushing, screening, and, sometimes, washing of the material. Some rock, for example, is harder than other deposits to winnow from the earth; some rock is more wearing on equipment than other rock;

[7] http://www.bizminer.com/

[8] http://www.onemine.org/

some can create all locally required marketable sizes with little or no waste, other rock processes end-up with piles of unsaleable waste.

- General mining costs may be compared to typical mining costs from reviews of other similar mine operations, mining cost models developed by Aventurine Mine Cost Engineering[9], and construction cost data sources including Dodge Cost Manuals[10]. Selling and administrative costs are based on typical mining costs from reviews of other similar mine operations, and construction cost data sources including Dodge Cost Manuals.

- Some portions of a mining cycle are more profitable than others. For example, every mine must expend time and money to expose the desired rock, this may only occur episodically, a normally profitable operation may lose money during the year that clearing and site-prep occurs. Focusing on financial statements that only cover a few years may not capture the complete mining cycle and, depending upon the portion of the cycle covered by the information, may result in either under or overvaluing the operation. In the same regard, if the analyst does not recognize future mining requirements, the result will be an overvaluation of the mine.

- As an operation mines deeper, costs may increase. At depth, water may be encountered, requiring pumping and water control or requiring mining under water. Deeper and larger mines require long haulage systems which can be expensive. Mine expansion may therefore require a different cost structure and thus a different valuation model.

- Operations that use onsite diesel generators to create electric current to run processing and may, therefore, exhibit significantly higher costs than those that use electricity from the utility power grid to run the plant. This factor must be taken into account when reviewing and comparing historic income and expense statements. The same is true for Hot Mix Asphalt plants. In today's energy market plants, plants that heat asphalt with natural gas have a significant cost advantage over those that burn fuel oil for heat.

- As the operation nears its completion, it must prepare to close when operations terminate. Local and state requirements will control how the site must be closed. Depending on the requirements and the current mining situation, this may or may not represent a significant liability.

- Mining equipment wears out. A long-term Discounted Cash Flow (DCF) is used to model these future expenses. A review of equipment depreciation schedules, hours used/maintenance schedules, a view of the operating equipment, and a discussion with the operator, can aid in predicting these future costs.

---

[9]SHERPA, Aventurine Mine Cost Engineering, Elk, Washington, 99009

[10] Dodge Unit Cost and Heavy Construction Cost Manuals, Marshall and Swift Publishing, Mc Graw Hill, New York, New York, annual.

- Income is generated by the sale of the product. The income and expense statement should allow the appraiser to see how much is transferred internally to the owner's asphalt, concrete, or construction business and how much is sold on the open market. Owner operators may internally transfer commodities such as stone at retail, at cost, or at some other value. The appraiser must, based on the scope of work, determine what the appropriate price/income structure is before completing the appraisal.

To summarize, based on the scope of work, the appraiser must build the DCF model based on a determination of:

- Local/regional demand
- Market prices
- Realistic mining and processing costs
- Future factors affecting cost and production.

In most banking situations, there are two appraisal goals:

- Determine the overall enterprise value and cash flow of the operation:
  - Will it be successful?
  - Can it generate a cash flow to pay back the loan?

- Determine the value of the (mortgageable) fee estate:
  - Mineral/Land
    - Quarry mineral and land
    - Support and buffer land
    - Reversionary or post mining land uses
    - Excess Land
  - Site Improvements as permitted for mineral extraction
    - Structures
    - Fixed Equipment, such as Crushing and Screening Plants, Hot Mix Asphalt Plants, Concrete Plants, etc.

The value of the total operation is the net present value of the operational DCF. <u>In-place mineral\land value</u> can be difficult to extract from the overall value. Generally, two methods are available. The first is to calculate a <u>Residual Value</u> from an analysis of the total value. In this procedure, the known or market values of the other components of value are subtracted from the total value, i.e., total value less the value of:

- Buildings and structures
- Working capital and inventory
- Machinery and equipment
- Realistic entrepreneurial profit.

The second method is to assume that the mineral/land would command a royalty of rent from an operator. In many situations, the land and mineral are owned by some other entity than the mine operators. In these instances, the operator pays a royalty to the mineral land operator for every unit of material mined and <u>sold</u> from the property. This royalty is frequently calculated as a fixed amount per ton or as a percentage of the selling price. In either case:

- It is generally paid when the material is mined and sold – so it is part of a DCF calculation.
- Royalties are common enough that rates and amounts can be extracted from the market – making the valuation of the mineral market-based rather than residual to the total DCF.

Most texts suggest that presumed royalty value be assigned to the mineral as though the operation were exploiting minerals owned by a third party. This assumption allows the appraiser to look to the market for royalty rates similar to the way the land appraiser looks to the market for sales and leases. Using this method, the present worth of the presumed royalty income stream is calculated. This value represents an estimate of what the operator would pay to a third party to use the equipment at the site to mine the mineral, therefore, producing a profitable income stream. Since, in the quarry situation, the mining consumes the land as well as the mineral, presumably the royalty represents the real value of the mineral in-place as real estate. The royalties typically paid for limestone and other aggregate sources vary from mineral type, location, ease of mining, and the local market. Surveys show that royalty rates are higher in the urban areas than in the rural areas.

Having determined a royalty value, the appraiser can now separate the components of value based on market indicators:

- Total Value – operational discounted cash flow
- Land and Mineral – royalty approach
- Excess Land – comparative sales
- Reversionary Value – delayed realization of land values derived from comparative sales
- Fixed Machinery and Equipment – comparative sales of installed replacement equipment that will serve a similar use
- Rolling Stock (mining and hauling equipment) – comparative sales of replacement equipment that will serve a similar use
- Inventory and Working Capital – market surveys of typical amounts required for the business area
- Excess Inventory – site specific examination.

Cost documents for the new equipment and sources such as “Top Bid” and “Machinery and Equipment Trader” for used equipment are typically used to determine a range of probable auction prices of machinery, equipment, and rolling stock items. Cost documents such as “Marshall and Swift” are often consulted for building values. However, it must be emphasized that since this is an appraisal of an operating entity, the appraiser is using these as source guides. The valuation of the capital assets is related to the “as-is” nature of the operating business. With an eye to the auction trade value and the equipments condition, a portion of the overall operational value is really allocated by answering questions such as:

- Do the items serve their function?

- Do they contribute to the operation?
- Is there any excess or deficiency?

By this method, the business and intangible values become the residual calculation, i.e., the total value less all of the market derived components. The business value represents the entrepreneurial interest – the value of assembling, at some risk, the machinery and equipment, personnel and management, and marketing and finances at the subject location. However, this process does not recognize that a portion of this business value actually remains with the land. A portion, sometimes a large portion, of the "business value" is related to the fact that the land area is permitted and zoned to allow mining and is improved and opened for mining.

It can be exceedingly difficult to obtain permission to mine at any location. This permission generally goes with the land. While the miner may be required to obtain a license – it is the site which is permitted to host a mine. Like a residential land development site that has been approved for subdivision development, when a permitted mining operation is sold, it is sold as permitted and developed. Therefore, a portion of the "business" or residual value calculated above should be assigned to the fee estate (mineral/land). According to Carroll and Watkins[11]:

> "Corporate acquirers are prepared to pay a premium for sites with large proven, permitted, and zoned reserves, extending cash flow generating ability. Expansion oriented aggregate producers are confronted with two choices. The first choice is to establish a Greenfield site, in which timing and total costs may be unknown variables in the equation. A firm may invest significant dollars over several years and still not have a viable operation. The second choice is to purchase an existing site(s), with predictable production for a defined period of time (reserve life), immediately generating cash flow over the reserve life."
>
> "The difference between the two choices is obviously the risk associated with each. Total proven and probable reserves are estimated by using geological surveys and drilling definition holes. The size and the amount of capital equipment, including shovels, dozers, haul trucks, crushers, screens, and other ancillary equipment, combined with estimated weather and maintenance downtime, will determine annual production levels. Knowing the reserve amount and the annual production rate determines the remaining reserve life. The greater the reserve life, the longer and more predictable the cash flows are, and a greater acquisition value assigned."

The value of a permitted site in a rural area far removed from neighbors in a municipality with no zoning is generally the cost of the search efforts for land, permit application, plant design, air quality permits, and highway occupancy permits, all typically completed by a consulting firm with oversight from a company representative. Some municipalities request building permits for anything on a foundation, such as plant equipment, scale houses, and scales. The total cost before the purchase of the plant may exceed $250,000. Extensive public hearings, which are generally standard, will increase this cost. In difficult situations, the costs to obtain permits and zoning approval may exceed $1,000,000.

If the site lies in a municipality that has zoning or other land use controls, then additional work is needed. Most sites are granted permission by Conditional Use. This involves a formal request for the proposed land use, which is invariably followed by a public

[11] Carroll, T. M., and Watkins, W. P., January 2000. Mining higher aggregate company values. U.S. Bancorp, Piper Jaffray, p. 18.

hearing. In order to get to this level, most municipalities need to make sure the operation is serious about the request and expect the company to have the appropriate permits submitted to any and all state level governing bodies. Even with this level of commitment, there is no guarantee that a Conditional Use Permit will be granted.

The last point to consider is the time value of the permitting process in today's "NIMBY" (NOT IN MY BACK YARD) world. Even when good sources of aggregate are known to exist, the NIMBY attitude makes it very difficult to open new quarries.[12] The time needed to complete this process is usually two years; in a worst case scenario, the time delay may be extended to a five or seven-year process and may need to be repeated at multiple locations (an operator may be denied a few times). The more urban the area, the longer it will take to get a green field site permitted and the greater the chance that a Conditional Use Permit will be denied.

The addition of an asphalt plant to the quarry can further complicate the approval process. Municipalities are reluctant to grant Conditional Use Permits for asphalt batch plants. According to a white paper published by the Engineering and General Contractors Association, the siting of asphalt operations is significantly affected by the NIMBYism. Even when permits are granted, the encroachment on the asphalt operations by local development causes the manufacturing businesses to continually mitigate the conditions granted through the permit. According to the paper, "ultimately, costs become imbalanced, hours of operations are reduced, and the availability and supply of affordable materials have vanished from the community."[13]

Kris Wernstedt, an Associate Professor of Urban Affairs and Planning at Virginia Tech, conducted a study in 2000 on the perceptions of the general public in regard to aggregate operations. Interviewees were asked to assign their perception of the degree of local opposition into categories ranging from "never any" to "always." The categories of "always," "usually," and "often" were judged to represent significant opposition to the operation. Fewer than 20 percent of the respondents reported significant local opposition to existing operations, whereas an average of 75 percent reported significant opposition to proposed new operations. The respondents suggested that community reaction appears to vary relative to the size, nature, and location of the operation.[14]

The value of the in-place permits can be based on:

- The estimated cost of obtaining permission to mine – engineering and legal expense. Like any other site improvement, the value of these expenses will

[12] Bilec, Dr. Melissa; Marriott, Dr. Joe; Fernanda; Padilla, Maria; and Snyder, Dr. Mark, Market Analysis of Construction Materials with Recommendations for the Future of the Industry, Pennsylvania Department of Transportation, University of Pittsburgh, January 14, 2010, Page 25.

[13] EGCA White Paper, FINAL 11/11/04 The Impending Asphalt Plant Crisis, Engineering and General Contractors Association, www.egca.org.

[14] Robinson, Gilpin R and Brown, William M., Socio-cultural Dimensions of Supply and Demand for Natural Aggregate – Examples from the Mid-Atlantic Region, United States, U.S. Geological Survey Open-File Report 02-350, page 22.

be passed on from owner to owner and thus included in a perspective sale price.

- The value of the time delay related to purchasing or leasing alternative land, preparing the mine permit application, and obtaining the permit from local and state agencies. Based on surveys, this time period is assumed to be at least two years and could be significantly higher based on regional market conditions. In short, this value is based on the loss income related to delaying the operation's cash flow.

The in-place permits for the operation of the mine and associated plant facilities are tied to the land. Therefore, the value of delay is an additional bonus attributed to the land as a value above and beyond the present value of the royalty stream. In essence, this is the bonus value a mining company would pay for the permitted site. This amount is then subtracted from the residual business value and added to the value of the fee estate (land and mineral).

In short, a site that is ready to "rock and roll" is worth more than a site that is not. In an operating site, this enhancement is only partially estimated from the cost of site permitting, preparation, and development. The site's largest value component may, in fact, derive for the delay in net income that must be endured until a virgin site can be permitted. For example, recently a permit was granted to a limestone quarry in Pennsylvania. Salient information used to value the quarry operation are summarized below:

- A 400-acre quarry contains at least 30,000,000 tons of mineable / saleable limestone.

- Based on the market study, the quarry is expected to mine approximately one million tons of stone per year for at least 30 years at an average selling price of $9 per ton; producing $270 million in gross income over the life of the mine. No inflation is assumed.

- Even though the operator owns the site, a 6% royalty is assumed for allocation purposes. Market research of similar operations serving the same region that mine comparable material is used to establish the likely royalty rate. This assumes that the royalty allocates $16,200,000 to mineral and land over the life of the mine.

- Mining, on-site haulage, crushing, washing, selling, scale and loading, reclamation, and administrative costs are estimated at $6.50 per ton. No inflation is assumed.

- Net Operating Income (NOI) after all costs and royalty allocation is $2.44 per ton. Yielding $73,200,000 total income over life of the operation.

- Pretax discount rates with inflationary expectations removed are:

    - 10% for the royalty interest – a passive interest with little or no capital and/or expense risks.

- 15% for the royalty interest – an active interest reflecting capital, forward expenses, and management risk.

- Discounted cash flow is calculated as a midyear discount, reflecting the ongoing continuous nature of expenses and income.

- A $6 million crushing and washing plant is in place and mining machinery used to extract rock is worth approximately $2 million.

- The legal and permitting expenses are $1.5 million. The permitting effort is estimated to take three years which will delay the realization of income for three years.

- No start-up or ramp-up time is assumed. The site is assumed to sell one million tons during the first year of operation.

- Residual value following closure of the mine is based on the sale of the modest amount of buffer land surrounding the water-filled pit; averaging a net, after selling costs, of $1,000 per acre or $400,000 realized during following the last year of mining (year 31).

- Land restoration is expected to require the expenditure of $1,000,000 or $2,500 per acre. This expenditure also is anticipated to occur during the year following closure (year 31).

Given these assumptions the present value of net cash flow is estimated to be $20,907,885 (PV of Royalty plus PV of NOI). This total is not the value of the mortgageable interest. The mortgageable interest is identified through the allocation as follows:

Allocation of Value							
Total DCF as calculated					**$20,907,885**		
Allocation							
By Component of Value						**Tons in-place**	**Acres**
						30,000,000	400
Land & Mineral	Royalty & Residual Land	$5,360,854					
	Permit/Zoning Cost		$1,500,000				
	3-year Delay of Royalty income		$1,333,165				
	Subtotal			**$8,194,018**		$0.27	$20,485
M & E	Plant	$6,000,000					
	Mining Equipment	$2,000,000					
	Subtotal			**$8,000,000**			
Operating Capital	Working Capital		$1,800,000				
	Inventory		$552,500				
	Subtotal			**$2,352,500**			
Liabilities not included in operating costs				**$0**			

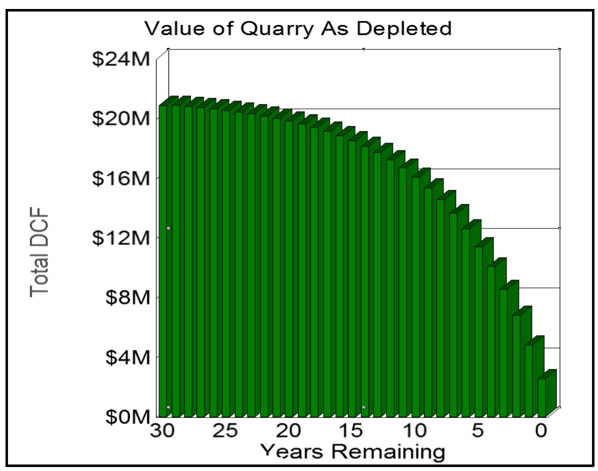
Subtotal					**$18,546,518**	**$0.62**	**$46,366**
Business Value (Subtraction of allocated & tested values from total DCF)					**$2,361,367**	**$0.08**	**$5,903**
Total					**$20,907,885**	**$0.70**	**$52,270**

In the example above, the mortgageable fee simple real estate value is $8,194,018. The balance of the as-is, as operating value ($12,731,866) involves inventory, operating capital, machinery and a equipment, as well as intangible business values.

It should be noted that in some instances the calculated residual that is allocated to business and intangible value may be negative. This value may be subtracted from the royalty calculation and the machinery and equipment estimates. This negative adjustment is a reflection of market conditions and can be considered as an adjustment for super adequacy and economic obsolescence. Should these adjustments result in extreme low values (e.g., adjusted land and mineral below raw land values and/or adjusted equipment values below auction values), the appraisal is telling the analyst to explore liquidation. This site does not support the continued or intended use.

Ultimately, following completion of the research and the characterization of the site, the commodity, and the market, the final formula is reduced to the sum of the expected period future cash flows discounted to a present worth. As always, the estimate of value is only as good as the data supporting the estimation. Where data is lacking or where the operations data is tied to an integrated operation, the analyst uses reasonable approximations based on research and experience.

Since the total value is the sum of the remaining discounted cash flows, as the rock resource is depleted, the value is reduced. Since the value is the sum of the remaining discounted cash flows, the amount is recalculated at each interval. Using the example quarry, the effect of depletion on overall value is shown in the adjacent graph (Value of Quarry as Depleted). The allocation to the Mineral/Land and Machinery and Equipment will follow this pattern. The allocation to the working capital and business enterprise will not.



A detailed site visit and management review is essential. During the site visit the appraiser gets to see how the operation is run – is it in good working order or is it sloppily maintained? While on-site, the appraiser can see if the equipment is well maintained and if it matches the task at hand – is it too big, too small, etc.? The site visit also affords the appraiser the opportunity to discuss the deposit, mining problems, competition, market factors, staffing, and other factors that affect value. Lastly, it is important to at least drive-by and look-over the local competition – comparing mining techniques, amount of material in stockpiles, number trucks on-site, amount of activity, apparent reserves remaining, as well as access to transportation (truck, rail, or barge). The site visits and comparisons are referenced by the appraiser when making subjective evaluations that make up a large part of any appraisal.

Finally, the market survey should also include a search for likely buyers. There tends to be two types of buyers: 1) local interests with a project or projects in mind or who desire to augment a local operation and 2) national and, more recently, international interests who attempt to cover territory and to control market share. The local buyer frequently requires significant capital and loans to complete the transaction. These smaller operations tend to lack some of the data required to easily complete an analysis. Therefore, the appraiser of the smaller operation takes more time to collect information and to analyze the information provided. In contrast, many of the larger operators maintain excellent detailed income and expense statements, detailed mining and geologic records, and are aware of finance and appraisal needs. Most important, the larger operations typically assign professional personnel to assist the appraiser in gathering data.

The following is a list of many of the factors typically considered when completing a mineral appraisal (coal, aggregate, and other minerals):

1) Geographic Location

Location:	proximity to towns, supply depots, markets, etc.
Topography:	access to property, access to mineral deposit
Climatic conditions:	months of operation
Surface conditions:	vegetation, stream diversion
Political boundaries:	land use issues, i.e., zoning

2) General Geologic

Mineralization:	type, grade, uniformity
Geologic structure:	geometry and size of deposit --complexity of mining
Rock:	physical properties
Overburden	
Stratigraphy	
Drainage patterns	
Seam or deposit thickness	
Overall depth of deposit	
Physical characteristics of mineral:	grade, chemical characteristics, variability

3) Nearby and Likely Exploitation Activities

Regional activities:	types, success, history
Similar deposits/reservoirs	

4) Environmental Factors

Likely constraints to exploitation

5) Nearby and Site-specific Exploration

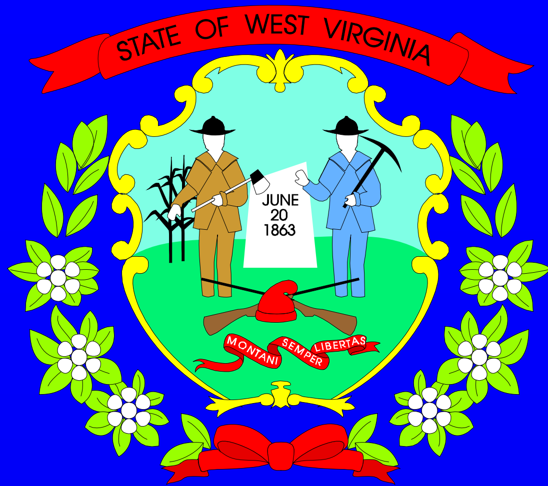
Historic:	district and property
Current program	
Reserves:	tonnage, distribution, classification
Sampling:	types, procedures
Proposed or likely exploitation program	

6) Governmental Considerations

Taxation:	federal, state, and local
Reclamation requirements	
Operational requirements	
Zoning	
Proposed mining legislation	

7) Transportation	
Property access	
Product transportation:	methods, distance, costs
Location of rail, highway, and/or pipeline systems	
Capacity of rail, highway, and/or pipeline systems	
8) Market Characteristics	
Marketable form of the product:	concentrates, ore, specifications of product
Proximity to markets	
Market location and alternatives	
Expected price levels and trends:	supply demand, competitive cost levels. new source of substitutions and tariffs
9) Utilities	
Electric Power Availability	
Location	
Natural gas:	availability, location, costs
Alternatives:	on-site generation potential
Rights-of-Way	
10) Water	
Potable and process:	sources, quality, quantity, availability, cost
Mine water:	quality, quantity, depth, source, drainage method, treatment
11) Land and Mineral Rights	
Ownership:	surface, mineral, acquisition and/or option costs
Acreage requirements:	mine, preparation, concentration location, waste sites, tailings sites
Competing, restraining surface uses	
Principal lease terms	
Reliability of titles, patents, and mapping	
12) Literature Review	
State geologic survey	
Industry publications	
USGS publications	
USBM publications	
13) Production Data	
Historic production at site (5 to 10 years in today's market).	
However typically 3 to 5 will work	
Intended future production	
Anticipated production changes (technical, management, economic)	
Anticipated production anomalies	
Intended market (proportion historic, new, fixed or contracted, open or spot)	
Maximum capacities	
Minimum thresholds	
Quality parameters of output (flexibility of equipment and market)	
14) Financial Data	
Discount rates expected:	likely market requirements for capital
Historic profitability	
Balance sheets and profit and loss statements for at least 3 years	

Tax returns for at least three years	
Current market conditions	
Financial requirements of similar industries:	risk factors, equity ratios, dividends, yields, etc.



Natural Resource Taxation

Presentation before the West Virginia Legislature

November 17, 1997

Jerry A. Knight

History and Background

House Bill 4127

- Provided for reappraisal of all properties in WV
- Gave appraisal responsibility for natural resources to State Tax Commission
- Permitted refiling and use of prior approved legislative rules

Appraisal of Natural Resource Properties

1992-1994

- Refiled rules with context changes
- Appraised all properties consistent with rules
- Total value of all properties estimated at $2 billion

Controversy Developed 1994

- Accuracy of appraisal of coal properties?
  - Was coal undervalued in total?
  - Were values of individual parcels equal and uniform?
- State Tax Commission response
  - Total value was accurate
  - Perhaps individual property values could be improved upon

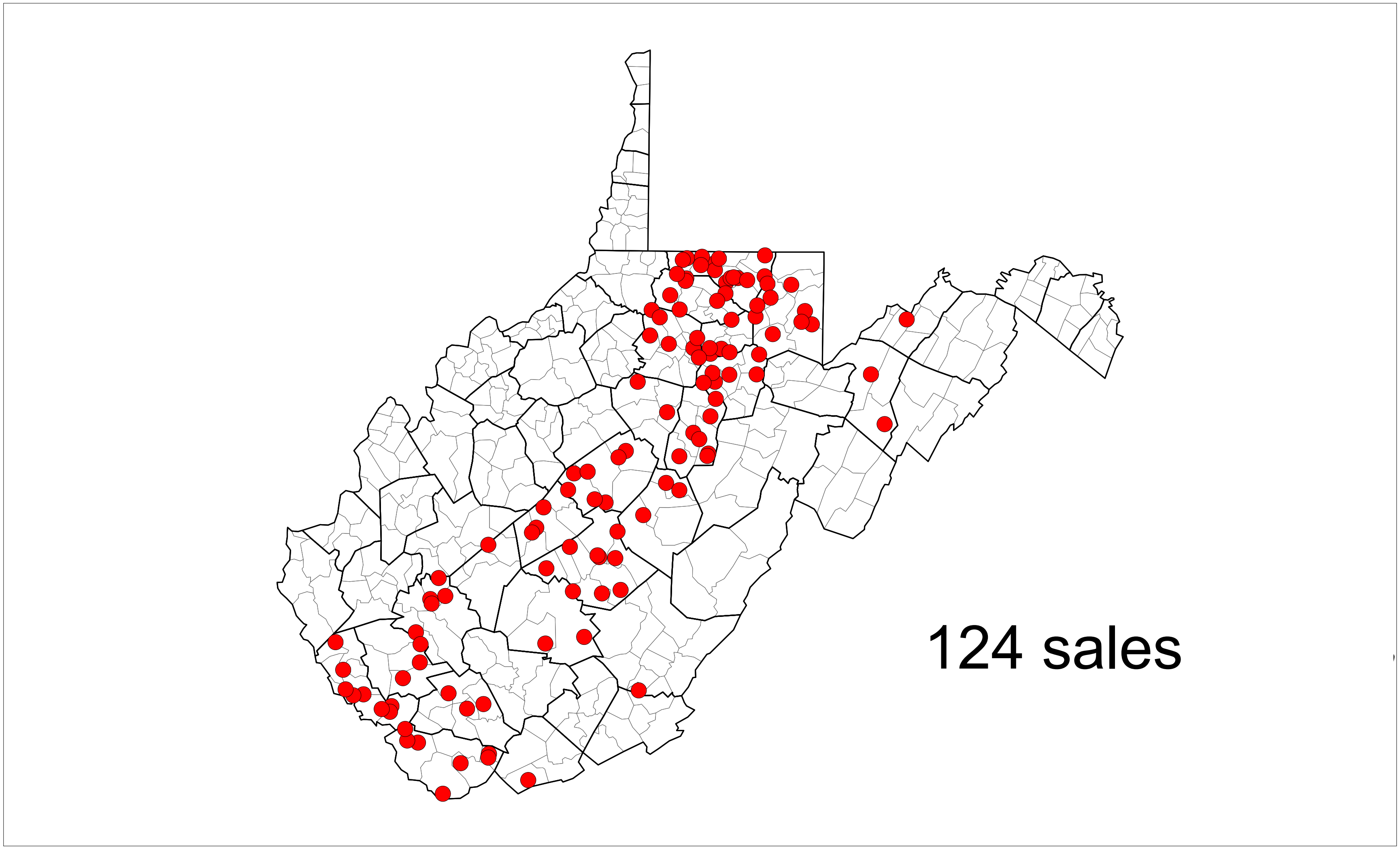
Litigation

- **1995**
  - Suit filed (Lawson v. Paige)
  - Settled through agreed order
  - Contract with consultants

Litigation

- 1996
  - Suit filed (Adkins v. Paige)
  - Court denied all relief requested by plaintiffs
  - Court retained jurisdiction of case
  - State Tax Commission extended contract with consultants

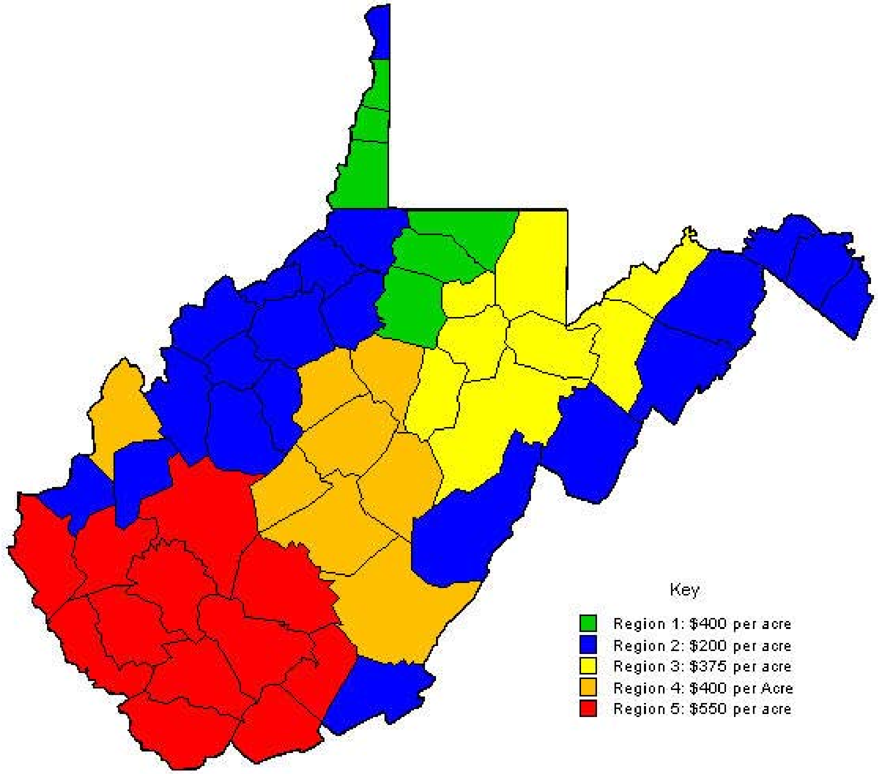
Distribution of Comparative Sales Currently Used by Commission



Sales Used to Estimate Regional Values

REGION	PROPERTIES	SALES	APPRAISED VALUE	MINIMUM SALE	MAXIMUM SALE
1	13,989	33	$400	$14	$11,813
2	23,976	1	$200		
3	43,708	30	$375	$16	$4,777
4	37,753	26	$400	$16	$8,827
5	39,967	34	$550	$19	$6,756
Total	159,393				

Current Regional Tax Assessments



Consultants make recommendations

- **1997**
  - Consultants issue appraisal methodology recommendations
    - Value of all coal in West Virginia approximately two billion dollars
    - appraisal method for reserve coal can and should be changed
  - State Tax Commission files proposed rule

Consultants Presentation

- Will provide rationale for process
- Will present an overview of the method and details of the data
- Will not provide detailed value results for individual properties, districts, or counties

Dr. Thomas F. Torries

Overview of the Method to Appraise Reserve Coal Properties

Definitions

- Active Coal - within 7 years
- Reserve Coal - after 7 years
- Fee Appraisal
- Mass Appraisal

Basics of the Reserve Coal Valuation Methodology

- Aggregate Value of All Unmined Coal
- Subtract Value of All Active Coal
- Equals Value of All Reserve Coal
- Apportion the value of reserve coal among the 159,000 properties to obtain appraised values of individual properties.

Three Critical Items

- Must First Determine Aggregate Value
  (Provides Total Value)
- Then Determine Active Coal Value
- Must Have Correct Apportionment
  (Provides Equity)

Three Views of Aggregate Value

- **200 years x 175 mm tpy x $1.00/t = $35 billion.**
- **Coal worth nothing until it is mined.**
- ***Neither of the above is correct!***
- **Some coal has high value. Much has low value.**

Aggregate Value of Unmined Coal

- Coal to be mined sooner brings a higher price than coal to be mined later.
- Most of the 200 years of coal is to be mined later.
- Calculated value of all unmined coal is about $2 billion.

Value of All Active Coal

- Use present active coal appraisal method.
- Each active coal property is individually appraised
- Total active coal value equals the sum of the individual values.

Apportionment Process Determines Relative Value of Individual Reserve Coal Properties

- Identify regional coal characteristics by coal seam.
- Use these data to classify 159,000 properties and apportion value.
- Same characteristics used by coal buyers

Value Indicators Used to Estimate Relative Value of Coal

- Coal Quality, Quantity, and Thickness
- Coal Prices and Royalties
- Prevailing Coal Property Sales and Lease Values
- Mining Conditions
- Transportation Considerations
- Environmental Impediments
- Level of regional activity
- Land Use Conflicts

Results of Proposed Method

- Uses all available data
- Easily updated, corrected, and improved
- Consistent with State GIS program
- Low reporting requirements
- Captures all value
- Results in equitable appraisals

Proposed Method Significantly Superior to Current System

Mr. Jeffrey R. Kern

Data and Procedures

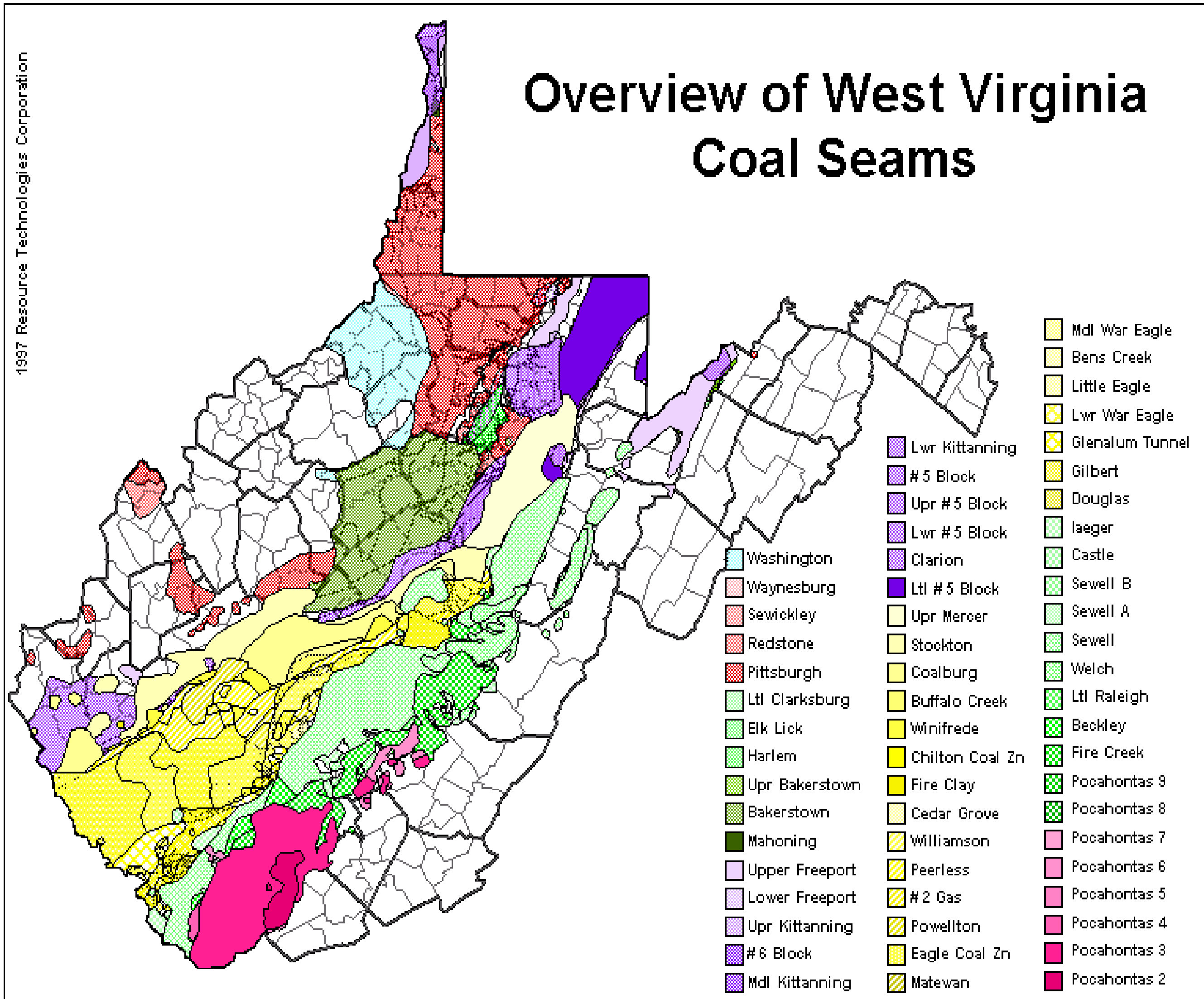
Goals for Assessment Process

- Equity
- Efficiency
- Representative of Actual Market Value
- Market Responsive

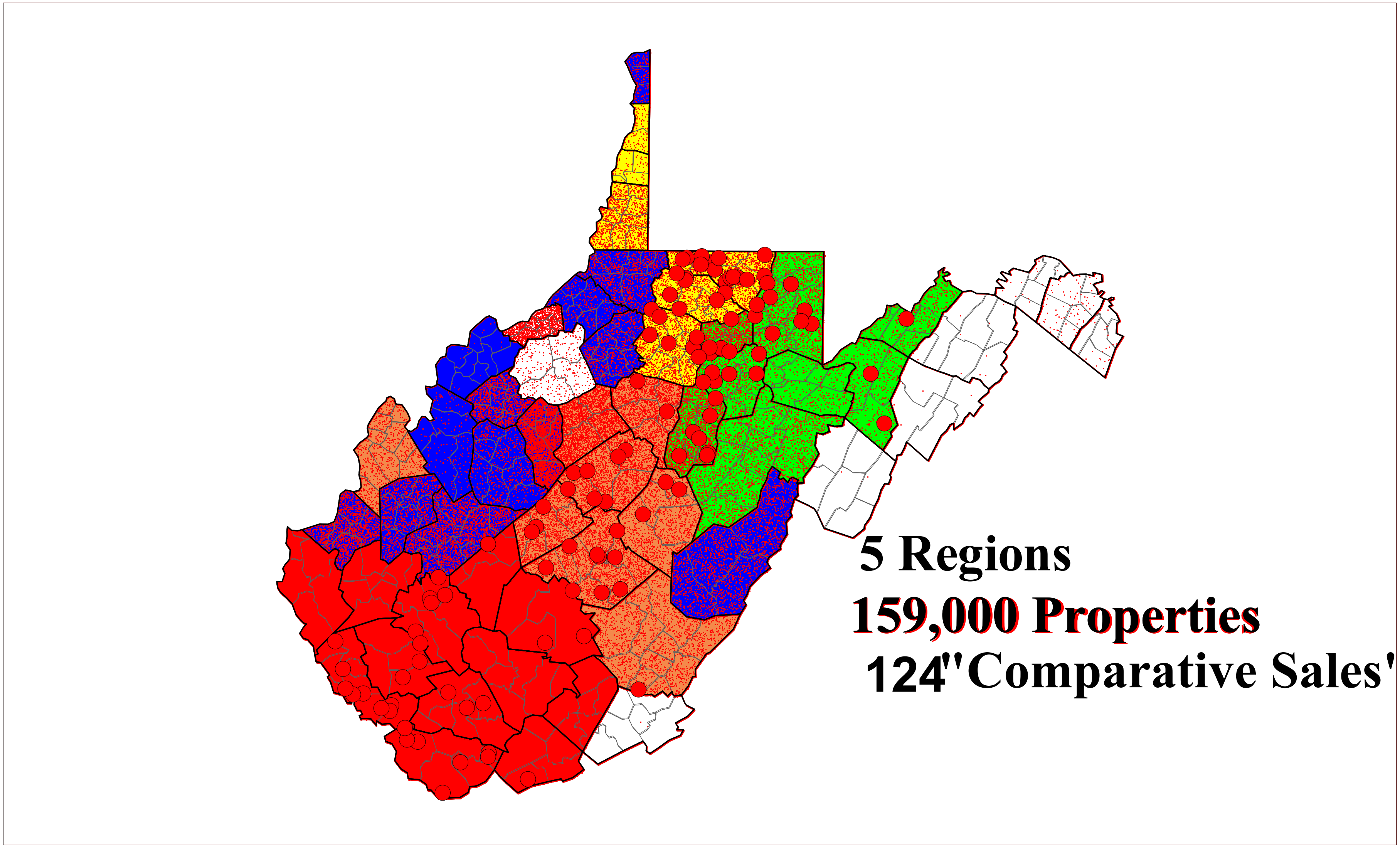
Taxation Environment

- Comprised of Over 159,000 Properties
- Involving 60 + Seams of Coal
- Serving Multiple Dynamic Markets
- Included in Several Production Transportation Regions
- Comprised of over 200 years of supply
- Characterized by incomplete records and mapping

Overview of West Virginia Coal Seams



Appraisal Problem



Shortcomings of Current Procedures

- Small number of coal sales can not reflect the diverse characteristics of all properties
- Sales include many non-coal attributes
- Coal not usually sold by the acre
- Most coal transactions involve leases

Alternatives Available

- Current Procedures
- Fee Appraisal
- Mass Appraisal

Current Procedures

- Inexpensive: To administer, no new effort required
- Not equitable: Does not discriminate among coals or properties
- Not defensible: Continual challenges based on fairness and accuracy
- At Risk: Depending upon Court Outcome

Fee Appraisal

- Accurate: uses actual site and market data for each property
- Would be time Consuming: 159,000+ properties
- Would be expensive: $ millions
- Would require precise estimates of when coal will be mined
- Would require large amount of site-specific data

Fee Appraisal

It is not possible to complete a useful fee appraisal of 159,000 properties over next 200 years:

- **Not possible to estimate time of mining for 159,000 properties**
- **Not possible to be precise for 159,000 properties**

Mass Appraisal

- Relatively inexpensive
- Uses public data to indicate relative value
- Handles all properties by same procedure
- Provides for annual updates
- Is self-correcting

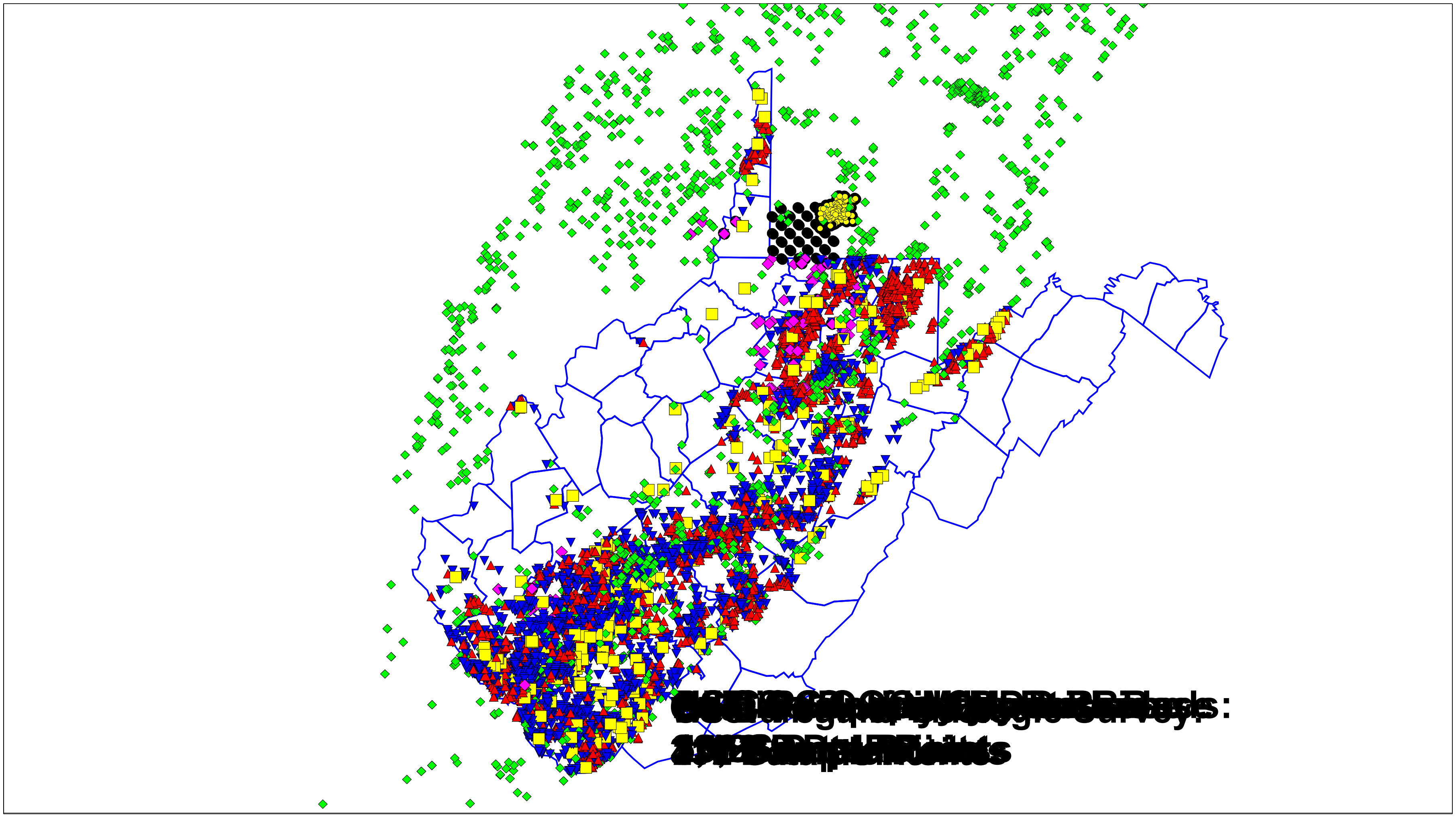
Mass Appraisal

- Entirely possible to do a mass appraisal for 159,000 properties
- Consistent with the way all other properties are appraised for tax purposes in West Virginia

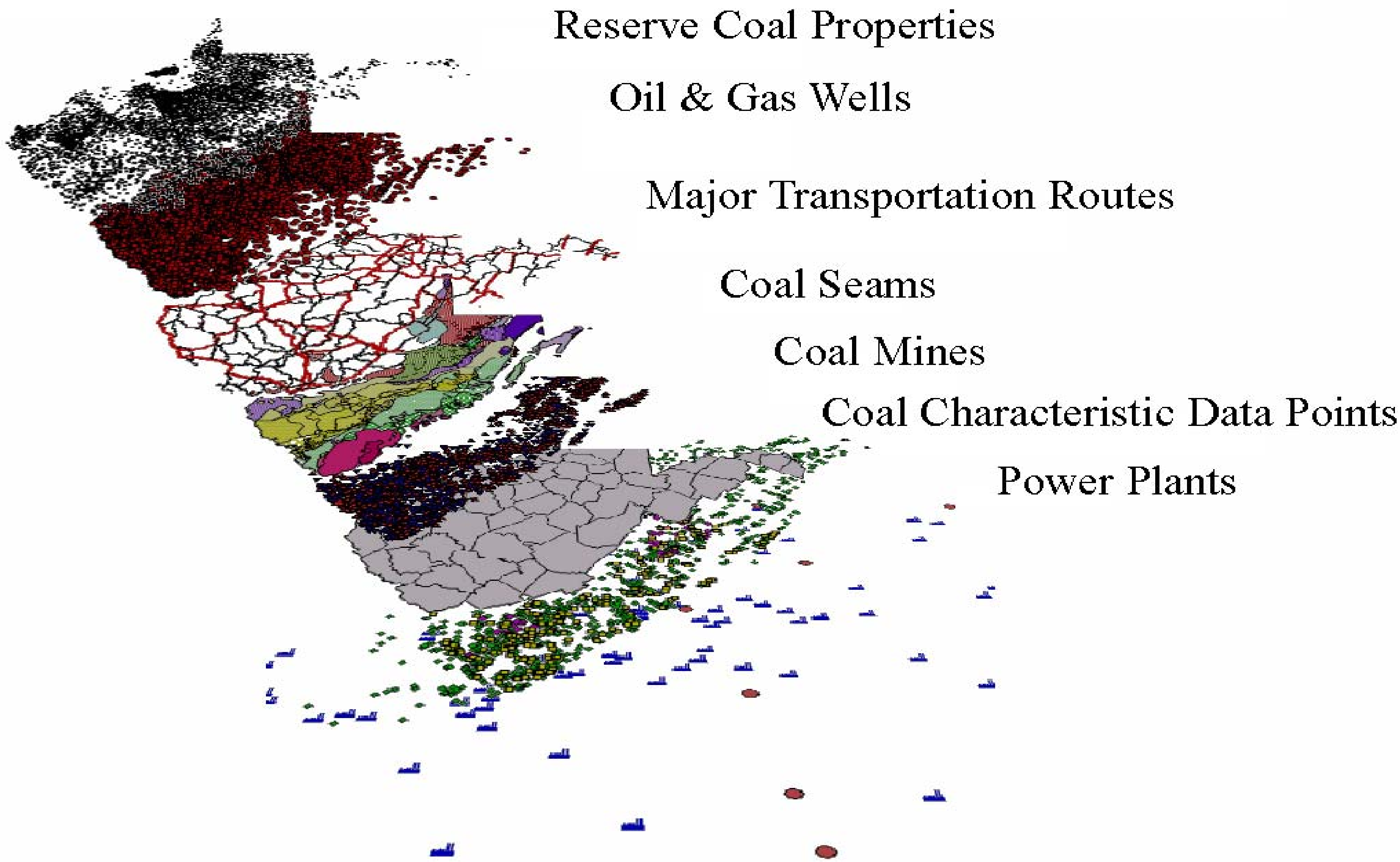
Value Indicators Used to Estimate Relative Value of Coal

- Coal Characteristics (Quality & Quantity)
- Lease Rates & Property Sales: by seam and location
- Coal prices: price by mm Btu FOB to power plants
- Mineability: nearby mining of same seam
- Environmental Impediments
- Marketability: history of delivery of this coal to market from this geographic area
- Use Conflicts: Gas wells, urban land use, etc...

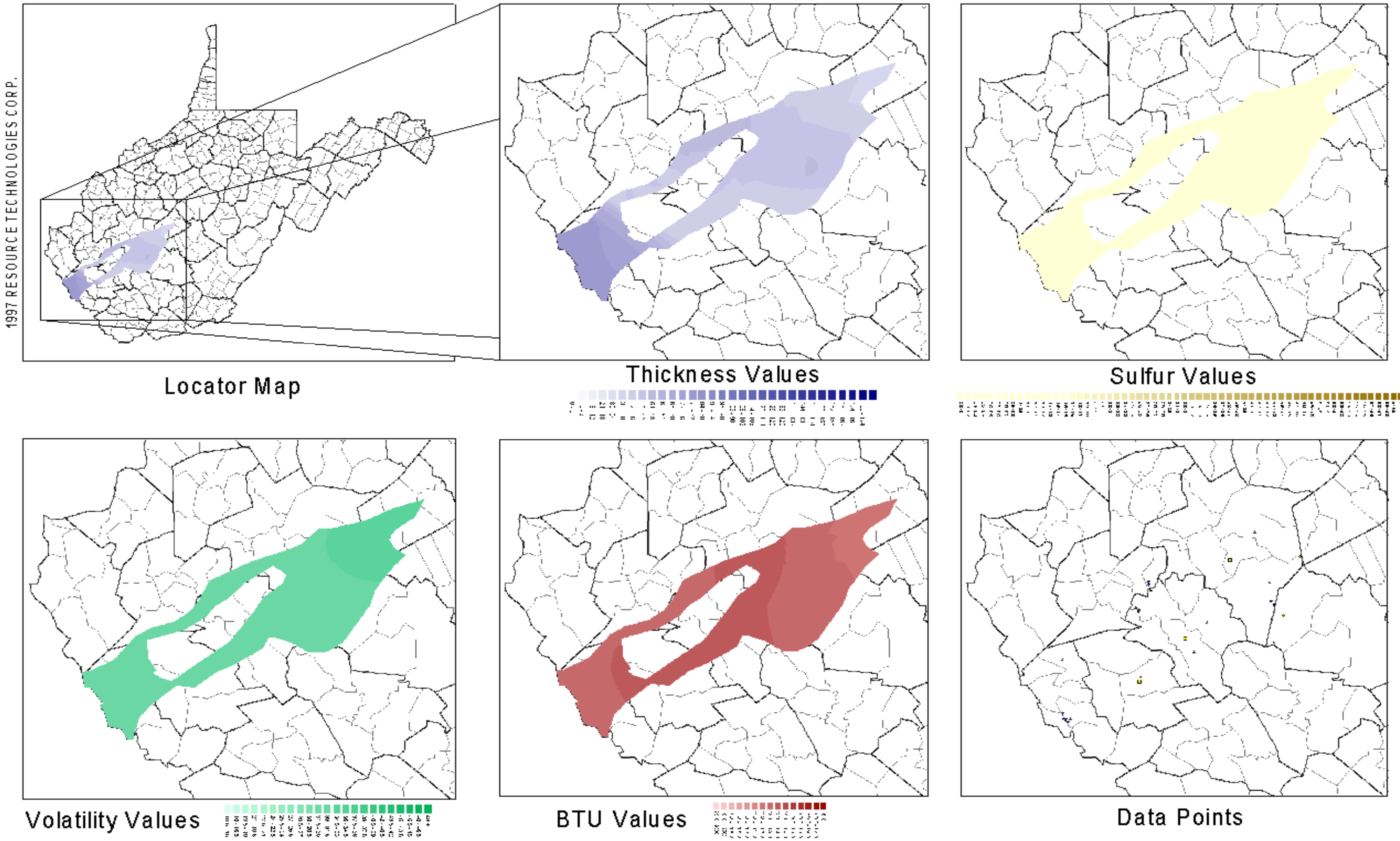
Coal Characteristics Data Base



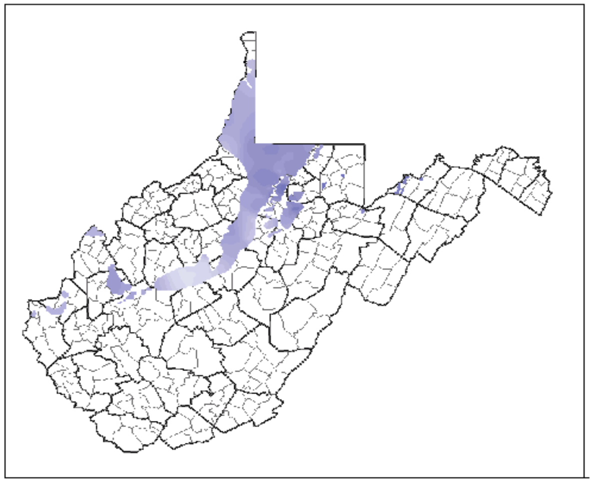
Data Layers Used For Valuation Model



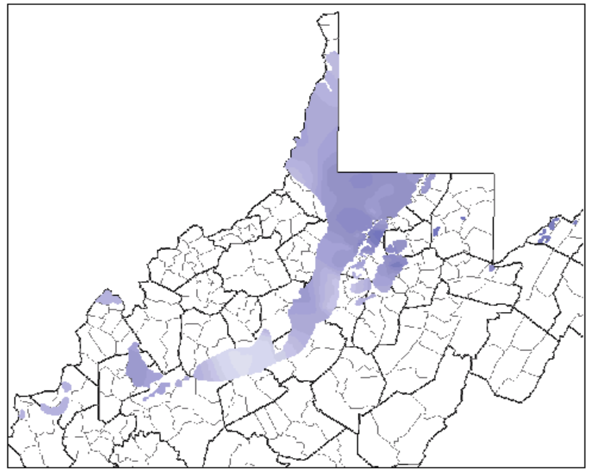
Upper Number Five Block Seam



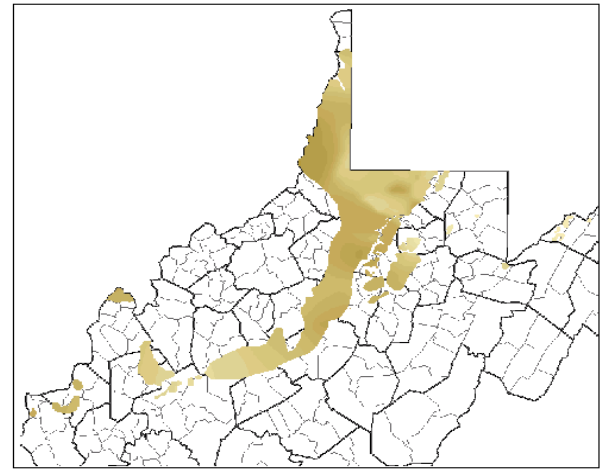
Pittsburgh Seam



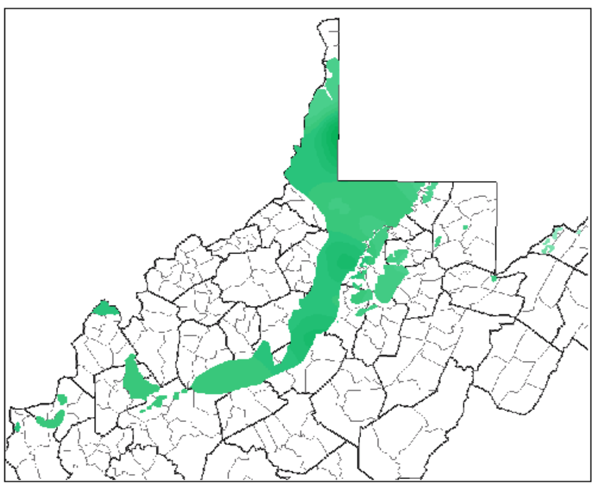
Locator Map



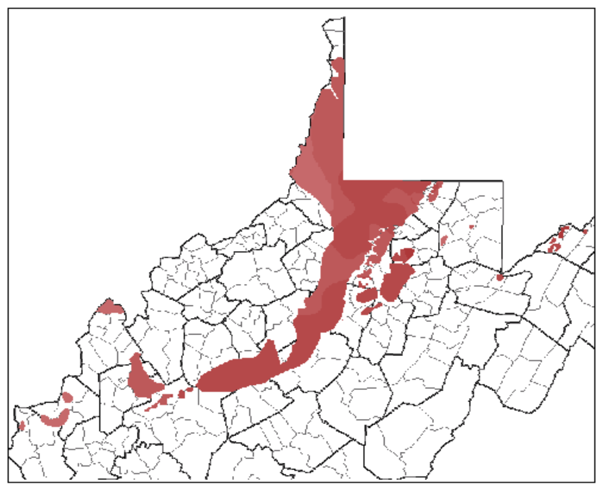
Thickness Values



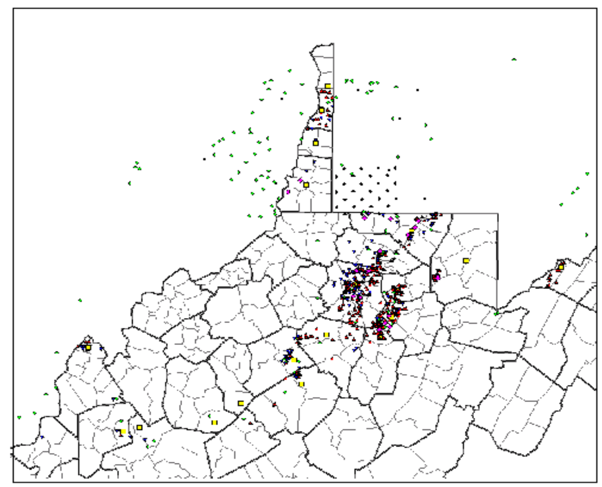
Sulfur Values



Volatility Values

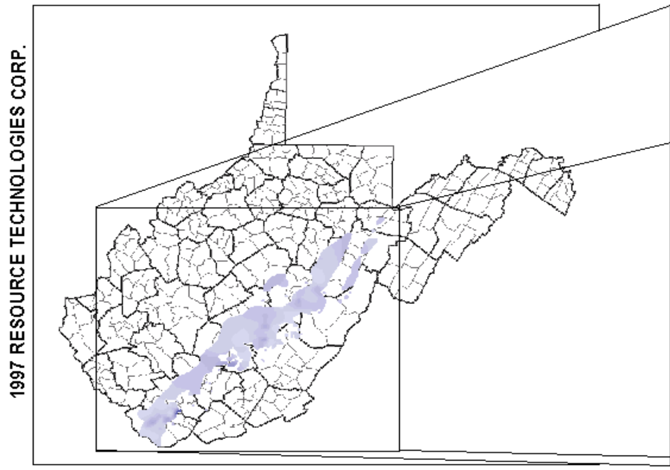


BTU Values

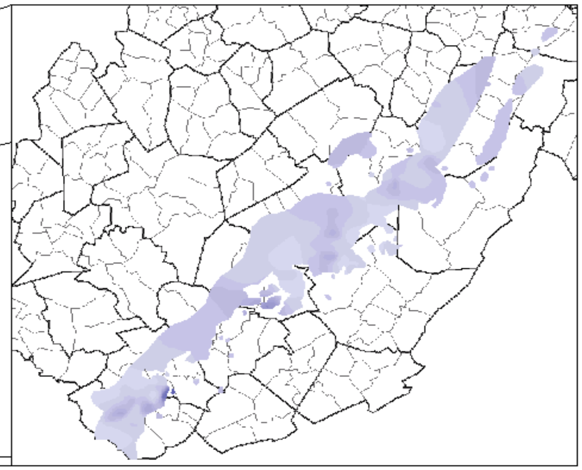


Data Points

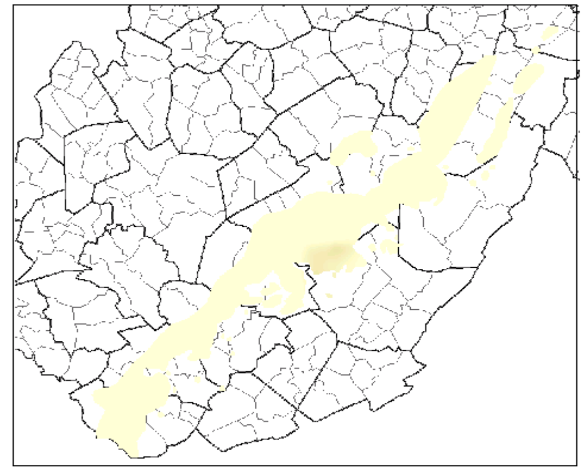
Sewell Seam



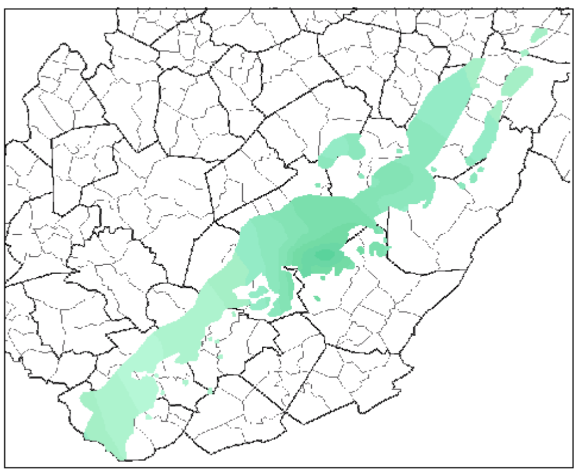
Locator Map



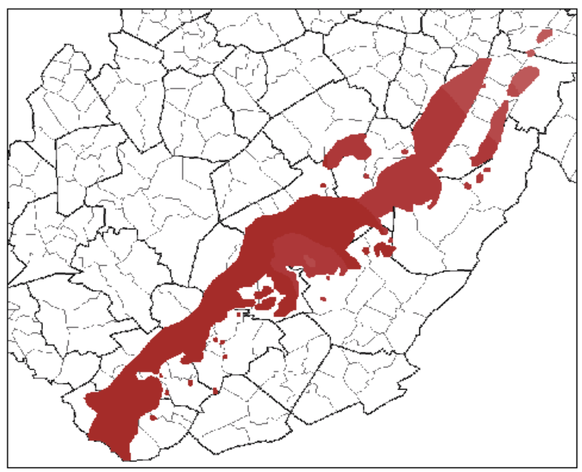
Thickness Values



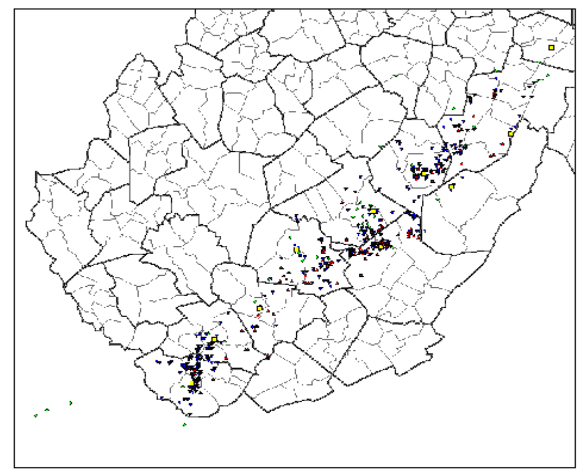
Sulfur Values



Volatility Values

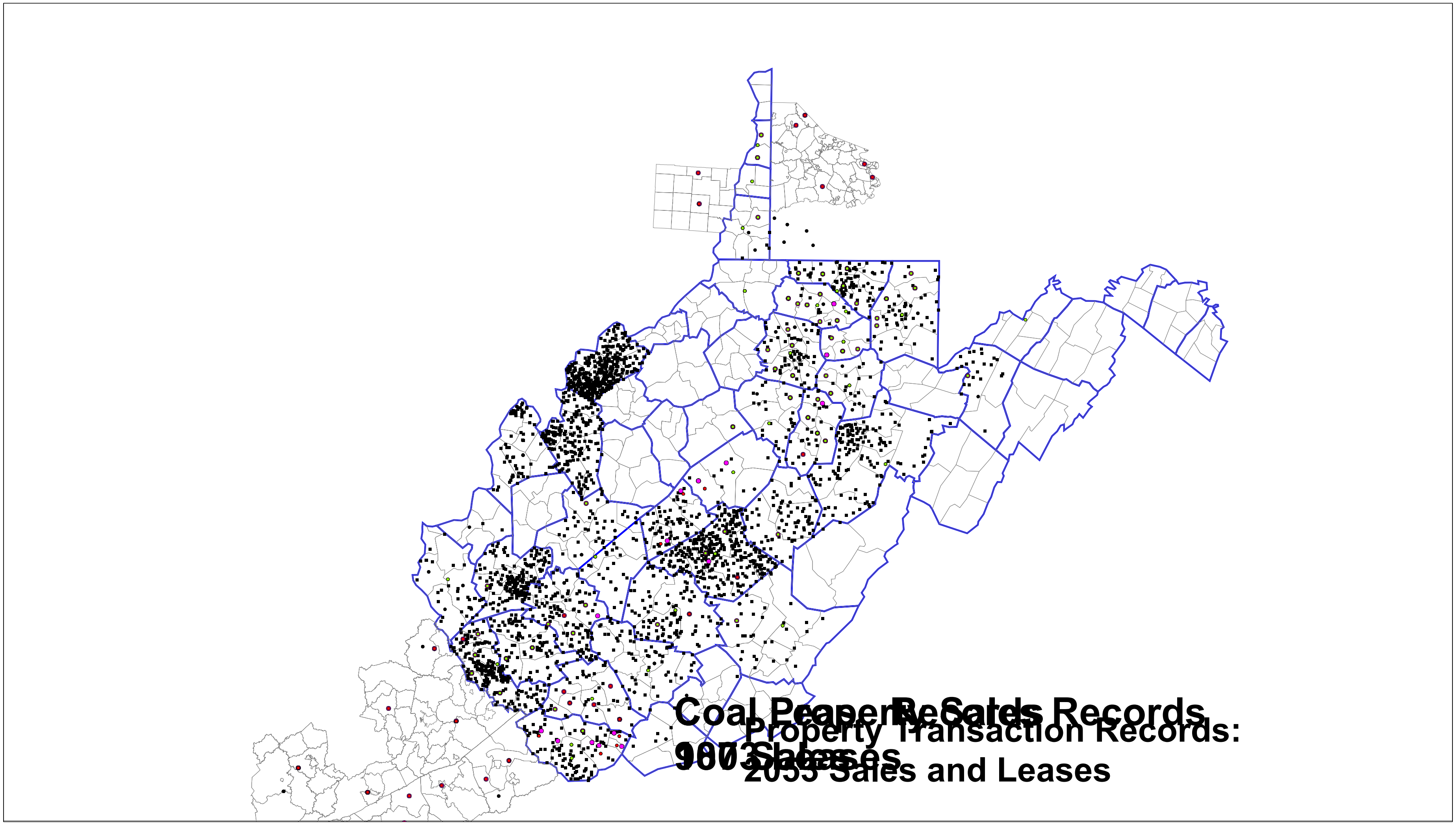


BTU Values

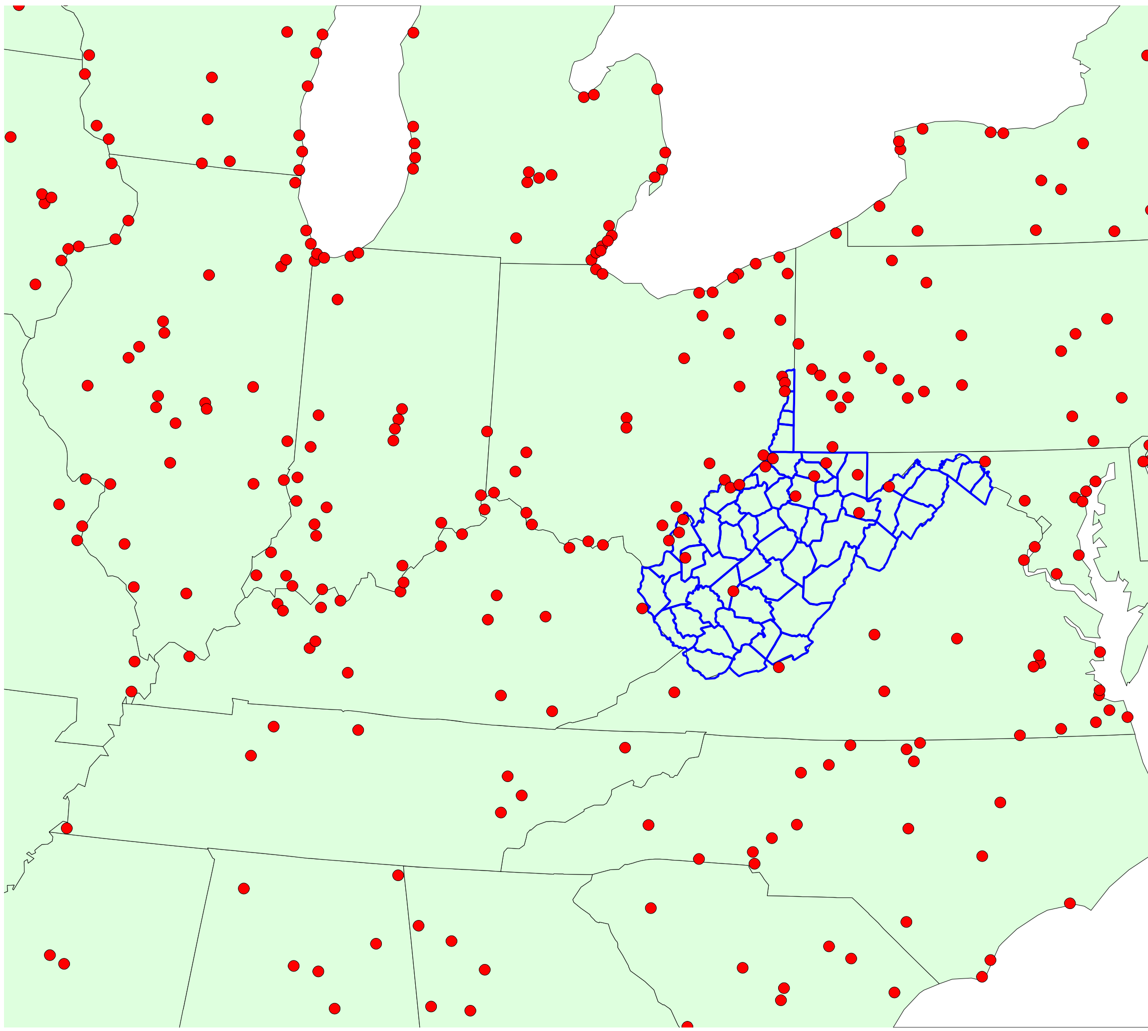


Data Points

Sale and Lease Data Base



Coal Prices
FOB Steam Power Plant Sales
Mine Source, Seam, & Shipping Information

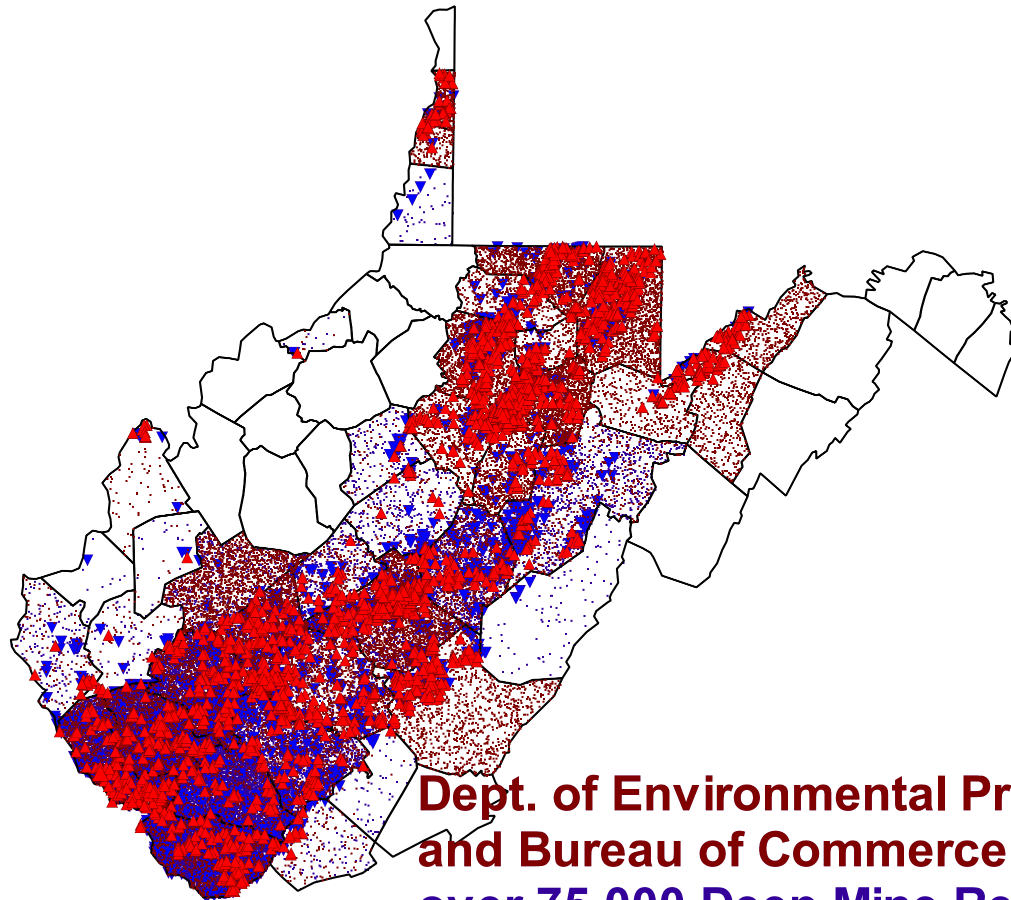


Data Sources:

Public Service Commission
-- over 15,000 records

US Department of Energy
-- over 65,000 records

Historical Mine Data



Dept. of Environmental Protection and Bureau of Commerce

over 75,000 Deep Mine Records

over 25,000 Surface Mine Records

Identified Value Indicators

General Coal Characteristics	Quality and Thickness	10,900 observations
Lease Rates	Location and/or Seam	1,100 observations
Coal Property Sales	Location and/or Seam	1,000 observations
Historic Mining Records	Location and/or Seam	80,000 observations

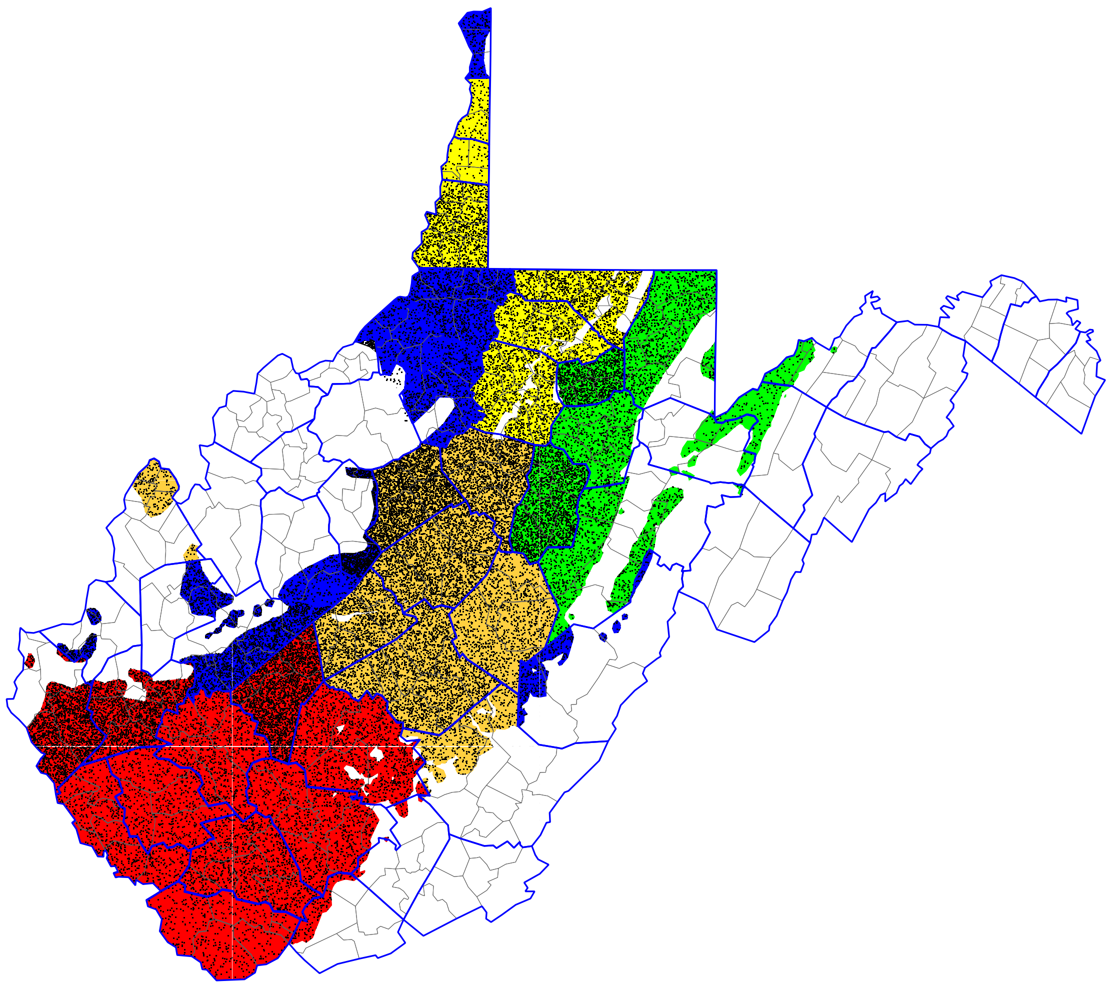
Identified Value Indicators

• Remaining reserves	• Seam Location	• 80,000 observations
• Potential Mining Impediments	• Over Under Mining	• 80,000 observations
• Use Conflicts	• Gas Wells, Urban Development	• 160,000 observations
• Transport Availability	• Transport Maps, Shipping Patterns, Costs	• 100,000 observations

Identified Value Indicators

• Coal Pricing	• FOB coal Sales, Mine, Seam, Location, Destination	• 100,000 observations
• Current Mining	• Seam, Location, Inspection	• 800 observations
• Total Observations		• 613,800 observations

Result:
5 Values Become 159,000 values



Conclusion

- Mass Appraisal Process
  - Is Better
  - Is Much Better
  - Is a good sound method
  - Is the only viable alternative
- Current Method
  - Doesn’t Work

Alternatives and Consequences

- Do Nothing
  - Continues present process
  - Continued inequities
  - Continued lawsuit
  - Compromise defensibility
- Adopt Proposed Method
  - Minimize Legal Challenge to methodology
  - Increased equity
  - Guarantees that assets are fully valued
  - Enhances defensibility
- Devise another method
  - Requires more time and cost
  - Results in doing nothing for some time period

Questions and Answers

RESOURCE TECHNOLOGIES CORPORATION
248 E Calder Way, Suite 305, State College, PA 16801 814-237-4009 f: 237-1769
PO Box 242, State College, PA 16804 www.resourcetec.com

Development of Revised Procedures for the Assessment of Active and Idle Coal in [redacted]

Jeffrey R. Kern, ASA
Resource Technologies Corporation
Post Office Box 242
State College, Pennsylvania 16804

Letter of Transmittal

January 23, 2017

[redacted]

Ms. [redacted]:

Resource Technologies Corporation (RTC) has been engaged by the [redacted] to review the procedures that [redacted] uses in the development of the property tax assessed values for "idle coal". RTC's report concerning the assessment of active and idle coal reserves in the [redacted] of [redacted] is attached to this letter.

Our research shows that Eastern and Western Coals represent two separate coal regions based on distinct geology and topography, previous mining amounts and patterns, and market. Therefore, RTC recommends that the assessment procedures reflect the differences.

The system used by the [redacted] is based on the income approach to value, wherein the taxable value of the coal reserves is based on the estimated present worth of an expected future royalty-based income stream. This procedure, in one form or another, is used by other states, mining companies, and banks and is the basis of most texts concerning the valuation of mineral deposits. Therefore, RTC is not recommending a wholesale change in procedures.

The income approach is intended to be market responsive, based on current prices, up-to-date financial information, and contemporaneous production data. When the [redacted] system was developed, much of this data was only readily available from annual reports and the energy and financial markets were much less volatile than today. The basis for the currently used discount rates, as applied to both active and idle coal, is:

- Out-of-date – the market has significantly changed since the early 2000's.
- Not based on market factors related to the two distinct coal markets.

For the current year, RTC recommends to apply the following discount rates in the calculation of the present value of both active and idle coals, hese values should be updated annually:

- Western Coal: 12.88%
- Eastern Coal: 19.72%

Additionally, the categorization of coal into three active categories and one idle category is also out-of-date and does not reflect the current coal situation. Active coal represents property with significant investment and that generates cash flow. The research shows that active coal currently encompasses eight years or less of the coal inventory in the western mining region and six years or less of coal inventory in the eastern mining region. The balance of the coal should be assessed as idle, mined out, or unmineable.

Using the data presently maintained by the [redacted] RTC recommends the following factors when calculating values in 2017:

- Western Coal:
  - Active Coal 1 year group: 0.941221 mid-period (.5)
  - Active Coal 2 to 8 years: 0.545651 mid-period (5th year)
  - Idle Coal 9+ years: 0.000254 at 60th year

- Eastern Coal:
  - Active Coal 1 year group: 0.913938 mid-period (.5)
  - Active Coal 2 to 6 years: 0.486780 mid-period (4th year)
  - Idle Coal 7+ years: 0.000697 at 46th year

In order to stay market-responsive, the [redacted] should update these factors periodically, if not yearly. Should you have any questions, please contact me at your convenience.

Sincerely,

Jeffrey R. Kern, ASA, CMA, MRICS
President, Senior Appraiser [redacted])
Resource Technologies Corporation

Table of Contents

1.0 Current Coal Assessment System

The [redacted] uses a modified form of the income approach to value idle coal lands. The procedure for idle coal assessment follows a similar form as used for assessing the value of actively mined property, albeit with a longer delay time.

The current assessment process is based on the assumption that the previous year's production will remain relatively constant into the future, and on sum of the mineable acreage reported by mine operators. In short, mining will continue with coal that is classified as actively mineable (permitted) at a constant rate. The coal areas currently are grouped as:

- One Year Coal Acreage: the acreage representing approximately one year of production (current mining);
- Two to Five-Year Acreage: the area included in the currently permitted acreage that will likely be mined beyond the current year and within the next five years; and
- Six to Fifteen-Year Coals: the acreage of permitted coal that will not be mined for at least 6 years and is likely to be mined or depleted within 15 years.

The [redacted] uses independent data and a geographic information system to audit or verify the acreage of coal considered to be potentially mineable.

Other coal areas are currently classified as follows:

- Coal acreage that is judged to be mineable but is not permitted or within the 15-year active coal time frame which is classified as idle coal;
- Coal acreage judged to be not mineable for various reasons and is therefore classified as unmineable; and
- Mined-out coals that form a final classification.

Coal value is determined by discounting an estimated future royalty for the number of years in each category (Active 1, Active 2-5, Active 6-15, and Idle). In order to be market-responsive, the coal royalty rates and coal prices are developed annually by a Kentucky-wide analysis of reported sales and leases. Based on the same rationale, the discount rate would be calculated annually; however, the following discount rates were used over the last ten years:

- For Active Coal (less than 15 years), the [redacted] has chosen to rely on the discount rate developed annually by the state of West Virginia;
- For Idle Coal (more than 15 years), the [redacted] has consistently used 17.5% as the discount rate.

For the property tax assessment effort, the [redacted] only assesses the real estate value of yet unmined coal and not the business value of operating mines. Much of the coal is mined by operators who do not own the coal but rather lease the coal from property owners. There is a lively market for coal leases, and the [redacted] has access to the leases or royalty rates. These royalties, therefore, provide the coal owner with a market basis to approximate the value of coal in-place before it is mined. The coal tax assessment procedures are based on calculating the present worth of expected future royalties that can be attributed to probable/predictable future mining. This is accomplished by discounting the expected future royalty to a present worth or value.

In short, the procedure requires knowledge of royalty rates, identification of an appropriate discount rate, and the determination of the likely time of mining. The [redacted] has access to all of this information that is necessary to complete this task.

The discounting procedures are straightforward and are based on the formula: 1/((1+i)^n), where “i” is the discount rate and “n” is the number of years. Instead of waiting to be paid when the coal is mined in the future, the coal owner would likely take less to be paid in advance, i.e. this year. Sixty dollars per ton of coal paying a 5% royalty rate would yield the coal owner $3.00 at the time it is mined. Using the one year 17.5% discount factor, the owner would be willing to accept $2.55 today for coal to be mined next year: 1/((1+0.175)^15)) = 0.089009; 0.89009 * $3.00 = $0.27. Like most operators and investors, the [redacted]’s assessment procedures use ths formula to estimate the present value of coal in-place, coal yet to be mined. **Exhibit 1.0-1** shows the Summary of Discount rates currently used.

Exhibit 1.0-1: Summary Of Discount Current Basis

Coal Type	Years of Tonnage Included	Discount Rate	Discounted at: (mid-point)
Active 1	1	West Virginia + 1	Year 0.5
Active 2-5	2-5	West Virginia + 1	Year 3.5
Active 6-15	6-15	West Virginia + 1	Year 10
Idle	Mineable past 15 years	17.5	Year 30

2.0 The Discount Rate

The discount rate is intended to account for 1) the loss of liquidity investing in something that cannot be instantly converted to money, 2) the loss of opportunity in investing in something else, as well as 3) the risk associated with the specific investment.

For tax assessment purposes, the discount rate should be market-responsive, estimated annually, and based on industry and region specific information. For commercial real estate evaluators and appraisers, there are numerous "cap-rate" studies published monthly by reputable analytical services. These studies produce periodic reports concerning vacancy, absorption, capitalization, discount, and rent rates. They are generally categorized by region and property type (e.g. commercial, residential, industrial, etc.). Appraisers use these statistics to provide a comparative basis for calculating the present value of the expected future income from a subject asset that is similar to the properties surveyed.

A number of states publish annual guides of discount rates for mineral properties, e.g. New York, Utah, Texas, and West Virginia. Each uses a similar method to build-up a mineral or industry-specific weighted average cost of capital (WACC). Many mineral industry appraisers research these annually, in fact, [redacted] has consistently relied on the annual West Virginia calculations in assessing active coal (likely to be mined within 15 years or less and permitted). Unfortunately, there are no publications concerning coal mining in [redacted].

The evaluator or appraiser faced with no ready source of reliable published rates applicable to the specific industry, asset, company, or market being examined must develop a rate for comparative information. One method is to build up a rate based on an estimated weighted cost of capital that is related to the subject industry and market. The weighted average cost of capital (WACC) is a statistic that looks to what an industry must pay to borrow money and what an industry must offer in return for equity investment. Obviously, these rates change from time to time and from industry segment to industry segment.

Short-term U.S. Treasury bonds, for example, have very low yields: they do not tie up money for long periods of time, are easily convertible into cash, and are essentially risk free (the U.S. has never defaulted on it's bonds). Longer-term U.S. Treasury bonds yield higher rates while they are still virtually risk free and easily converted into cash; however, they do tie up funds until the bond matures – 5, 10, 20, or 30 years. The higher rates reflect the loss of liquidity and the risk of inflation eroding value. Other bonds, such as industrial bonds, are graded on the actual or perceived risk of the firms ability to repay the loan during the time period specified. These bonds may have rates more than 5%, some as high as 10% or even 20%, depending on the buyers' perception of the risk and the duration of the bond.

The discount rate is a tool that allows the evaluator or appraiser to assess market expectations of investing in assets that are intended to produce a future income. The more risky the outcome of the investment, the higher the discount rate; the longer the investor must wait for repayment and profit, the higher the discount rate. In appraisals, the discount rate is generally developed by looking at alternative investment patterns – seeking to ascertain what the market demands, what return is necessary to attract investors. In short, the rate reflects the "opportunity cost", the cost of giving up the ability of investing in other opportunities.

Equity investments in companies generally require higher returns than that expected from the bond market. Here, the investor becomes an owner of a share of the company, therefore, obtaining stock in the company. Generally, in bankruptcies, the creditors get paid first and the owners get paid last. Many equity investments are long-term, with little or no return or growth in the initial period, and then with luck and skill, the investor receives higher rewards as the company or the industry grows and becomes successful. Of course, the business may fail, the industry may go into decline, or there may be a general market downturn. Given these risks, investors in industries demand higher returns–the riskier the business, the higher the return required to attract investments.

The WACC for the [redacted] Idle Coal tax assessment should consist of the following considerations:

- Expected inflation rate:
  - Sources for this information include:
    - Bureau of Labor Statistics
      - http://www.usinflationcalculator.com/
      - https://www.bls.gov/cpi/
    - Subscription Services: http://www.duffandphelps.com/
    - Federal economic reserve data: https://fred.stlouisfed.org/
  - RTC estimates expected inflation by contrasting yields on various U.S. Treasury Bonds – short term vs. long term and inflation protected vs. open yield bonds.

- Safe rate: the rate at which money can be invested at little or no risk
  - Sources for this information can be obtained from various sources including:
    - Subscription Services such as:
      - Standard and Poors: https://www.standardandpoors.com/
      - Duff and Phelps: http://www.duffandphelps.com/
    - New York University, Stern School of Business http://pages.stern.nyu.edu/~adamodar/

- Proportion of industry funded by equity as compared to debt. As above, this information can be obtained by using reporting services such as:
  - Standard and Poors
  - Duff and Phelps
  - NYU Stern School of Business.

- Historic or typical premiums paid to equity investors over the safe rate to account for risk. As above, this information can also be obtained by using reporting services such as:
  - Standard and Poors
  - Duff and Phelps
  - NYU Stern School of Business.

- Specific industry-based risk adjustments:
  - Coal mining
  - Steel manufacture – related to coal demand and prices
  - This information can also be obtained by using reporting services such as:
    - Standard and Poors
    - Duff and Phelps
    - NYU Stern School of Business.

- Risk related company/operation size – smaller operations are generally more risky and thus command a higher equity premium; Duff and Phelps published annual studies showing relationships to firm size and investment risk.

- Tax rates to adjust for cost of debt.

- Debt or bond rates for the same or similar industries in similar situations. These rates can be found at various sites including The Wall Street Journal: *http://online.wsj.com/mdc/public/page/2_3022-bondbnchmrk.html*

3.0 [redacted] Coal Regions

There are two coal regions in [redacted] simply known as Eastern [redacted] and Western [redacted] (**Exhibit 3.0-1**). The [redacted], the industry, and the Federal Energy Information Administration (EIA) view these as two distinctly separate markets. It is appropriate to treat them separately for tax assessment purposes. To develop market-responsive annual discount rates that can be applied to the assessment of idle coal in [redacted], the [redacted] has to look at the unique [redacted] markets.

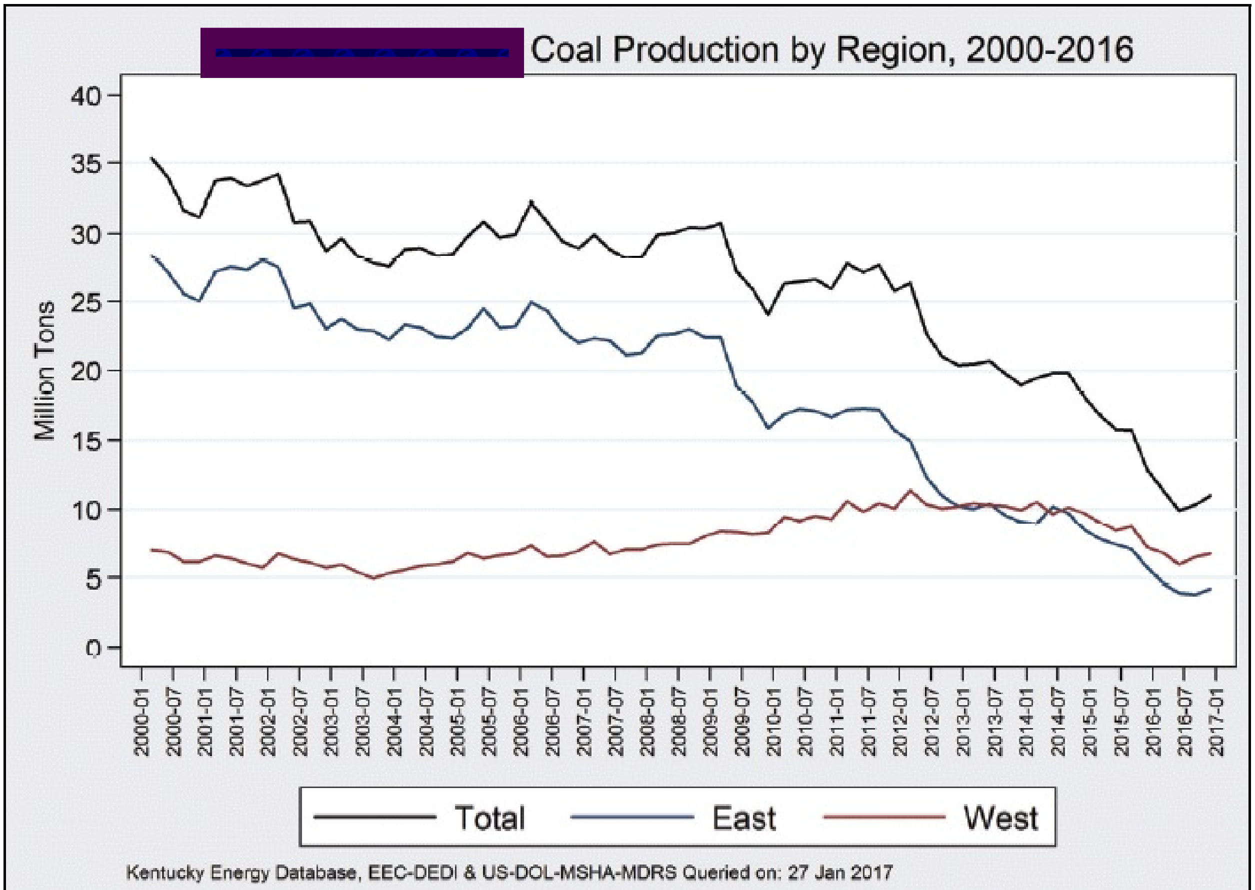


Exhibit 3.0-1: Production in Western and Eastern [redacted]

- [redacted] is part of the [redacted] Basin Coal Region ([redacted]):
  - Consisting of a few large operations
    - 2010: 25 reporting mines producing an average of 1,475,000 tons
    - 2015: 18 reporting mines producing an average of 1,860,000 tons.
  - Most production relies on underground mining.
  - Producing more than 3,500 tons per acre classified as active acreage.
  - Market is mostly thermal (steam - electric power generation) coal.
  - Significant deposits of coal suitable for the domestic thermal coal market remain. Geologically, the western coal is amenable to efficient

large scale underground mining technology. It is well located to meet electric utility demands.

- Eastern [redacted] is part of the Central [redacted] Coal Region ([redacted])
  - Consisting of many small operations
    - 2010: 486 reporting mines producing an average of 140,000 tons
    - 2015: 263 reporting mines producing an average of 106,000 tons.
  - Nearly equally divided between underground and surface mining.
  - Producing less than 2,000 tons per acre classified as active acreage.
  - Markets include both thermal (steam - electric power generation) and metallurgical coal. Considered superior quality coal (relatively low sulfur, high btu, high carbon).
  - Much of the easier to exploit coal has been depleted over the last 150 years. The remaining coal consists of high quality coal but is expensive to mine and process and is mined by small operators. Coal demand must command relatively high prices to make mining in eastern [redacted] profitable. The metallurgical portion of the market responds to an international market whereas the thermal coal responds to a domestic market. Both markets are highly competitive.

4.0 Western [redacted]

4.1 Review and Development of Active and Idle Classifications for Western Coal

As discussed previously, factors necessary for the calculation of the present value of the future income are royalty (price times rate), time of mining, and discount rate:

- The [redacted] uses current prices and its County-based royalty rate survey to establish current royalty values. For the [redacted]s tax calculations, these values are held constant – no inflation is applied to estimate future royalty amounts
- The time of mining is established as the midpoint of each classification
- The [redacted] has consistently used the following discount rates:
  - Idle coal classification has here-to-for been a constant 17.5%
  - Active coal has been 1% plus the discount rate used in West Virginia.

Exhibit 4.1-1 shows the recent pattern of coal acreage classification used by the [redacted]:

Exhibit 4.1-1: Coal Acreage Classification: Western [redacted]

Tax Year	1 Year	2 - 5 Years	6 - 15 Years	Idle	Mined Previous Year	Unmineable
2010	9,815	36,982	40,229	846,819	7,478	8,396,143
2011	11,288	37,753	55827	838094	8,818	7,184,283
2012	12,993	47,791	39037	827564	10,074	8,403,511
2013	11,036	36,998	27395	822588	10,009	8,432,742
2014	10,634	35,539	36,534	808,365	9,145	8,441,719
2015	9,778	30,011	28267	789093	8,078	8,475,148

Exhibit 4.1-2 shows the number of mines, the tons, and acres actually mined, as well as the average tons mined per acre and by mine operation.

Exhibit 4.1-2: Mining Activity: Western [redacted]

Tax Year	Active Mines	Underground	Surface	All	Acres Mined	Tons per Acre Mined	Tons per Mine
2010	25	29,605,000	7,293,000	36,898,000	8,818	4,184	1,475,920
2011	25	31,903,000	8,933,000	40,836,000	10,074	4,054	1,633,440
2012	24	34,091,410	7,951,938	42,043,348	10,009	4,201	1,751,806
2013	22	35,047,090	5,831,877	40,878,967	9,145	4,470	1,858,135
2014	18	34,393,332	5,575,698	39,969,030	8,078	4,948	2,220,502
2015	18	28,780,419	4,643,583	33,424,002		4,371	1,856,889

Tons per acre mined for the current year is the average of the previous five years.

This acreage is converted to tonnage for each classification based on each year's production in **Exhibit 4.1-3** below:

Exhibit 4.1-3: Annual Tonnage Projected into Tax Classifications							
Tax Year	**1 year**	**2-5 year**	**6-15 year**	**Active Years**	**Idle**	**Idle Years**	**Idle Mid Year**
2010	36,898,000	154,747,316	168,334,049	9.76	3,543,425,659	96.03	57.77
2011	40,836,000	153,035,687	226,300,513	10.29	3,397,300,634	83.19	51.89
2012	42,043,348	200,748,691	163,977,038	9.68	3,476,227,520	82.68	51.02
2013	40,878,967	165,384,365	122,458,097	8.04	3,677,041,849	89.95	53.02
2014	39,969,030	175,842,951	180,766,098	9.92	3,999,698,556	100.07	59.96
2015	33,424,002	131,187,261	123,563,703	8.62	3,449,366,868	103.20	60.22

As shown above in **Exhibit 4.1-3**, the midpoint of the years of coal included in the idle tax assessment category can be calculated by diving the idle years by 2 and adding it to the total years included in the active classifications, e.g. (103.2 / 8.62) + 9= 60.22. In short, this means that in the western region, given current production and based on the [redacted]'s research and accepted classification (mineable v. unmineable) system, the midpoint of the coal classified as idle is 60 years from "today". Using the present worth formula, the "n" for idle for this year would be 60. The [redacted] currently uses a timing factor of 30 for western coal. The 30-year factor was set more than 10 years ago.

Coal considered to be active is coal where some investment has been undertaken to create a mine block, produce engineered plans, obtain a permit, and develop entries and transportation systems. In short, active coal is part of a cash generating mine operation. The statistical review shows that, at least since 2010, less than ten years of coal has been included in actively permitted and mined coal operations in the Western Coal Fields. As shown in **Exhibit 4.1-4**, the amount of coal as measured in years, actively pursued by the industry has declined to 8.62 years in 2015

Given these factors, the [redacted] could reconsider the classification system. The system could be stream-lined to three groups:

- Active:
  - 1- year, with 0.5 being the mid point for discounting value
  - 2 - 8 years, with 5 being the mid point for discounting values
- Idle, and based on the current market, with 60 representing the mid-point.

Ultimately, to be market-responsive, the [redacted] should recalculate these mid-points every five years. As the coal market improves, the industry may choose to move additional coal into the active acreage and, if the industry continues to decline, more coal may be left fallow and be correctly classified as idle. A five-year review should allow the [redacted] to keep abreast of these factors.

Coal operators and owners have suggested that the use of previous calendar-year data tends to make the model less responsive in a volatile market. The [redacted] publishes quarterly coal reports. The quarterly data included in the coal reports can be used to create more contemporary "annualized" information by summing 4th quarter for the previous year to the immediate three quarters from the current year (**Exhibit 4.1-5).**

Exhibit 4.1-5

Date		[redacted]				[redacted]			
		Average Employment		Tons of Coal Produced		Average Employment		Tons of Coal Produced	
		Quarter	Annual	Quarter	Annual	Quarter	Annual	Quarter	Annual
2008 -2009	Q4	19,030	18,539	30,477,960	114,531,790	3,610	3,772	7,974,371	32,701,698
	Q1	19,422		30,809,810		3,754		8,332,597	
	Q2	18,630		27,264,780		3,928		8,266,060	
	Q3	17,075		25,979,240		3,797		8,128,670	
2009 -2010	Q4	16,380	16,873	24,127,190	103,624,950	3,651	4,000	8,224,772	36,311,413
	Q1	16,378		26,304,890		3,974		9,421,068	
	Q2	17,217		26,510,520		4,166		9,171,091	
	Q3	17,517		26,682,350		4,209		9,494,482	
2010 -2011	Q4	17,796	18,120	25,972,700	108,888,030	4,312	4,418	9,244,791	40,151,844
	Q1	17,684		27,889,220		4,353		10,606,360	
	Q2	18,191		27,222,030		4,496		9,836,813	
	Q3	18,810		27,804,080		4,509		10,463,880	
2011 -2012	Q4	18,087	16,676	26,047,990	96,717,050	4,506	4,574	10,103,710	41,937,910
	Q1	17,932		26,571,280		4,729		11,399,530	
	Q2	16,278		22,924,670		4,547		10,356,000	
	Q3	14,406		21,173,110		4,514		10,078,670	
2012 -2013	Q4	14,107	13,190	20,555,240	81,775,580	4,543	4,407	10,212,120	41,155,680
	Q1	13,223		20,590,860		4,326		10,446,240	
	Q2	12,882		20,752,660		4,392		10,288,110	
	Q3	12,548		19,876,820		4,368		10,209,210	
2013 -2014	Q4	11,892	11,734	19,081,980	78,307,550	4,449	4,361	9,935,408	40,208,143
	Q1	11,790		19,494,440		4,424		10,524,930	
	Q2	11,574		19,864,630		4,127		9,624,035	
	Q3	11,681		19,866,500		4,442		10,123,770	
2014 -2015	Q4	11,619	10,213	18,204,500	66,534,830	4,433	3,873	9,696,298	35,948,735
	Q1	10,465		16,938,520		3,826		9,149,591	
	Q2	9,674		15,817,610		3,716		8,396,251	
	Q3	9,094		15,574,200		3,515		8,706,595	
2015 -2016	Q4	8,401	7,029	12,884,260	44,416,590	3,324	2,890	7,171,565	26,328,174
	Q1	6,941		11,397,478		2,932		6,763,269	
	Q2	6,519		9,913,978		2,701		5,933,430	
	Q3	6,254		10,220,874		2,601		6,459,910	

Active coal represents property for which significant investment has been made and which will likely generate cash flow. The research shows that surface mines tend to have approximately 3 to 5 years of coal under permit and deep mines tend to have 7 to 12 years of coal under permit. An 8-year mine life encompasses the average expected active acreage in the Western [redacted] region. Using time factors of 1 (1-year coal), 5 (2 to 8-year coal), and 56 (idle coal) will lower the overall value of all coal throughout the western region, while at the same time, maintain the value of coal expected to be mined within the next 8 years. Simply put, revising the time factors reflects the current mining and investment situation. These factors can be reviewed periodically.

4.2 Calculation of Discount Rate for the Current Tax Year for [redacted] Coal

As described above, the [redacted] currently uses the West Virginia discount rate plus 1 to calculate the present worth of the active coal properties and 17.5 to calculate the present worth of all idle reserves. Based on our discussions with Revenue Cabinet staff, members of the coal associations, and our research conducted, using West Virginia's rate plus 1 for active coal valuations and a constant 17.5 for idle coal valuations is not appropriate.

The [redacted] requires a method to develop appropriate discount rates annually. While there are many procedures available, it is recommended that the [redacted] use verifiable published sources to develop an annual build-up method for both Active and Idle Coal valuations. Further, the [redacted] should refrain from using projected price increases, royalty increases, growth rates, or inflation and use real value based-factors on the most current data collected.

Since the [redacted] looks at a universe of operations/owners and treats each of them the same, the build-up method of developing a discount rate is appropriate. The procedure involves determining the following from publicly traded companies and from published sources reporting market activity:

- The overall inflation rate is used to adjust the discount rate to a constant dollar amount.

- The proportion of the business sector is generally funded through equity /ownership with the remaining proportion funded through debt.

- For the equity portion:

    - A Risk-Free Rate: the rate that the public expects to get in return for an investment that has virtual guarantee of and on the investment
    - An Equity Risk Premium (ERP): the rate of return typically or historically expected over and above the risk-free rate for investment in equity in a business. This value is based on the overall market, such as the S & P 500 over a long time period
    - An Industry Sector Premium or adjustment: the quantified additional or decreased risk associated with a particular industry as compared to the overall market
    - A local business or situation-specific adjustment
    - A Size Premium: The ERP, based on the S & P 500, is biased toward very large companies. Various analyses have shown that small operations need to return higher rates of return in order to attract investments – small operators.
    - An adjustment to remove inflation from the equity portion of the discount rate: Equity as measured by the stock market is purchased with investor expectations. These expectations include anticipated inflation. Since the [redacted] is using constant prices, royalty rates with no growth, the inflation expectations are removed from the

equity portion of the discount rate.

- For the debt portion:

  - Many industries, including the coal industry borrow money to finance operations and capital expenditures. The likely current cost of money (borrowing cost) can be approximated by looking at the corporate bond market. Bonds are classified by a rating of their credit worthiness. The three major bond-rating services are Standard & Poor's, Moody's, and Fitch. While the rating system varies between the three rating companies, it generally consists of using letters to signify a grading system for the credit rating. For instance, a AAA (stated as "triple A") credit rating by S&P is their highest rating. Investment grade bonds are any bonds with a rating of BBB- or better. A grade designation below BBB- is a non-investment-grade quality bond. Bonds with a CCC rating from S&P are considered low-grade speculative bonds. Often these bonds are called junk bonds. A bond with a D grade is a bond that is currently in default.

    Bond ratings have an effect on the interest bond issuers must pay. If the bond is investment grade, the issuer can issue the bond at a lower yield and thus incur lower interest costs. The price of a bond already in the market will fall if its bond rating is subsequently downgraded.

    The coal industry is currently suffering from significant financial distress. Many firms, indeed most to the industry, are over leveraged with many defaults; some major banks have announced decisions not to lend coal companies money. Borrowing rates for these firms can mimic junk bond rates.

  - The cost of debt estimates used to develop the discount rate are adjusted for the effect of taxation as borrowing costs are tax deductible. Since the [redacted] is using constant dollars as its valuation premiss, to the extent that anticipated inflation is included in the cost of debt, it too must be deducted from the interest rate.

The current inflation adjusted pretax discount rate for Western coal is estimated from the attached WACC calculation as 12.88%. The following published information is used to calculate this rate:

- Cost of Capital, 2016 Valuation Handbook, Duff and Phelps
- Cost of Capital, 2016 Industry Cost of Capital and quarterly updates, Duff and Phelps
- St. Louis Federal Reserve Data Set, Moodys' Bond rating
- Damodaran Online Financial Data Sets: http://pages.stern.nyu.edu.

Exhibit 4.2-1 provides the input, sources, and calculations. All calculations assume mid-year discounting; that is, the royalty is assumed to be paid in full mid-year rather than at year-end or in advance at the start of the year. This approximates a typical monthly payment stream. The factors to use for the 2017 valuation are calculated as:

- Active Coal 1 year group: 0.941221 mid year (0.5)
- Active Coal 2 to 8 years: 0.545651 mid year at 5th year
- Idle Coal 10+ years: 0.000254 at 60th year

Exhibit 4.2-1: Calculation of Constant Weighted Cost of Capital: Western [redacted] Coal

Inflation Calculation - Calculation of Cost and Price Increases						
As Of:		Jun	through		Aug	2016
Inflation Rate						
10-year Inflation Indexed Rate		0.52			10yIIR	Bloomberg
30-year Inflation Indexed Rate		1.14			30yIIR	Bloomberg
10-year no index		2.37			10yr	Bloomberg
30-year no index		3.11			30yr	Bloomberg
Annual Market Expected Inflation			1.91		AMEI	
	Historic Inflation		3.20		HI	US Inflation Calculator
	Assumed Inflation			2.56	AI	IA=(AMEI+HI)/2
Weighted Cost of Capital - Calculation of the Discount Rate						
Risk Free Rate				2.74	RFR	Twenty Year (10yr+30yr)/2
Equity Risk (Premium over risk Free)				5.50	ER	Duff and Phelps 2016
Industry Specific Premium Adjustment						
12	Coal Mining	1.00	3.20			Duff and Phelps 2016
491	Electric Generation	0.00				Duff and Phelps 2016
331	Steel Manufacturing	0.00				
	Weighted Industry Premium			3.20	WIPA	= $ISPA_n$ * proportion
Size Premium			8.76		SP	10 th decile (Mrkt cap > $100 million)
	Overall Industry Equity Risk Rate			20.20	OERR	= RFR+ER+WIPA+SP
Company/Site/Control Adjustment			0.00		CSA	site as well as corporate & market conditions
Site/Operation Equity Cost				0.00		
Inflation Adjust		yes		-2.56		
	Equity Cost			17.65	EC	= OERR + CSA
Tax Structure						
Industry Specific Effective Rates						
12	Coal Mining	1.00	13.74			Effective Federal Tax Rate (Stated = 35%) (Damodaran)
491	Electric Generation	0.00				Effective Federal Tax Rate (Stated = 35%) (Damodaran)
331	Steel Manufacturing	0.00				Effective Federal Tax Rate (Stated = 35%) (Damodaran)
						Effective Federal Tax Rate (Stated = 35%) (Damodaran)
Federal Tax Rate				13.74	EFTR	Proportional Effective Federal Tax Rate
Local/State		0.06			STR	
	Overall Tax Rate			13.79	OTR	=EFTR+((1-EFTR)*STR)
Debt						
Interest Rate	20 yr (ccc)		5.20		I	Moodys High Yield Corp
	Tax Adjusted Debt Rate			4.88	TADR	= I/(1-OTR)
Weighted Average Cost of Capital						
After Tax (free cash flow)						
	Capital Structure					
Debt		0.50	2.24		ATD	=TADR * CSRatio
Equity		0.50	8.82		ATE	=EC * CSRatio
Weight Cost of Capital After Tax				11.06	WACC	=ADT+ATE
Pre Tax						
	Capital Structure					
Debt		0.50	2.60		PTD	=I * CSRatio
Equity		0.50	10.28		PTE	=(EC/ ((1-OTR) + ((OTR/(1-OTR))*((AI/(1+AI))))* CSRatio
Weighted Cost of Capital Pre Tax				**12.88**	WACC	

Sources:

Duff and Phelps, Valuation Handbook, 2016
St Louis Federal Reserve Data Set - Moody's Baa May 2016
Damodaran On-Line Financial Data Sets: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/home.htm

The basis for the currently used discount rate is:

- Out-of-date – the market has significantly changed since the early 2000's.
- Not based on market factors such as the WACC for the western coal market and western coal operators/owners.

The use of 30 years as the time factor is also out-of-date. As shown, previously, based on the data from the last five years, the [redacted] is currently classifying more than 100 years of coal as idle.

Therefore, it is recommended that for Western Coal:

- For the current year, the [redacted] use a 12.88% discount rate to calculate the factors for active and idle coal.
- For the current year, use the time of mining factors as determined above.
- For subsequent years, the [redacted] recalculates the factor based on existing market conditions.

Using the data presently maintained by the [redacted], RTC recommends the following factors when calculating values in 2017 for Western Coal:

Active Coal	1 year group:	0.941221	mid-period (.5)
Active Coal	2 to 8 years:	0.545651	mid-period (5th year)
Idle Coal	9+ years:	0.000254	at 60th year

In order to stay market-responsive, the [redacted] should update these factors periodically, if not yearly.

5.0 [redacted]

5.1 Review and Development of Active and Idle Classifications for Eastern Coal

As discussed previously, factors necessary for the calculation of the present value of the future income are royalty (price times rate), time of mining, and discount rate:

- The [redacted] uses current prices and its County-based royalty rate survey to establish current royalty values. For the Commonwealth's tax calculations, these values are held constant – no inflation is applied to estimate future royalty amounts
- The time of mining is established as the midpoint of each classification
- The discount is used for:
  - Idle coal classification has here-to-for been a constant 17.5%
  - Active coal has been 1% plus the discount rate used in West Virginia.

Exhibit 5.1-1 shows the recent pattern of coal acreage classification by the Commonwealth in Eastern [redacted]:

Exhibit 5.1-1: Coal Acreage Classification: [redacted]						
Tax Year	1 Year	2 - 5 Years	6 - 15 Years	Idle	Mined Previous Year	Unmineable
2010	29,692	68,351	49,244	589,189	21,202	10,285,675
2011	31,843	78,305	48,282	753,610	18,179	11,881,295
2012	30,640	63,927	53,863	742,689	17,374	12,511,735
2013	24,262	47,013	51,881	665,113	15,482	12,711,206
2014	20,605	34,952	36,935	640,948	12,323	13,195,777
2015	18,752	35,295	33,622	575,585		13,268,920

Notice that drastic changes in acreage per category is possible, which may make is necessary to update yearly mining categories.

Exhibit 5.1-2 shows the number of mines, the tons and acres actually mined, as well as the average tons mined per acre and by mine operation.

Exhibit 5.1-2: Mining Activity: [redacted]							
Tax Year	Active Mines	Underground	Surface	All	Acres Mined	Tons per Acre Mined	Tons per Mine
2010	486	34,388,000	33,675,000	68,063,000	18,179	3,744	140,047
2011	506	33,345,000	34,585,000	67,930,000	17,374	3,910	134,249
2012	452	24,187,310	25,176,650	49,363,960	15,482	3,188	109,212
2013	347	19,561,036	20,284,540	39,845,576	12,323	3,233	114,829
2014	347	18,413,940	19,088,760	37,502,700	10,584	3,543	108,077
2015	263	14,538,838	13,417,080	28,000,918	7,902	3,524	106,467

This acreage is converted to tonnage for each classification based on each year's production in **Exhibit 5.1-3**.

Exhibit 5.1-3: Annual Tonnage Projected into Tax Classifications							
Tax Year	**1 year**	**2-5 year**	**6-15 year**	**ML Active**	**Idle**	**ML**	**Idle Minelife**
2010	68,063,000	255,909,242	184,371,768	7.47	2,205,950,322	32.41	23.67
2011	67,930,000	306,162,004	188,776,117	8.29	2,946,513,601	43.38	29.97
2012	49,363,960	203,829,600	171,740,794	8.61	2,368,044,832	47.97	32.59
2013	39,845,576	152,013,314	167,753,658	9.03	2,150,597,305	53.97	36.01
2014	37,502,700	123,846,785	130,873,226	7.79	2,271,096,047	60.56	38.07
2015	28,000,918	124,373,618	118,478,249	9.67	2,028,264,320	72.44	45.89

As shown above in **Exhibit 5.1-3**, the midpoint of the years of coal included in the idle tax assessment category can be calculated by dividing the idle years by 2 and adding it to the total years included in the active classifications, e.g. (72.44 / 2) + 9.67 = 45.89. In short, this means that in the eastern region, given current production and based on the [redacted] research and accepted classification system, the midpoint of the coal classified as idle is 46 years from "today". Using the present worth formula, the "n" for idle for this year would be 46. The [redacted] currently uses a timing factor of 15 for eastern coal. This factor was set more than 10 years ago.

Coal considered to be active is coal that some investment has been undertaken to create a mine block, produce engineered plans, obtain a permit, and develop entries and transportation systems. In short, active coal is part of a cash generating mine operation. The statistical review shows that, at least since 2010, less than six years of coal have been included in actively permitted and mined coal operations in the Eastern Coal Fields. As shown in **Exhibit 5.1-3**, the amount of coal as measured in years actively pursued by the industry, from 2010 through 2015, has remained consistent at approximately five years.

Coal operators and owners have suggested that the use of previous calendar year data tends to make the model less responsive in a volatile market. The [redacted] publishes quarterly coal reports. The quarterly data included in the coal reports can be used to create more contemporary "annualized" information by summing 4th quarter for the previous year to the immediate three quarters from the current year (see **Exhibit 5.1-5**).

Exhibit 5.1-5									
		[redacted] Total				Eastern [redacted]			
Date		Average Employment		Tons of Coal Produced		Average Employment		Tons of Coal Produced	
		Quarter	Annual	Quarter	Annual	Quarter	Annual	Quarter	Annual
2008 -2009	Q4	19,030	18,539	30,477,960	114,531,790	15,420	14,767	22,503,580	81,830,080
	Q1	19,422		30,809,810		15,668		22,477,210	
	Q2	18,630		27,264,780		14,702		18,998,720	
	Q3	17,075		25,979,240		13,278		17,850,570	
2009 -2010	Q4	16,380	16,873	24,127,190	103,624,950	12,729	12,873	15,902,420	67,313,540
	Q1	16,378		26,304,890		12,404		16,883,820	
	Q2	17,217		26,510,520		13,051		17,339,430	
	Q3	17,517		26,682,350		13,308		17,187,870	
2010 -2011	Q4	17,796	18,120	25,972,700	108,888,030	13,484	13,703	16,727,910	68,736,200
	Q1	17,684		27,889,220		13,331		17,282,860	
	Q2	18,191		27,222,030		13,695		17,385,220	

Exhibit 5.1-5									
Date		[redacted] Total				Eastern [redacted]			
		Average Employment		Tons of Coal Produced		Average Employment		Tons of Coal Produced	
		Quarter	Annual	Quarter	Annual	Quarter	Annual	Quarter	Annual
	Q3	18,810		27,804,080		14,301		17,340,210	
2011 -2012	Q4	18,087	16,676	26,047,990	96,717,050	13,581	12,102	15,944,280	54,779,150
	Q1	17,932		26,571,280		13,203		15,171,750	
	Q2	16,278		22,924,670		11,731		12,568,670	
	Q3	14,406		21,173,110		9,892		11,094,450	
2012 -2013	Q4	14,107	13,190	20,555,240	81,775,580	9,564	8,783	10,343,130	40,619,922
	Q1	13,223		20,590,860		8,897		10,144,620	
	Q2	12,882		20,752,660		8,490		10,464,560	
	Q3	12,548		19,876,820		8,180		9,667,612	
2013 -2014	Q4	11,892	11,734	19,081,980	78,307,550	7,443	7,374	9,146,575	38,099,428
	Q1	11,790		19,494,440		7,366		8,969,519	
	Q2	11,574		19,864,630		7,447		10,240,600	
	Q3	11,681		19,866,500		7,239		9,742,734	
2014 -2015	Q4	11,619	10,213	18,204,500	66,534,830	7,186	6,341	8,508,199	30,586,095
	Q1	10,465		16,938,520		6,639		7,788,933	
	Q2	9,674		15,817,610		5,958		7,421,363	
	Q3	9,094		15,574,200		5,579		6,867,600	
2015 -2016	Q4	8,401	7,029	12,884,260	44,416,590	5,077	4,139	5,712,695	18,088,416
	Q1	6,941		11,397,478		4,009		4,634,209	
	Q2	6,519		9,913,978		3,818		3,980,548	
	Q3	6,254		10,220,874		3,653		3,760,964	

Exhibit 5.1-5 clearly shows that the recent decline in Eastern [redacted] coal output has outpaced the current category assignments used by the [redacted]. Clearly, by using year-old information, the [redacted] is assigning much more coal to the active category than is currently appropriate. As discussed in the section concerning Western [redacted], active coal represents property for which significant investment has been made and which is likely generating cash flow. The research shows the Eastern mines are smaller and shorter-lived than the western mines. The topography, geology, and the extent of previous mining limits the size of the eastern mines. These mines also serve a more volatile market.

As of 2016, a six-year mine life encompasses the average expected active acreage in the Eastern [redacted] region. Using time factors of 1 (1-year coal), 4 (2 to 6-year coal), and 46 (idle coal) will lower the overall value of all coal throughout the eastern region while, at the same time, maintain the value of coal actually expected to be mined within the next 6 years. Simply put, revising the time factors reflects the current mining and investment situation. These factors can be reviewed periodically. Using a mid-year discounting process, the Commonwealth could reconsider the classification system. The system could be stream-lined to three groups:

- Active:
    - 1- year, with 0.5 being the mid point for discounting value
    - 2 - 6 year, with 4 being the mid point for discounting values

- Idle, and based on the current market, 46 (representing the mid point

Ultimately, to be market-responsive, the [redacted] should recalculate these mid-points every five years. As the coal market improves, the industry may choose to move additional coal into the active acreage and, if the industry continues to decline, more coal may be left fallow and be correctly classified as idle. A five-year review should allow the [redacted] to keep abreast of these factors.

5.2 Calculation of the Discount Rate for the Current Tax Year for Eastern [redacted] Coal

As described above, the Commonwealth currently uses the West Virginia discount rate plus 1 to calculate the present worth of the active coal properties and 17.5 to calculate the present worth of all idle reserves. Based on our discussions with Revenue Cabinet staff, members of the coal associations, and our research, using West Virginia's rate plus 1 for active coal valuations and a constant 17.5 for idle coal valuations is not appropriate.

As discussed in the Western Coal section, the [redacted]requires a method to develop appropriate discount rates annually. While there are many procedures available, it is recommended that the [redacted] use verifiable published sources to develop an annual build-up method for both Active and Idle Coal valuations. Also, as discussed previously, the [redacted] should refrain from using projected price increases, royalty increases, growth rates, or inflation and use real value based-factors on the most current data collected.

Exhibit 13 on the following page provides the input, sources, and calculations. The WACC developed in the eastern calculations is significantly higher than that used to indicate the western discount rate. This difference results from:

- Recent significant downturns in the eastern coal market
- Heavy debt burdens of the existing operations
- Higher debt rate likely to result from the current conditions
- Partial but significant reliance on the highly volatile steel market and other marginal markets
- The smallness and thus riskiness of the operations.

As shown in **Exhibit 5.2-1**, the recommended discount rate for Eastern Coal for the current tax year is 19.72%. The difference between the Eastern and the Western rate is based on the smallness of the operations (size adjustment: Eastern – 11.79, Western – 8.76) and the Debt or Bond Rate (Eastern : CCC – 15.36, Western: bb – 5.20).

The factors to use for the 2017 valuation are calculated as:

●	Active Coal	1 year group:	0.913938	mid year (.5)
●	Active Coal	2 to 6 years:	0.486780	4th year
●	Idle Coal	7+ years:	0.000254	at 46th year

Exhibit 5.2-1: Calculation of Constant Weighted Cost of Capital: Eastern [redacted] Coal

As Of:		Jun	through		Aug	2016
Inflation Rate						
10-year Inflation Indexed Rate		0.52			10yIIR	Bloomberg
30-year Inflation Indexed Rate		1.14			30yIIR	Bloomberg
10-year no index		2.37			10yr	Bloomberg
30-year no index		3.11			30yr	Bloomberg
Annual Market Expected Inflation			1.91		AMEI	
	Historic Inflation		3.20		HI	US Inflation Calculator
	Assumed Inflation			2.56	AI	IA=(AMEI+HI)/2
Risk Free Rate				2.74	RFR	Twenty Year (10yr+30yr)/2
Equity Risk (Premium over risk Free)				5.50	ER	Duff and Phelps 2016
Industry Specific Premium Adjustment						
12	Coal Mining	1.00	3.20			Duff and Phelps 2016
491	Electric Generation	0.00				Duff and Phelps 2016
331	Steel Manufacturing	0.00				
	Weighted Industry Premium			3.20	WIPA	= $ISPA_n$ * proportion
Size Premium			11.79		SP	10 th decile (Mrkt cap > $100 million)
	Overall Industry Equity Risk Rate			23.23	OERR	= RFR+ER+WIPA+SP
Company/Site/Control Adjustment			0.00		CSA	site as well as corporate & market conditions
Site/Operation Equity Cost				0.00		
Inflation Adjust		yes		-2.56		
	Equity Cost			20.68	EC	= OERR + CSA
Tax Structure						
Industry Specific Effective Rates						
12	Coal Mining	1.00	13.74			Effective Federal Tax Rate (Stated = 35%) (Damodaran)
491	Electric Generation	0.00				Effective Federal Tax Rate (Stated = 35%) (Damodaran)
331	Steel Manufacturing	0.00				Effective Federal Tax Rate (Stated = 35%) (Damodaran)
						Effective Federal Tax Rate (Stated = 35%) (Damodaran)
Federal Tax Rate				13.74	EFTR	Proportional Effective Federal Tax Rate
Local/State		0.06			STR	
	Overall Tax Rate			13.79	OTR	=EFTR+((1-EFTR)*STR)
Debt						
Interest Rate	20 yr (ccc)		15.36		I	Ycharts June/July 2016
	Tax Adjusted Debt Rate			13.24	TADR	= I/(1-OTR)
Weighted Average Cost of Capital						
After Tax (free cash flow)						
	Capital Structure					
Debt		0.50	6.62		ATD	=TADR * CSRatio
Equity		0.50	10.34		ATE	=EC * CSRatio
Weight Cost of Capital After Tax				16.96	WACC	=ADT+ATE
Pre Tax						
	Capital Structure					
Debt		0.50	7.68		PTD	=I * CSRatio
Equity		0.50	12.04		PTE	=(EC/ ((1-OTR) + ((OTR/(1-OTR))*((AI/(1+AI))))* CSRatio
Weighted Cost of Capital Pre Tax				**19.72**	WACC	

Sources:

Duff and Phelps, Valuation Handbook, 2016
St Louis Federal Reserve Data Set - Moody's Baa May 2016
Damodaran On-Line Financial Data Sets: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/home.htm

The basis for the currently used discount rate is:

- Out of date – the market has significantly changed since the early 2000's.

- Not based on market factors such as the WACC for the eastern coal market and eastern coal operators/owners.

Therefore, it is recommended that for Eastern Coal:

- For the current year, the [redacted] uses 0.1972 discount rate to calculate the factors for active and idle coal
- For the current year, the [redacted] uses the time of mining factors as determined above.
- For subsequent years, the [redacted] recalculates the factor based on existing market conditions.

Using the data presently maintained by the [redacted] RTC recommends the following factors when calculating values in 2017 for Eastern Coal:

●	Active Coal	1 year group:	0.913938	mid-period (0.5)
●	Active Coal	2 to 6 years:	0.486780	mid-period (4th year)
●	Idle Coal	7+ years:	0.000697	at 46th year

In order to stay market-responsive, the [redacted] should update these factors periodically, if not yearly.

Appraisal of Mineral Properties

April 3, 2009

Appraisal of Mineral Properties

INSTRUCTOR: JEFFREY R. KERN

- **CERTIFIED GENERAL APPRAISER:**
  - Pennsylvania
  - Delaware
  - Texas
  - Virginia
  - Ohio
  - Illinois
  - Alaska
  - West Virginia
  - Kentucky
  - New Jersey
  - New York
  - North Carolina
- **Pennsylvania Certified Evaluator**

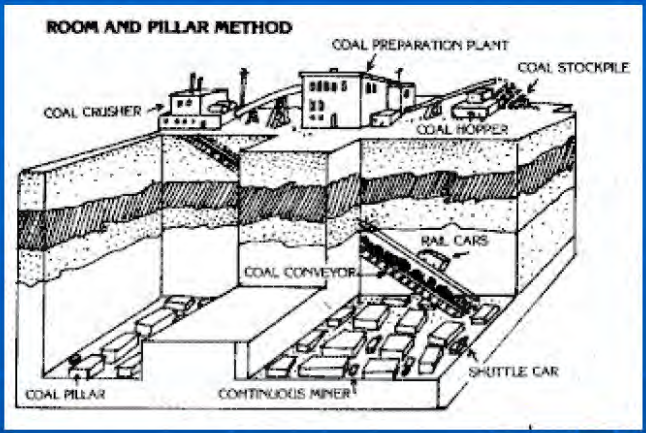
June 7, 2002

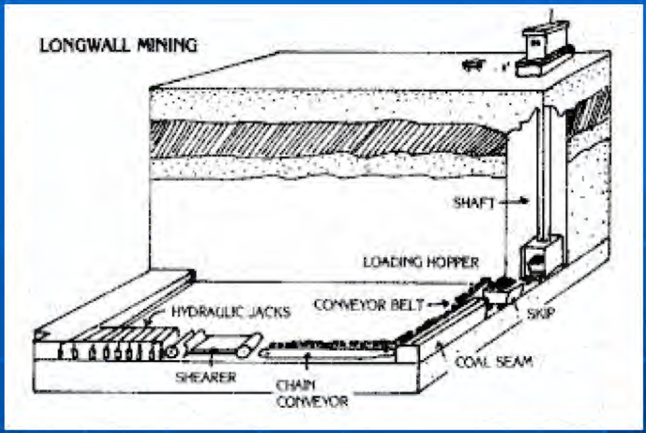
Minerals to be Valued

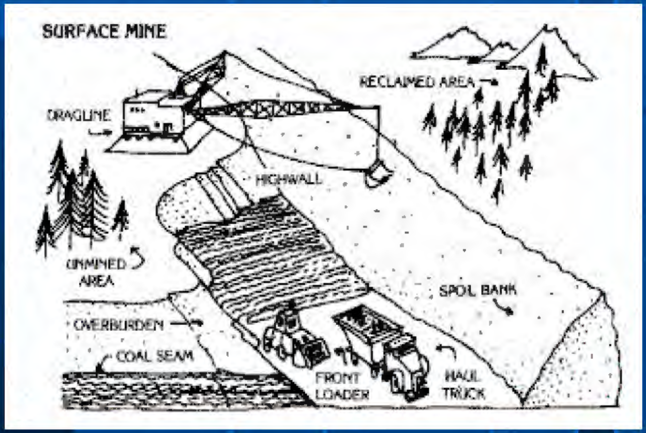
What is a mineral?

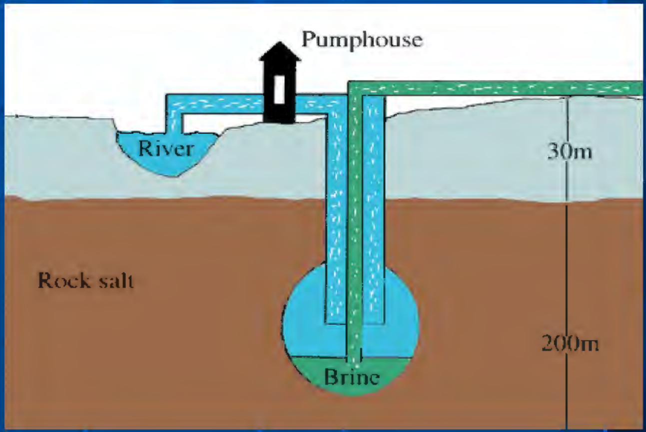
- Coal – Anthracite, Bituminous, Lignite
- Clay
- Crushed Stone
- Dimension Stone (Granite, Limestone, Slate)
- Gypsum
- Iron Ore
- Natural Gas
- Oil
- Phosphate
- Sand and Gravel
- Other Mineral Commodities

Typical Mining Methods





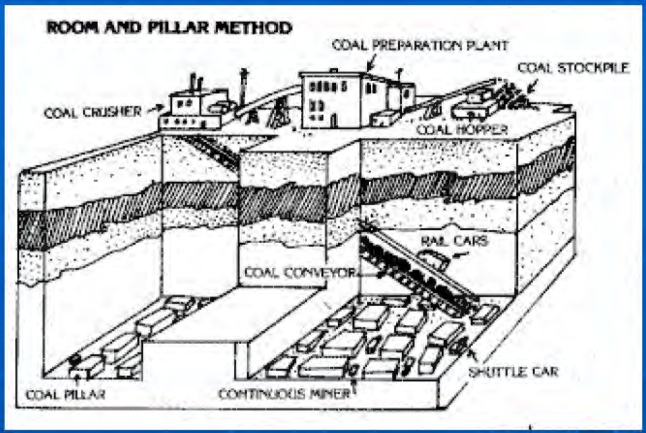


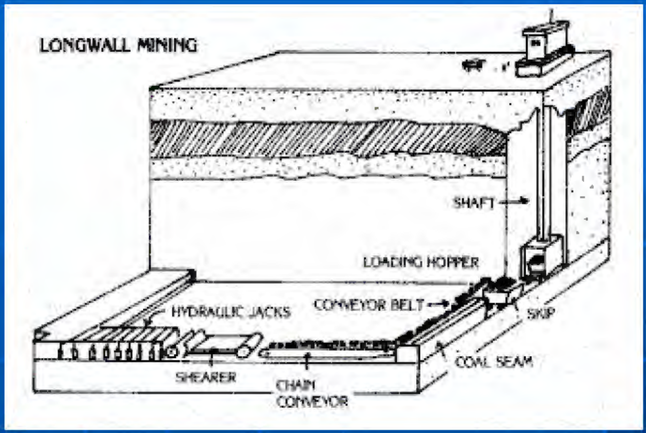


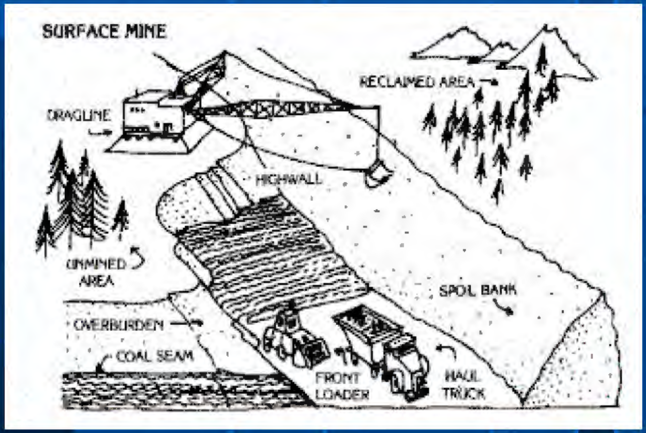
Bucket Wheel Excavator Picture

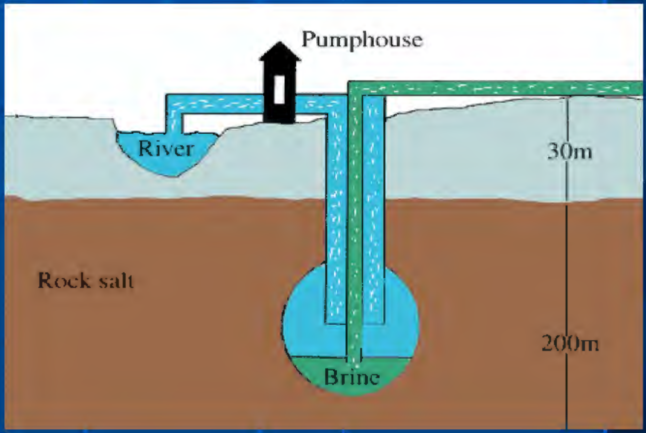
Drag Line and Dozer Picture

Typical Mining Methods









Long Mining Machine Picture

Continuous Mining Machine Picture

Long Wall Mining Machine Picture

Night Ops -- Picture

Sand and Gravel Stackers Picture

Sand and Gravel Dredge Picture

Sand and Gravel Picture

Dimension Stone Mine Picture

Dimension Stone Saw Shop Picture

Drag Line

Processing

Coal Preparation

Lime Kiln

Minerals Defined

Minerals are defined in terms of economics.

Given legal, environmental, and political factors can the material or commodity be:

- Identified and processed,
- Extracted from the ground,
- Processed for market, and
- Delivered to market

At a competitive price ?

Why Appraise Mineral Properties ?

- Sale or Acquisition of Operating Companies or Reserves
- Investment and Operating Decisions
- Tax planning
- Reports to federal agencies (Securities Exchange Commission)
- Financing
- Income, severance, and ad-valorem taxation
- Condemnation

Mineral Value

What is Mineral Value ?

- **After processing unit value of a commodity**
  - **Price per processed and delivered ton of coal**
  - **Price of delivered gasoline**
  - **Price of a diamond ring**
- **FOB Price at the mine site**
- **In-place value in the ground**
- **Speculative value for future development**

A Mineral Property only has value as it relates to its ability to produce future income

Legal Basis for Assessment

As early as 1884, Pennsylvania courts found that:

"where minerals beneath the surface have been severed from the surface by a lease to mine the same, equivalent to a sale, the surface and minerals must be assessed and taxed separately to their respective owners"

(as cited in Pa 1984: Sanderson v Scranton, 105 Pa. 469, 3 Kulp 125, 14 WNC 409, 41 L.I. 388, 32 P.L.J. 39, 6 Law Times, N.S.; Com. Pl. 1986: Berwind-White v. Clearfield County, 18 Pa. C.C. 545).

Legal Basis

- In June 1969, the PA Supreme Court found:

- "...coal is real estate and where the coal has been severed from the ownership of the surface by agreement or conveyance, the coal is separately assessable and taxable to the owner of the coal estate."

- Further, the court stated that the owner of the coal in place can be held liable for taxes due even though he has no right to mine or remove the coal.

- Mathies Coal Company and Consolidated Coal Company v. Washington County Board for the Assessment and Revision of Taxes, 255 A.2d 906).

Legal Requirements

- **Objects of local taxation:**

   must be assessed, rated, and valued according to an actual value thereof, and where "actual value" means market value

  – 72 P.S. § 5020-402 (Valley Forge Golf Club, Inc. v Board for Assessment and Revision of Taxes of Montgomery County, 285 A.2d 213, 3 Pa. Cmwlth. 644).

- **In determining a proper tax assessment for a property, it is:**

   necessary first to determine the correct fair market value of a property...

  – 72 P.S. § 5350 (Feist v. Luzerne County Bd. Assessment Appeals, 347 A 2d. 772, 22 Pa Cmwlth. 181, certiori denied 97 S Ct. 1115, 429 U.S. 1097, 51 L. Ed. 2d 545).

Legal Basis of Mineral Fair Market Value

The Pa Supreme Court in 1969 found that:

"since the probable quantity of merchantable coal in the ground is only one of many factors to be considered in determining the market value of the coal lands, other factors including the quality of the coal, the difficulty in mining it, the state of the market, the location of the land, and the character of its development..." must be considered.

In **Mathies Coal Company and Consolidated Coal Company v. Washington County Board for the Assessment and Revision of Taxes, (255 A.2d 906, 1969)**,

Specific Legal Valuation Requirements

- **"In addition to the prices paid in sales of similar lands, due regard must be given to the physical features of the property to be valued.**

- **The formation of the coal strata should be taken into account as well as the number of veins, their depth, thickness, pitch, basins, their proximity to outcrop, and the character of the separating rock formation.**

- **"Similarly, the quality of the coal, and whether of a gaseous or nongaseous nature; the kind of overlying surface; the availability of the coal, and the difficulty in mining it; the probable quantity of the merchantable coal in the ground with allowance for loss in mining; the demand for the product; and all elements which a prudent purchaser would take into consideration." should also be taken into consideration.**

- **In 1988, the Commonwealth Court, in the appeal of CNG Coal Company v. Greene County Board of Assessment Appeal (551 A.2d 328), cited earlier decisions (Ciafonnia v Washington County Board of Assessment Appeal, 535 A.2d 247 and Philadelphia & Reading Coal & Iron v Commissioners of Northumberland County, 323 Pa. 185)**

Application to Gas

Commonwealth Court July 2001

- **In Pennsylvania Taxable Lands can be in 3 estates:**
  - Surface
  - Minerals
  - Support
- **Gas is a mineral "land"**
- **Oil and gas severed from the surface is a separate estate**
  - Value based information or knowledge

Independent Oil and Gas Association of Pennsylvania, George O. Scott, d/b/a Dorso Energy, Lomak Resources Company, Phillips Production Company, Inc. , Castle Exploratioin Company, Inc. , Douglas Oil & Gas, Inc. , Oil & Gas Management, Inc. , and William S. Burkland v. Board of Assessment Appeals of Fayette County, Pennsylvania and County of Fayette, Pennsylvania, No. 2560 C.D. 2000, May 9, 2001

Application to Gas

Supreme Court December of 2002
A Challenge to the Legislature

- **Court said:**
  - Legislature could not have intended to include oil and gas when it comes to land
  - Oil and Gas are "Fugacious"

- **But in section §5020-419 Assessment of Auxiliary Forests, the legislature specifically reminded the local assessors to not reduce the assessed value of minerals including oil and gas when reducing forest land values:**

  - " All surface land which has, since the fifth day of June 1913, been classified and set apart as auxiliary forest reserves, in the manner provided by law.... be rated in value for the purpose of taxation, not in excess of one dollar .... **Provided, however, that if the said surface land be underlain by coal, iron ore, oil, gas, or other valuable minerals, said minerals may be assessed separately."**

Ownership

Ownership Defines Use and Availability

- Fee Ownership – **complete mineral and surface rights**
- Surface Lease – **control by lease of surface rights**
- Mineral Lease – **control by lease of mineral rights**
- Surface Only – **ownership of surface rights**
- Mineral Only – **ownership of mineral rights**
- Adverse – **properties not owned or leased**

Categories of Mineral Property Value

- **Active Extractive Operations**
  - **Mines**
  - **Quarries**
  - **Wells**
- **Reserve**
  - **Properties included in active operational control**
  - **Properties which are situated to, amenable to future extraction**
- **Resources: properties which may contain future reserves**

Minerals are Just Like....

Active Mine ➡ **Commercial Real Estate**
➡ **Industrial property**

Active Reserve ➡ **Undeveloped parcel in growing industrial or commercial area**

Reserve ➡ **Undeveloped parcel which may have future developmental possibilities**

Highest and Best Use

Just like any other property

- **Possible:**

–Does the asset exist, is there a sufficient quantity of the appropriate quality of resource, and is it technically possible to use it?

- **Legal:**

–Is it legal or permissible to exploit the asset?

- **Feasible:**

–Can the asset be utilized or exploited in a realistic manner? Is there appropriate access (in mineral properties, this may include rights to mine, rights of ingress and egress, wheelage rights, air shaft, and water control rights)?

- **Economic:**

–Can the resource be exploited in such a way as to return a positive economic return on the investment necessary to exploit the resource? Is there a potential profit in the present or foreseeable market place?

Whitney Benefits Facts

- Whitney Benefits' land of 1327 acres which were irrigated and subirrigated by the Tongue River alluvial valley floor.
- The land was leased to PKS in 1974, and advanced royalties were paid to Whitney.
- PKS expended exploration costs of $1 million in 1976
- PKS filed a permit application with the Wyoming Department of Environmental Quality (DEQ).

Whitney Benefits Facts

- A year later, SMCRA was enacted.

- No permit or application shall be approved if it should "interrupt, discontinue or preclude farming on alluvial valley floors that are irrigated or subirrigated

- Thus, Whitney's right to mine the coal on its property was invalidated by the enacted legislation of SMCRA and was the basis for the alleged taking in 1983.

Whitney Benefits Exchange Failed

- SMCRA provided for an exchange mechanism as a "method for ascertaining and paying just compensation"

- 1981: PKS had requested an exchange for federal lands to the BLM:
- BLM offered Ash Creek PKS spent $130,000 on exploration costs on it.
- BLM also offered the Hidden Water tract, which PKS refused *as it had mined it in the late 40s to early 50s and was not interested in the remaining coal.*

- *PKS and Whitney proceeded with their 1983 claim under the Tucker Act for a 5th Amendment regulatory taking*

Whitney
Is it a Taking?

Consider three factors:

1 The economic impact of the restriction

The Court found that:

there was a market for Whitney coal

the coal was economically and technologically mineable it was valuable

SMCRA had a "devastating economic impact on the property“

2 The restriction's interference with investment expectations

Investors could reasonably expect the returns on investments as projected.

In place assigned reserves were valued at $1.01/ton, and residual reserves at $.20/ton.

3 The character of the government's action.

there were no economically viable alternative uses for the property.

Court’s Conclusion: "... the substantial public interest at stake does not outweigh the private interest so that plaintiffs must bear the full burden imposed by the government action".

Whitney Findings

The Court established a final sum of $60,296,000 for the total 1977 value of recoverable Whitney Coal assuming:

- An annual production rate of 2.5 million tons
- Cost of $2 million for backfilling.
- Interest was payable to Whitney from Aug. 3,1977 to date of payment.

The amount was intended to represent what a willing purchaser would have paid Whitney *as a willing seller, to mine the Whitney Coal after calculating all mining related costs.*

The Court held that:

- *the enactment of SMCRA totally eliminated economic value of plaintiffs' coal and constituted a taking under the Fifth Amendment;*
- *the taking occurred at the time SMCRA became effective:*
- *the valuation method incorporating discounted cash flow approach offered reliable method for determining the fair market value of the coal on the dale of the taking*
- *the plain tiffs were entitled to pre-judgment interest*

Specific Legal Valuation Requirements

In addition to the prices paid in sales of similar lands, due regard must be given to the physical features of the property to be valued. The formation of the coal strata should be taken into account as well as:

- **number of veins**
- **depth**
- **thickness**
- **pitch**
- **basins**
- **proximity to outcrop**
- **character of the separating rock formation**
- **quality of the coal**
- **gaseous or nongaseous nature**
- **kind of overlying surface**
- **availability of the coal**
- **difficulty in mining it**
- **probable quantity of the merchantable coal in the ground with allowance for loss in mining**
- **demand for the product**
- **all elements which a prudent purchaser would take into consideration**

▪**In 1988, the Commonwealth Court, in the appeal of CNG Coal Company v. Greene County Board of Assessment Appeal (551 A.2d 328), cited earlier decisions (Ciafonnia v Washington County Board of Assessment Appeal, 535 A.2d 247 and Philadelphia & Reading Coal & Iron v Commissioners of Northumberland County, 323 Pa. 185)**

Factors to be Investigated

- Resource / Reserves
- Quality and Processing
- Environmental Considerations
- Current Operations
- Mining Plans
- Production Costs
- Markets and Transportation
- Valuation Techniques

Resources / Reserves

- **Resources**
  - Naturally occurring concentration or deposit
  - Economic extraction is potentially feasible
- **Reserves**
  - Only Potentially Recoverable Mineral
  - Economic exploitation probable
  - Classified as:
    - Inferred
    - Indicated
    - Measured
- **Active**
  - Current mining occurring in definable deposit

Reserves

The ore body defines the future use of the deposit

- Geology
  - Thickness and consistency of deposit
  - Overlying strata (roof or overburden)
  - Geologic disturbances or anomalies
- Topography
- Surface features
  - Flood plains
  - Drainage areas
  - Aquifers

Surface Mine Reserves

- **Overburden ratio (stripping ratio)**
  - **Volume of overlying material which must be removed to extract a ton of coal (cu ft / ton)**
  - **Difficulty in removing overburden**
    - **Hard rock**
    - **Difficult access**
    - **Water**
    - **Disposal Problems**
- **Dilution**
  - **Contamination of ore with overburden during the mining process**
- **Multiple Seam Mining (e.g. Mountain Top Removal)**
  - **Improving ratio**
  - **Able to retrieve otherwise "non-economic" seams**

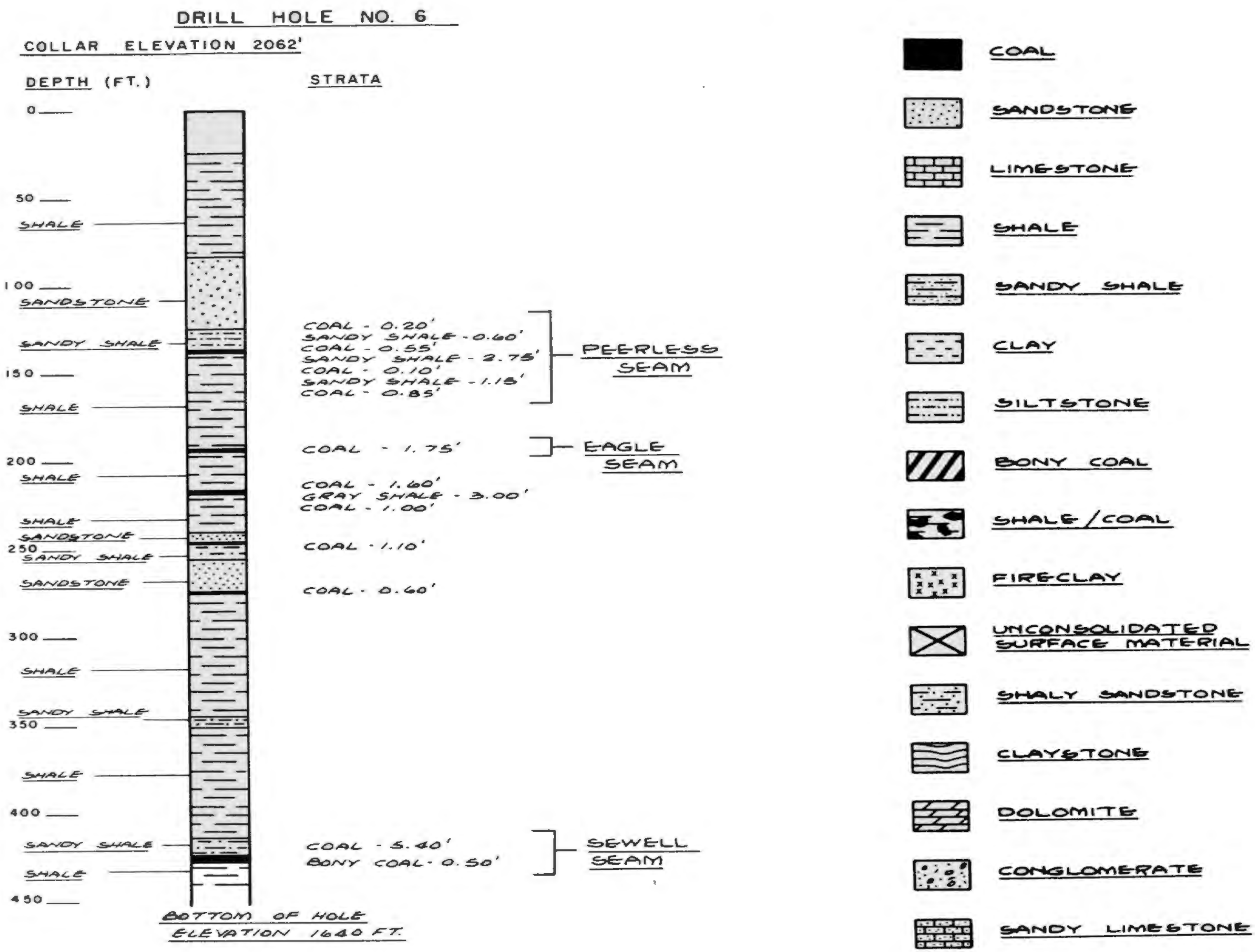
Deep Mine Reserves

- **Roof Rock**
  - **Types of control measures required**
  - **Control not possible**
- **Floor Rock**
  - **Mining equipment moves freely**
  - **Condition pose problems to movement**
- **Water**
  - **Seam above drainage can be mined with water controls**
  - **Seam below drainage requiring significant water control and treatment**
  - **Seam can not be mined without significant water drainage problems**

Reserves: Data Sources

- **Geologic maps and Data**
  - **USGS**
  - **State Geologic Survey**

- **Topographic maps**
- **Permit Data**
  - **DEP Offices**
  - **Court House records**
- **Public Reports**
- **Confidential Mining Company Maps and Reports**



DRILL HOLE NO. 6
COLLAR ELEVATION 2062'
DEPTH (FT.)
STRATA
0
50
SHALE
100
SANDSTONE
SANDY SHALE
150
SHALE
200
SHALE
SHALE
SANDSTONE
250
SANDY SHALE
SANDSTONE
300
SHALE
SANDY SHALE
350
SHALE
400
SANDY SHALE
SHALE
450
COAL - 0.20'
SANDY SHALE - 0.60'
COAL - 0.55'
SANDY SHALE - 2.75'
COAL - 0.10'
SANDY SHALE - 1.15'
COAL - 0.85'
PEERLESS SEAM
COAL - 1.75'
EAGLE SEAM
COAL - 1.60'
GRAY SHALE - 3.00'
COAL - 1.00'
COAL - 1.10'
COAL - 0.60'
COAL - 5.40'
BONY COAL - 0.50'
SEWELL SEAM
BOTTOM OF HOLE
ELEVATION 1640 FT.
COAL
SANDSTONE
LIMESTONE
SHALE
SANDY SHALE
CLAY
SILTSTONE
BONY COAL
SHALE / COAL
FIRECLAY
UNCONSOLIDATED SURFACE MATERIAL
SHALY SANDSTONE
CLAYSTONE
DOLOMITE
CONGLOMERATE
SANDY LIMESTONE

Ownership Data Sources

- Deeds – **may or may not show considerations**
- Leases – **may or may not show royalty amounts**
- Memoranda – **never shows any $$$**
- Permit files – **will provide details**
- SEC files – **will provide details**
- Assessment files – ???

Quality

- **Market Identification**
  - What market will the commodity serve ?
- **Price Estimation**
  - What price will the commodity fetch ?
- **Absorption**
  - How much can be sold annually ?
- **Production Costs**
  - What is the cost to produce (process) ?

Quality and Processing

Coal

- Ash %
- Moisture %
- Heating Value – Btu per pound
- Sulfur %
- Volatile Matter
- Friability
- Grindability
- Fixed Carbon

Environmental Considerations

- Air Pollution
- Water Pollution
- Noise and Vibration
- Waste Disposal
- Physical Appearance
- Subsidence
- Reclamation

Environmental Controls

Permits required

- Mine Drainage
- Mining
  - Surface Mine
  - Underground Mine
  - Auger Mine
- Pollution
  - NPDES
- Safety
  - MSHA
- Specific Mining Modules
  - Subsidence
  - Coal Waste Disposal
  - Blasting
  - Sedimentation and Erosion

Current Operations

A key to assessing the future

- Identify likely market
- Furnish insight into operational characteristics
- Provide information concerning resources
- Contribute information concerning location and transportation
- Provide comparative basis for estimating:
  - Absorption // production rates
  - Royalty and discount rates
  - Valuation
    - per acre
    - per unit
    - per operation

Current Operations

Information Sources

- DEP records:
  - Regulatory Files:
    - Inspection reports
    - Permit Files
    - Annual Production reports
  - Environmental Information:
    - Geologic Studies
    - Annual reports
- Industry sources:
  - Keystone Coal Manual
  - Coal Outlook
- Operator records

Mining Plans

A KEY TO PREDICTING THE FUTURE

- Pre Mine Development
- Mine Life
- Annual production
- Equipment
- Capital Costs
- Production Costs
- Reclamation Procedures

Filed with the state prior to start-up, and periodically during operation

PRODUCTION COSTS

- LABOR COSTS
- SUPPLIES / MATERIALS
- POWER
- ROYALTIES
- PROPERTY TAXES
- INCOME TAXES
- DEPRECIATION
- PENALTIES AND FINES

Transportation

- Transport is a significant cost
- Transport costs can preclude economic viability of a deposit
- The higher the unit value the longer the transport distance:
  - Gold is transported world wide
  - Crushed stone is transported 30 ± miles
- Transport cost relate to methods
  - Conveyor – \$0.07 to 0.13 ± per ton mile
  - Barge – \$0.09 to 0.20 ± per ton mile
  - Rail – \$0.12 to 0.25 ± per ton mile
  - Truck – \$0.17 to 0.30 ± per ton mile

Market

- Reliability of Supplier (Supply)
- Reliability demand by purchaser
- Quantity of Reserve
- Quality of Reserve
- Production Cost vs. Market Price
- Transport Cost
- Delivered Price

Market Prices

- Contract
  - Specific needs of supplier and purchaser
  - May include other factors
- Spot
  - Open market bidding
- Sources of Information
  - Industry Publications
    - Coal Outlook
  - Public Utility Commissions
  - Energy Information Agency (US DOE)
  - UGSS
    - Commodity Surveys

VALUATION METHODS

Valuing the Property <u>not</u> the Business

- Comparative Sales
- Royalty Analysis
- Operational Analysis (Residual)
- Mass Appraisal

In 1992 the Pennsylvania Supreme considered the concepts of value-in-use and value-in-exchange.

In the Schaffer Brewing case, the court:

specifically stated that it was improper to value a property for tax assessment purposes as a value-in-use

defined the value-in-use as a specific value based solely on the continuation of the current that is specific to the current user.

Fair market value must, as defined by the court, be based on market forces as the property may be exposed to the universe of buyers.

The meaning of this case has been stretched beyond the bounds of credibility and used to thwart reasonable appraisal practice.

The Court did not find:

in contrast to reality, that an existing use cannot be the highest and best use.

that information describing the current use cannot be used to assist the appraiser in determining highest and best use and value.

that income information is illegal to use.

The court merely found that one cannot, for assessment purposes, use the investment value of a property to a single owner as current equipped and managed.

In the Schaffer case, the appraiser used a multiple of the barrels of beer which could be produced to determine the ad valorem tax value of the parcel. As it was used, this technique, while extremely useful and frequently used by the brewing industry, is inappropriate for tax assessment purposes. In this case there was no real attempt to:

isolate the value of the real estate from the value of the equipment or management of the plant

estimate the residual value of the property

use the detailed data about the existing use to draw conclusion about the general market for industrial and even competing brewing properties.

Considering the location, the market, the site improvements, the access to water, transportation, and other factors, the site may very well have had a highest and best use of a brewery.

Considering these factors income and other detailed information about the operation of the site is crucial to determining a fair market value and investment value.

Comparative Sales

Pros and cons

- **Advantages**
  - Government agencies generally prefer
  - Direct comparison easiest to present

- **Disadvantages**
  - Almost never any really comparable properties – particularly active mines or active reserves
  - Sufficient data may not be available
  - While some properties resemble others in some aspects, they may be extremely dissimilar in other aspects

Operational Analysis (Residual)

- Mine Life
- Annual Production
- Cash Flow
- Depreciation
- Gross Profit before Income tax
- Federal Taxes
- Net Income after Tax
- Capital Expenditures
- Sales per Year
- Sales Revenue

Operational Analysis (Residual)

Pros and Cons

- Advantages
  - Method used by most companies
  - Generally considered the preferred method of valuation
- Disadvantages
  - Requires significant information
    - Confidential company data
    - Many business assumptions
  - Time Consuming
  - Subject to considerable interpretation

Royalty Analysis

Modified Operational Analysis

- Seams (deposit)
- Terms
- Selling Prices
- Royalty Payments
  - Advance Minimum royalty
  - Production royalty
- Monthly Production Reports/Estimates

Royalty Analysis

Advantages and Disadvantages

- Advantages
  - Market Driven
  - Comparisons easier
  - Relatively easy to compute
  - Based on common economic and appraisal principles
  - Focuses on resource in-place not the business
  - Approximates the in-place value of the resource (represents what a will buyer pays a willing seller)
- Disadvantages
  - Not as property specific as operational analysis
  - Requires access to lease royalty comparisons

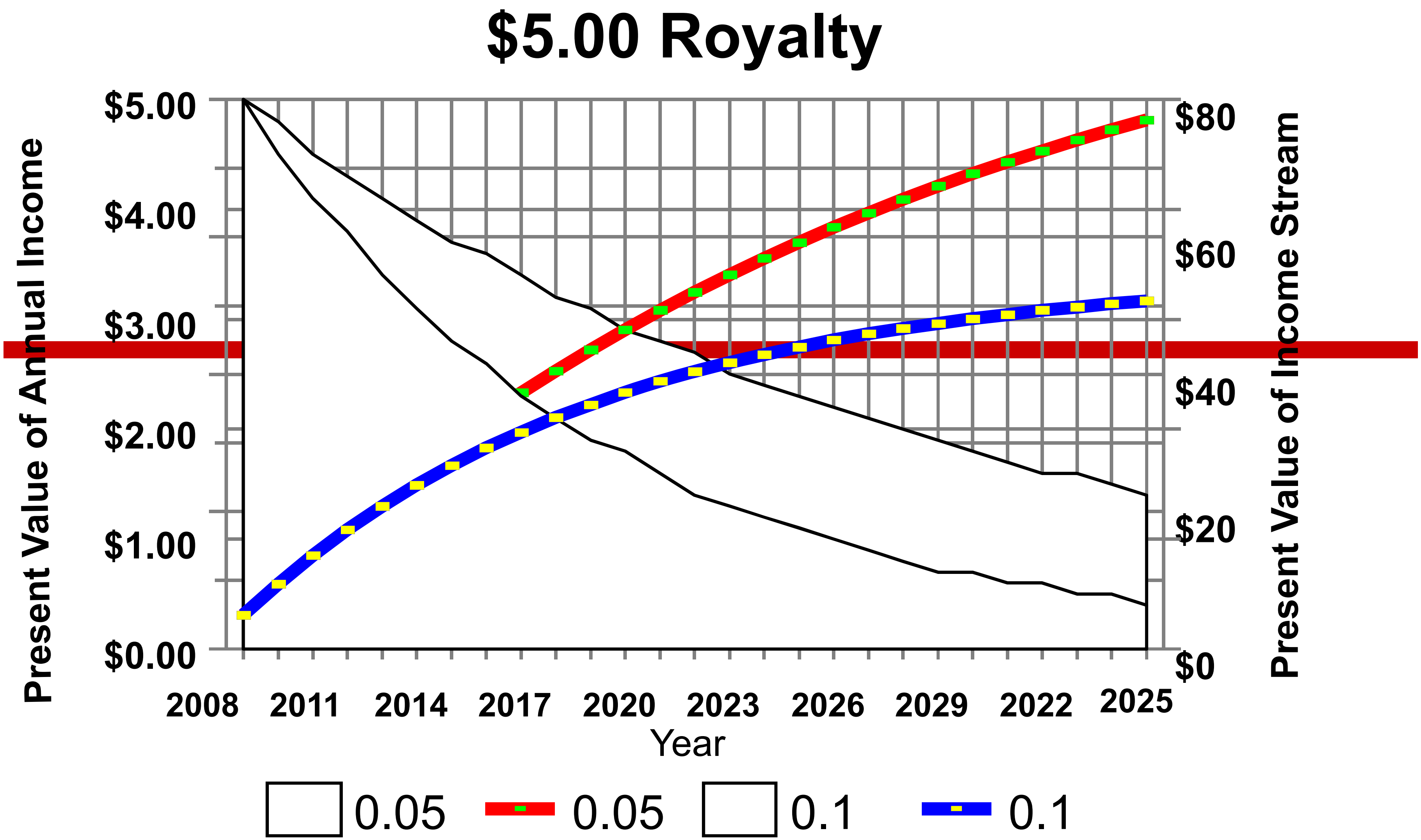
Basic Valuation Principles

- Dollar today is worth more than a dollar tomorrow
- Principle of substitution appropriate
- Production will approximate optimal market abortion rate

$5.00 Royalty
Value
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
2008
2012
2016
2020
2024
2028
2032
2036
2040
2044
2048
2052
Year
0.05
0.0725
0.1
0.125
0.15
0.18
0.2
0.15

Present Worth Calculation

Year	Rate								
	0.05			0.1			0.2		
	Annual Income	Discount Value	Cumulative	Annual Income	Discount Value	Cumulative	Annual Income	Discount Value	Cumulative
2008	$2.50	$2.50	$2.50	$2.50	$2.50	$2.50	$2.50	$2.50	$2.50
2009	$2.50	$2.38	$4.88	$2.50	$2.25	$4.75	$2.50	$2.00	$4.50
2010	$2.50	$2.26	$7.13	$2.50	$2.03	$6.78	$2.50	$1.60	$6.10
2011	$2.50	$2.14	$9.27	$2.50	$1.82	$8.60	$2.50	$1.28	$7.38
2012	$2.50	$2.04	$11.31	$2.50	$1.64	$10.24	$2.50	$1.02	$8.40
2013	$2.50	$1.93	$13.25	$2.50	$1.48	$11.71	$2.50	$0.82	$9.22
2014	$2.50	$1.84	$15.08	$2.50	$1.33	$13.04	$2.50	$0.66	$9.88
2015	$2.50	$1.75	$16.83	$2.50	$1.20	$14.24	$2.50	$0.52	$10.40
2016	$2.50	$1.66	$18.49	$2.50	$1.08	$15.31	$2.50	$0.42	$10.82
2017	$2.50	$1.58	$20.06	$2.50	$0.97	$16.28	$2.50	$0.34	$11.16
2018	$2.50	$1.50	$21.56	$2.50	$0.87	$17.15	$2.50	$0.27	$11.43
2019	$2.50	$1.42	$22.98	$2.50	$0.78	$17.94	$2.50	$0.21	$11.64
2020	$2.50	$1.35	$24.33	$2.50	$0.71	$18.65	$2.50	$0.17	$11.81
2021	$2.50	$1.28	$25.62	$2.50	$0.64	$19.28	$2.50	$0.14	$11.95
2022	$2.50	$1.22	$26.84	$2.50	$0.57	$19.85	$2.50	$0.11	$12.06
2023	$2.50	$1.16	$27.99	$2.50	$0.51	$20.37	$2.50	$0.09	$12.15
2024	$2.50	$1.10	$29.09	$2.50	$0.46	$20.83	$2.50	$0.07	$12.22
2025	$2.50	$1.05	$30.14	$2.50	$0.42	$21.25	$2.50	$0.06	$12.27
Total	**$45.00**	**$30.14**		**$45.00**	**$21.25**		**$45.00**	**$12.27**	


$5.00 Royalty
Present Value of Annual Income
Present Value of Income Stream
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
$80
$60
$40
$20
$0
2008
2011
2014
2017
2020
2023
2026
2029
2022
2025
Year
0.05
0.05
0.1
0.1

Questions and Answers

Appeal

When The Appeal Happens

State Taxation

State Taxation

Most states provide for the taxation of mineral value.

Nearly all states levy or permit local government to levy some form of property tax.

Some states also impose a severance tax on mineral production or production tax on the mineral as it is removed from the ground.

In states levying or permitting the levy of property tax on mineral properties, the tax may be based on:

- **The contributory value of the mineral to the fee estate**
- **The severed value of the mineral as a separate identifiable taxable entity**
- **Some fixed or "artificial value" used for levying property tax.**

State Survey

State Mineral Taxes

State	Income	Property	Sales/Use	Taxes Mining and Other
Alabama			Y	Coal severance tax
				Local coal severance tax
				Iron ore severance tax
				Minerals severance tax
Alaska	Y		N*	Mining license tax
				Production royalty on state lands
Arizona			Y	Severance tax on metalliferous minerals
Arkansas			Y	Severance tax on all natural resources
				Additional tax on coal
				Additional tax on stone and crushed rock
California			Y	Hazardous waste disposal fee
				EPA ID annual verification fee
				Envrironmental fee
Colorado			Y	Severance tax on metallic minerals, oil shale, Coal
Georgia			Y	Corporation net worth tax
Idaho			Y	Mine license tax
Illinois			Y	Personal property replacement tax
Indiana			Y	Coal severance tax, natural resource severance
Kentucky			Y	& processing tax
Maine			Y	Mining excise tax on metallic minerals
Michigan			Y	Low grade iron ore tax (in lieu of property
Minnesota			Y	tax)
				Ad valorem tax on unmined natural iron ore
				Ad valorem tax on unmined taconite
				Mine inspection fees
				Aggregate material tax iron ore Net proceeds tax
				on minerals other than taconite or taconite
				operations Ad valorem tax on auxiliary mining
Missouri			Y	lands for Ad valorem tax on severed mineral
				interests Taconite production tax
				Metallic minerals waste management fee
				Industrial mineral mine land reclamation fee

State Survey

State Mineral Taxes

State	Income	Property	Taxes Mining and Other
Montana		Y	Metal mines license tax Cement and gypsum producers license tax (RIGWAT) Resource indemnity and ground water assessment tax Micaceous mineral mines license tax Coal severance tax Coal gross proceeds tax Net proceeds tax on mines and mining claims not incl. coal and metal mines Metal gross proceeds tax
Nevada	N	Y	Business license tax Proceeds of minerals tax
New Mexico		Y	Severance tax on all natural resources
North Carolina		Y	Highway use tax
North Dakota		Y	Coal severance tax Coal conversion facility privilege tax
Oregon		Y	
Pennsylvania		Y	Capital stock and franchise tax
South Carolina		Y	
South Dakota	N	Y	Energy minerals severance tax Minerals severance tax Conservation tax (for energy minerals)
Tennessee		Y	Coal severance tax Local minerals severance tax
Utah		Y	Corporate franchise tax Minerals severance tax
Virginia		Y	Reclamation tax on coal
Washington	N	Y	Business and occupation tax
West Virginia		Y	Severance tax on all natural resources Recapture tax Business franchise tax
Wisconsin		Y	Occupation tax on iron ore concentrates Occupation tax on coal Net proceeds occupation tax on mining of metallic minerals
Wyoming	N	Y	Excise and severance tax on coal, oil shale, crude oil and gas, trona, uranium and other minerals

Canadian Provincial Mineral Taxes

	Taxes				
Province	Income	Capital	Property	Sales	Special Mining
Alberta	Y	N	Y	N	Minerals royalty
British Columbia				Y	Mineral tax
Manitoba				Y	Mining tax
New Brunswick				Y	Metallic minerals tax
Newfoundland/Labrador	Y	N	Y	N	Mining tax
Northwest Territories	Y	N	Y	N	Mining tax
Nova Scotia				Y	Mining tax
Nunavit	Y	N	Y	N	Mining tax
Ontario				Y	Mining tax
Prince Edward Island	Y	N		Y	Mining tax
Quebec				Y	Mining tax
Saskatchewan				Y	Freehold production tax Coal crown royalty
Yukon Territory	Y	N	Y	N	Mining royalty

GIS Based Method for Evaluating Large Coal Reserves and Resources

Seventh International Symposium on Mine Planning and Equipment Selection

October 6-9, 1998

Jeffrey Kern, RTC

Thomas Torries, WVU

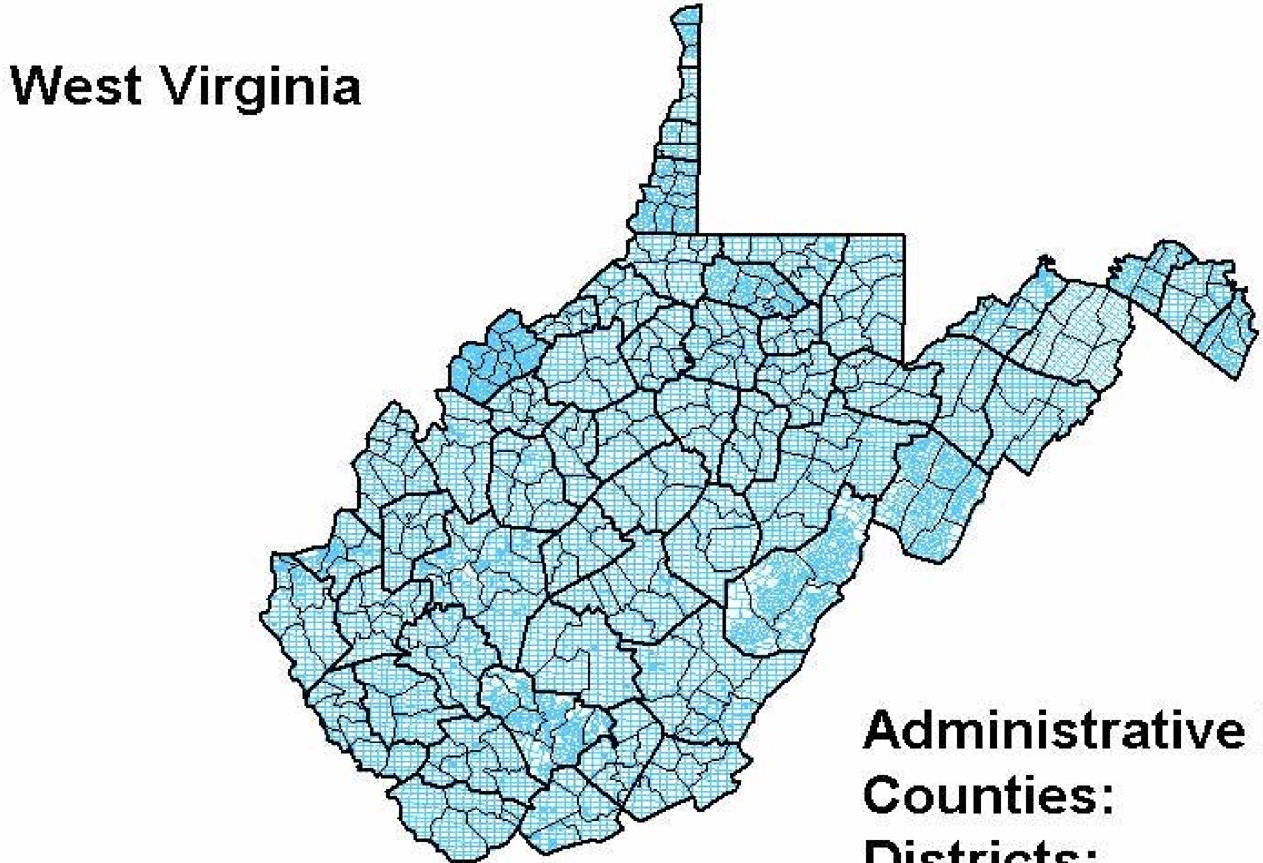
- Research funded by the West Virginia Department of Tax and Revenue

- Research completed by consultants to the Tax Department
  – Jeffrey Kern, Resource Technologies Corporation, State College, PA
  – Thomas Torries, Torries and Associates, Morgantown, WV

Goals

- Identify value of individual coal properties in WV for *ad valorem* taxation.
- Identify areas of high value for exploration.
- Make data base and evaluation model self correcting over time.

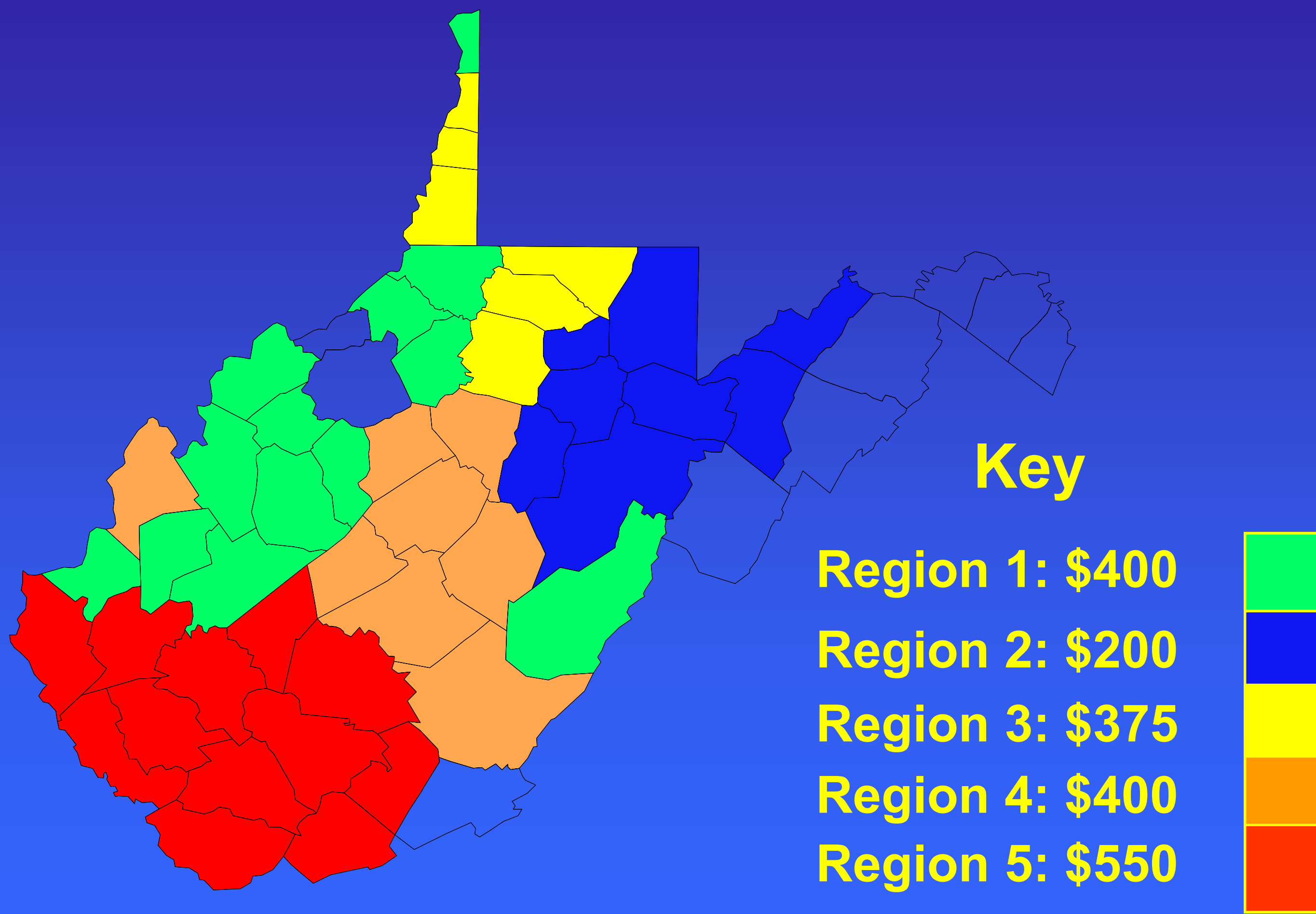
The Physical Setting: Administrative Districts



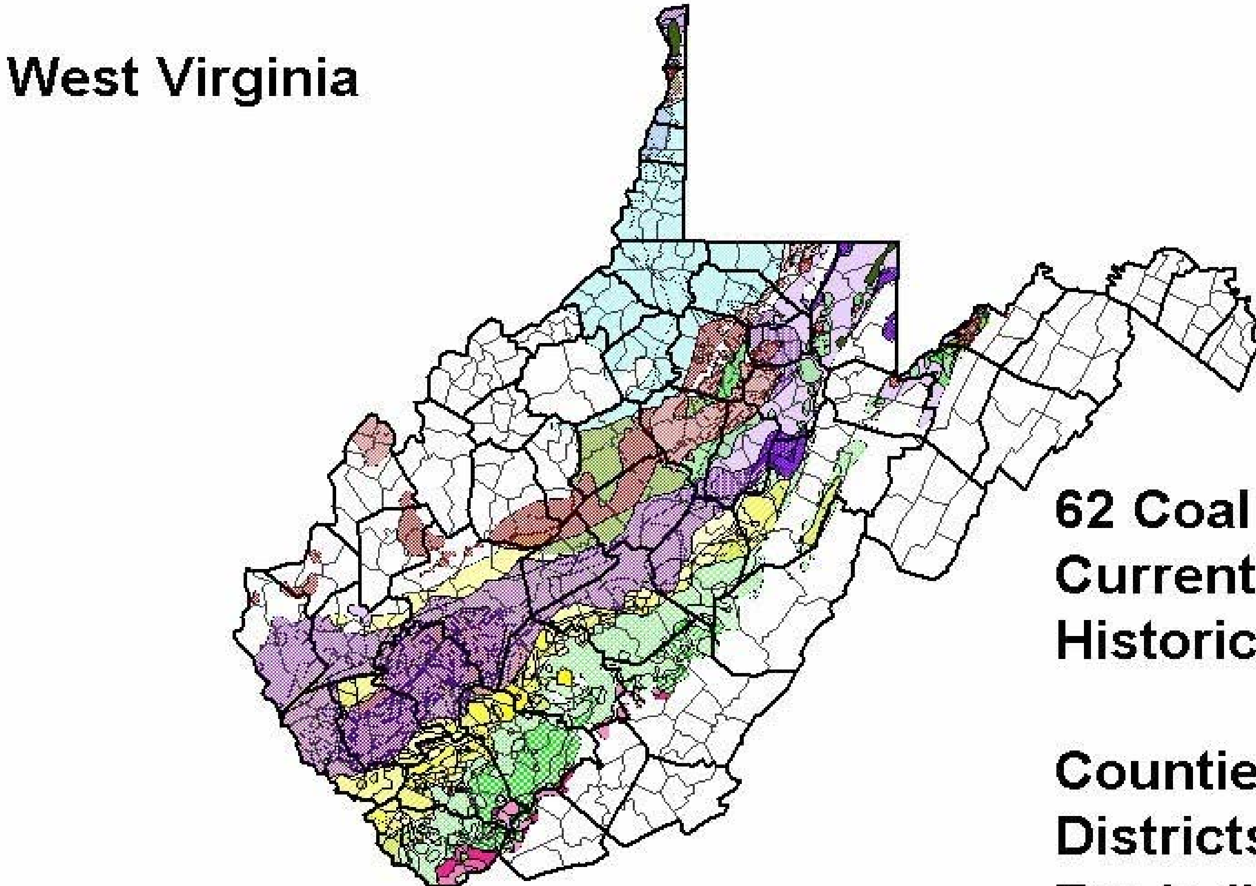
Administrative Districts

Counties:	55
Districts:	614
Tax Indices:	12,886

Current Regional Tax Assessments



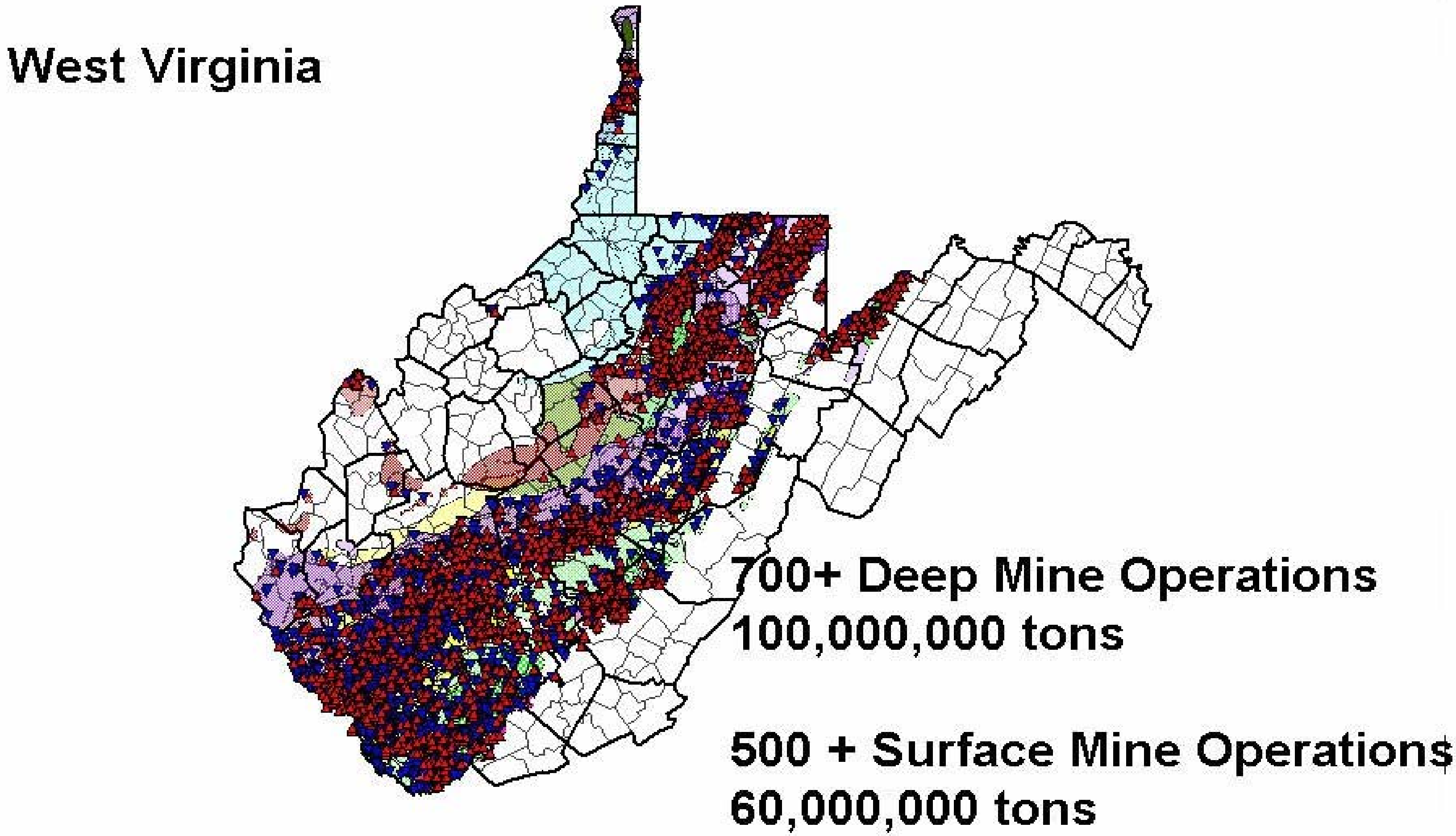
The Physical Setting: Coal Seams



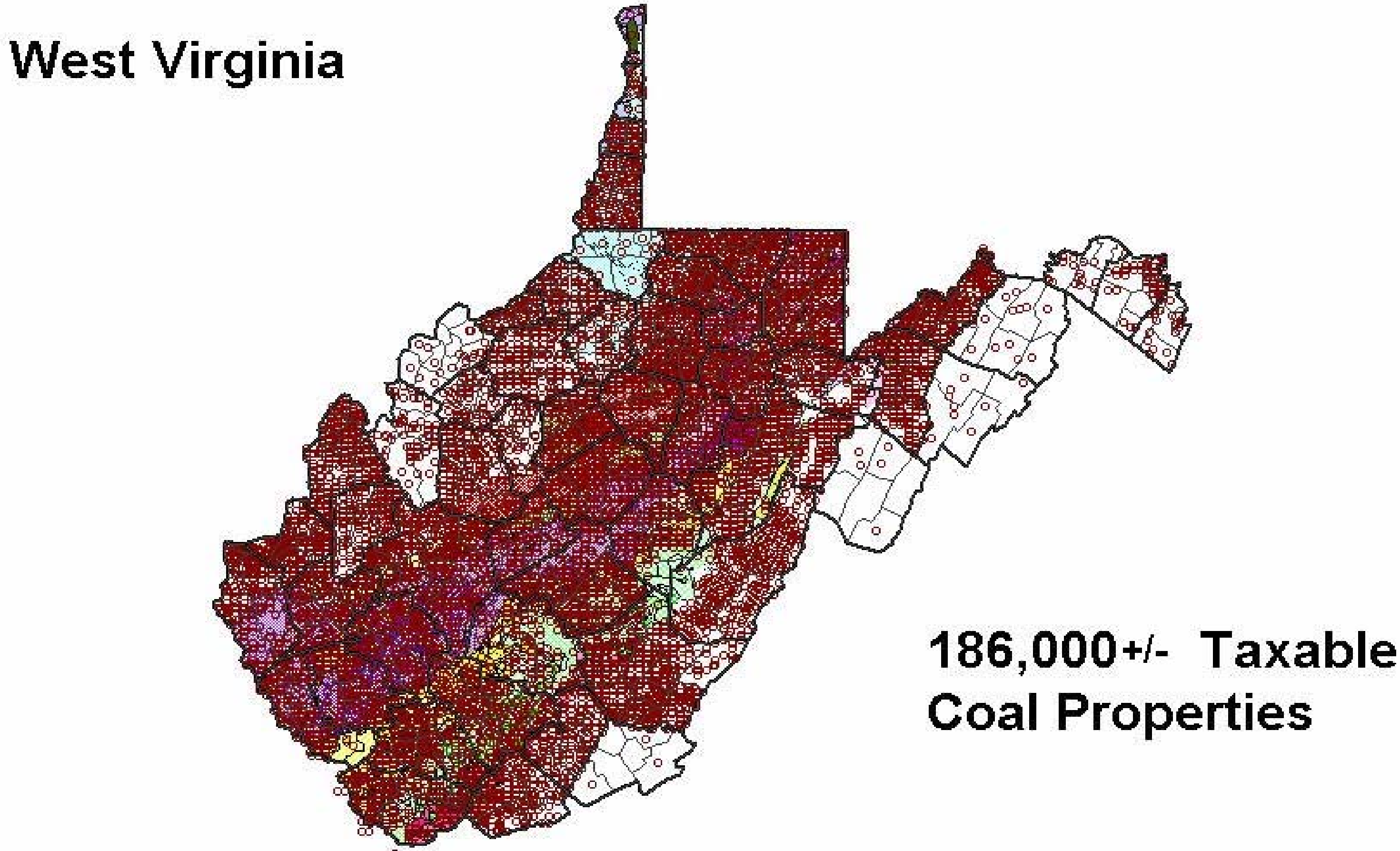
62 Coal Seams
Currently &
Historically Mined

Counties:	42
Districts:	357
Tax Indices:	6,837

The Physical Setting: Mining



The Physical Setting: Tax Properties



Many Factors Determine Value

- Coal markets, prices, royalties
- Coal quality and quantity
- Mining costs
- Transportation costs
- Conversion costs (convert to electricity)
- Environmental constraints
- When it is to be mined

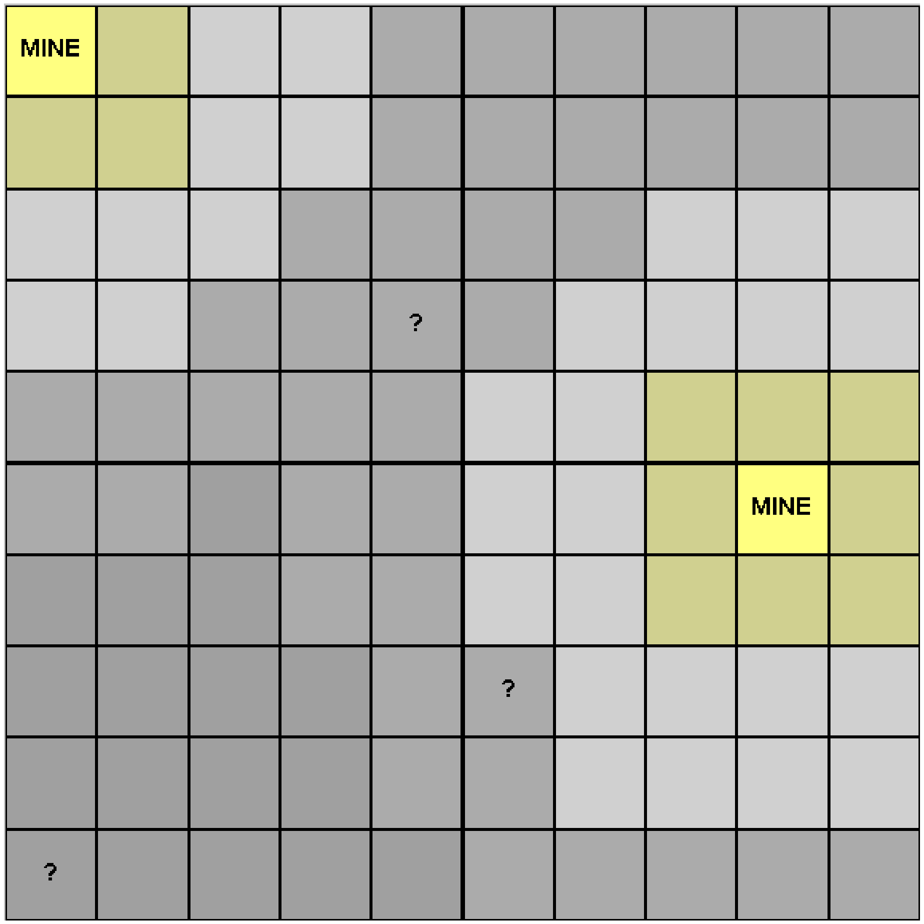
Property Value Determinants

- Amount of mineable coal - geology, mining and processing technology and costs.
- Amount of marketable coal - transportation and markets.
- 200 years of coal in WV that meet these criteria.
- The most sensitive factor is time of mining.

The Problem

- +200 years of coal reserves and resources.
- 186,000 individual coal properties.
- Property value largely depends when it is to be mined.
- Impossible to tell with precision when any individual parcel will be mined.
- How to tell the value of any given property?

Determination of Time of Mining



The Solution

- Detailed evaluation of 186,000 properties will *not* give the answer.
- Valuation using *mass appraisal techniques* will give the answer.
- Data intensive.
- Must be GIS based.
- Must involve corrrect economic theory.

Basics of the Reserve Coal Valuation Methodology

- Aggregate value of all unmined coal.
- Less value of all active coal
- Equals value of all reserve coal
- Model apportions value of reserve coal among the 186,000 properties
- Yields appraised values of individual properties.

Aggregate Value of Unmined Coal

- Investors pay more for coal property to be mined sooner rather than later
- Most of the 200 years of coal to be mined later.
- Most will have low value.
- Want to identify areas of highest value.
- Can use present value calculations.

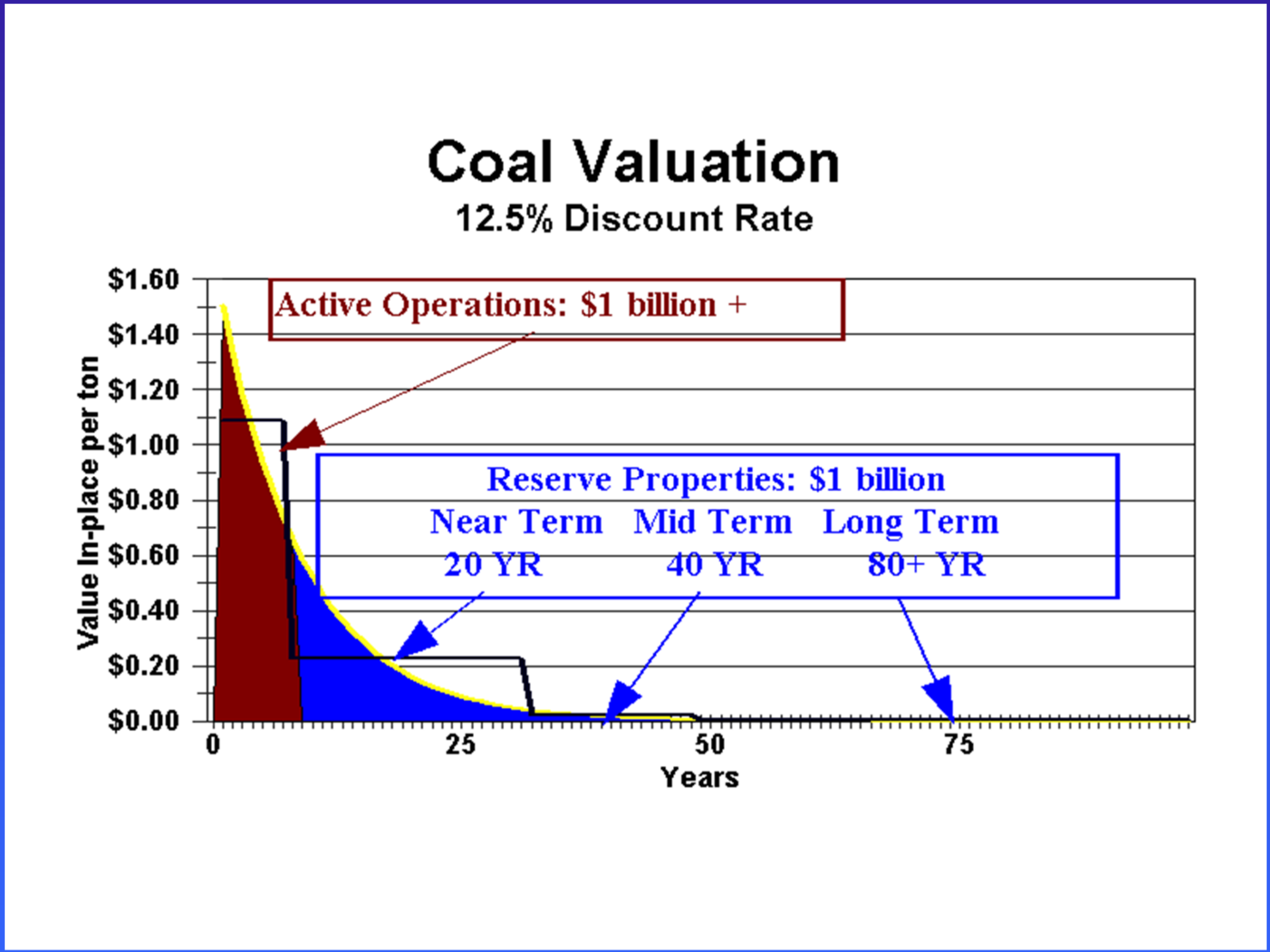
Aggregate Value of Unmined Coal - 1998

- Quantity shipped
- Average price $/t fob mine
- Average percent royalty
- Years of remaining reserves - 200 years
- Discount rate 12.5%
- Annuity value = $2.0 billion

How Apportionment Works

- Identify regional coal characteristics by coal seam.
- Use these data to classify 186,000 properties into 5 classes of when to be mined.
- Use same characteristics as coal buyers to classify.

Determination of Time of Mining



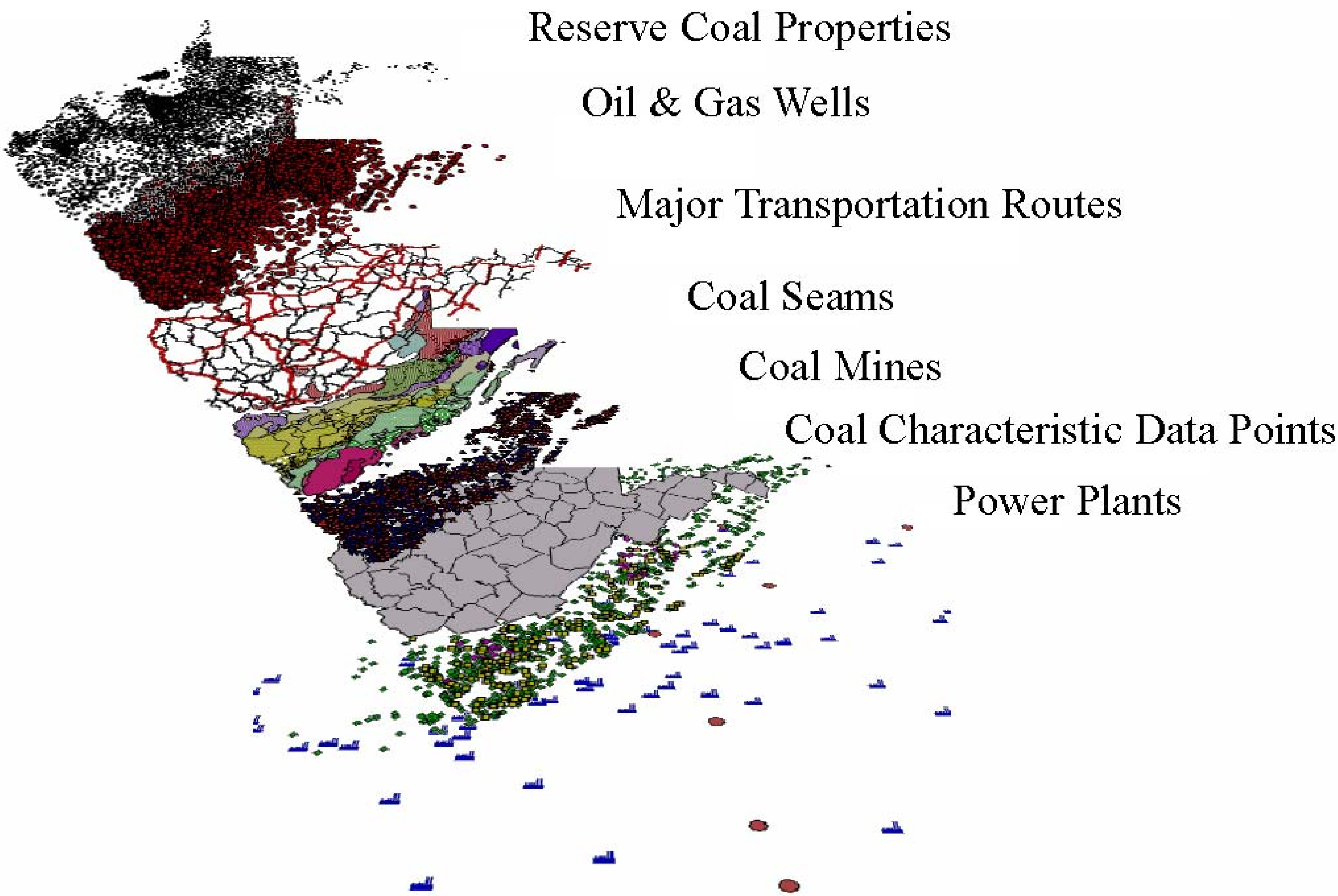
Determination of Value

- Time of mining each property is identified.
- Determine fob price if mined today.
- Discount current fob price to determine what an investor would pay for coal to be mined at identified time in future.
- Yields index fob $/t value.
- Apportion index values to total $2.0 billion.

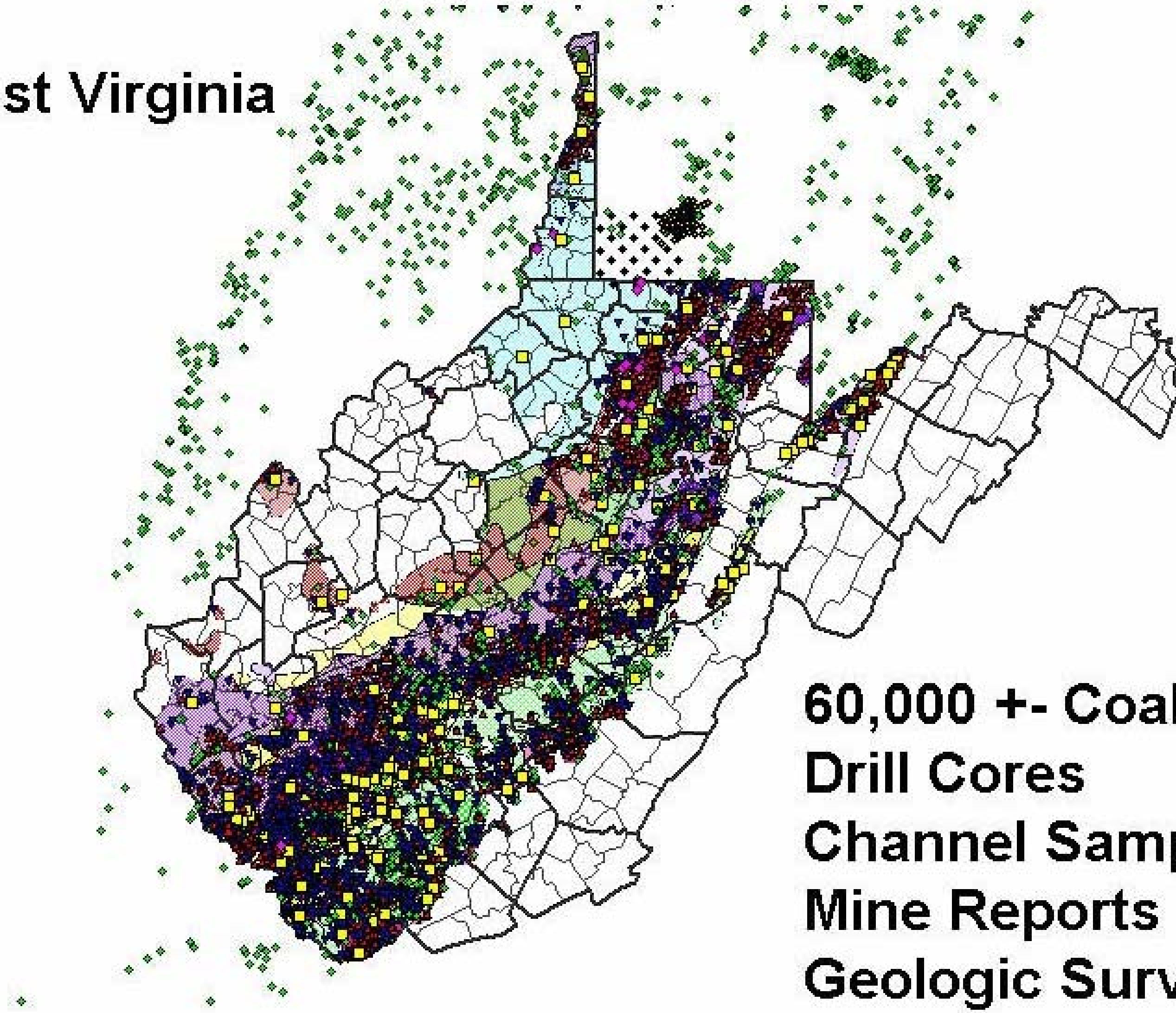
Input Maps

- Coal existence
- Coal quality
- Coal thickness
- Prime seam(s)
- Mining conditions
  - Underground or surface
  - Over and under mining

Data Layers Used For Valuation Model

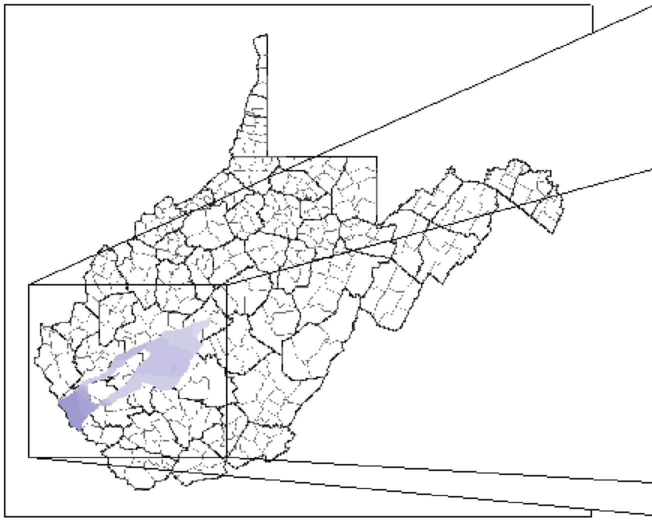


West Virginia

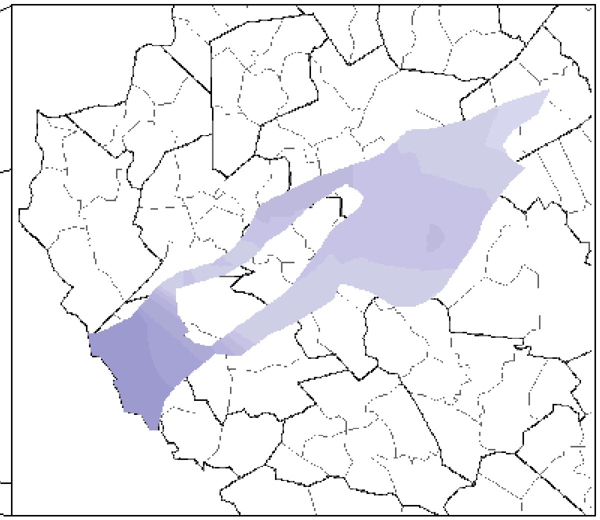


60,000 +- Coal Data Points
Drill Cores
Channel Sample
Mine Reports
Geologic Survey Samples

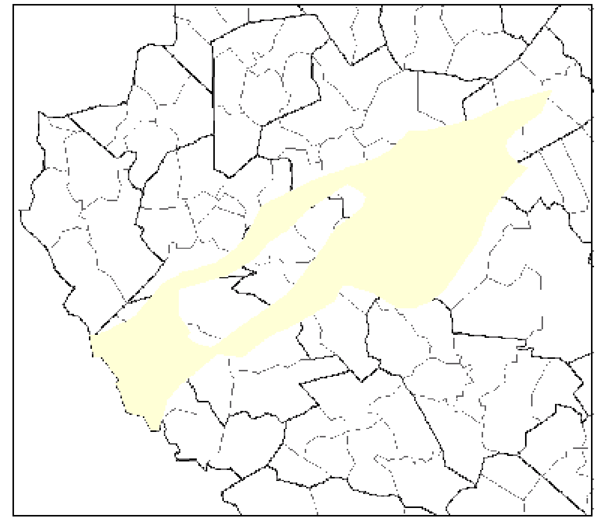
Upper Number Five Block Seam



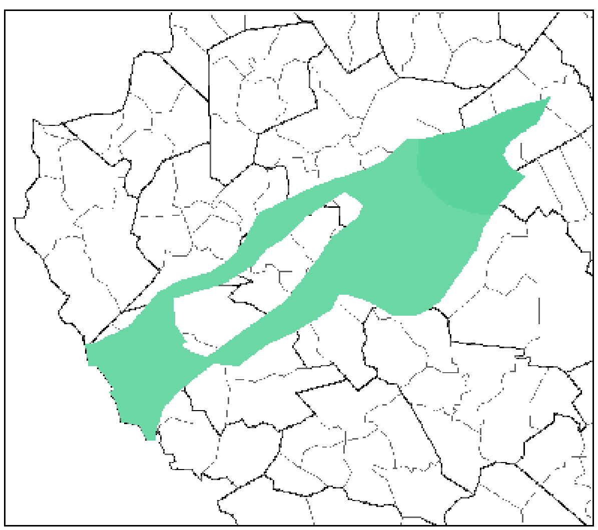
Locator Map



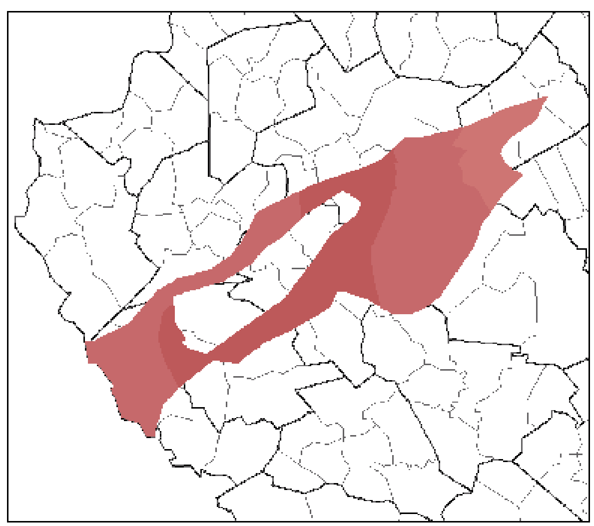
Thickness Values



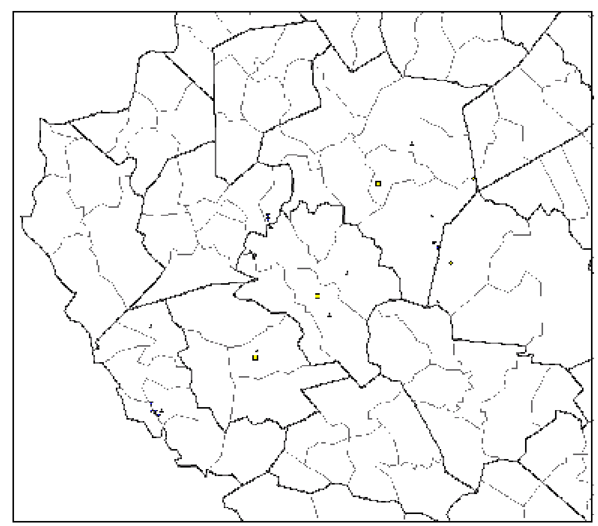
Sulfur Values



Volatility Values

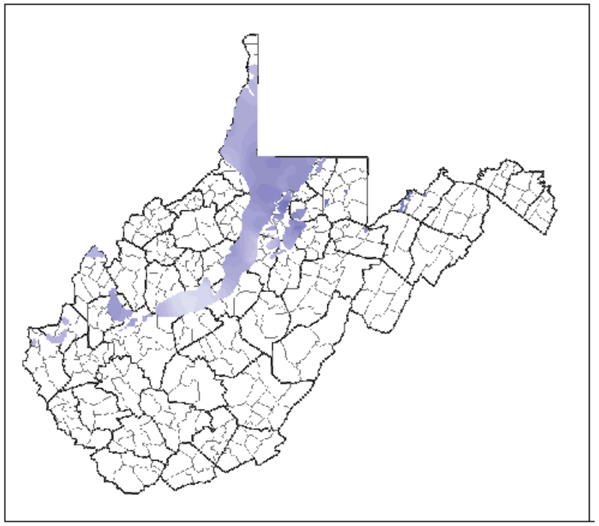


BTU Values

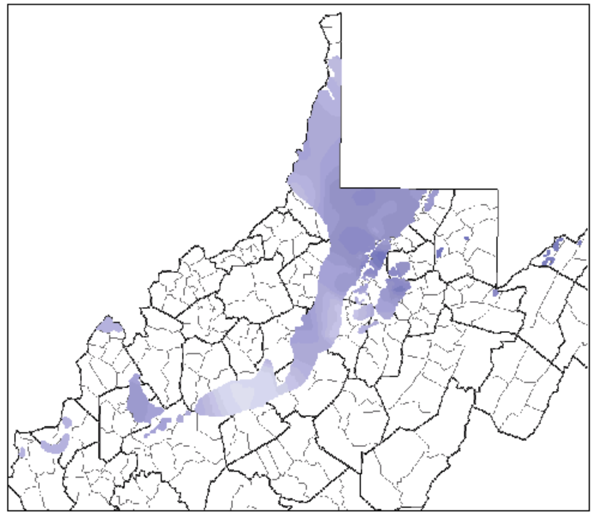


Data Points

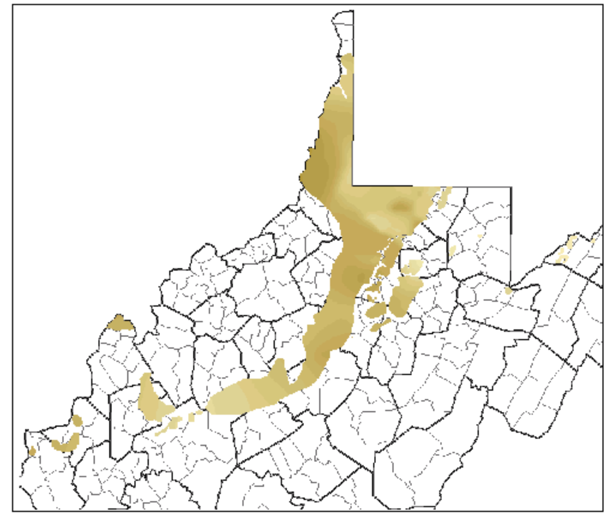
Pittsburgh Seam



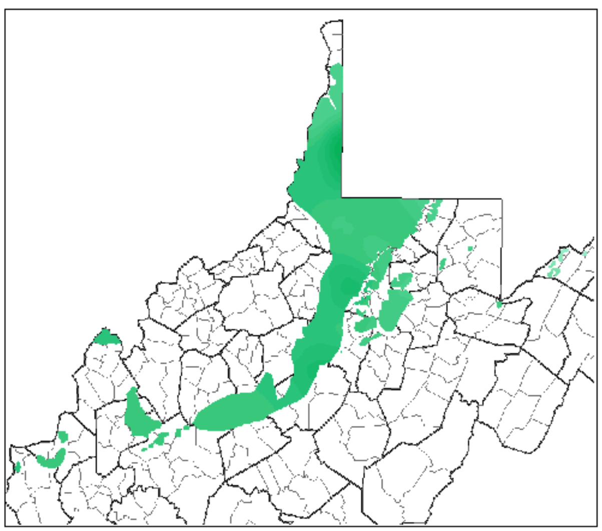
Locator Map



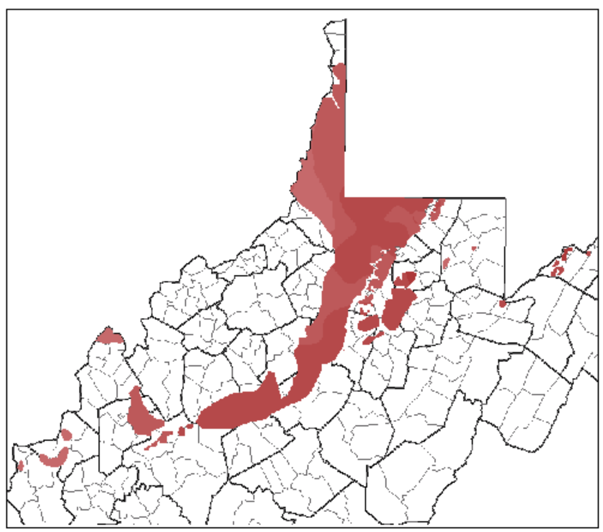
Thickness Values



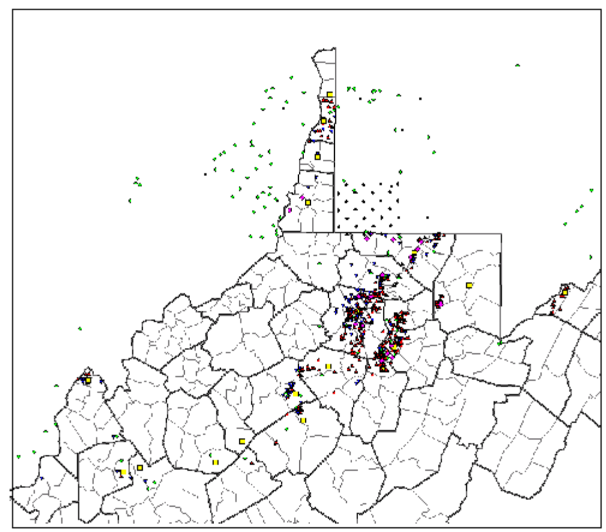
Sulfur Values



Volatility Values

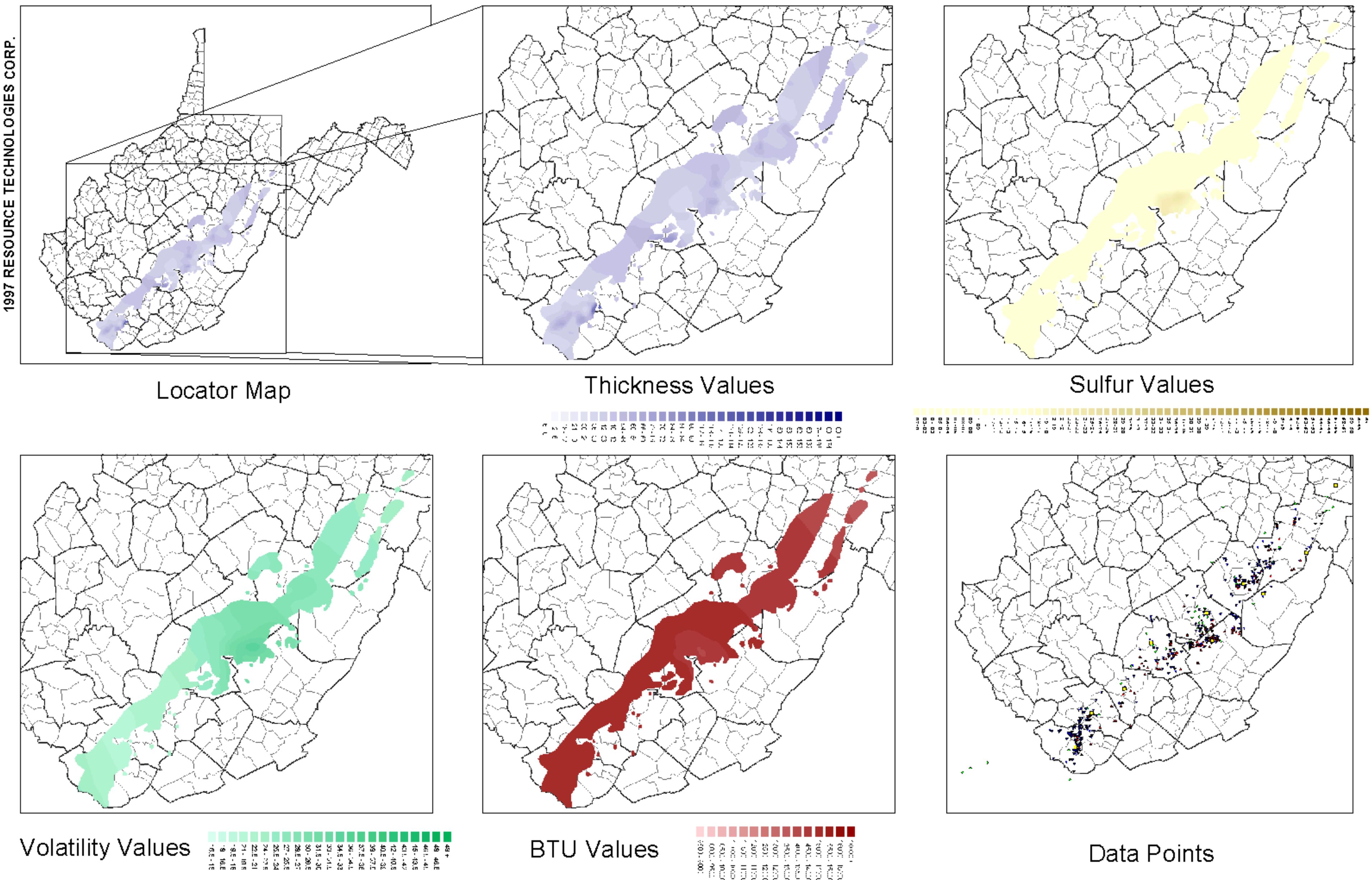


BTU Values

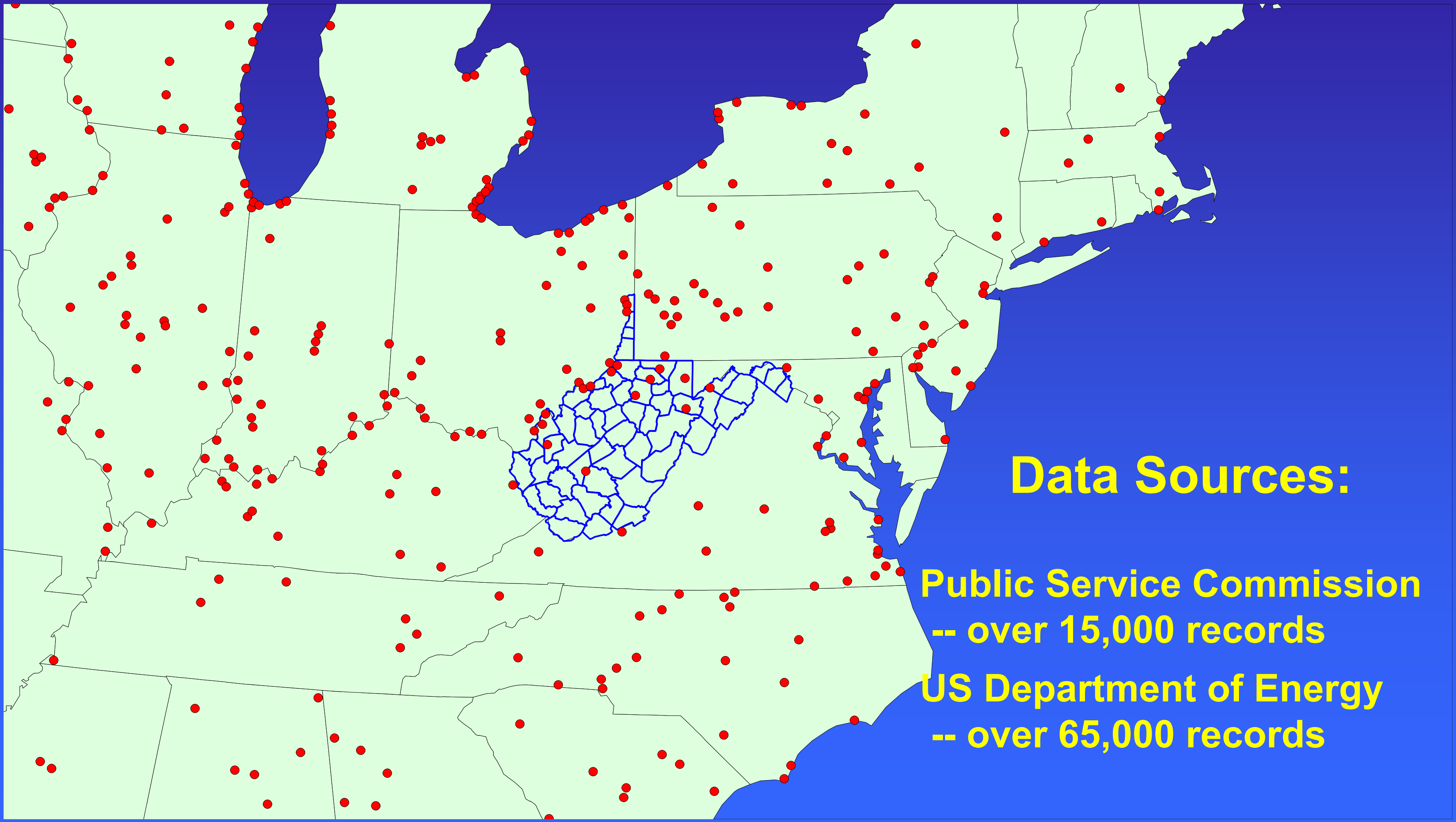


Data Points

Sewell Seam


1997 RESOURCE TECHNOLOGIES CORP.
Locator Map
Thickness Values
Sulfur Values
Volatility Values
BTU Values
Data Points

Coal Prices
FOB Steam Power Plant Sales
Mine Source, Seam, & Shipping Information



Data Sources:

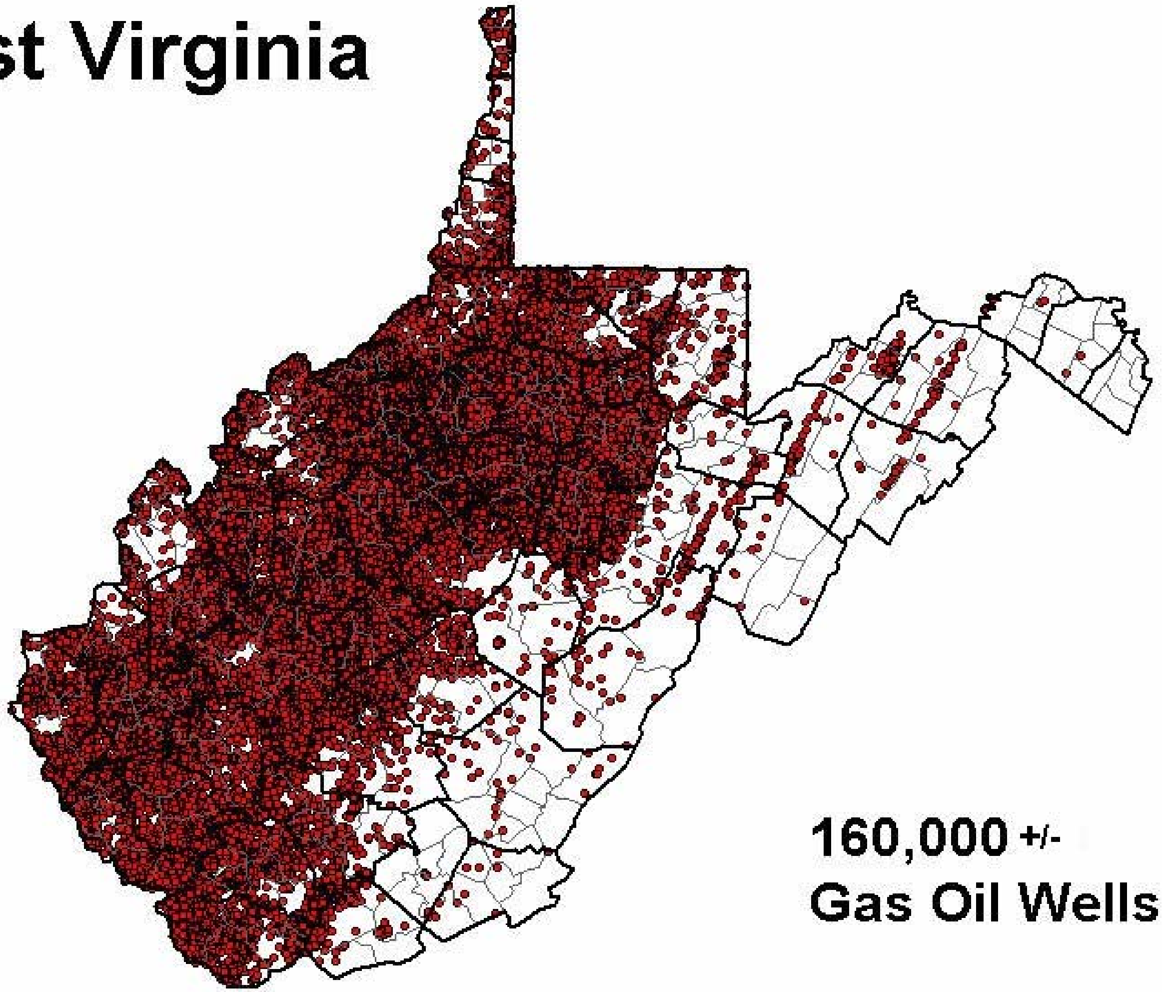
Public Service Commission
-- over 15,000 records

US Department of Energy
-- over 65,000 records

Input Maps (continued)

- Oil & gas well density
- Transportation costs
- Environmental conditions
- Regional transaction and mining activity
- Coal prices and royalties

West Virginia



160,000 +/-
Gas Oil Wells

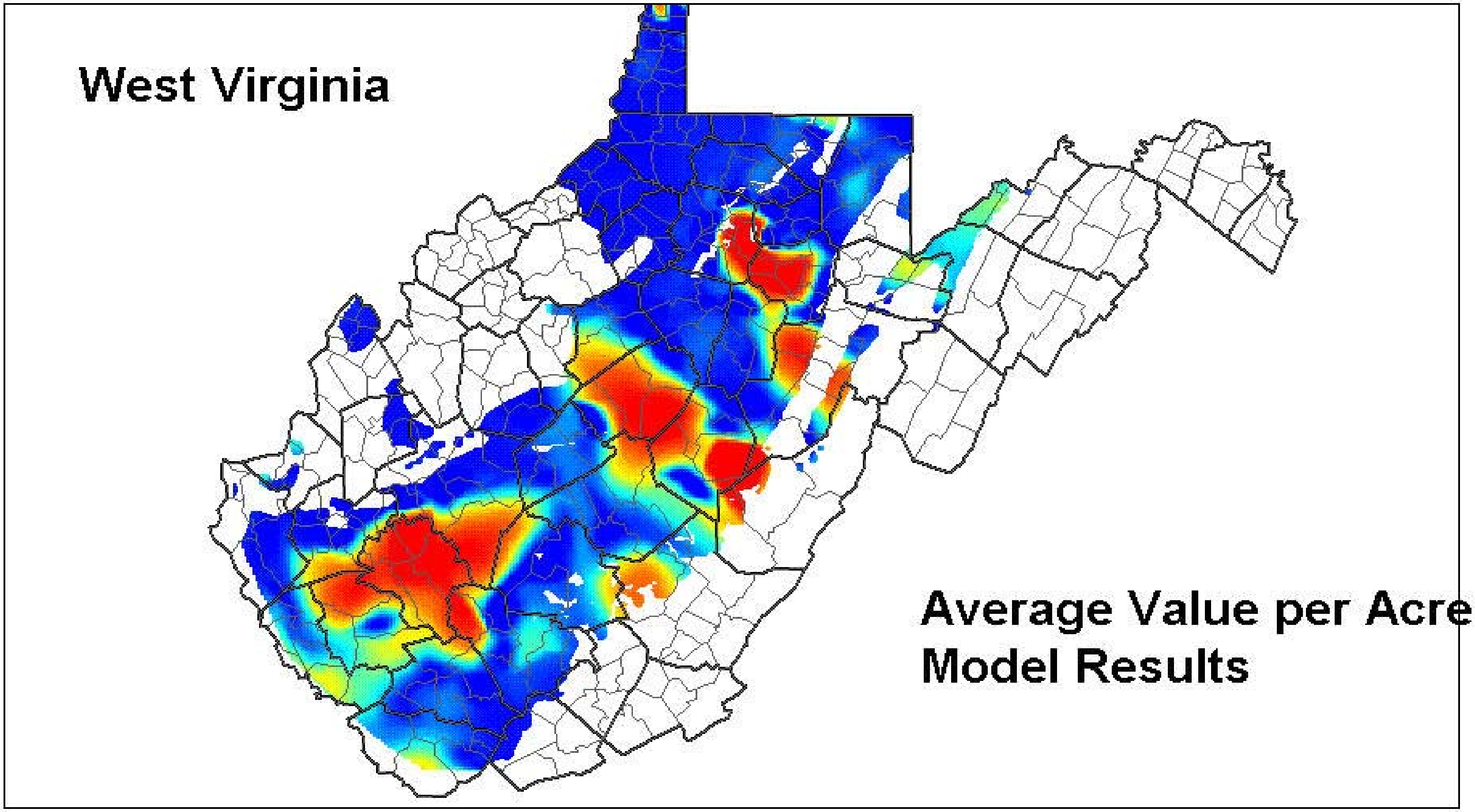
Output Maps

- Coal value $/ton fob mine
  - By seam
  - By region
- Coal value $/million Btu delivered
- Areas of remaining reserves
  - Low sulfur coal
  - Strip mining

Results of Proposed Method

- Uses all available data.
- Easily updated, corrected, and improved.
- Captures all value in State.
- Results in equitable tax appraisals.
- Identifies areas of exploration interest.

Valuation Model Results



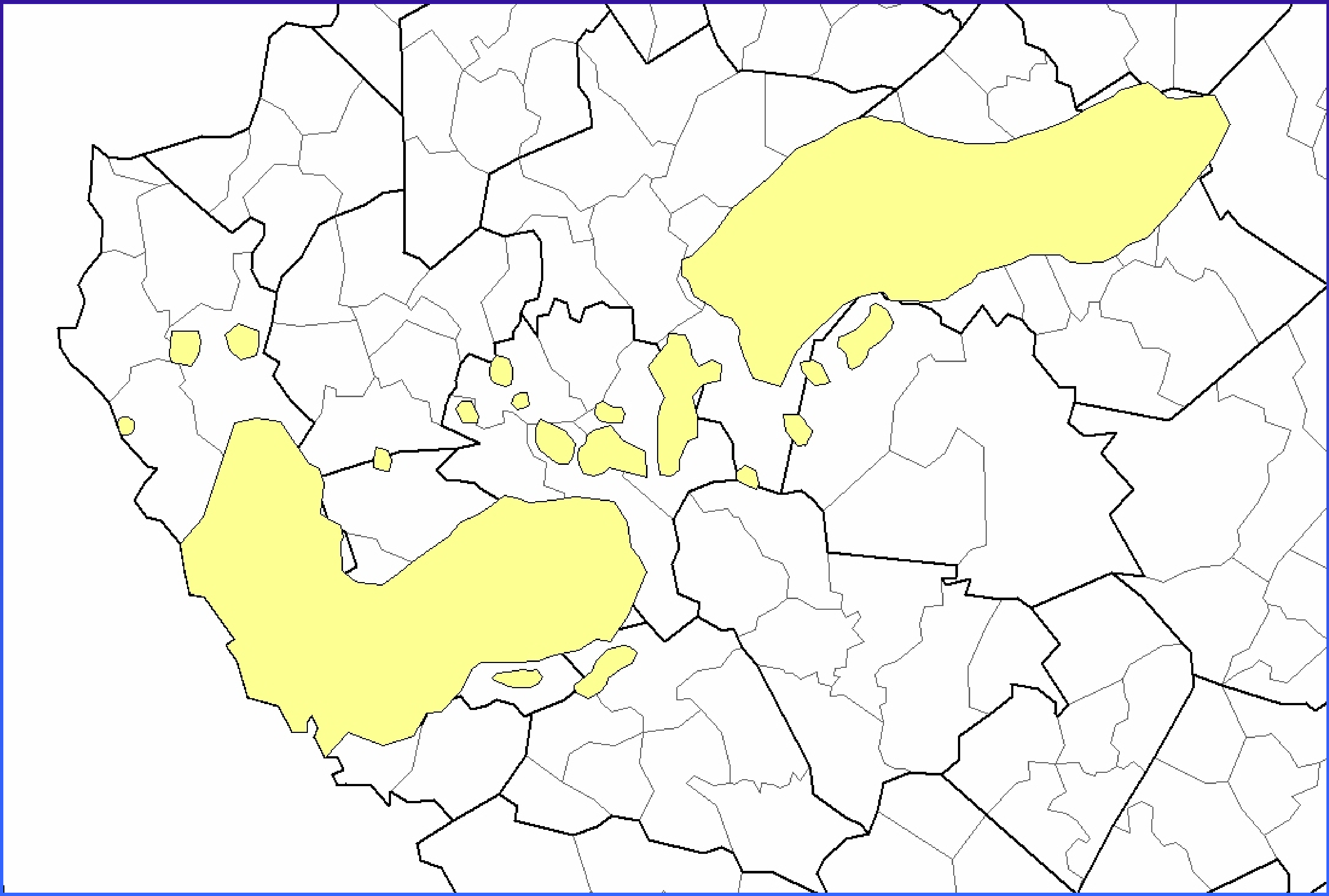
Validation of Model

- Gives sensible results
  - Distribution of values
  - Value by county and district
  - Resolve questionable results

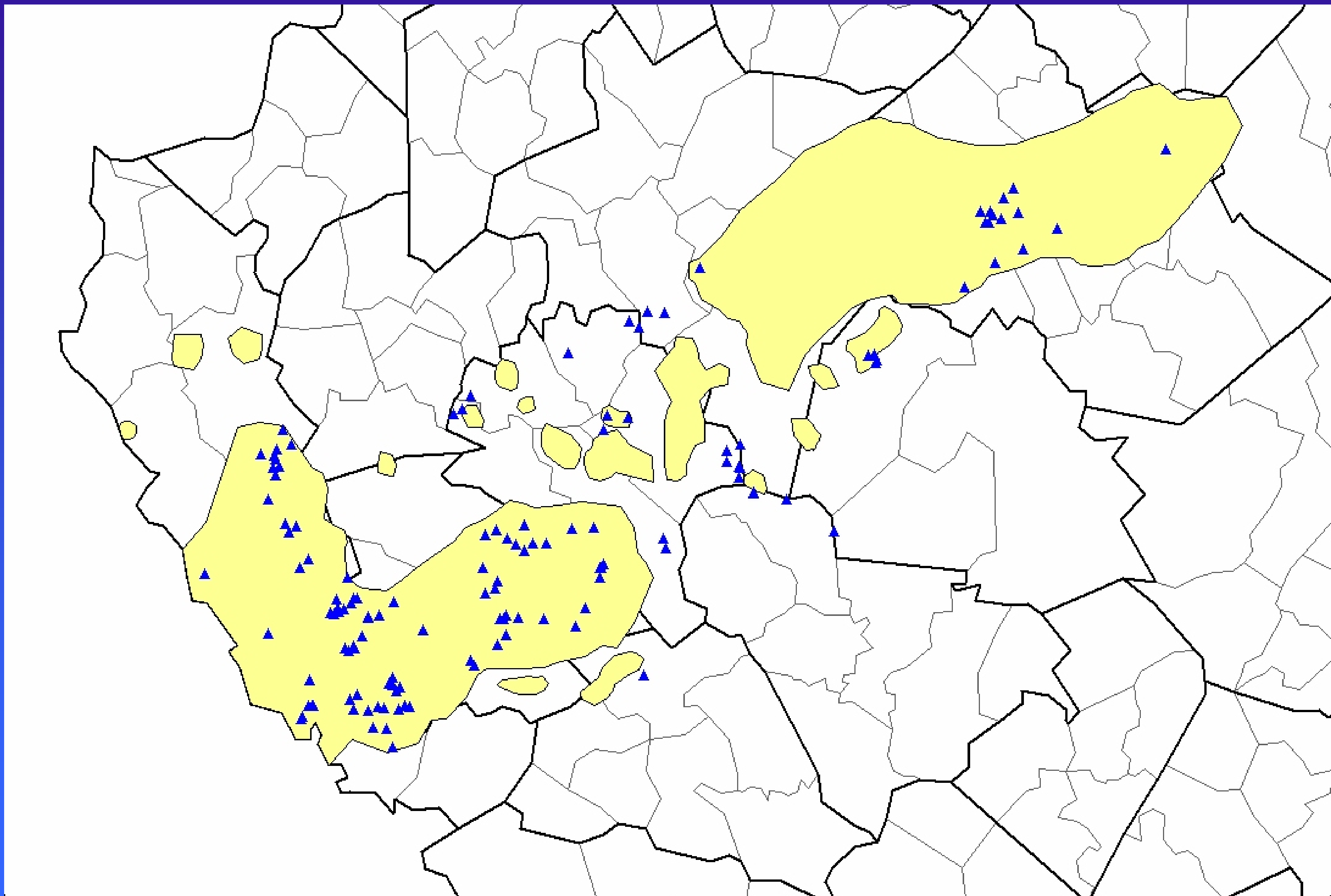
Work to be Done

- Better, but not precise, property locations
- Seam elevations
- Surface elevations
- Seam outcrop definition
- Seam correlation and areal extent

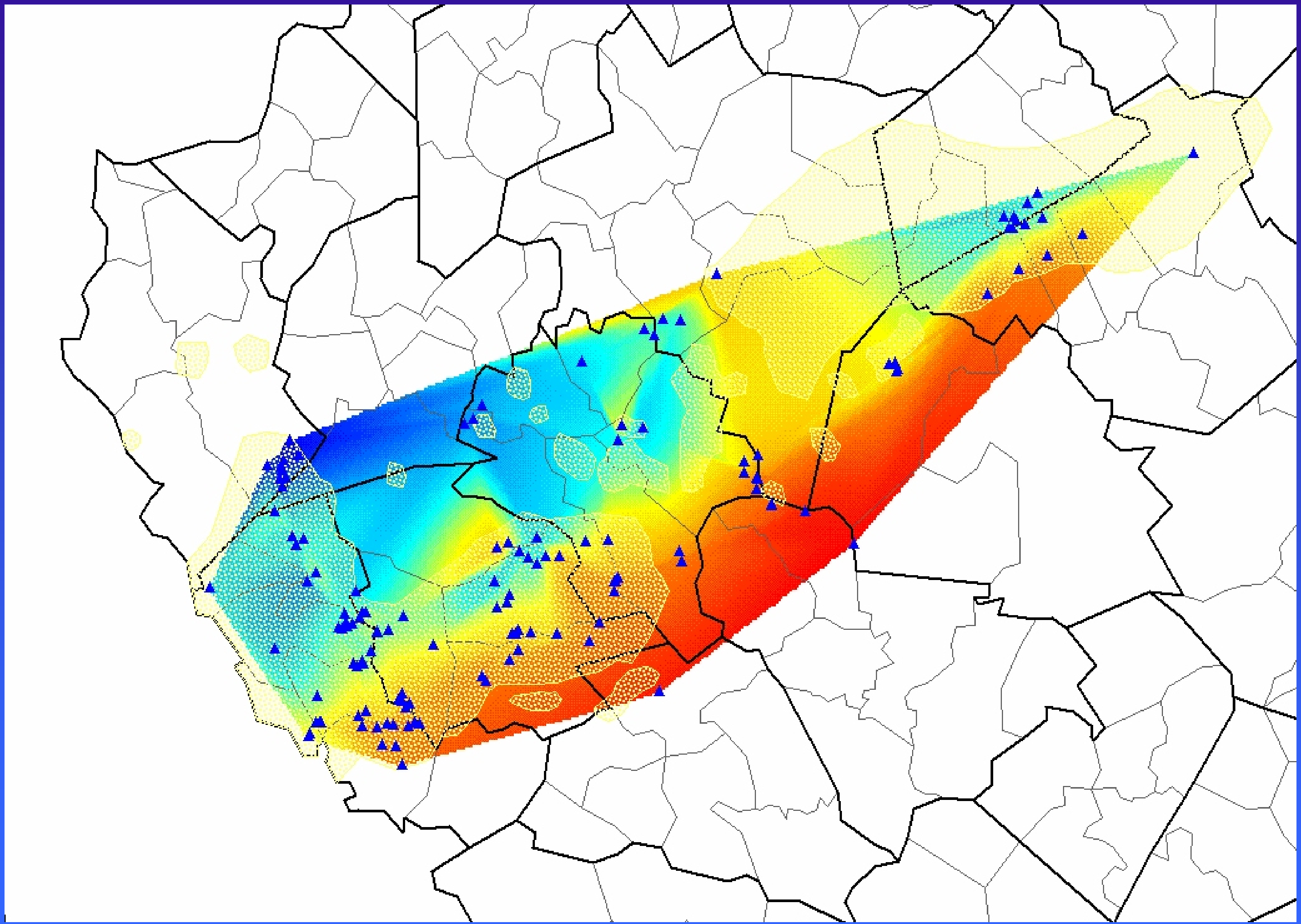
Original Coalburg Seam Extent Map



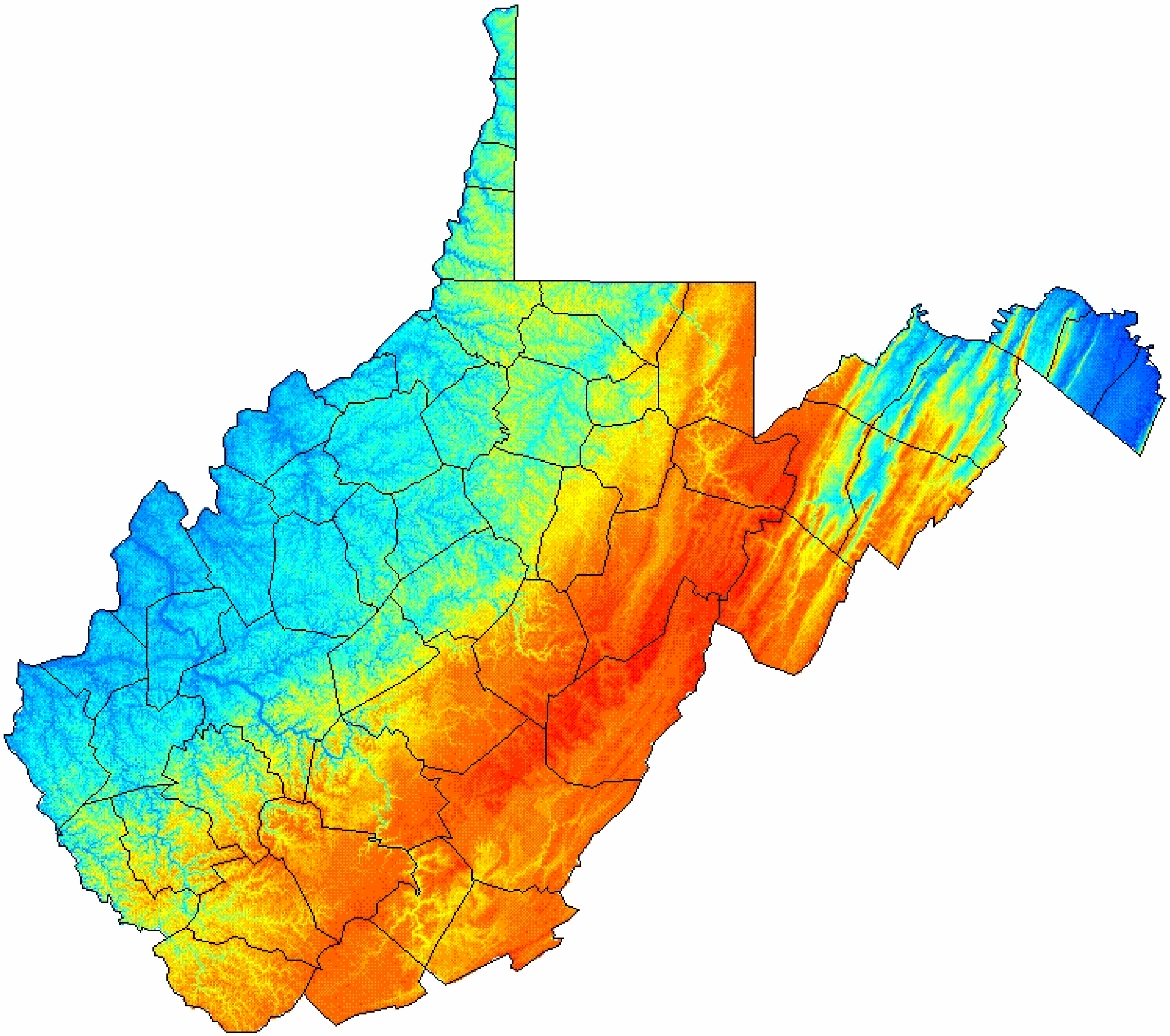
New Data Points Collected for Coalburg Seam



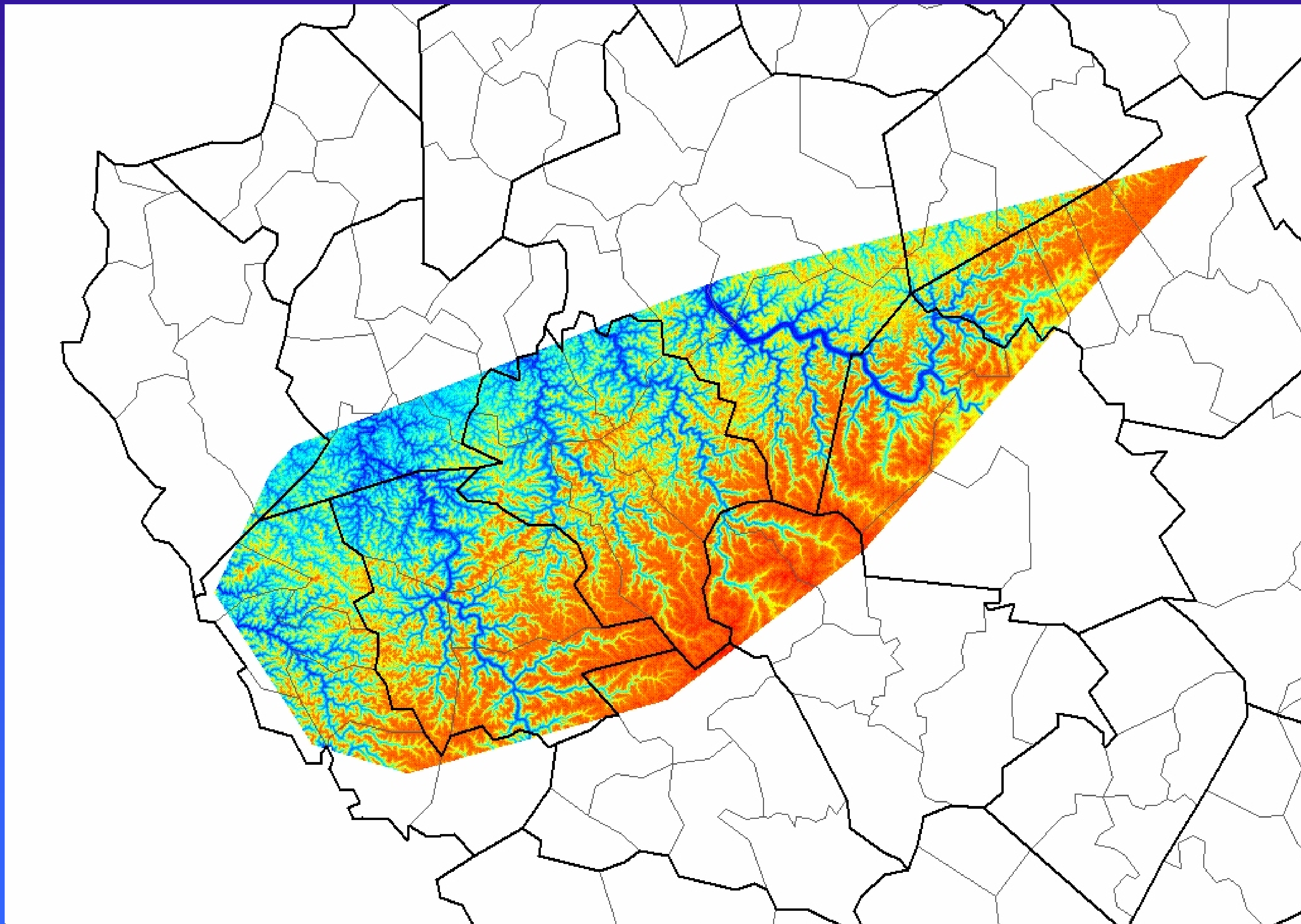
Coal Elevation Values Derived from New Data Points



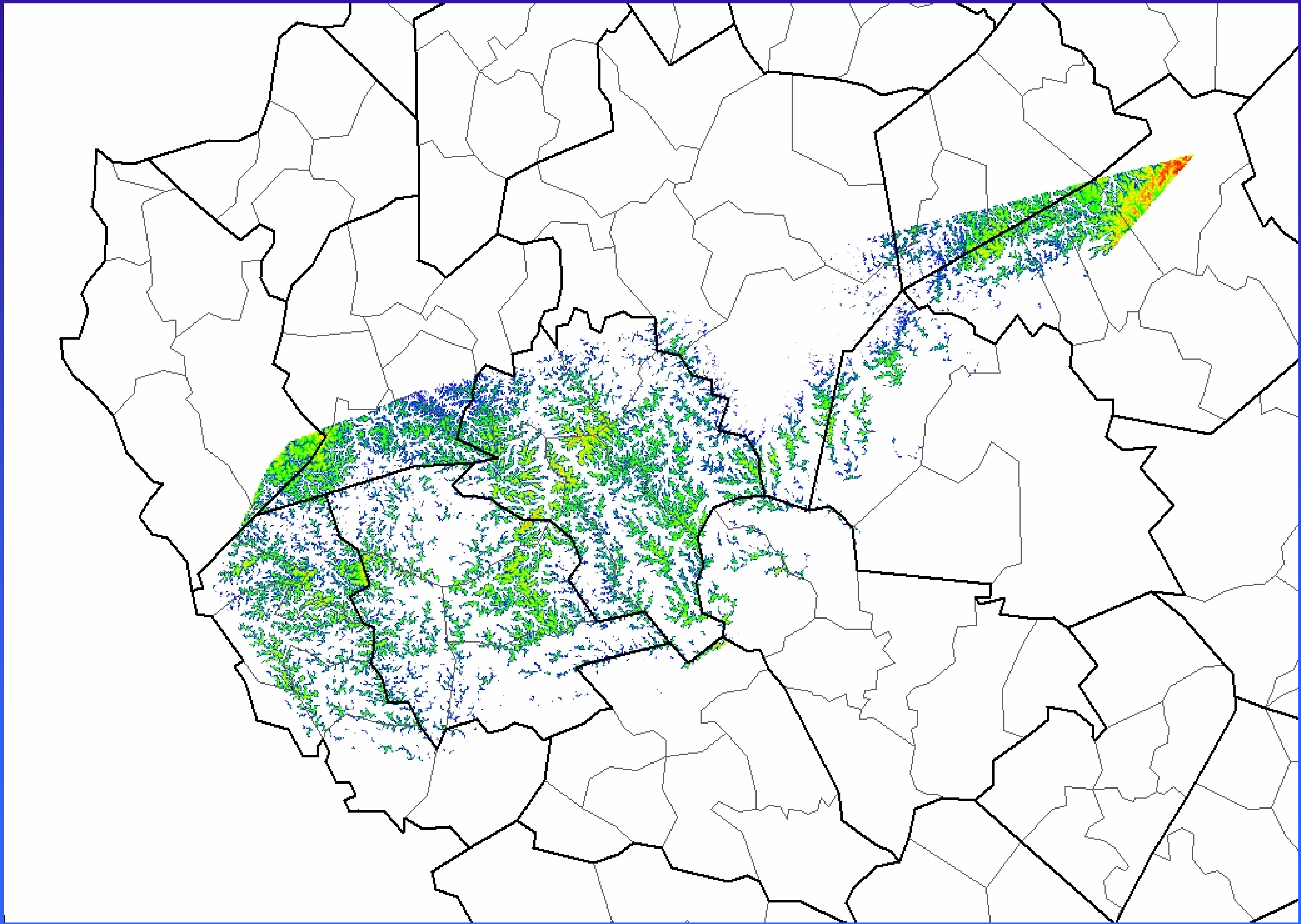
Statewide Elevation Model



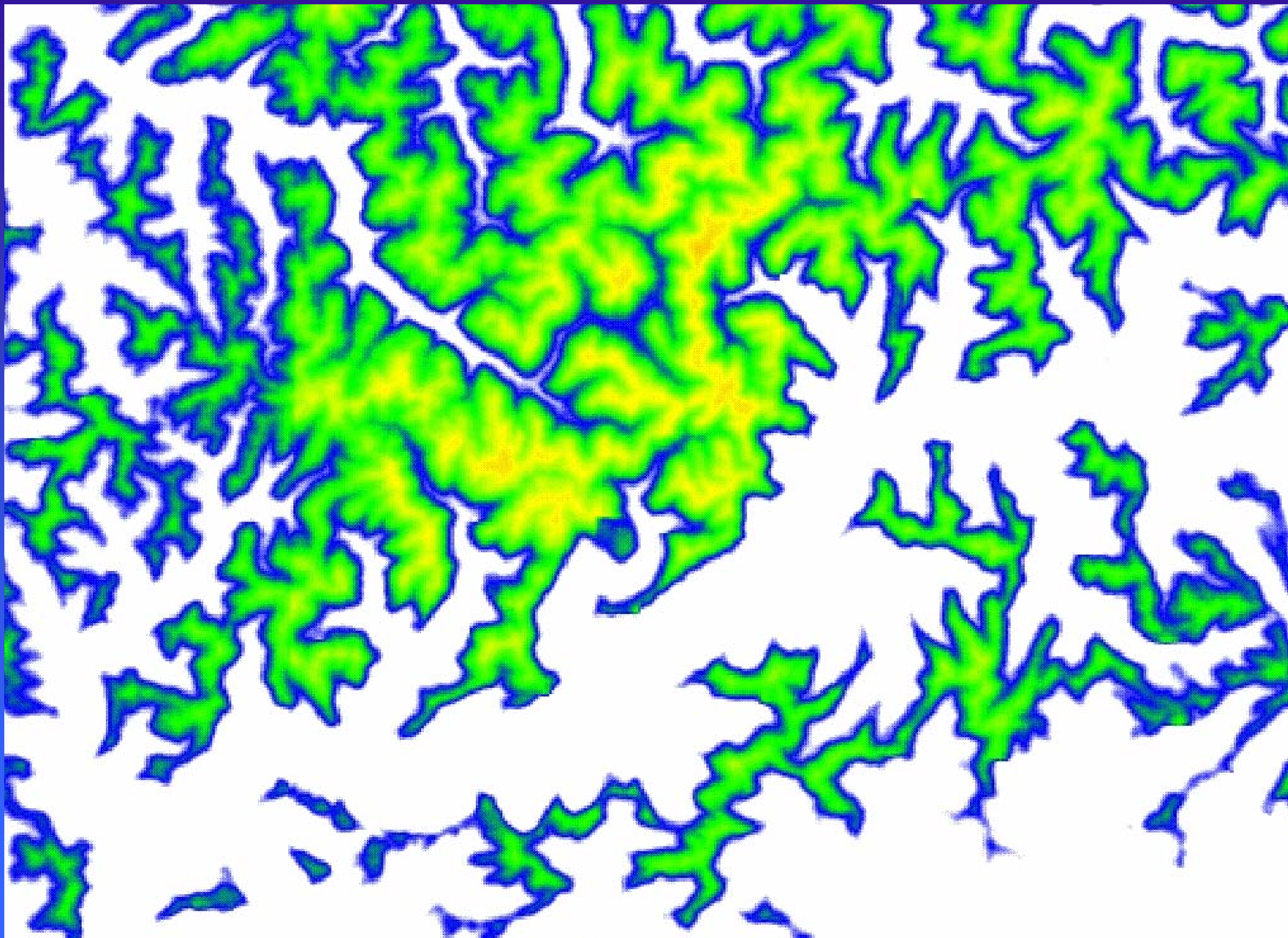
Coalburg Portion of Statewide Elevation Model



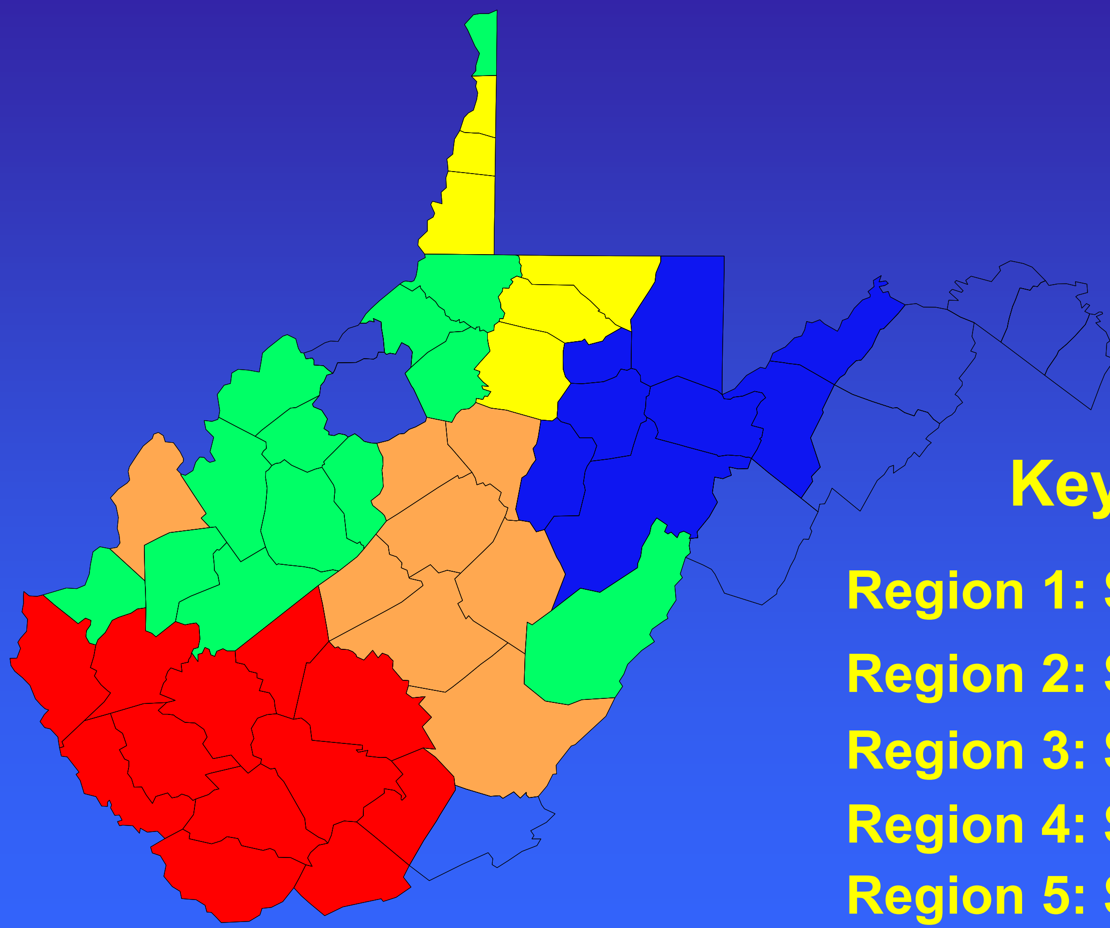
New Coalburg Seam Extents Showing Thickness of Overburden



New Coalburg Seam Extents Showing Thickness of Overburden



Current Regional Tax Assessments



Key

Region 1: $400

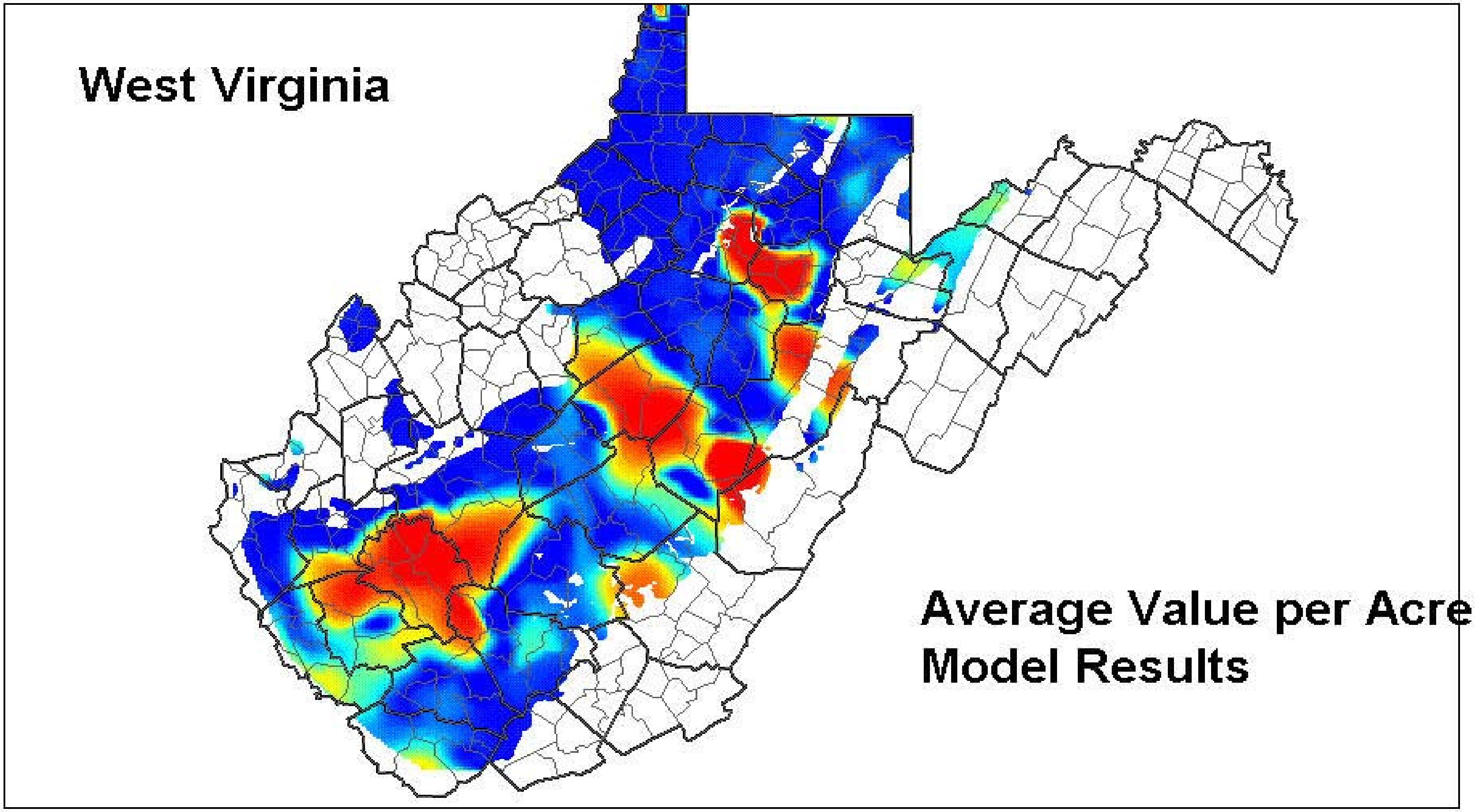
Region 2: $200

Region 3: $375

Region 4: $400

Region 5: $550

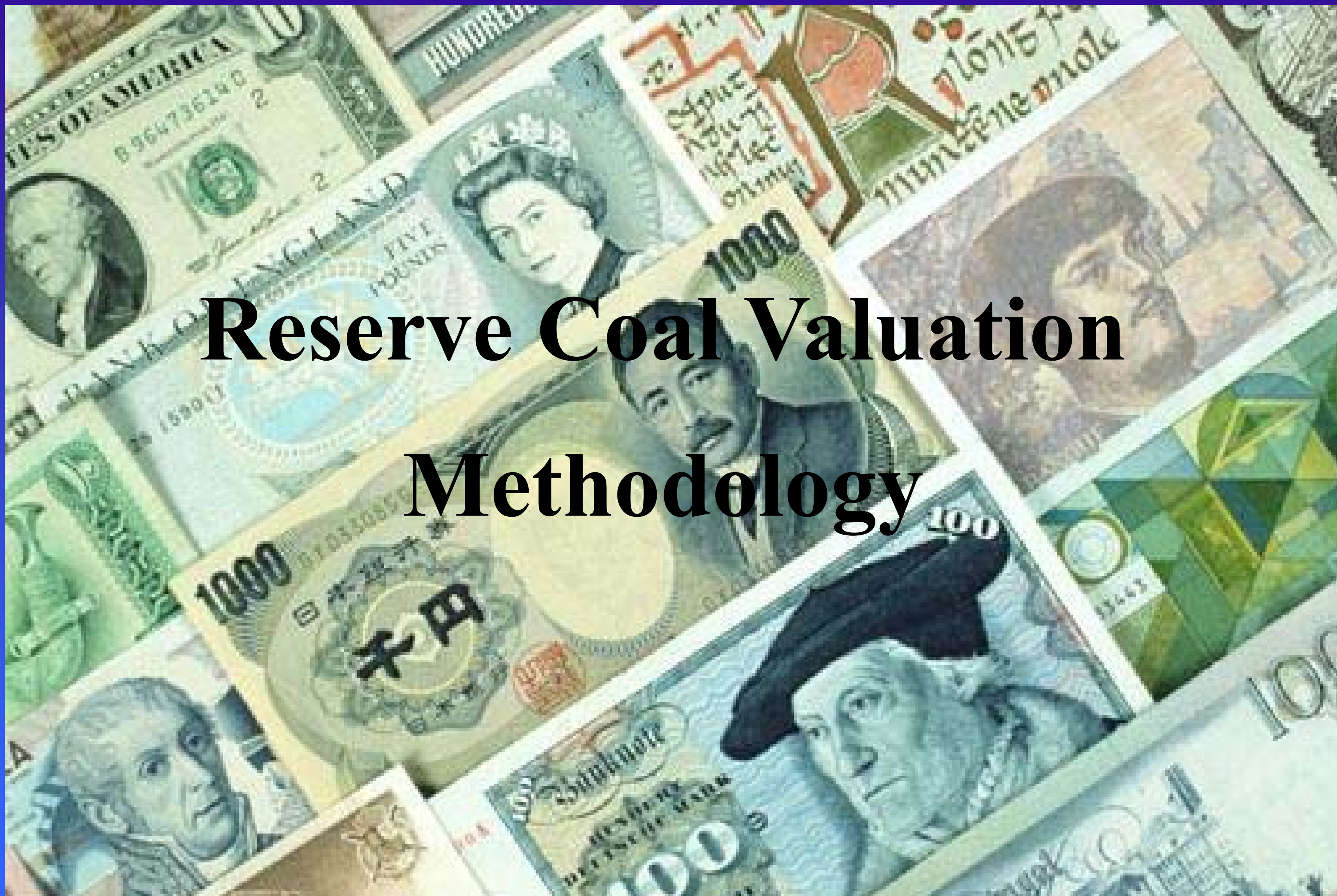
Valuation Model Results



Conclusions

- Mass appraisal techniques are cost effective
- Much available information
- Use of GIS essential
- Provides a means to identify and correct
  - Data omissions
  - Incorrect data
- This is a viable valuation procedure

Reserve Coal Valuation Methodology



Using Spatial Characteristics, Markets, and GIS Modeling to Determine Time of Mining of Individual Properties in Areas of Large Coal Resources

Jeffrey R. Kern, Thomas F. Torries, David H. Welsch and Ronald W. Stingelin
Resource Technologies Corporation

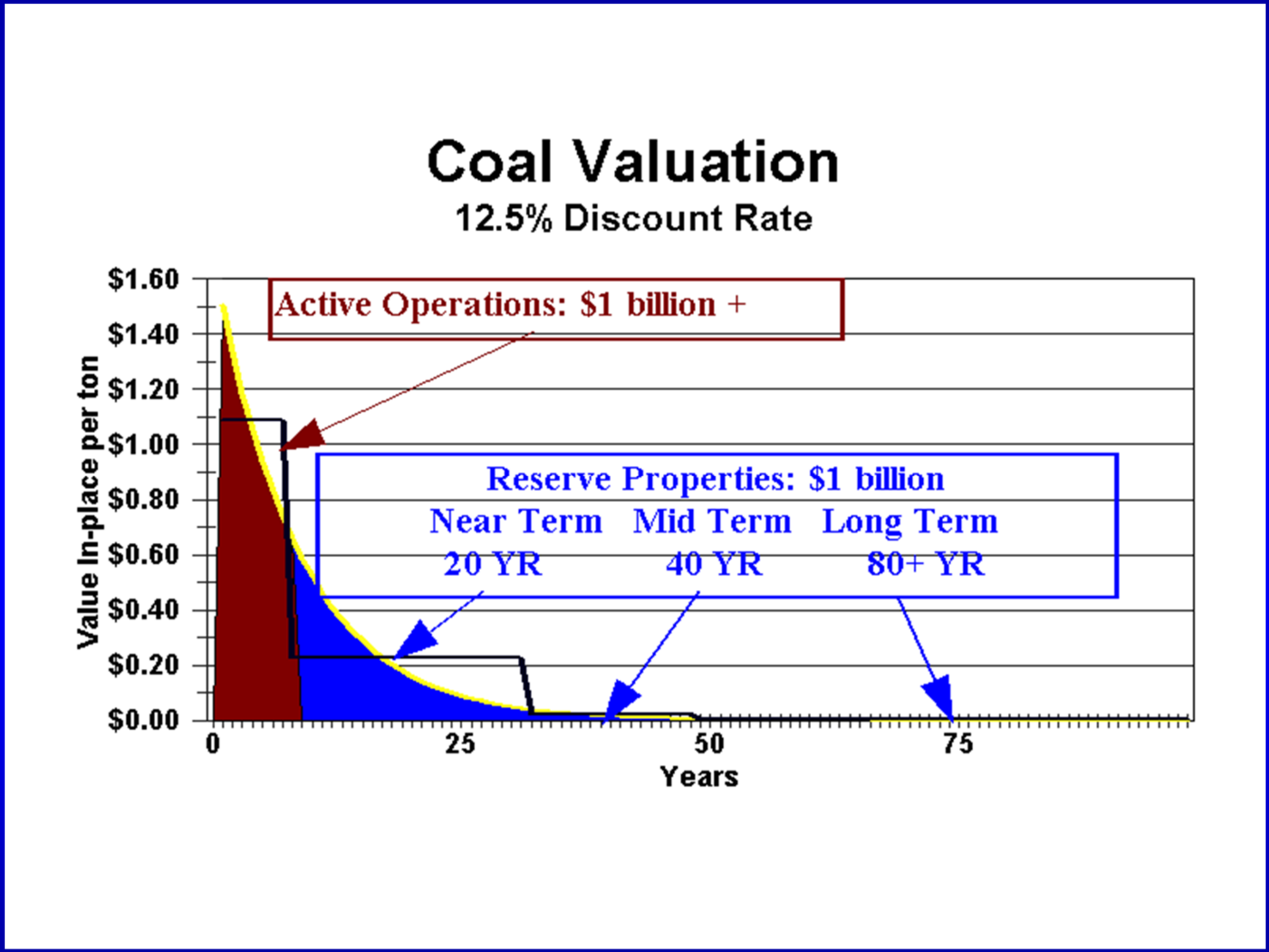
Time of Mining?

- In 1996, State of West Virginia hired RTC and Torries and Associates to develop new coal valuation methodology
- Developed methodology involves the mass appraisal of mineral properties and is known as the RCVM
- RCVM uses PV and PV is dependent on t, or Time of Mining

Basics of the RCVM

- Aggregate value of all unmined coal
- Less value of all active coal
- Equals value of all coal resources
- Apportions value of coal resources among the 200,000 properties
- Uses mass appraisal techniques to apportion value among properties using time of mining (t)

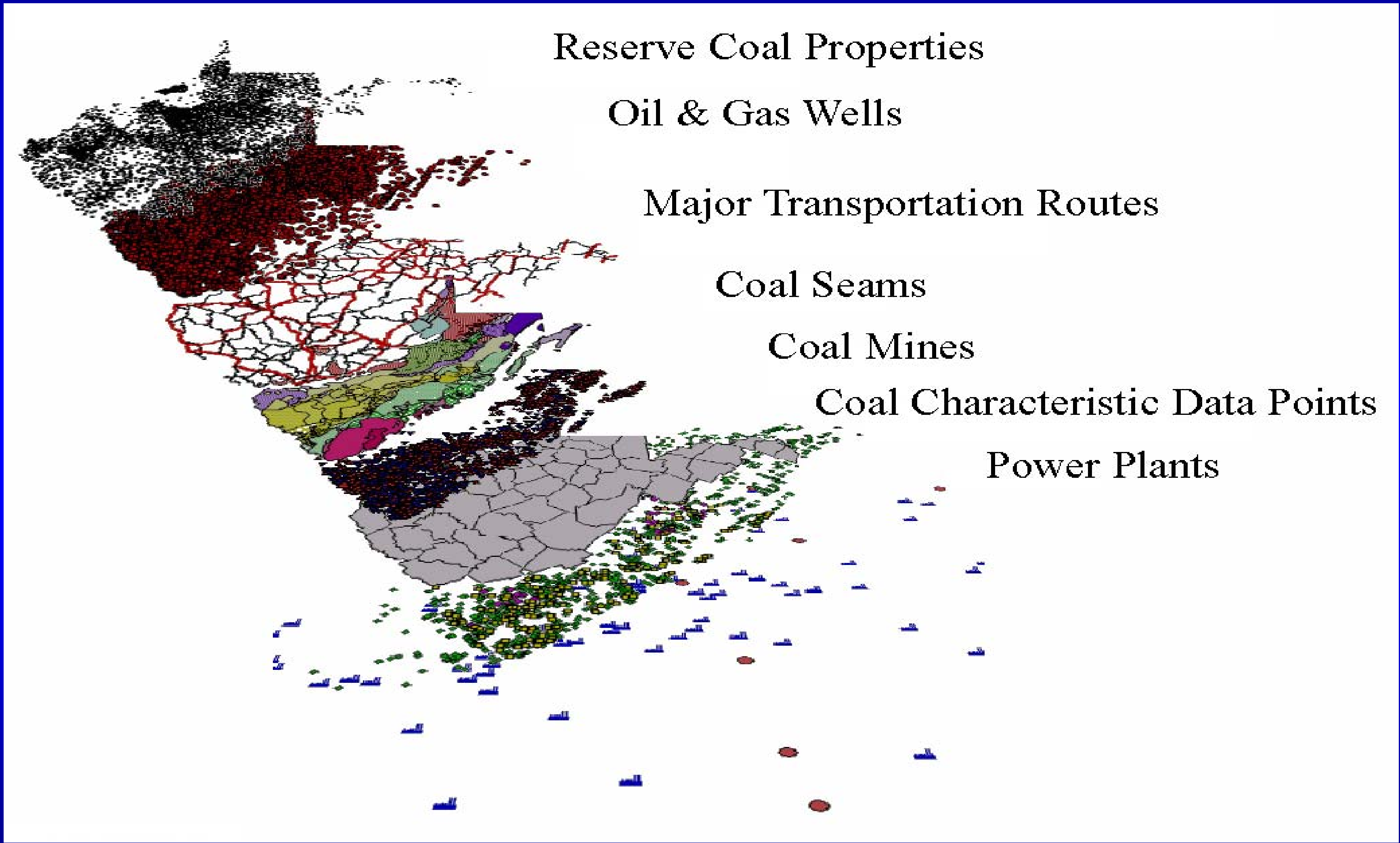
Determination of Time of Mining



Mass Appraisal Technique

- Spatial analysis is used to estimate resource volume on property
- PV is used to determine value for resource at property - $(1/(1 + i)^t)$
- t in index value is based on series of subordinate t values, each representing a different spatial attribute
- subordinate t (sub-t) values are determined by spatial analysis

T-factor Spatial Base



Components of the Spatial Base

- Properties - 200,000 polygons and points
- Geologic Data - 33,381 points
- Mine Data - 7,884 points
- Market Data (EIA, PSC) - +/- 120,000 points
- Oil and Gas Data - 64,180 points
- Resource Maps - Volatility, Sulfur, Btu and Thickness by seam, +/- 1,400 polygons
- Overburden/Elevation Grids - 120 30m statewide grids

The Power of OO Mapping

- Unlimited number of features per layer
- Points, polygons and lines can coexist in one layer
- Each object can be treated independently of each other object
- Passive topology
- Relies on disks for storage of files

Construction of t

$$t = (aP + bM + cW + dE + eV + fT) / 3$$

- Primary Seam Factor (P)
- Mining History Factor (M)
- Well Factor (W)
- Environmental Factor (E)
- Volatility Factor (V)
- Transaction Factor (T)
- a, b, c, d, e, f are calibration factors

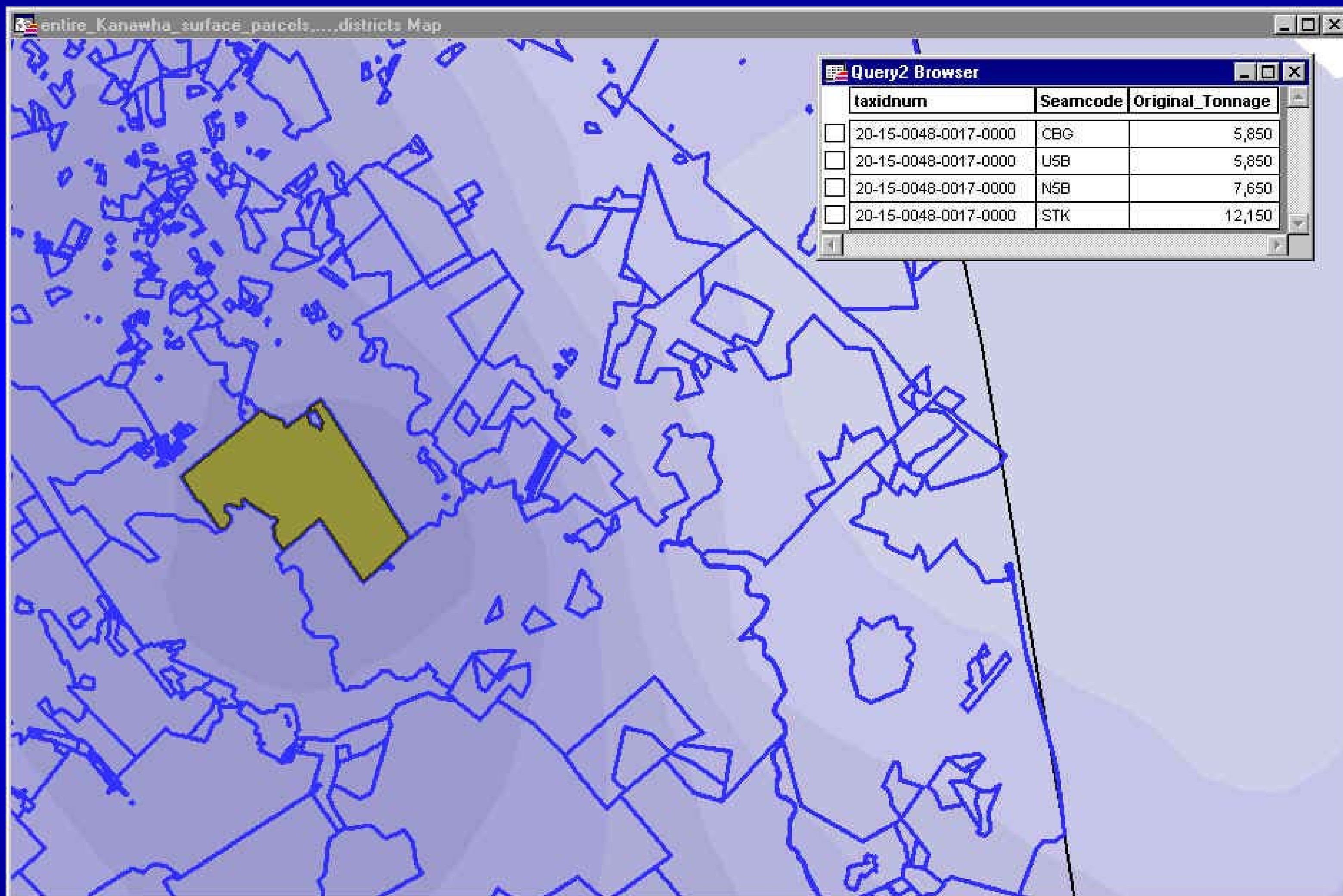
Primary Seam (P)

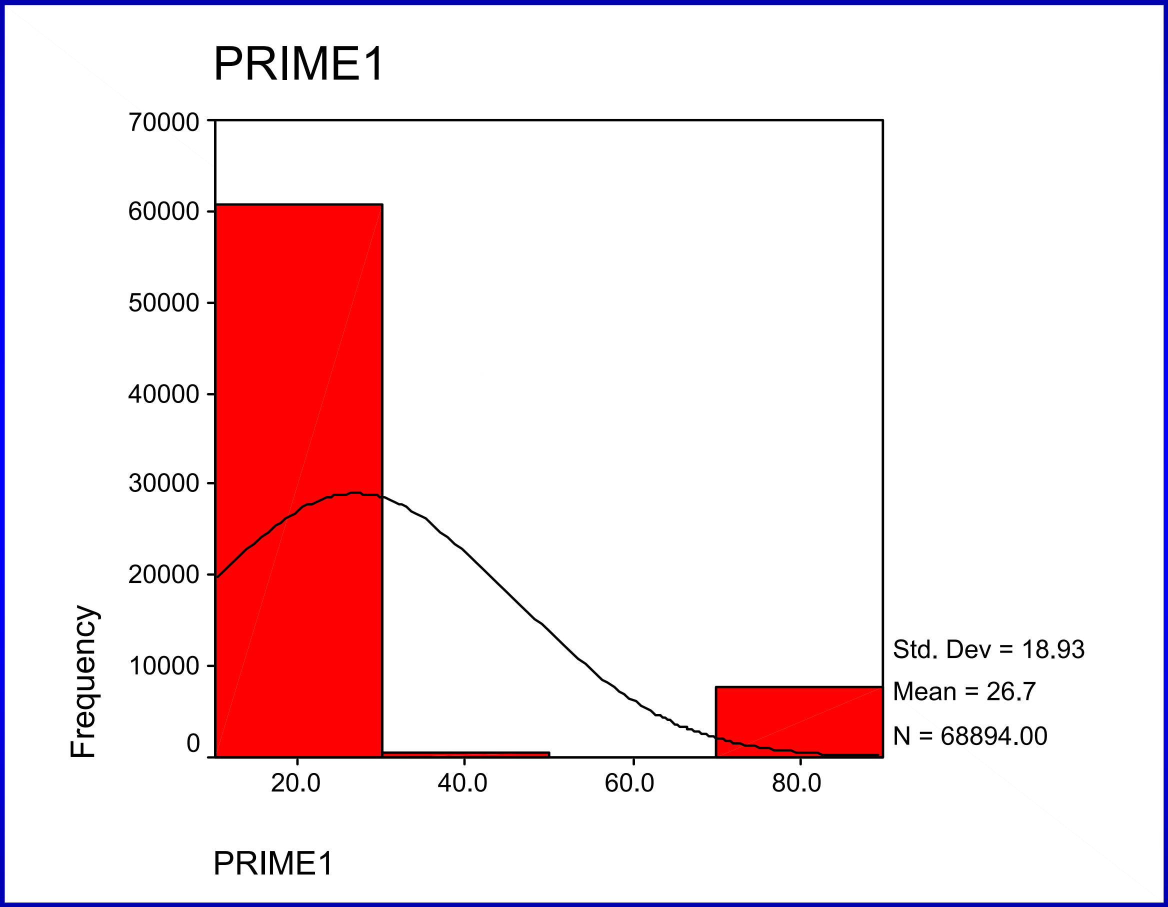
- Analysis of coal resource(s) to find highest in stratigraphic order, least sterilized by over/undermining, least depleted by previous mining and capable of supporting an extraction operation of a minimum size and life
- Can be a series of seams (MTR mining)

Primary Seam (P) Continued

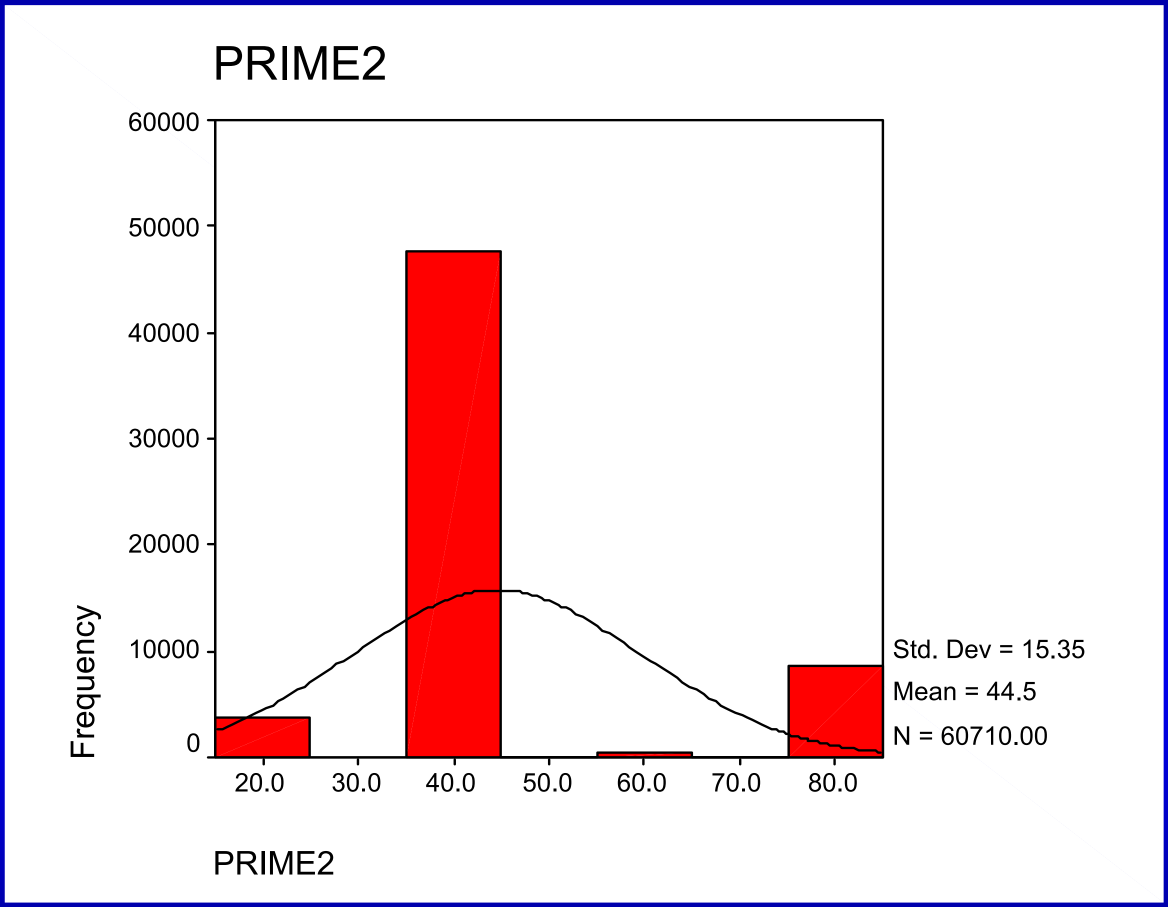
- Seam level analysis
  - volumetric calculation of resources at site
  - sum of historic production, calculation of depletion/sterilization of resource
  - calculation of extraction rate, recovery rate and expected resource life at site
- Not a proxy - a pure factor
- Range - 15 to 80 years

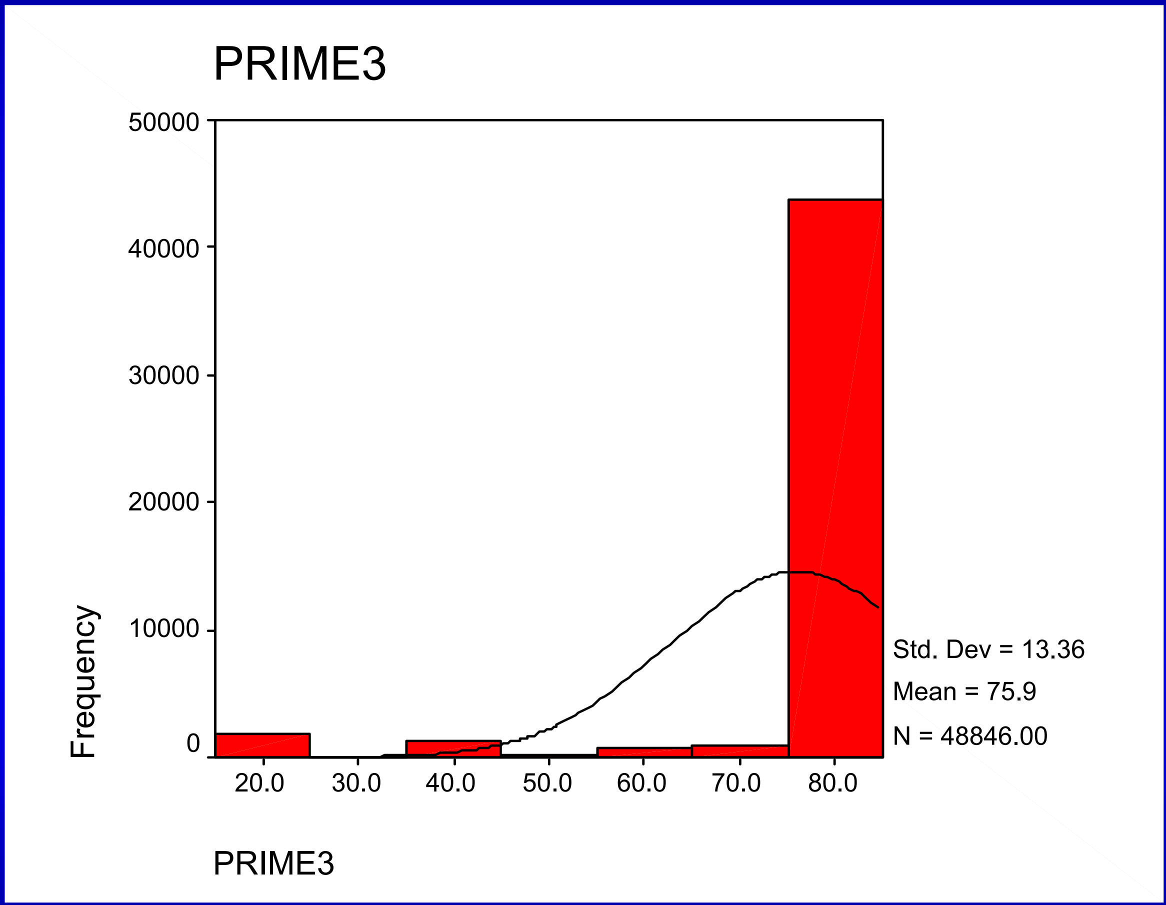
Primary Seam (P) Analysis





PRIME1
70000
60000
50000
40000
30000
20000
10000
0
Frequency
20.0
40.0
60.0
80.0
PRIME1
Std. Dev = 18.93
Mean = 26.7
N = 68894.00

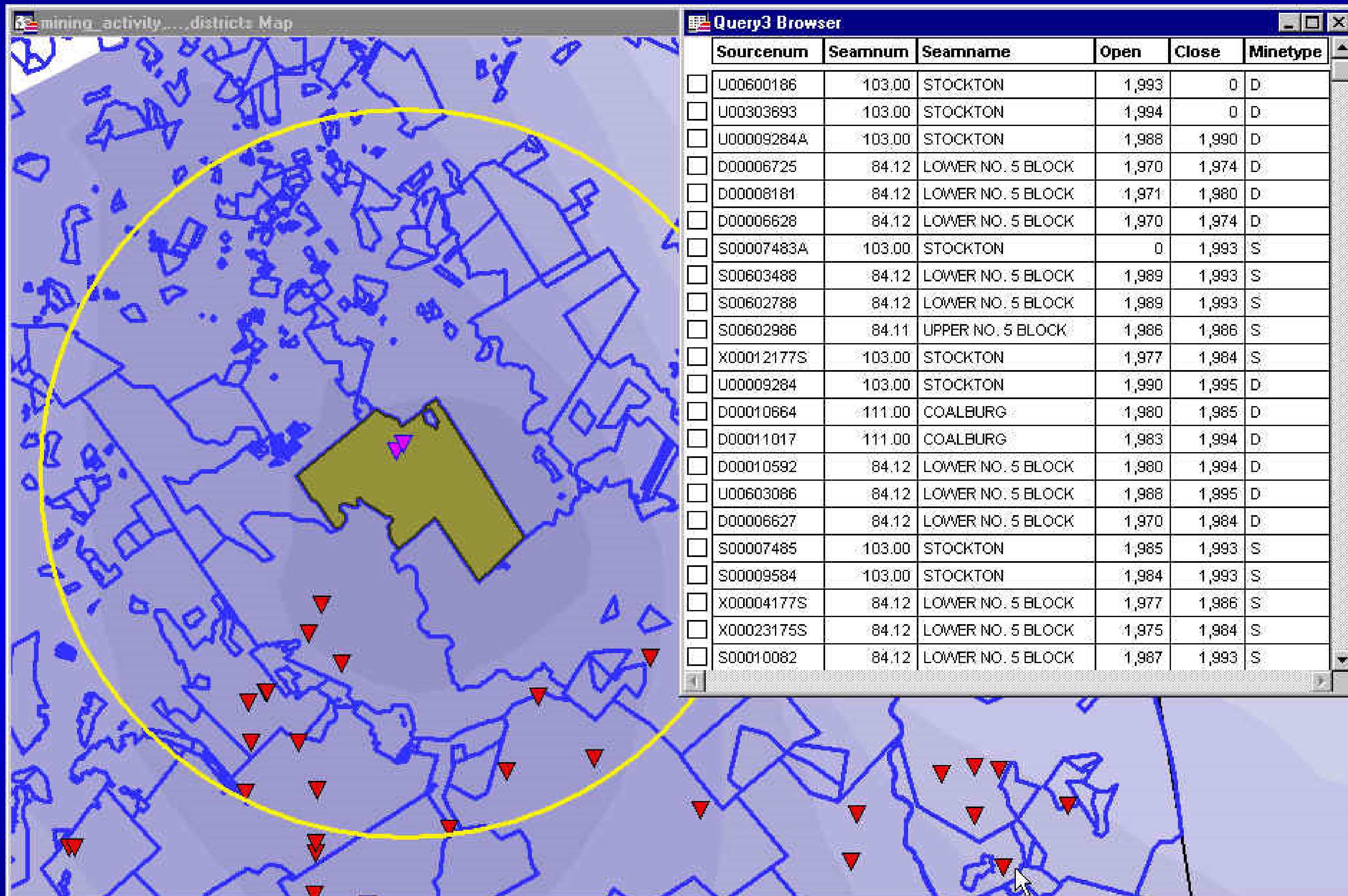

PRIME2
60000
50000
40000
30000
20000
10000
0
Frequency
20.0
30.0
40.0
50.0
60.0
70.0
80.0
Std. Dev = 15.35
Mean = 44.5
N = 60710.00
PRIME2


PRIME3
50000
40000
30000
20000
10000
0
Frequency
20.0
30.0
40.0
50.0
60.0
70.0
80.0
Std. Dev = 13.36
Mean = 75.9
N = 48846.00
PRIME3

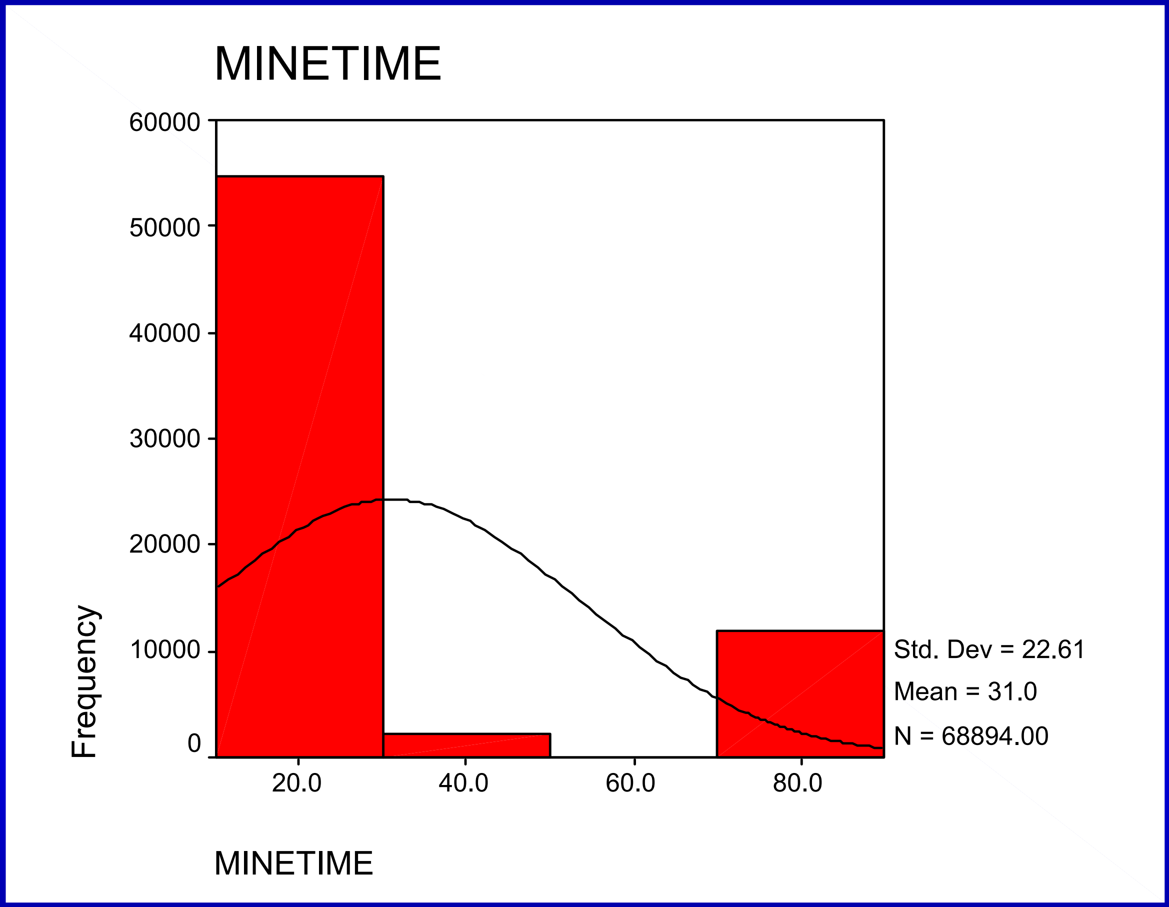
Mining History (M)

- Analysis of localized occurrence of mining prior to, during and after ‘boom’ years
- Property level analysis
  - Pure count of mining operations on set radius for all properties
- Proxy for mining costs at site
  - an increase in mining activity during boom years could indicate marginality of site
- Range - 20 to 80 years

Mining History (M) Analysis



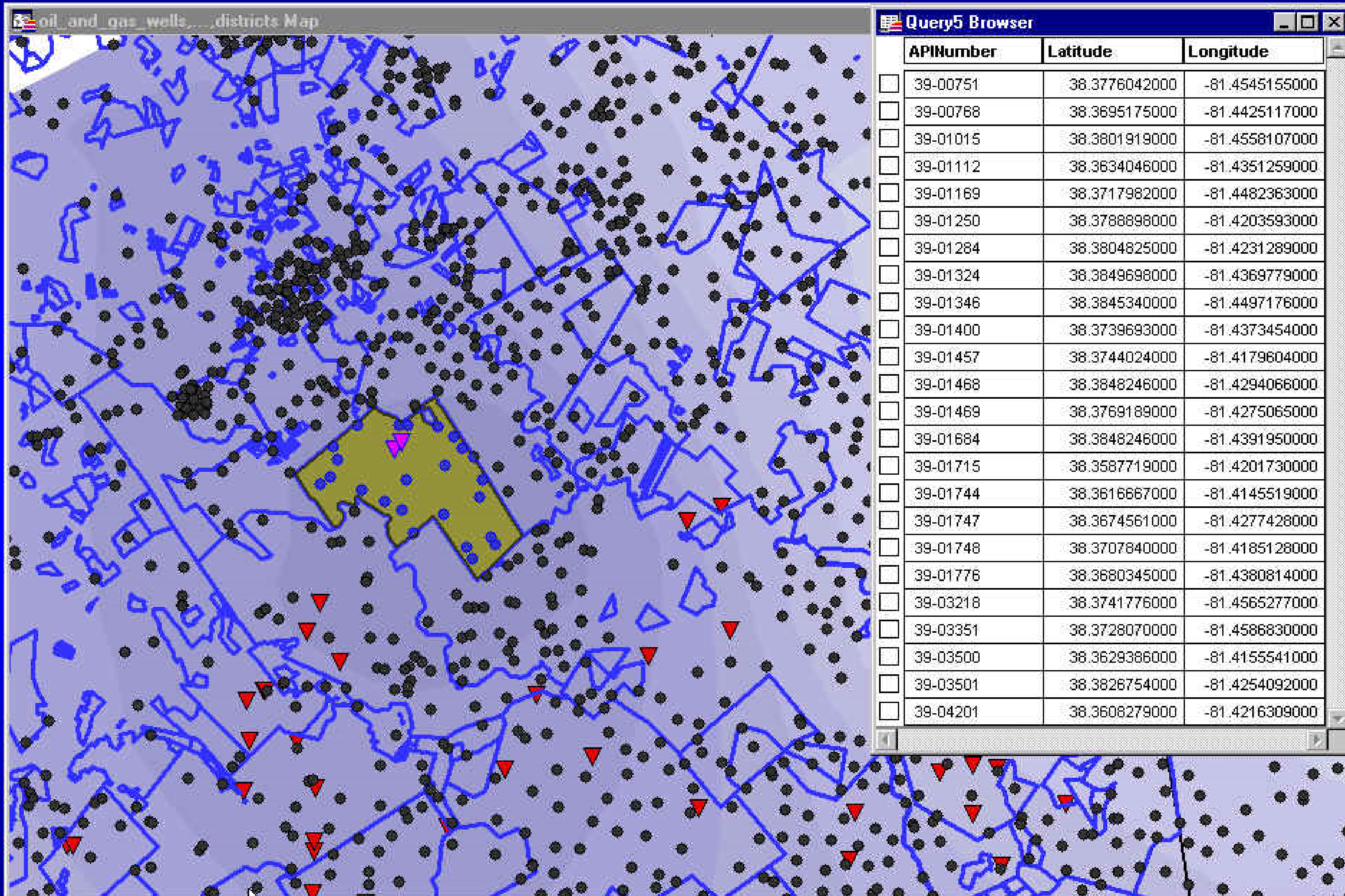
Sourcenum	Seamnum	Seamname	Open	Close	Minetype
U00600186	103.00	STOCKTON	1,993	0	D
U00303693	103.00	STOCKTON	1,994	0	D
U00009284A	103.00	STOCKTON	1,988	1,990	D
D00006725	84.12	LOWER NO. 5 BLOCK	1,970	1,974	D
D00008181	84.12	LOWER NO. 5 BLOCK	1,971	1,980	D
D00006628	84.12	LOWER NO. 5 BLOCK	1,970	1,974	D
S00007483A	103.00	STOCKTON	0	1,993	S
S00603488	84.12	LOWER NO. 5 BLOCK	1,989	1,993	S
S00602788	84.12	LOWER NO. 5 BLOCK	1,989	1,993	S
S00602986	84.11	UPPER NO. 5 BLOCK	1,986	1,986	S
X00012177S	103.00	STOCKTON	1,977	1,984	S
U00009284	103.00	STOCKTON	1,990	1,995	D
D00010664	111.00	COALBURG	1,980	1,985	D
D00011017	111.00	COALBURG	1,983	1,994	D
D00010592	84.12	LOWER NO. 5 BLOCK	1,980	1,994	D
U00603086	84.12	LOWER NO. 5 BLOCK	1,988	1,995	D
D00006627	84.12	LOWER NO. 5 BLOCK	1,970	1,984	D
S00007485	103.00	STOCKTON	1,985	1,993	S
S00009584	103.00	STOCKTON	1,984	1,993	S
X00004177S	84.12	LOWER NO. 5 BLOCK	1,977	1,986	S
X00023175S	84.12	LOWER NO. 5 BLOCK	1,975	1,984	S
S00010082	84.12	LOWER NO. 5 BLOCK	1,987	1,993	S


MINETIME
60000
50000
40000
30000
20000
10000
0
Frequency
20.0
40.0
60.0
80.0
MINETIME
Std. Dev = 22.61
Mean = 31.0
N = 68894.00

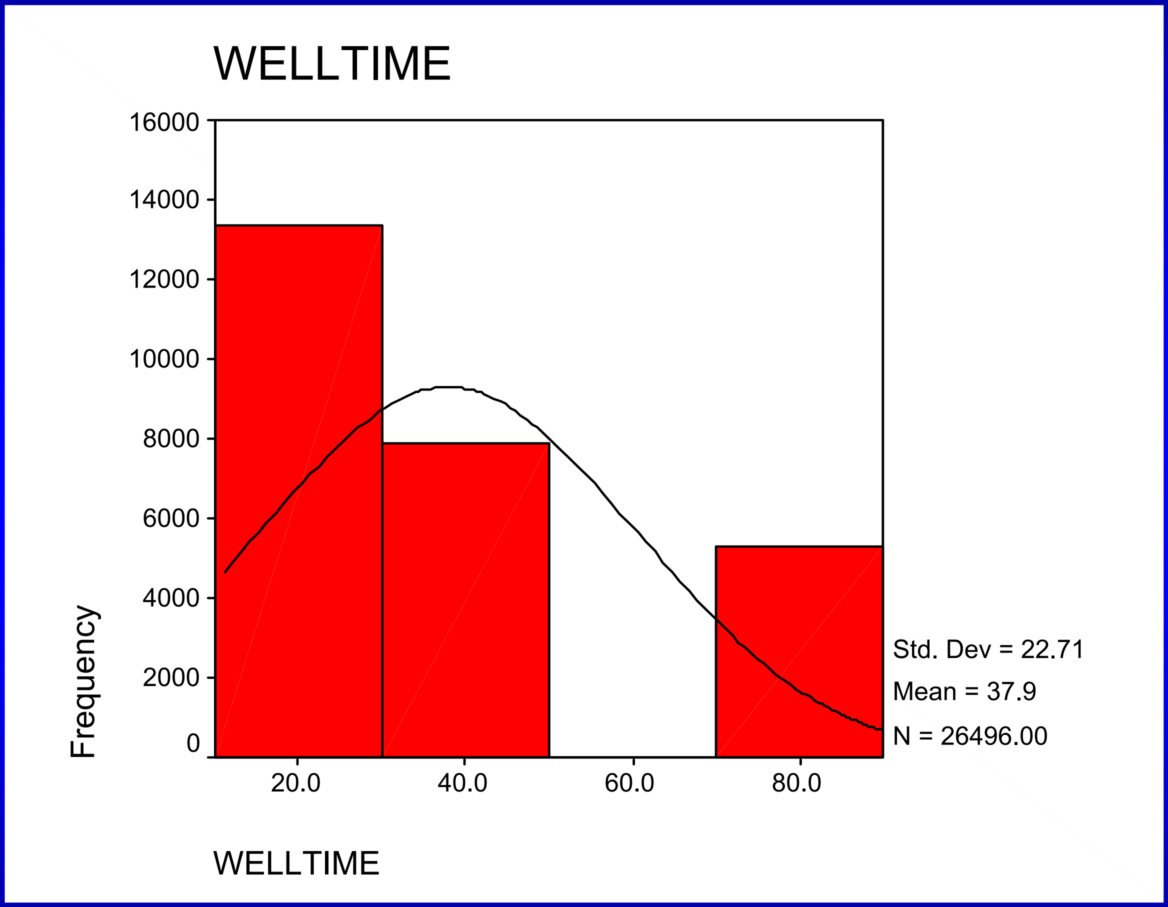
Wells (W)

- Density of oil and gas wells on site
- Property level analysis
  - density normalizes results for different sizes of sites
- Proxy for mining costs at Site
  - wells need to be handled prior to or during mine development
- Range - 0 to 80

Wells (W) Analysis



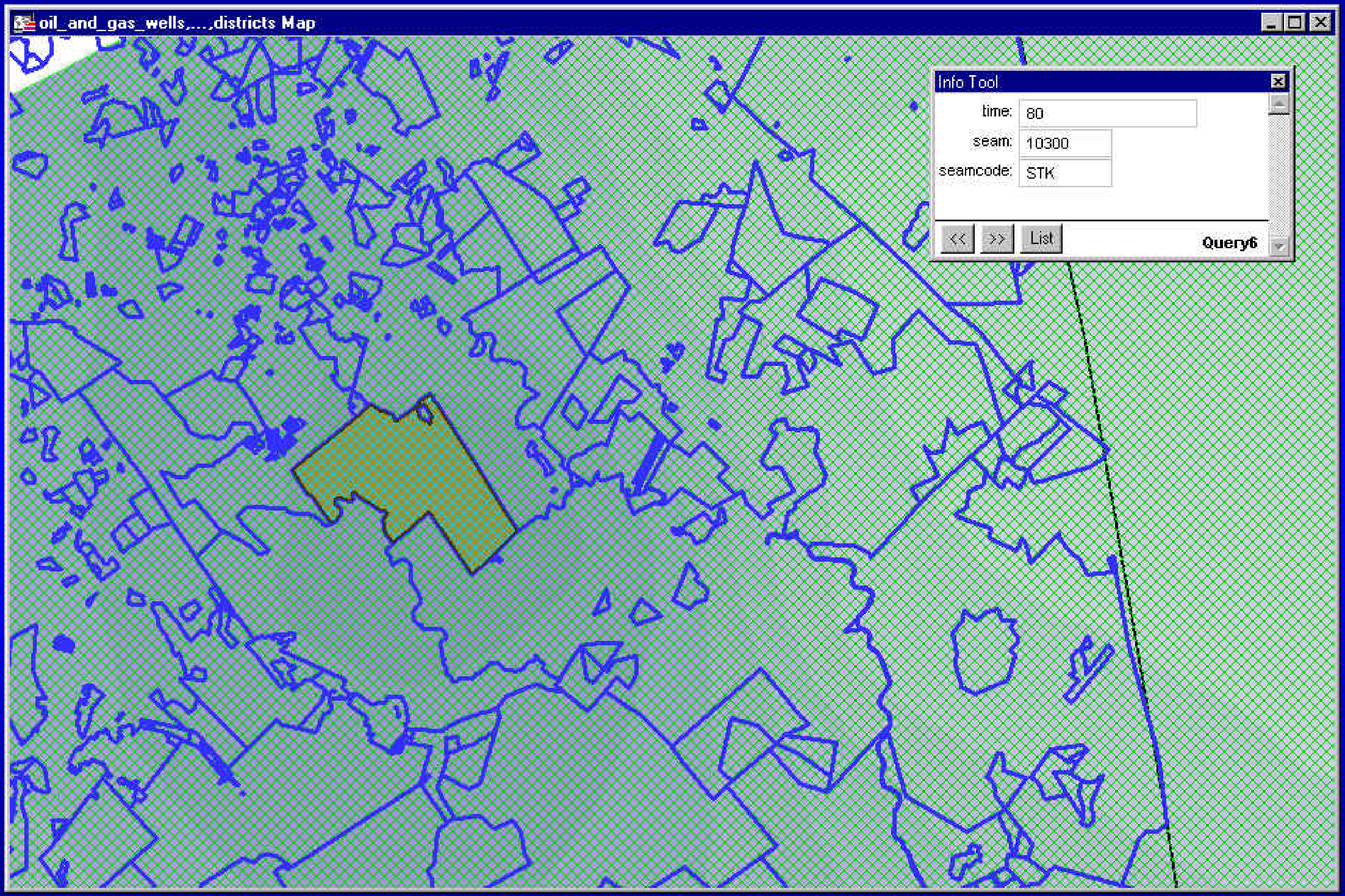
APINumber	Latitude	Longitude
39-00751	38.3776042000	-81.4545155000
39-00768	38.3695175000	-81.4425117000
39-01015	38.3801919000	-81.4558107000
39-01112	38.3634046000	-81.4351259000
39-01169	38.3717982000	-81.4482363000
39-01250	38.3788898000	-81.4203593000
39-01284	38.3804825000	-81.4231289000
39-01324	38.3849698000	-81.4369779000
39-01346	38.3845340000	-81.4497176000
39-01400	38.3739693000	-81.4373454000
39-01457	38.3744024000	-81.4179604000
39-01468	38.3848246000	-81.4294066000
39-01469	38.3769189000	-81.4275065000
39-01684	38.3848246000	-81.4391950000
39-01715	38.3587719000	-81.4201730000
39-01744	38.3616667000	-81.4145519000
39-01747	38.3674561000	-81.4277428000
39-01748	38.3707840000	-81.4185128000
39-01776	38.3680345000	-81.4380814000
39-03218	38.3741776000	-81.4565277000
39-03351	38.3728070000	-81.4586830000
39-03500	38.3629386000	-81.4155541000
39-03501	38.3826754000	-81.4254092000
39-04201	38.3608279000	-81.4216309000

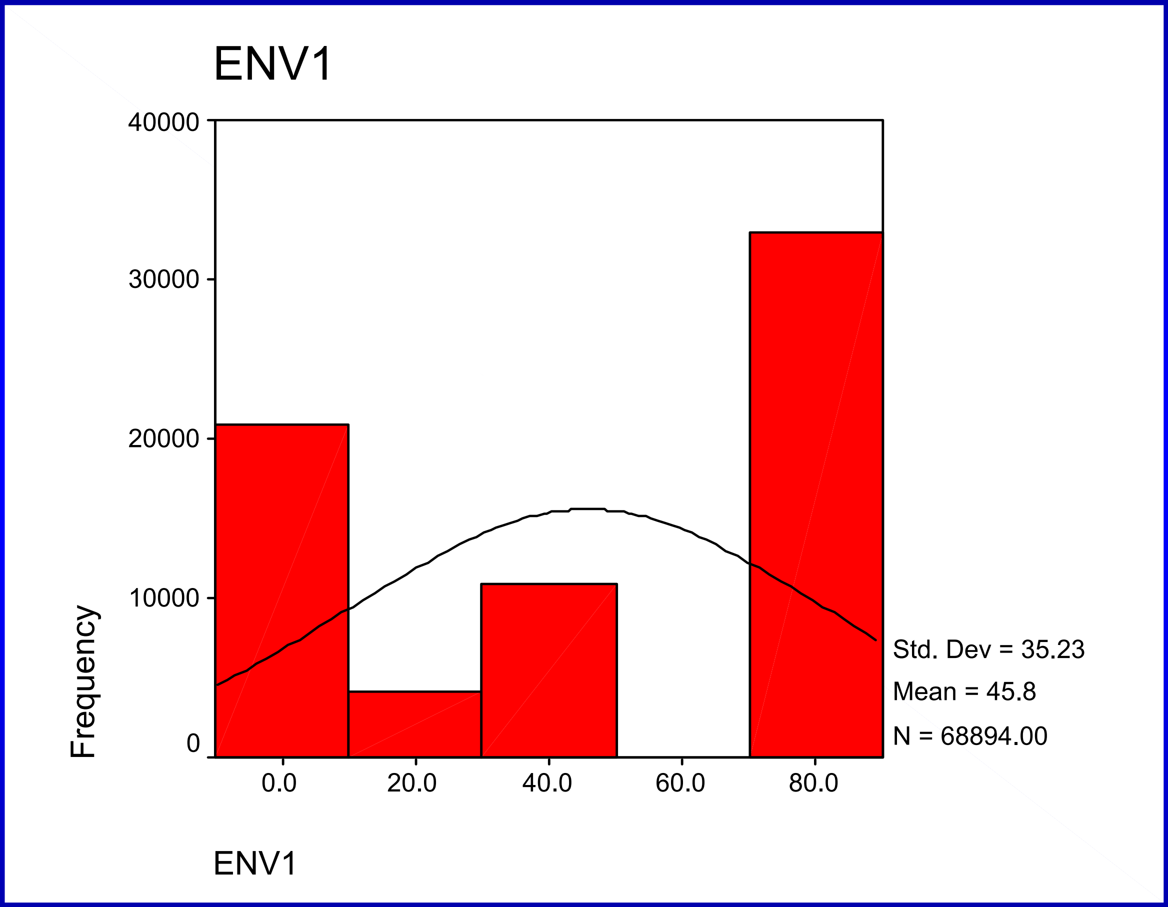

WELLTIME
16000
14000
12000
10000
8000
6000
4000
2000
0
Frequency
20.0
40.0
60.0
80.0
Std. Dev = 22.71
Mean = 37.9
N = 26496.00
WELLTIME

Environmental (E)

- Analysis of proximity of environmentally sensitive resources and surface features
  - acid bearing strata
  - cemeteries
- Seam and property level analysis
  - resource could be free of burdens, but property may not, and vice versa
- Proxy for mining cost, mining feasibility
  - generally subjective, but can be quantified
- Range - 0 to 80 years

Environmental (E) Analysis

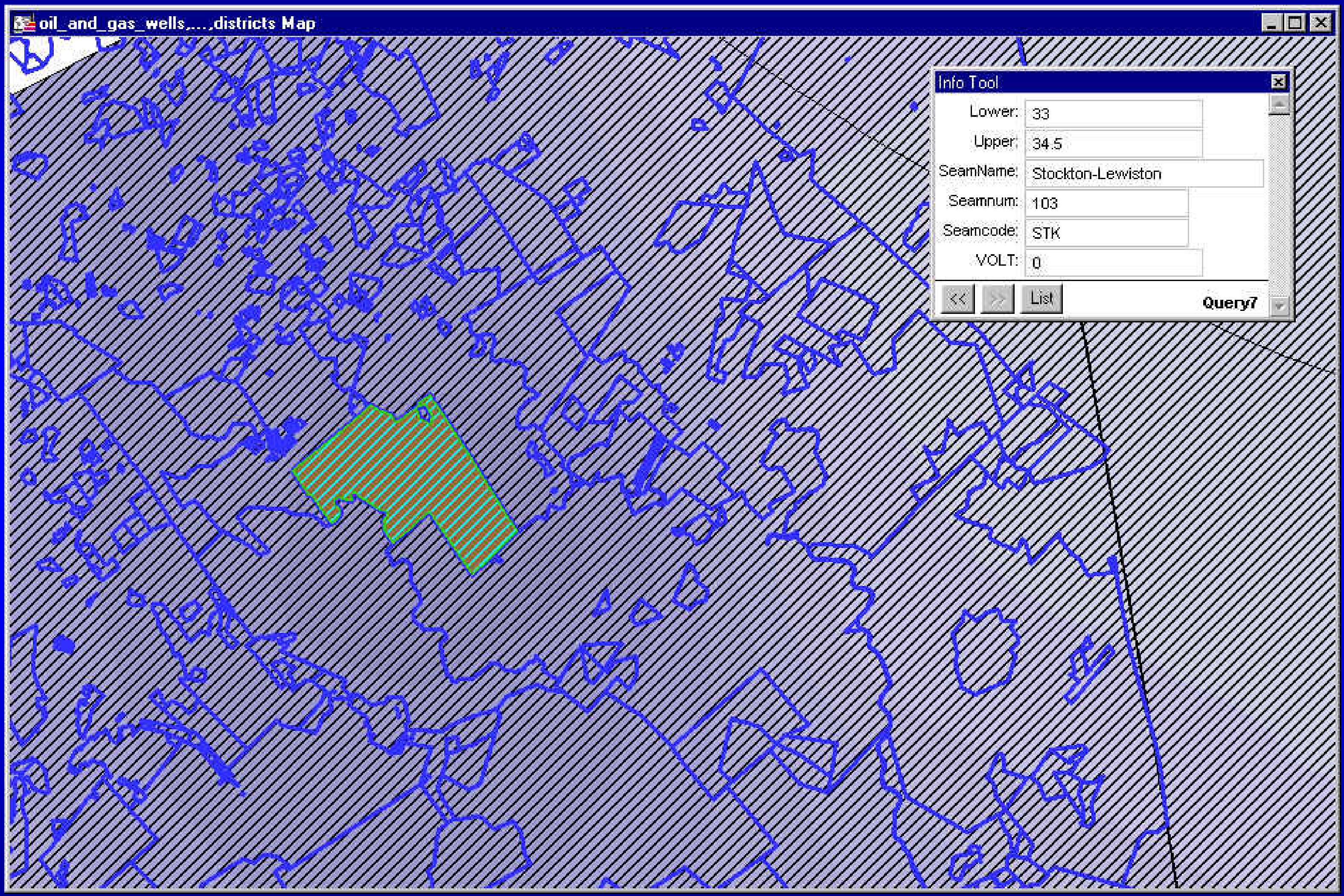


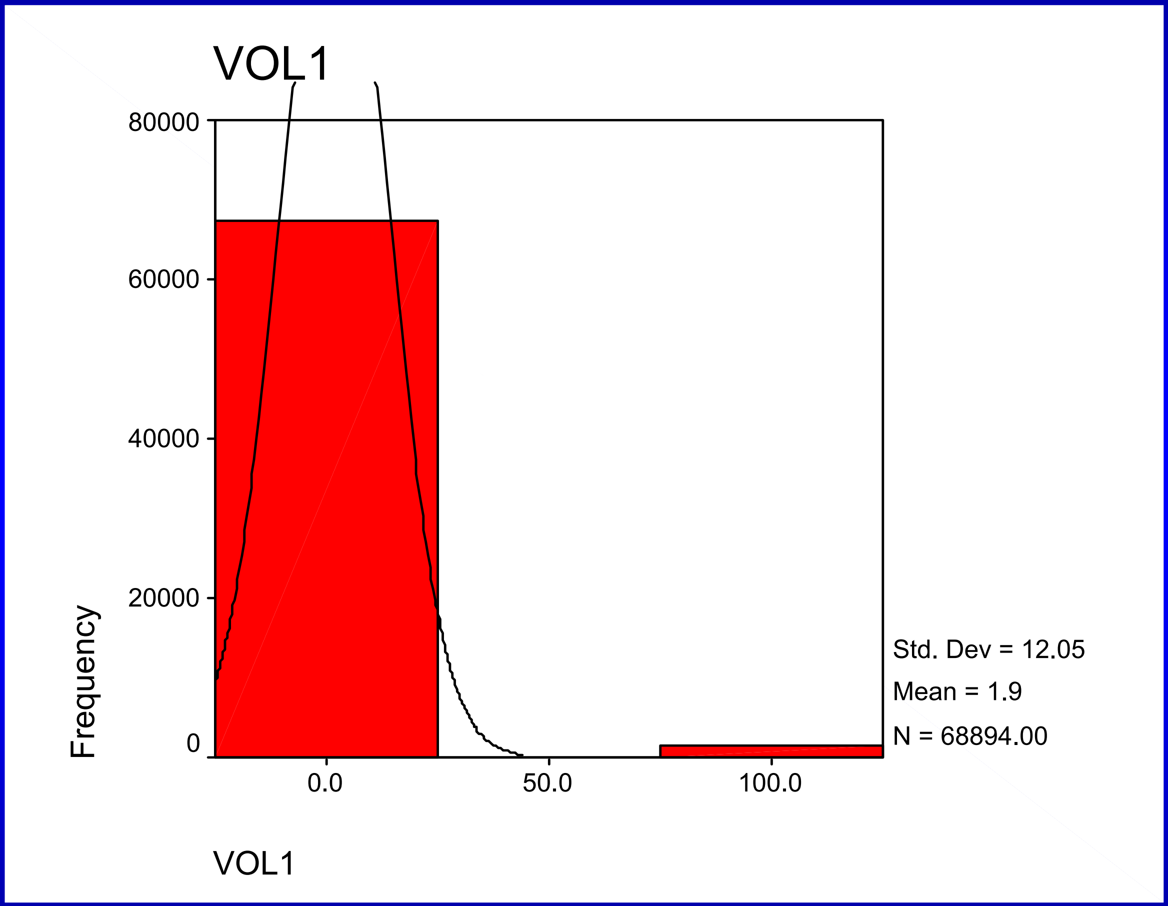

ENV1
40000
30000
20000
10000
0
Frequency
0.0
20.0
40.0
60.0
80.0
ENV1
Std. Dev = 35.23
Mean = 45.8
N = 68894.00

Volatility (V)

- Analysis of average volatility of resource at site
- Seam level analysis
  - average volatility of resource area on site
- Not a proxy - a pure factor
  - seperates coal into high and low Vol markets (metallurgic and steam coal)
- Range - 0 or 80 years (switch)

Volatility (V) Analysis

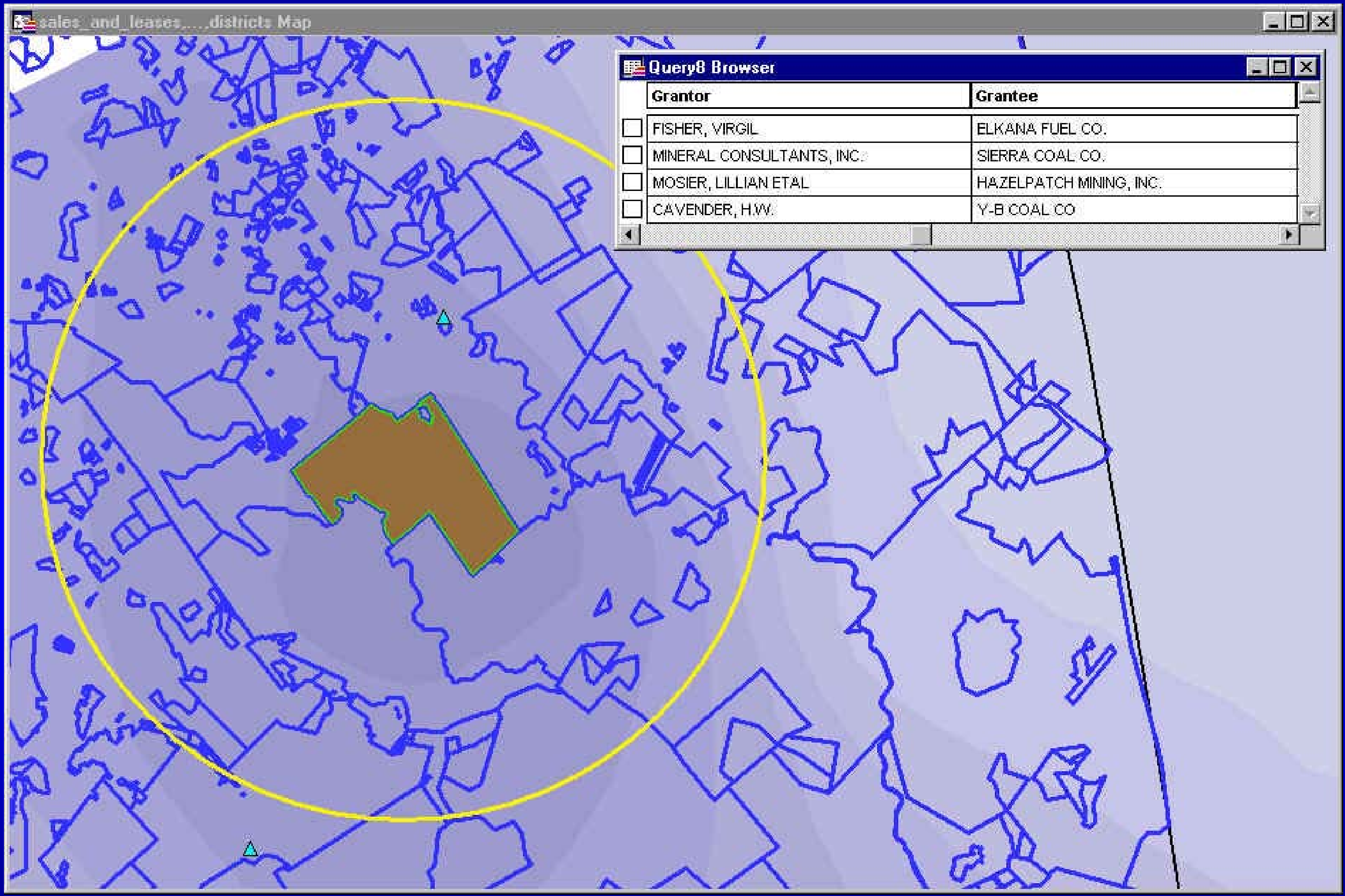


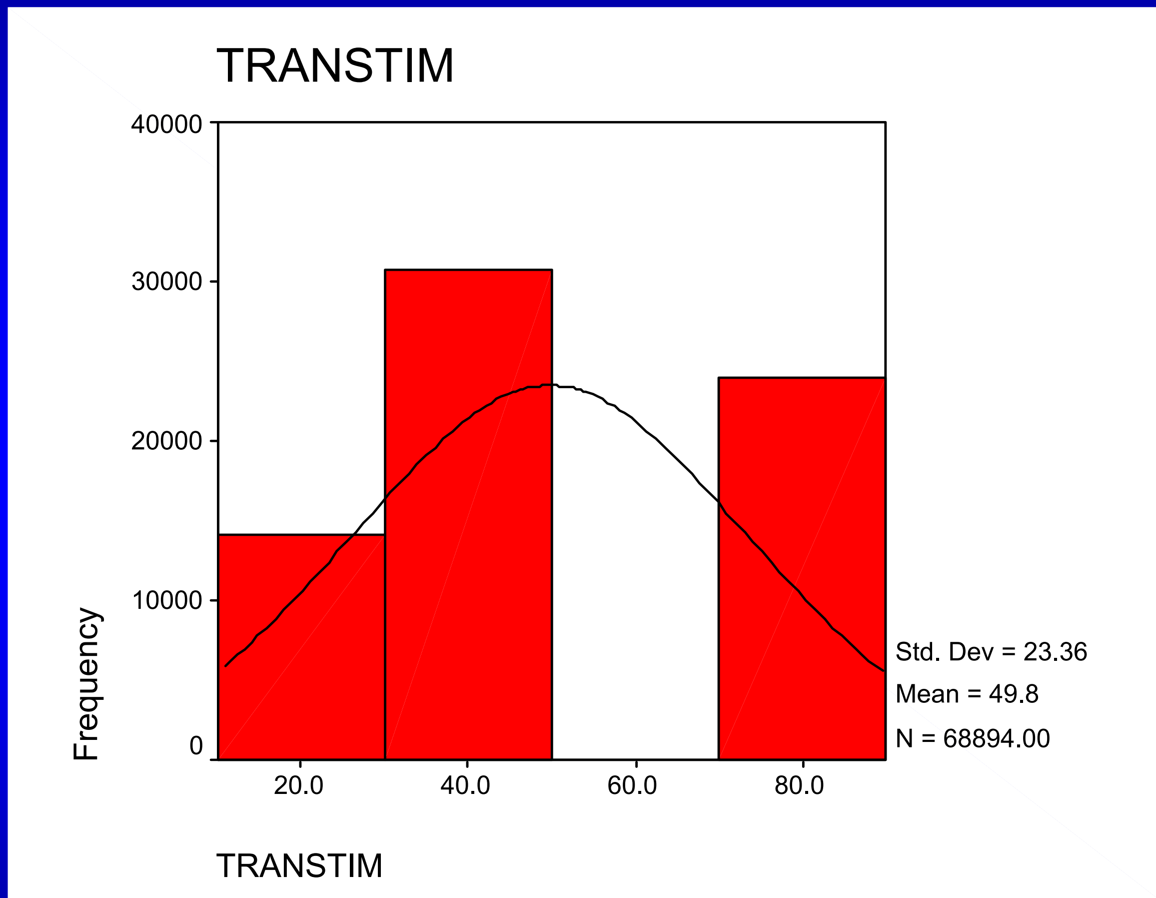

VOL1
80000
60000
40000
20000
0
Frequency
0.0
50.0
100.0
VOL1
Std. Dev = 12.05
Mean = 1.9
N = 68894.00

Transactions (T)

- Analysis of sales/leases of resources and reserves within set distance of property
  - can be weighted by size of transactions
- Seam and property level analysis
- Part proxy and part pure factor
  - analysis is used to determine royalty rates for different resources (pure)
  - analysis is used to indicate interest in certain areas and resources (proxy)
- Range - 20 to 80 years

Transactions (T) Analysis



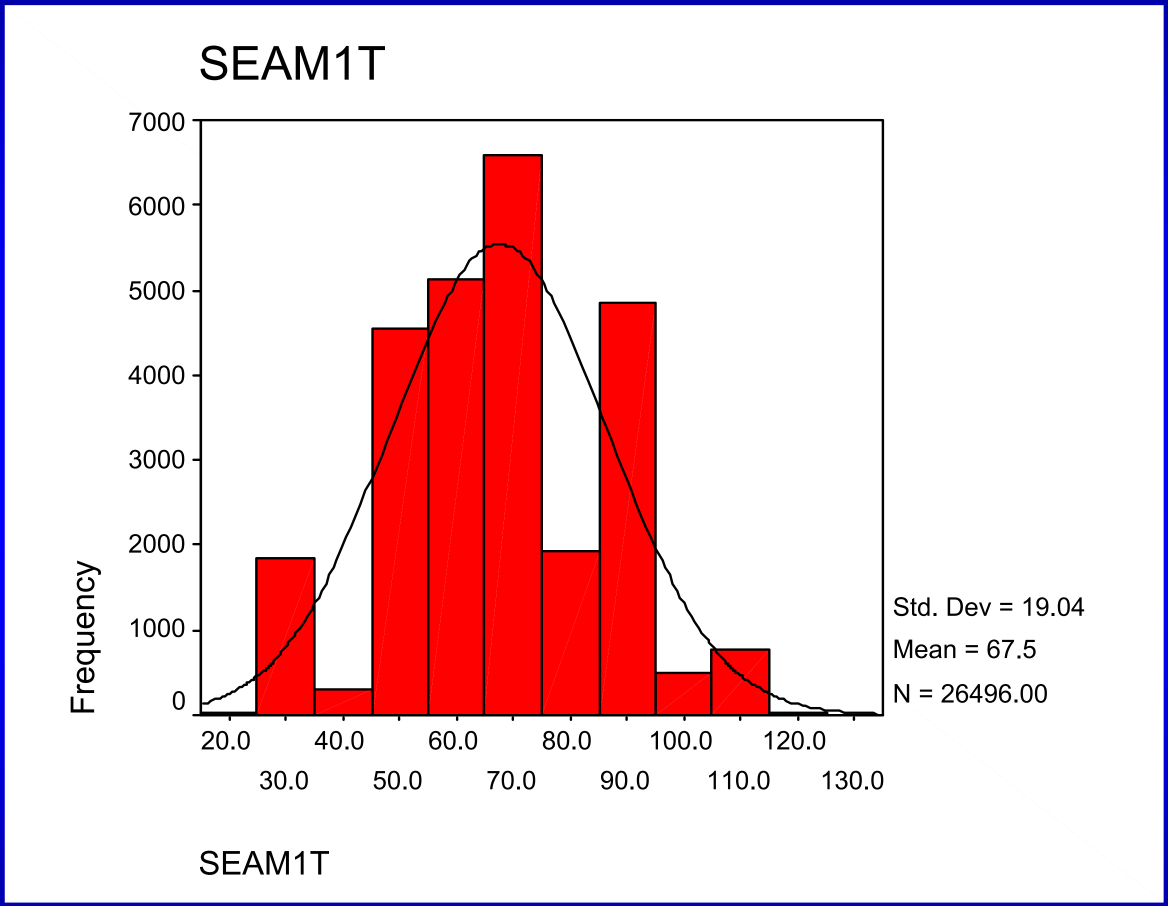

TRANSTIM
40000
30000
20000
10000
0
Frequency
20.0
40.0
60.0
80.0
Std. Dev = 23.36
Mean = 49.8
N = 68894.00
TRANSTIM

Range of t

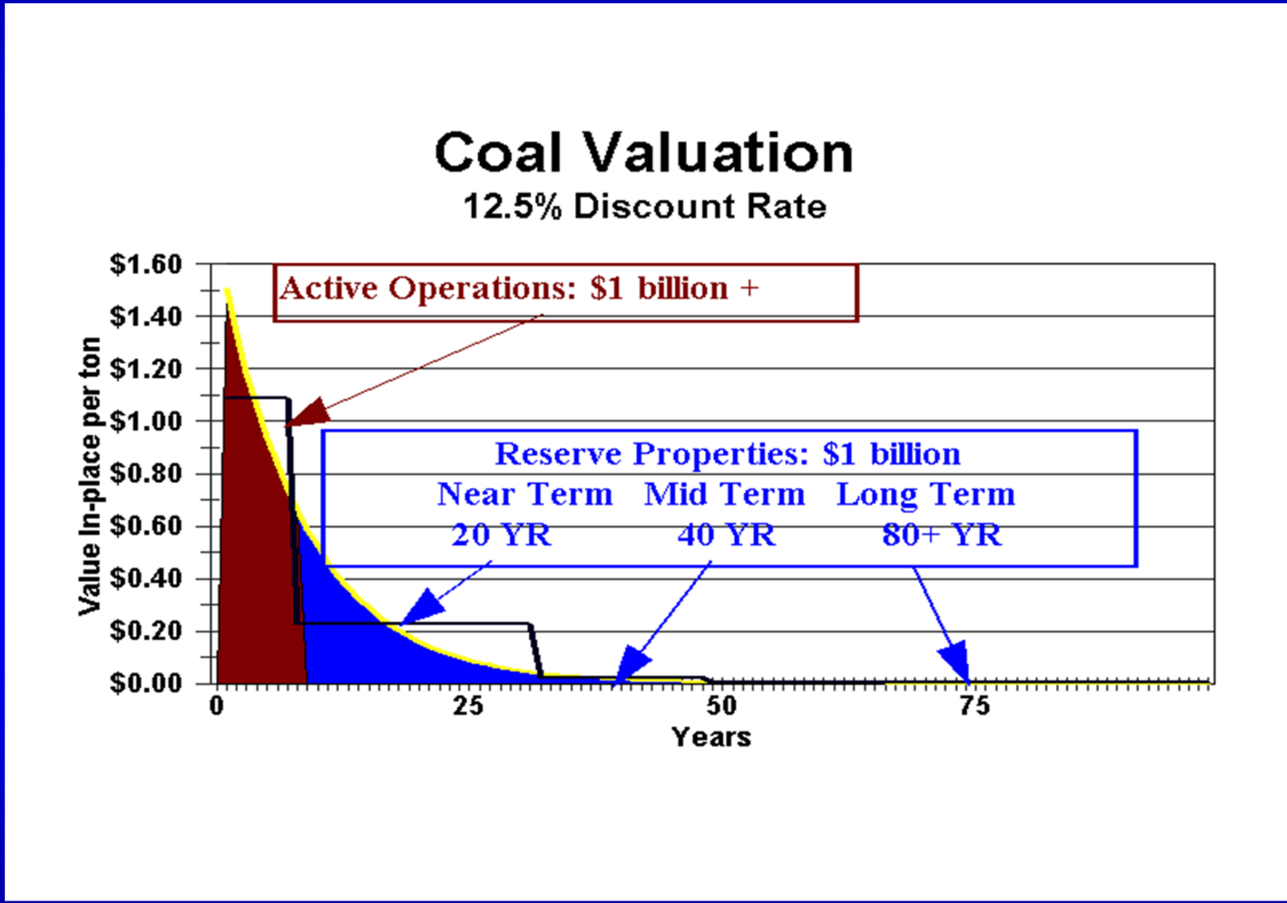
$$t = \frac{a(15 - 80) + b(20-80) + c(0-80) + d(0-80) + e(0-80) + f(20-80)}{3}$$

t = 18 to 160 years

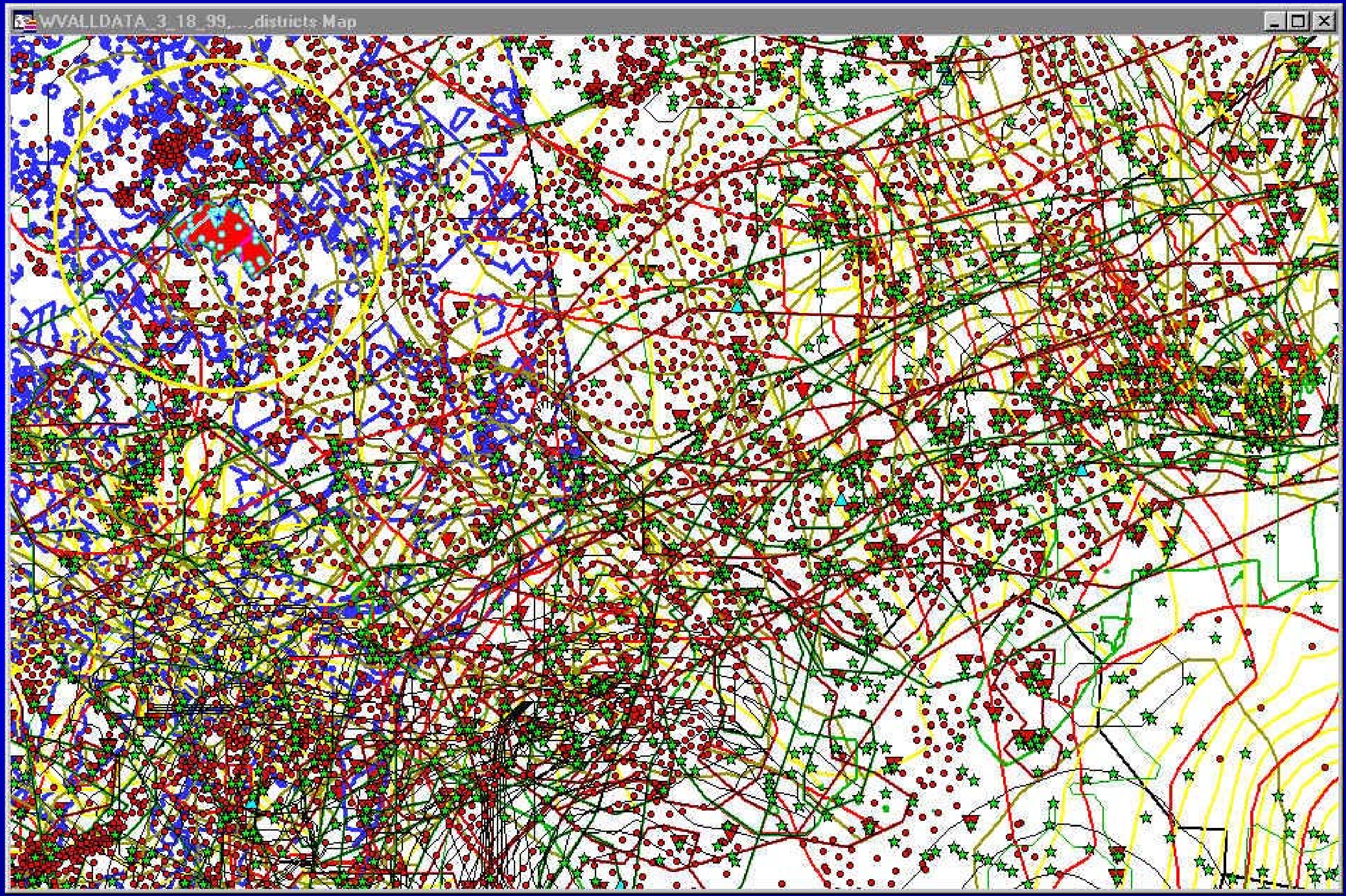
where a, b, c, d, e, f = 1


SEAM1T
7000
6000
5000
4000
3000
2000
1000
0
Frequency
Std. Dev = 19.04
Mean = 67.5
N = 26496.00
20.0
40.0
60.0
80.0
100.0
120.0
30.0
50.0
70.0
90.0
110.0
130.0
SEAM1T

Where t Falls on the Value Curve



Spatial Base of Analysis



Resource Technologies Corporation

Assessments Appraisals Systems Integration Information Systems Digital Mapping Environmental Analysis

Practical Solutions for the Information Age

www.resourcetec.com

P O Box 242
State College, Pennsylvania 16801-0242

Dave Welsch
Director, Information Services and Products
dwelsch@resourcetec.com

Additional Information

Time to Time(t)

- Test Bed - Intel PII 400 with RAID level 0 disk subsytem (80 megs/s transfer rate), 128 megs ram
- All files local
- One instance of MapInfo (OO) mapping software running
- 1/6th of a second per operation

0.166 seconds * 12 operations per seam * 25 seams per property * 200,000 properties = +/- 2800 hours

OO vs ARC/Info

- Unlimited file size
- Multiple feature types in same layer
- Passive topology
- Disk dependent
- Objects are independent of other objects
- Stability in PC environments
- Low TCO and entrance costs

- Software limitations on grid sizes, polygons in layers
- Single feature type in layer (built)
- Topology dependent
- Memory intensive
- Every feature is integral to every other feature
- Instable - UNIX shell ported to NT
- Extremely high TCO and entrance costs

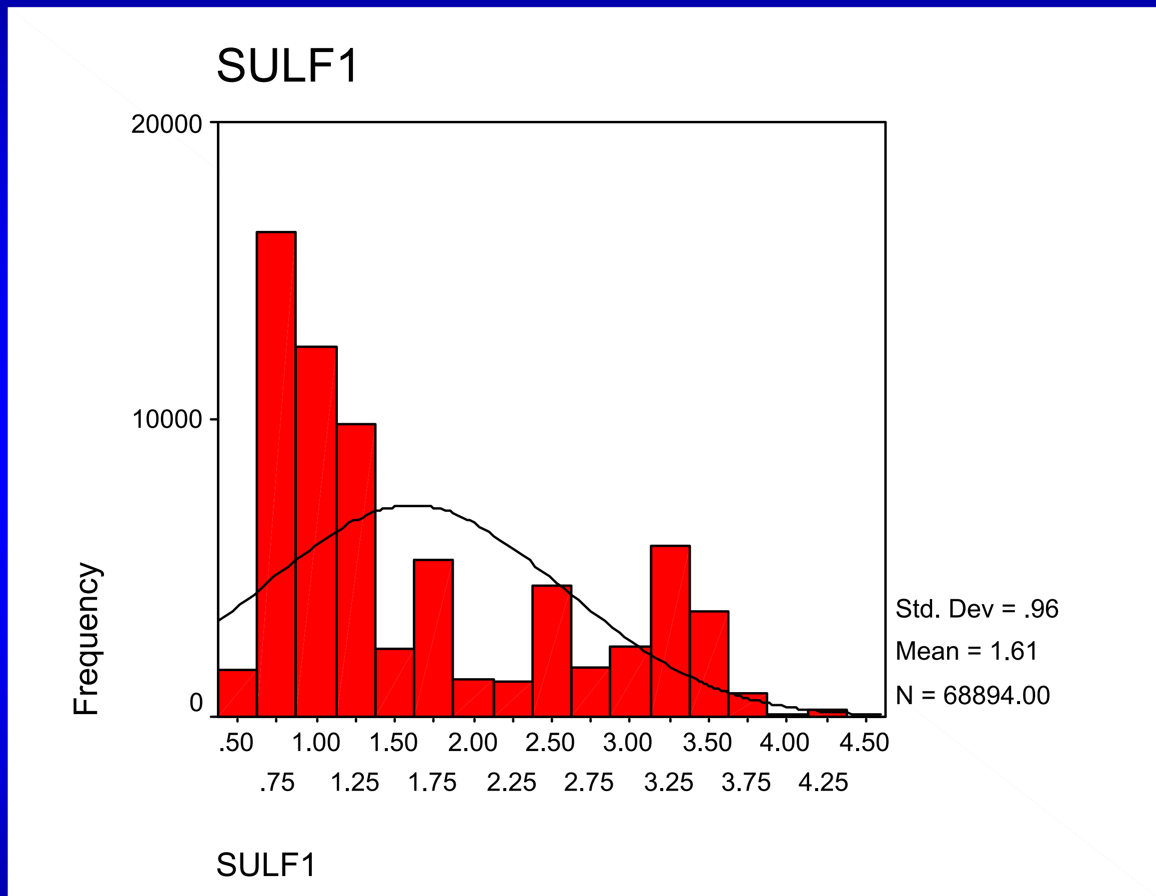
Time to Time(t) with ARC/Info

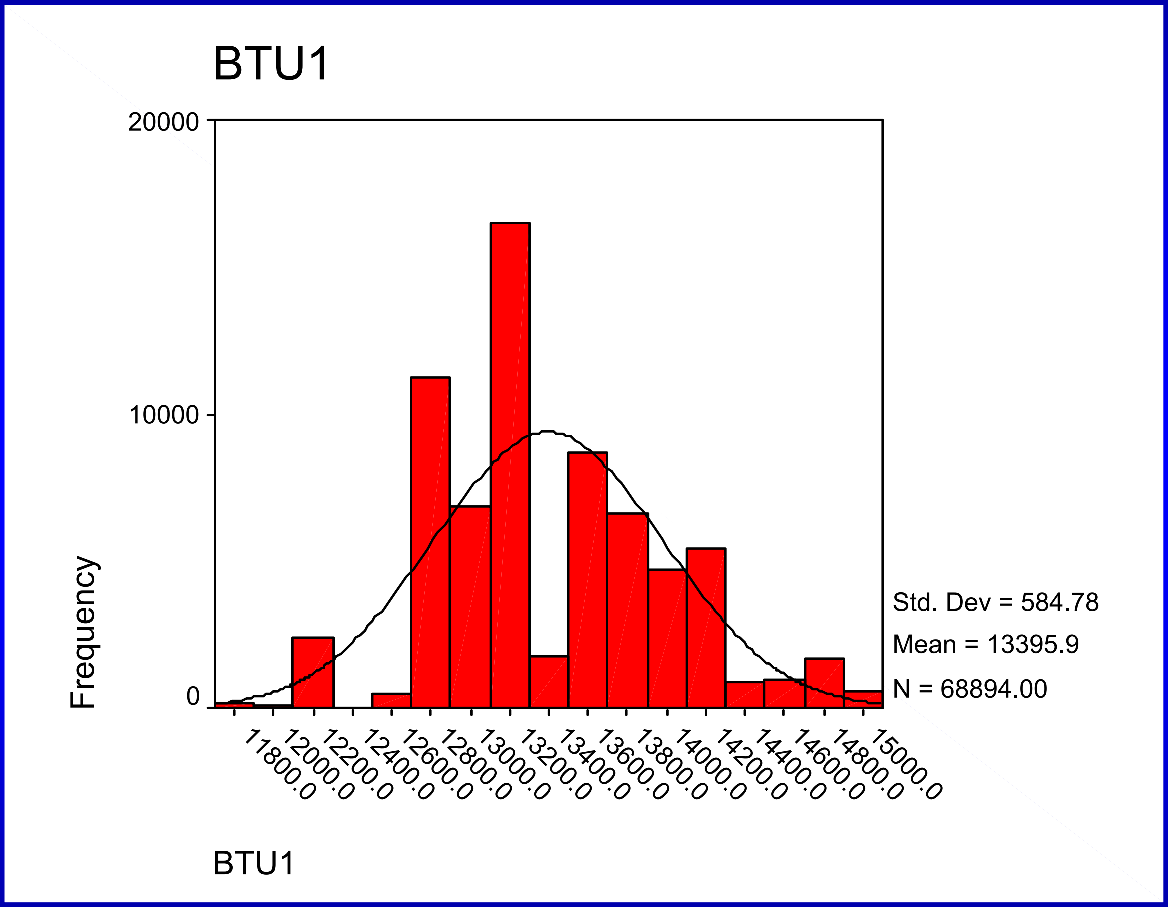
- Test Bed - Intel PII 400 with RAID level 0 disk subsytem (80 megs/s transfer rate) and 128 megs ram
- All files local
- One instance of ARC/Info mapping software running
- Data rebuilt to meet ARC topologic considerations for three tax districts
- 2 seconds per operation (polygon overlay on one layer) - does not count time to reload layers

2 seconds * 12 operations per seam * 25 seams per property * 200,000 properties = +/- 33,300 hours

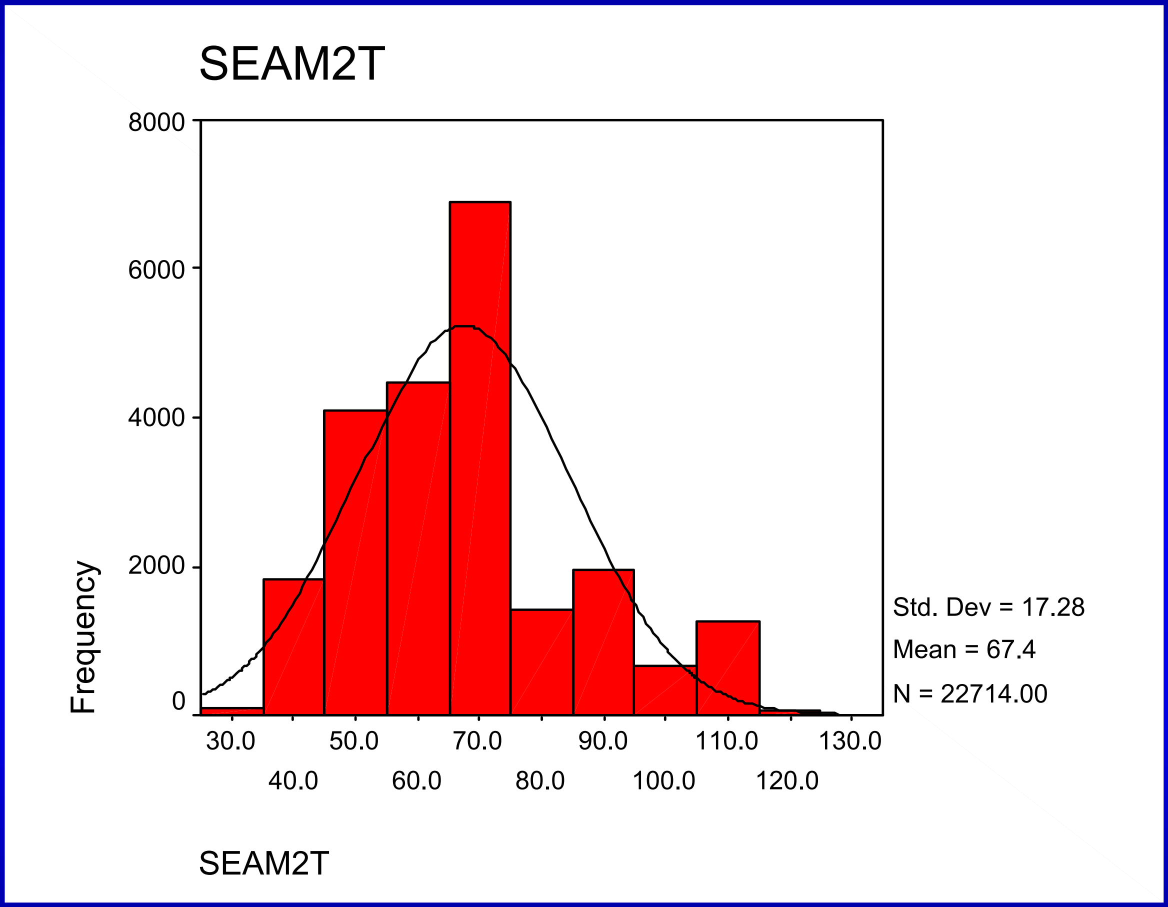
Spatial Base Mapping

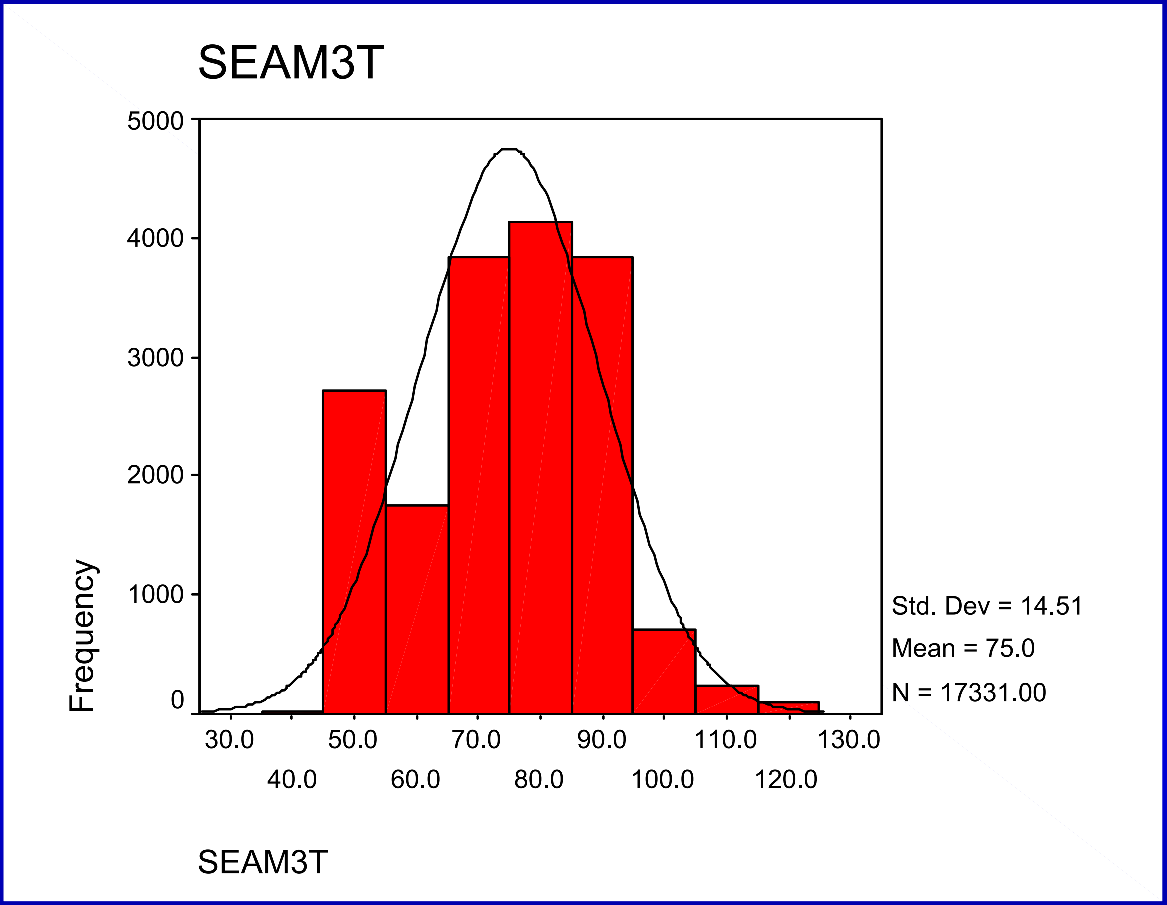
- All geologic mapping (resource physical and chemical characteristics)
  - points gridded using Vertical Mapper 2.5 (Northwood Geo)
  - Inverse distance weighting on 2.5 to 5 mi radius with decay exponent of 3 and no directional control (no octet search, etc.)
  - grids converted to polygon contours at 1/100th of data range
- Property mapping
  - 4 resolutions
    - District - 5 mi radius circle at centroid of district
    - Quad Ninth - 2.5 mi radius circle at centroid of quad
    - Tax Map - 1.25 mi radius circle at centroid of tax map
    - Absolute - polygon of property

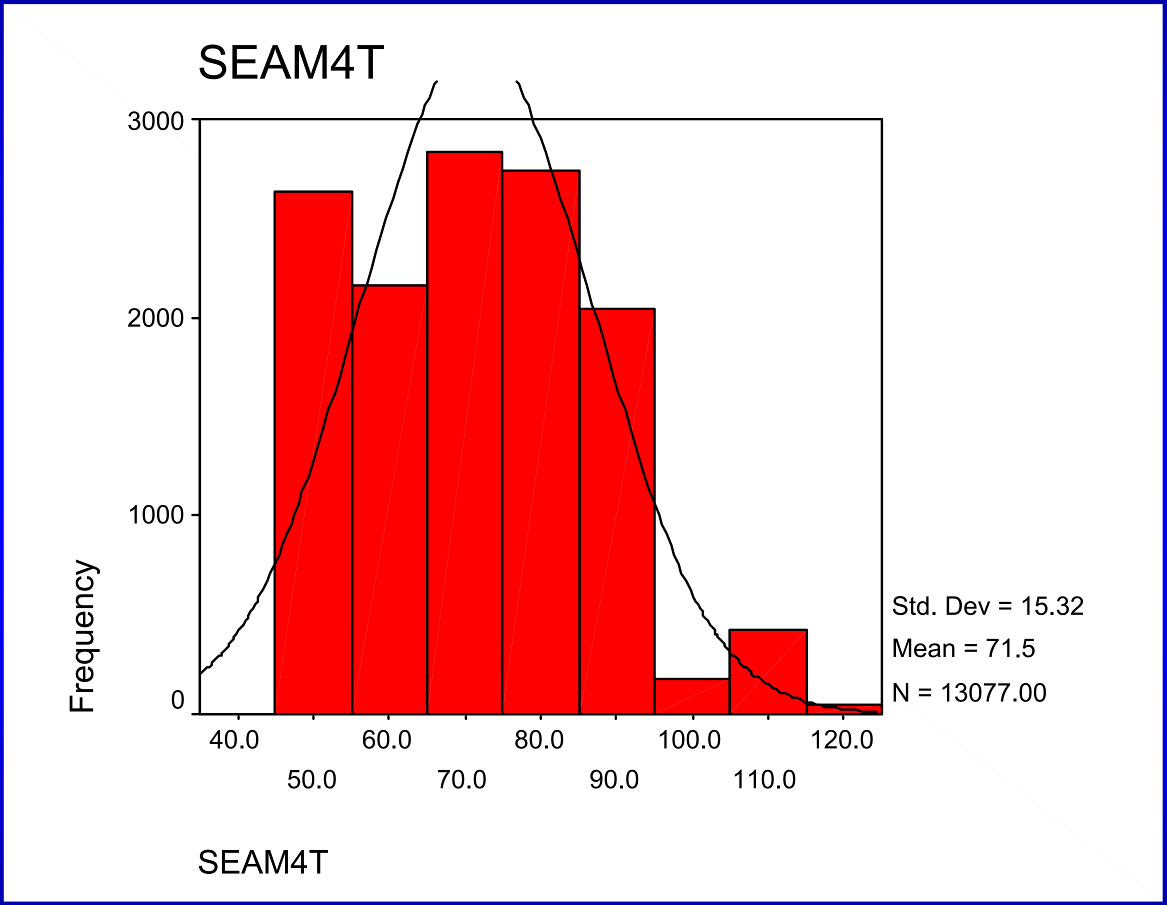

SULF1
20000
10000
0
Frequency
.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
.75
1.25
1.75
2.25
2.75
3.25
3.75
4.25
Std. Dev = .96
Mean = 1.61
N = 68894.00
SULF1

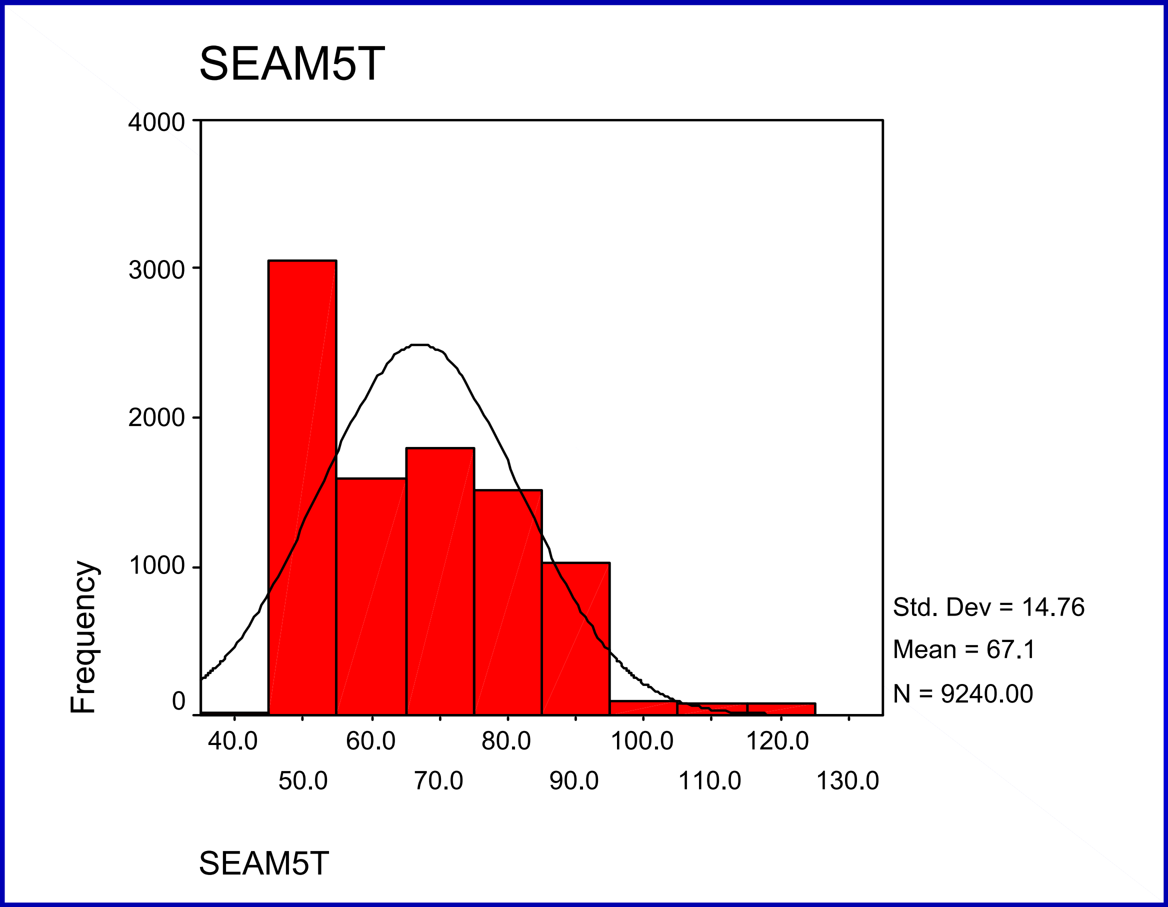


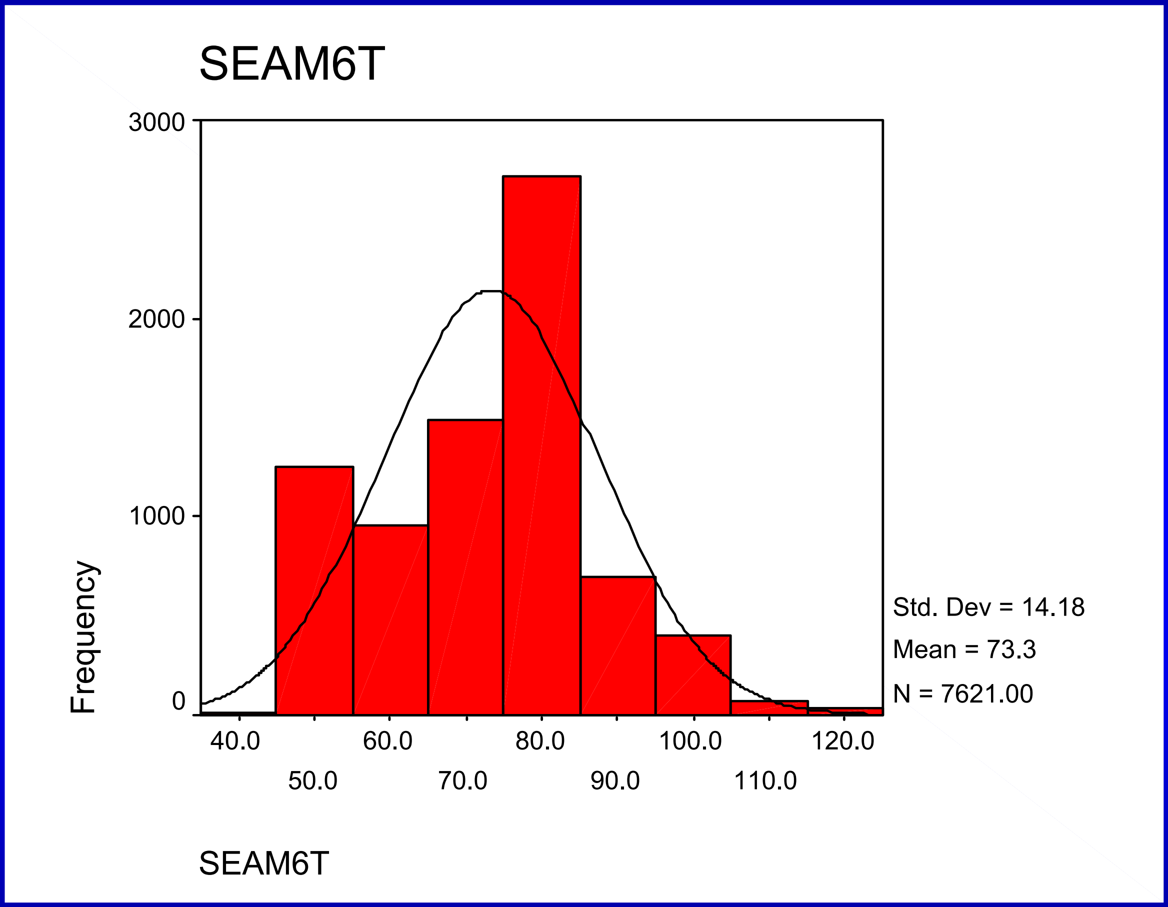
BTU1
20000
10000
0
Frequency
11800.0
12000.0
12200.0
12400.0
12600.0
12800.0
13000.0
13200.0
13400.0
13600.0
13800.0
14000.0
14200.0
14400.0
14600.0
14800.0
15000.0
Std. Dev = 584.78
Mean = 13395.9
N = 68894.00
BTU1

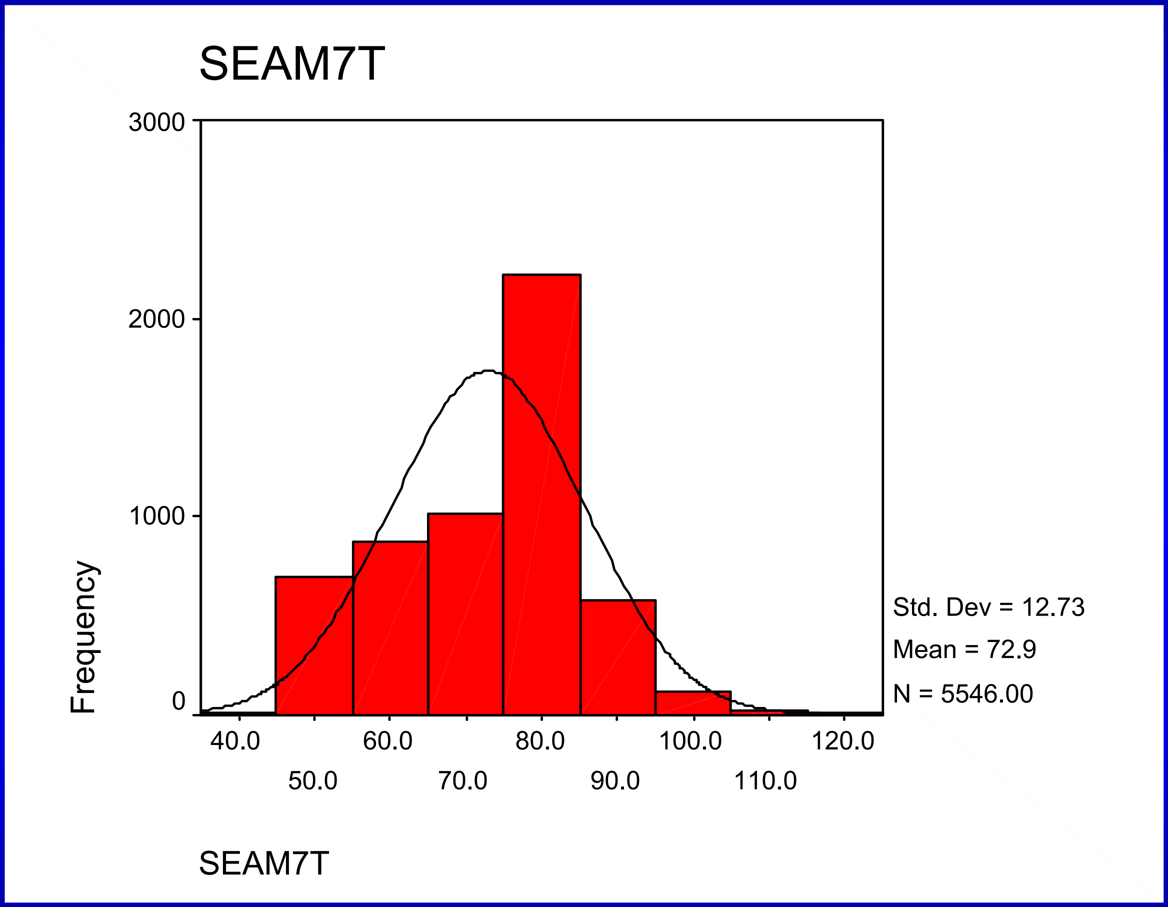

SEAM2T
Frequency
8000
6000
4000
2000
0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
130.0
Std. Dev = 17.28
Mean = 67.4
N = 22714.00
SEAM2T


SEAM3T
5000
4000
3000
2000
1000
0
Frequency
30.0
50.0
70.0
90.0
110.0
130.0
40.0
60.0
80.0
100.0
120.0
Std. Dev = 14.51
Mean = 75.0
N = 17331.00
SEAM3T


SEAM4T
3000
2000
1000
0
Frequency
40.0
60.0
80.0
100.0
120.0
50.0
70.0
90.0
110.0
Std. Dev = 15.32
Mean = 71.5
N = 13077.00
SEAM4T


SEAM5T
4000
3000
2000
1000
0
Frequency
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
130.0
Std. Dev = 14.76
Mean = 67.1
N = 9240.00
SEAM5T


SEAM6T
3000
2000
1000
0
Frequency
40.0
60.0
80.0
100.0
120.0
50.0
70.0
90.0
110.0
Std. Dev = 14.18
Mean = 73.3
N = 7621.00
SEAM6T


SEAM7T
3000
2000
1000
0
Frequency
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
Std. Dev = 12.73
Mean = 72.9
N = 5546.00
SEAM7T

Valuation of Energy Production Equipment (Mining & Oil and Gas Equipment) Value-in-Use vs. Value-in-Exchange

A Tale Without a Satisfactory End

Jeffrey R. Kern, ASA

Resource Technologies Corporation

Presenter

- ASA
- IAAO
- AIMA
- Appraisal and Value Consulting through North America
- Clients: Major Banks, State Governments, Federal Government, Bankruptcy Courts, Accounting Firms, County Governments
- Testimony in State and Federal Courts
- Certified in numerous states

Types of Value

- Investment Value
  - Produced, acquired, or maintained for later monetary income
- Utility Value
  - Benefit of ownership derived by use (not held for future sale)
- Personal Value
  - Value only to the individual owner (may or may not represent economic value)

Measure Of Value

- Value-in-Use
- Value-in-Exchange

How Value by Cost Approach became Value-in-Use or Did it?

- Large Coal Mine Complex located in multiple Counties in an Eastern Coal State

Assets Valued For Ad Valorem Taxation

- Machinery and equipment used for:
  - coal mining
  - coal loading (both rail and river) and transporting
  - coal preparation
- Rolling stock including trucks, dozers, scrapers, etc.

Assets Valued For Ad Valorem Taxation

- Constructed site improvements and fixtures (at first constructed as owned improvements and later converted to and constructed as leasehold improvements) involving permitted:
  - mine entries
  - mine and air shafts
  - mine mains and tunnels
  - deep mine and surface mines openings and faces
  - access haul roads
  - processing, office, storage, and work buildings
  - parking lots
  - cement pads
  - storage areas
  - disposal areas
  - coal preparation refuse disposal areas (landfills), etc.

Situation

Two Operating Sites:

- 42 million tons in the KC reserve area including compliance, low sulfur steam coal
- 78 million tons in the FC reserve area including compliance, low and medium sulfur steam coal

FC Reserve Area

- The FC coal and surface land was purchased 1997 for approximately $16,000,000 or $600 per acre.
- The property amounted to approximately 27,000 acres of essentially undeveloped potential coal reserves.
- The Company planned to mine 4,000,000 tons of coal per year by developing two underground mines and one small surface mine. Coal in the area is generally sold as low–sulfur coal to utility companies throughout the Appalachian area
- The FC coal Is shipped by way of CSX Rail.

FC Assessed Value

	Preparation Plant	Shop Area	Mine 1	Total County	Mine 2	Total
Machinery and Equipment	$19,800,000		$9,060,000	**$28,860,000**	$6,203,000	$35,063,000
Furniture and Fixtures	$9,000			**$9,000**	$2,000	$11,000
Leasehold Improvements	$4,580,000	$138,000	$5,070,000	**$9,788,000**	$2,104,000	$11,892,000
Computer Equipment	$17,000			**$17,000**	$4,000	$21,000
Inventory				**$0**	$0	$0
Mach.H/Inst.	$5,000		$90,000	**$95,000**	$20,000	$115,000
Other Property			$23,000	**$23,000**	$5,000	$28,000
Incomplete Construction	$2,400,000	$2,000	$230,000	**$2,632,000**	$566,000	$3,198,000
Salvage M&E					$0	$0
Pollution Facilities	$70,000	$159,000		**$229,000**	$49,000	$278,000
Rolling Stocks	$570,000	$25,000		**$595,000**	$128,000	$723,000
Molds Jigs etc.						
Total	**$27,451,000**	**$324,000**	**$14,473,000**	**$42,248,000**	**$9,080,000**	**$51,328,000**
Land and Coal (Real Estate)		**(based on 2001 pre-sale values)**		**$8,750,000**	**$9,260,000**	**$18,010,000**
Total				**$50,998,000**	**$18,340,000**	**$69,338,000**

FC Operation

- Operation employed more than 250 people
- Produced three to four million tons per year.
- Complex included a 900 ton per day coal preparation facility.
- During 2001 and 2002, there were five permits pending approval for new operations
- Additional 20 to 30 million tons of coal were potentially available from adjacent properties.

KC Assessed Value

Item	Mine 1	Office	Mine 2	KC Operation Process Plant	Loadout	Mine 3	Total
Machinery and Equipment	$4,270,000	$280,000	$2,310,000	$6,630,000	$0	$0	**$0**
Furniture and Fixtures		$30,000		$4,000	$5,000	$10,000	**$15,000**
Leasehold Improvements	$780,000		$320,000	$2,010,000	$946,000	$1,916,000	**$2,862,000**
Computer Equipment		$30,000		$30,000		$0	**$0**
Inventory						$0	**$0**
Mach.H/Inst.	$180,000	$30,000	$240,000	$620,000		$0	**$0**
Other Property			$13,000			$0	**$0**
Incomplete Construction						$0	**$0**
Salvage M&E				$7,000		$0	**$0**
Pollution Facilities						$0	**$0**
Rolling Stocks	$16,000	$210,000	$1,000	$14,000	$139,000	$282,000	**$421,000**
Molds Jigs etc.							
Total	**$5,246,000**	**$580,000**	**$2,884,000**	**$9,315,000**	**$1,090,000**	**$18,640,000**	**$37,755,000**
Land and Coal (Real Estate)						**$660,000**	**$3,550,000**
Total						**$19,300,000**	**$41,305,000**

FC Facilities

- Permitting for the access road, preparation plant, underground mines, refuse disposal area, and the computerized rail lead-out facility began in the Spring of 1998.
- Initial construction of the facilities began in December 1998.
- The following facilities were constructed:
  - 900 ton per hour processing plant (including raw and clean coal handling facilities)
  - Slope and shaft underground mine, 250 feet below drainage
  - 150-car unit train lead-out facility
  - Two to three mile railroad spur
  - Coal refuse disposal area
  - Underground slurry injection system
  - Fresh water distribution system
  - Four-mile access road (Kanawha County)

Equipment On Site

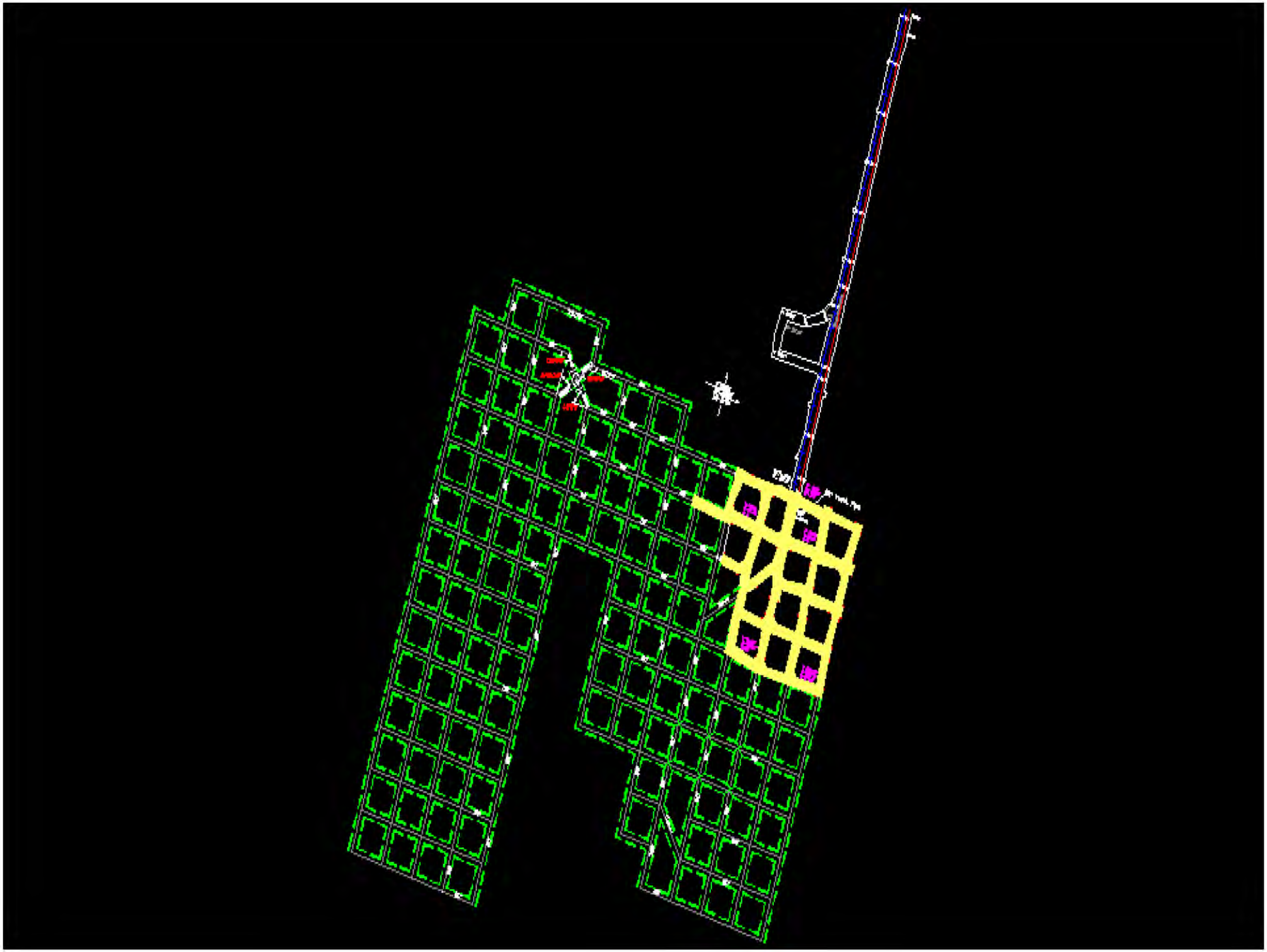
- .Machinery and equipment used for:
  - .mining
  - .loading (both rail and river)
  - .transporting
  - .preparation.

- .Rolling stock including:
  - .trucks
  - .dozers
  - .scrapers


28,000,000

Improvements On Site

- Constructed site improvements and fixtures involving permitted:
  - mine entries
  - mine and air shafts
  - mine mains and tunnels
  - deep mine and surface mines openings and faces
  - access haul roads
  - processing, office, storage, and work buildings
  - parking lots
  - cement pads
  - storage areas
  - disposal areas
- Coal preparation refuse disposal areas (landfill), etc.



Operating Equipment

- FC 1 Mine involved:
  - two mine faces
  - using two continuous miners
  - four shuttle cars
  - two roof bolters
- FC 2 Mine involved
  - single continuous miner
  - two shuttle cars

Operation

- The first shipment of coal took place approximately 1 year and 9 months after the construction
- Two additional surface mines and one additional deep mine permit applications were being reviewed by the State during 2001 and 2002.

Valuation Procedures Used

- According to the State Regulations, the goal of the assessment process is to estimate “fair-market-value.”
- The Legislative rule defines fair-market-value as:
  - “... highest price in terms of money that a property will, in a competitive and open market,
  - assuming buyer and seller are acting prudently and knowledgeably,
  - allowing sufficient time for sale and assuming that the price is not affected by stimulations.”

Valuation Procedures

- Inspected by the appraisers to acquaint the appraisers with the condition and utility of assets

- Taxpayer supplied a complete asset register showing:
  - acquisition cost
  - date placed in-service
  - asset modification
  - current book value (asset value depreciated according to federal income tax schedules).

Assessment Definitions Used

According to the IAAO:

- "Machinery and Equipment are items of personal property used in the normal conduct of business that are not permanently attached and, unlike inventory, not intended to be sold.
- Utility and ability to produce income are factors that influence the economic life of machinery and equipment.
- The market value of machinery and equipment typically follows a declining path once the assets are acquired and put into operation.
- Salvage or scrap value should be considered at the end of the economic life."

State Appraisal Rules

- Sales Comparison Approach
- Income Approach
- Cost Approach

The degree of dependence on any one approach will change with the availability of reliable data.

Income Approach

- "A property's present worth is directly related to its ability to produce an income over the life of the property."
- According to the West Virginia Code, "the income approach is not normally used because of the difficulty in estimating future net benefits to be derived except in the case of certain kinds of leased equipment."

Market Approach:

- "The market data approach will be applied by considering the selling prices of comparable properties."

- According to the West Virginia Code, pertaining to the valuation of machinery, equipment, furniture, fixtures, and leasehold improvements, "the market approach is used less frequently, principally due to a lack of meaningful sales

State Focuses on Cost Approach

The state, like the IAAO, while recognizing the utility of the comparative sales approach, particular for residential real estate, provides the rational for not using the approach for most machinery and equipment:

- “Industrial machinery, equipment, furniture, fixtures, and leasehold improvements sell infrequently and are often liquidation sales which typically are not at market value.
- The market approach to value is of little, if any, use in appraising industrial personal property due principally to the lack of a sufficient number of meaningful sales to statistically support development of the approach.”

Cost Approach

- "...to determine fair-market-value under this approach, replacement cost of the improvements is reduced by the amount of accrued depreciation and added to an estimated land value.
- In applying the cost approach, the tax commissioner will consider three types of depreciation:
  - physical deterioration
  - functional obsolescence
  - economic obsolescence."
- According to West Virginia Code, "...the cost approach may be most consistently applied to machinery, equipment, furniture, fixtures, and leasehold improvements because of the availability of data.

Common Approach

- According to the IAAO, the most common approach for the valuation of machinery and equipment is the cost approach.

- IAAO also states that, “The sales comparison approach may have limited application for appraising machinery and equipment used in business.

Cost Approach Methodology

According to State: Cost used can be:

- Original
- Acquisition
- Replacement
- Reproduction costs

- Original or acquisition costs are readily available for personal property.
- The cost approach provides an estimate of value based on the depreciated cost of the property.

Assessment Methodology

- According to the IAAO, the assessor must be aware that the depreciated value shown on the taxpayer-provided asset register does not represent current market value, only accounting value for income tax calculations.

"The assessor should recognize that the appraisal and accounting practices for depreciating personal property may differ. Accounting practices provide for recovery of the cost of an asset, whereas appraisal practices strive to estimate a value related to the current market."

Assessed Valuation Summary

	County 1	County 2	County 3	All
Machinery and Equipment	**$28,860,000**	$13,490,000	$19,131,000	$61,481,000
Furniture and Fixtures	**$9,000**	$39,000	$22,000	$70,000
Leasehold Improvements	**$9,788,000**	$4,056,000	$6,254,000	$20,098,000
Computer Equipment	**$17,000**	$60,000	$35,000	$112,000
Inventory	**$0**	$0	$0	$0
Mach.	**$95,000**	$1,070,000	$526,000	$1,691,000
Other Property	**$23,000**	$13,000	$16,000	$52,000
Incomplete Construction	**$2,632,000**	$0	$1,189,000	$3,821,000
Salvage M&E	**$0**	$7,000	$3,000	$10,000
Pollution Facilities	**$229,000**	$0	$103,000	$332,000
Rolling Stocks	**$595,000**	$380,000	$440,000	$1,415,000
Molds Jigs etc.	**$0**	$0		
Total	**$42,248,000**	$19,115,000	$27,720,000	**$89,083,000**
Land and Coal (Real Estate)	**$8,750,000**	$2,890,000	$9,920,000	**$21,560,000**
Total	**$50,998,000**	$22,005,000	$37,640,000	**$110,643,000**

History of Issues

- Company acquired coal land in 1997 for approximately $16,000,000..
- Company spent $100 million to develop mines, preparation, rail load-out, and other support facilities on the property.
- Company began to ship coal from the facility in 2000. The first coal shipments were delayed from the original time schedule.
- The major mining operation encountered some geologic situations which deviated from the original mining plans

History of Issues

- During the same period, the firm lost a jury award of nearly $15 million
- To obtain cash, Company sold the FC land and coal to a limited Partnership in the business of assembling and lease coal, oil and gas and other resources lands to operators.
  - Sale consummated in May 2001 for nearly $33,000,000.
  - Sale specifically excluded all machinery and equipment, leasehold improvements, fixtures, and other assets
  - Obvious that a portion of the assets were attached or could only be used at the present location.
- The buyer owned lands adjacent to the FC properties. Increasing the reserves from less than 60 thousand acres to over 80 thousand acres (150 to 209 million tons).

History of the Issues

Company immediately leased the coal back to Operator. The terms of the lease were:

- 10 initial renewable in 5-year increments or until exhaustion of all mineable and merchantable coal
- Payment of $2.00 (minimum) per ton or 7% of gross sales price for coal extracted by underground mining methods (F.O.B at the plant *not on board train*).
- Payment of $2.00 (minimum) per ton or 7.5% of the gross selling price for coal extracted from surface mining techniques (F.O.B at the plant *not on board train*).
- Wheelage fee ($0.10 per ton or 0.25% of gross selling price) for coal mined on adverse lands and transported over this property.
- Processing fee ($0.15 per ton or 0.50% of the gross selling price) for any coal processed on site that was mined from other reserves (land owner does not own equipment).
- Minimum monthly rental (recoupable) of:
  - $200,000 until total producti0n reaches 35,000,000 tons then
  - $100,000 until total production reaches 50,000,000 tons and finally
  - $50,000 for the balance of the lease.
  - (Total recoupment equals a minimum production of 100,000 tons per month.)

Too Much Debt, Not enough Cash Flow, Now required to pay Exorbitant Lease on Coal

- Chapter 11 Bankruptcy in February 2002.
- Requested a reduction in the taxes assessed on personal property as of July 1, 2001 and July 1, 2002.

Request Reduction

- From over $110,000,000 to $14,000,000

- From over $110,000,000 to $14,000,000
- From over $110,000,000 to $14,000,000

The bankruptcy is evidence of a loss of utility of the assets reducing value

In short, the bankruptcy stopped or delayed the planned exploitation of the coal by this operator causing the operator duress. The assets of the operator/owner were thus devalued.

- The taxing authorities cannot and should not take the special unique financial circumstances into account when valuing property.
- All property owners have unique financial circumstances that may inflate or deflate the business, personal, or intangible value of any taxpayer. These circumstances may be transitory.
- The taxing authorities are tasked with establishing a fair and equitable value for all taxable property treating all taxpayers impartially without reference to peculiar circumstances.

Cost Approach and the ASA

This premise is supported by the following statement from the American Society of Appraisers manual:

- "It is a rare event when only machinery and equipment are sold for continued use.
- Usually, any total plant sales involve not only machinery and equipment but real estate and intangibles.
- A major factor affecting comparability is the product being made and how much income can be generated from the sale of the product, which will affect fair-market value for continued use.
- Finally, when entire plants are sold in liquidation it is difficult, if not impossible, to compare the sale of a 'dead plant' to the sale of a facility that continues to operate."

State Focuses on Cost less Depreciation

According to the State code:

- The cost approach is based upon the assumption that the cost of a property, less depreciation (loss in value) yields a reasonable estimate of market value.

- Depreciation is a loss in value due to:
  - physical deterioration through use
  - functional obsolescence through design or utility
  - economic obsolescence due to outside market forces.

Depreciation

- Depreciation is a process used to estimate the remaining economic life of an asset.
- Nearly all industrial machinery, equipment, furniture, fixtures, and leasehold improvements become completely depreciated
- State uses measures of depreciation to estimate the remaining economic life of an asset and estimate the related remaining value of the asset. Economic life is affected by more than the simple age or physical deterioration of an asset.
- The economic life may or may not be equivalent to the physical life of the asset.

Types of Depreciation included in States Analysis

- Physical Deterioration
- Technological Obsolescence
- Functional Obsolescence
- Economic Obsolescence

Physical Deterioration

- "... a loss in value due to natural wear and tear of property resulting from age, use, abuse, etc."

Technological Obsolescence

- A new item of equipment may be able to complete the same task for less money than an older model of equipment designed to complete the same task.
  - shorter time
  - less waste
  - less space, with lower cost employees, etc.
  - comparing of the output and cost of two machines put to the same task can be related to a measure of technical obsolescence.

Functional Obsolescence

- According to the ASA, “Items of machinery and equipment are usually designed for or adapted to a specific use.   This can be defined as the highest and best use for the subject item and the most profitable use to which a property can be put. A limitation in use could be described as functional obsolescence.

- The loss of value due to factors such as excess capacity, changes in technology, flow of material, seasonal use, part-time use, or other like factors. The inability to perform adequately the function for which an item was designed.

Economic Obsolescence

- External to the machinery itself.
- The causes of economic obsolescence may include:
  - reduced demand for the product
  - increased competition
  - changes in raw material supplies
  - increased costs of raw materials, labor, or utilities without corresponding price increases of the product
  - Inflation
  - high interest rates
  - unfavorable legislation
  - unique environmental considerations
- "Whenever the operating level of an asset or entire plant is less than its rated capability, an 'inutility' penalty exists.
- "...a loss in value of a property arising from 'outside forces' such as changes in use,
- legislation, that restricts or impairs property rights, or changes in supply and demand relationships.

Mass Appraisal Techniques

- Allow the administration of the tax system to be workable and practical.
- Rely on statistical inference and generalities concerning the use and condition of individual assets.
- Typically used by taxing authorities, large companies with vast holdings, and financial institutions with large inventories of mortgages.
- Intended to provide an accurate overall estimate of value.
- Precision concerning the value of individual assets is sacrificed for manageability of the process and consistency among all properties.
- Promote equity among all taxpayers.

Mass Appraisal Techniques

Accomplished by:

- Developing standard procedures
- Using standardized referenced materials
- Fixing values on specific dates
- Basing values on specific definable and repeatable assumptions
- Avoiding individual financial positions
- Using long-term trends rather than short-term or local variations to predict market activity
- Providing all taxpayers and taxing bodies a timely avenue to appeal valuation

Mass Appraisal Techniques

- Original acquisition cost and date of acquisition as the basis for the cost approach.
- “The acquisition costs are trended and depreciated as appropriate to reflect current market values
- The state consults nationally available cost trend and asset depreciation guides

Guidelines

According to the IAAO:

- “appraisal practice must consider depreciation in the forms of physical deterioration, functional obsolescence, and external obsolescence.
- Useful guidelines in the form of depreciation schedules or tables are available from state or provincial assessing authorities, professional valuation companies, and appraisal publishing firms.... Generally, these guides are sufficiently accurate for use in mass appraisal of property.
- …there are always particular types of property where depreciation defies the use of guides and can only be estimated by applying experience and judgment.

Data Sources

Valuation based of industrial machinery, equipment, furniture, fixtures, leasehold improvements, rolling stock, and pollution control equipment is based on:

- Marshall and Swift
- The Green Guide – Administrative Valuation and Assessment of Used Construction Equipment
- The Green Guide – The Handbook of New and Used Equipment Values Top Bid

One more thing:

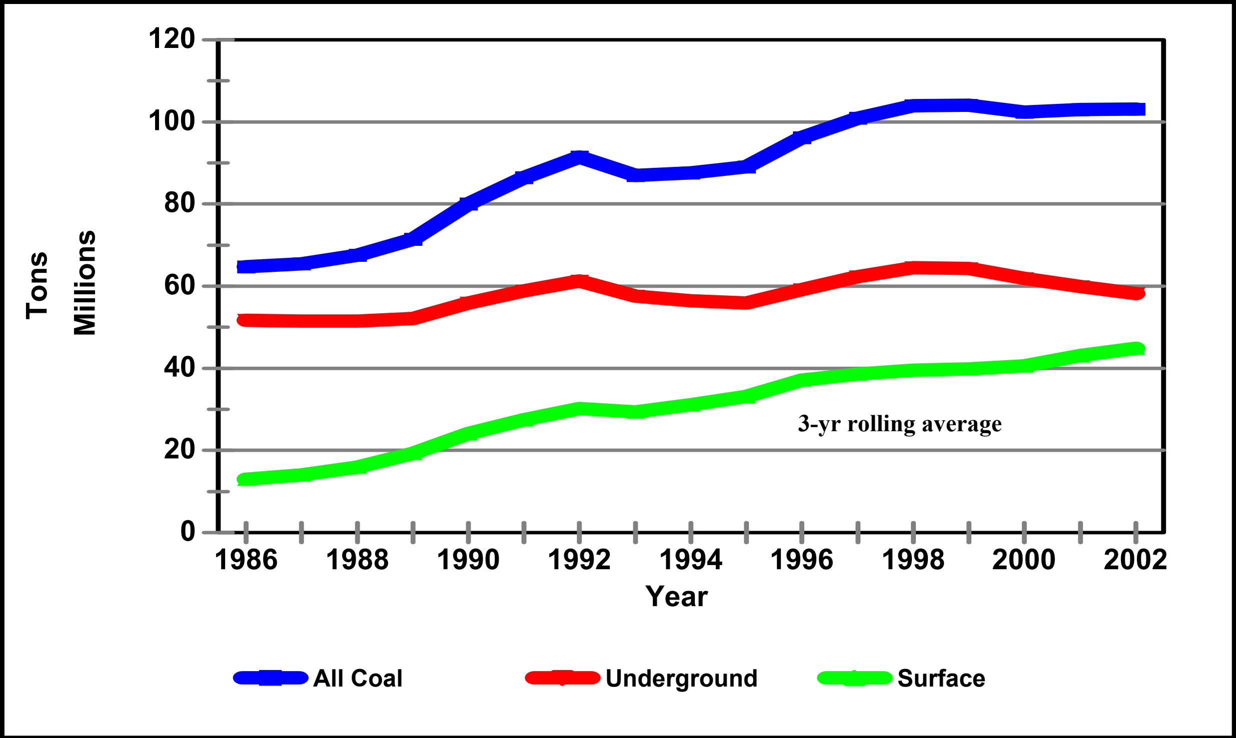
- The company attempted to sell it's West Virginia operations
- Initial estimates of value prior to completion of due-diligence varied but all approached $200,000,000 cash value and assumed debt.
- Following due-diligence efforts, none of the potential transactions were consummated. Purchasers would be buying the physical assets, assuming the Lease-back and assuming all reclamation and other liabilities.

Premises for Value Reduction

To reduce the appraised value, the taxing authorities must accept one or all of the following premises:

- The bankruptcy is evidence of a loss of utility of the assets, thus reducing their value.
- The bankruptcy is evidence of a depressed coal market
- The bankruptcy resulted from poor local mining and marketing conditions which diminishes the value of assets
- The value of the bankruptcy sales is equal to the fair-market value of the assets.

The bankruptcy is evidence of a depressed coal market



The bankruptcy resulted from poor local mining and marketing conditions which diminishes the value of assets

- Make mining the coal at this location more difficult and more expensive
- Reducing the rate of production or terminating the viability of the sites ability to produce coal.
- Factors would have to be translatable to all potential owner/ operators and to all locations within the tracts and affect all equipment, improvements, and fixtures.
- The local mining or market conditions cannot be overcome by this or any operator – thus universally diminishing the value of all assets.

The bankruptcy resulted from poor local mining and marketing conditions which diminishes the value of assets

- Real property was sold for nearly $33,000,000 to a fairly sophisticated coal and energy property holding company

- The land and coal had been purchased by Pen in 1997 for approximately $16,000,000. If the market for coal or if the site was so poor as to not be able to support mining, it is doubtful that the site would have sold for more than twice what was originally paid.

- New Operators are now functioning on the site

The value of the bankruptcy sales is equal to the fair-market value of the assets.

- On October 1, 2002, Company sold <u>all</u> of FC related personalty assets to the new Land/Coal owner for less than $5,000,000.

- A liquidation sale is not an arm's-length transaction.
  - Sale involved related parties.
  - Sale was transacted after Operator filed bankruptcy

Plaintiff's Theory

- Value is attached to use
- Since much equipment is constructed on-site
  - Not transportable
  - Not readily transferable
- Business is defunct – therefore equipment and improvements equipment has little or no value
- *Of course the opposite claim is frequently made when business is good (as in we're just good managers using outdated equipment)*

State/County Theory

- Value equals cost depreciated
  - But:
    - if mine doesn't operate – the constructed improvements are scrap
    - can't move this stuff
  - But:
    - If some one else buys the mine it will have value

What the New Owner Says

- Acquired rights to this property pursuant to four acquisitions between 1996 and 2002.

- The ___________ property consists of 84,000 acres:
  - 53,000 acres in fee
  - mineral interests to 19,000 acre
  - lease 12,000 acres from third parties

- In January 2004, we completed the construction of a new coal loadout facility for one of our lessees….. The $4.0 million loadout facility is designed for the high-speed loading of 150-car unit trains and became operational in January 2004.

New Owner Says

- As of December 31, 2003, the property included:
  - 201 million tons of proven and probable coal reserves
  - a coal loading dock on the Famous River,
  - a 900-ton per hour coal preparation plant,
  - a unit train loading facility and a modular coal preparation plant.

- As of December 31, 2003:
  - we leased 86% of the property reserves pursuant to 11 leases.
  - Production from the property totaled 3.9 million tons …. shipped to our lessees' customers via truck, barge and railroad.

Royalty/Lease

- “Normal” == 5%
  - 2002 --- $1.25 / ton
  - 2003 ----$1.30 / ton
  - 2004 (1st half) --- $1.50 / ton
  - 2004 (2nd half) ---$ 1.75 / ton
- Actual == 7.5% +
  - 2002 --- $1.87 ($2.00) / ton
  - 2003 --- $1.95 ($2.00) / ton
  - 2004 (1st half) --- $2.10 / ton
  - 2004 (2nd half) ---$ 2.65 / ton

- Bonus = $0.62 to $.90 per ton
- $2,500,000 to $3,500,000 per year
- $18,000,000 (.145 discount rate)
- $36,000,000 (.10 discount rate)

Based on Leases

- Coal == $50 to $100 million
- M&E and Impr == $18 to $36 million

- $68 to $135 million

Based On Leases (Planned Production

- Coal > $350,000,000
- M&E > $100,000,000

- Over 25,000,000 per year

So What is the Answer?

- Discussion!!!

Appraisal of Mineral Properties

Spring 2016

www.resourcetec.com

Appraisal of Mineral Properties

INSTRUCTOR: JEFFREY R. KERN

- Certified General Appraiser:
  - Pennsylvania
  - Delaware
  - Texas
  - Florida
  - Georgia
  - Virginia
  - Mississippi
  - Indiana
  - Ohio
  - Illinois
  - Alaska
  - West Virginia
  - Kentucky
  - Colorado
  - Tennessee
  - Wyoming
  - New Jersey
  - New York
  - North Carolina
  - Arkansas
  - Montana
  - Alabama
  - North Carolina
  - South Carolina
- Pennsylvania Certified Evaluator
- Member
  - International Institute of Mineral Appraisers
  - American Society of Appraisers
  - International Association of Assessing Officers
  - Institute of Business Appraisers
  - Minerals Economics and Management Society

Drag Line and Dozer

Minerals to be Valued

What is a mineral?

- Coal – Anthracite / Bituminous / Lignite / Coal Refuse
- Aggregates: Sand and Gravel / Crushed Stone
- Dimension Stone (Granite, Limestone, Slate)
- Gypsum / Talc
- Iron Ore
- Hydrocarbons: Natural Gas / Oil / NG Liquids
- Industrial Minerals: Phosphate / Trona / Zircon / Titanium
- Other Mineral Commodities

Coal Refuse

Minerals Defined

Minerals are defined in terms of economics.

Given legal, environmental, and political factors, can the material or commodity

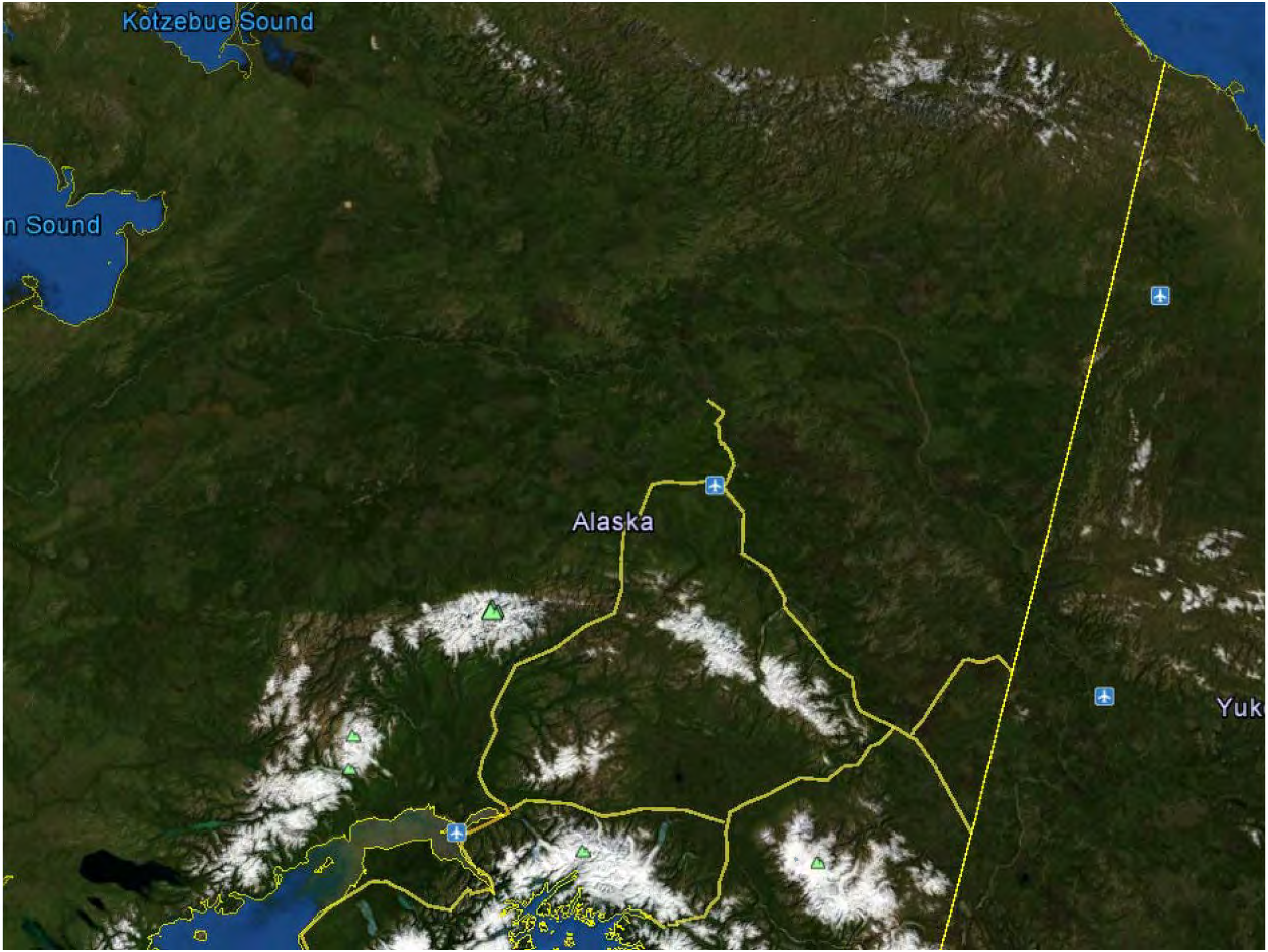
be:

- Identified and processed,
- Extracted from the ground,
- Processed for market, and
- Delivered to market

At a competitive price ?

Why Appraise Mineral Properties ?

- Sale or Acquisition of Operating Companies or Reserves
- Investment and Operating Decisions
- Tax planning
- Reports to federal agencies (Securities Exchange Commission)
- Financing
- Income, severance, and ad-valorem taxation
- Condemnation



Kotzebue Sound
n Sound
Alaska
Yuk


2

Mineral Value

What is Mineral Value ?

- After processing unit value of a commodity:
  - Price per processed and delivered ton of coal
  - Price of delivered gasoline
  - Price of a diamond ring
- FOB Price at the mine site
- In-place value in the ground
- Speculative value for future development

A Mineral Property only has value as it relates to its ability to produce future income

Nevada Desert

Nevada Gold?


Golden Chariot # 3
Golden Chariot # 1
Golden Chariot # 1 Shaft
Last Chance
Mohawk
GoldenChariot # 2
Daisy
Image © 2016 DigitalGlobe

Categories of Mineral Property Value

- Active Extractive Operations
  - Mines
  - Quarries
  - Wells
- Reserve
  - Properties included in active operational control
  - Properties which are situated for future extraction
- Resources
  - Properties which may contain future reserves

Sand and Gravel

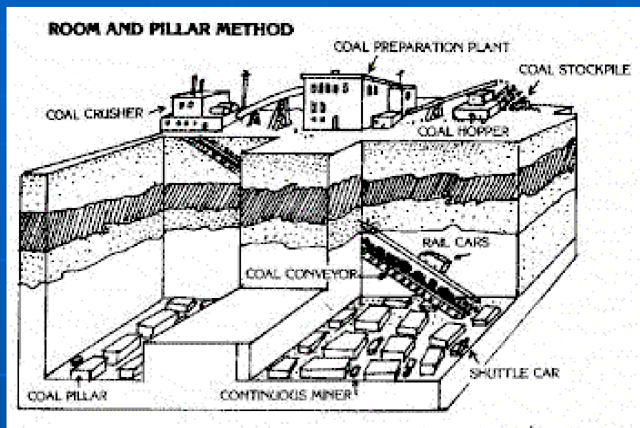
Minerals are Just Like....

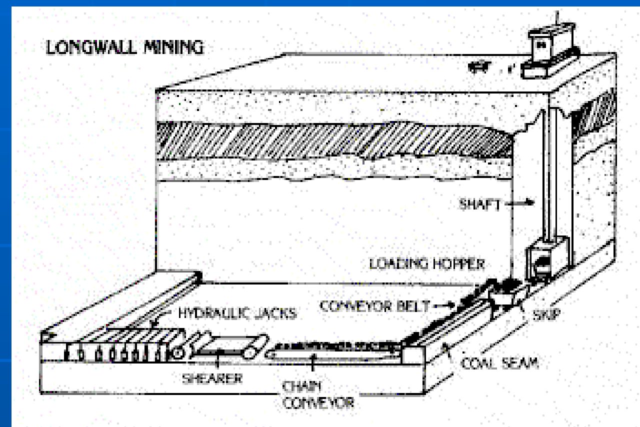
Active Mine ➡ **Commercial Real Estate**
➡ **Industrial property**

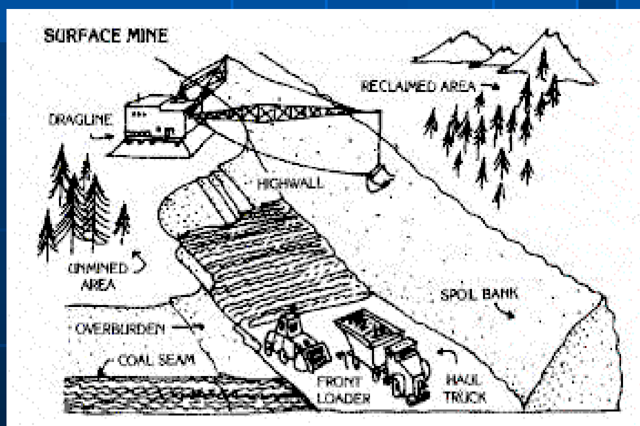
Active Reserve ➡ **Undeveloped parcel in a growing industrial or commercial area**

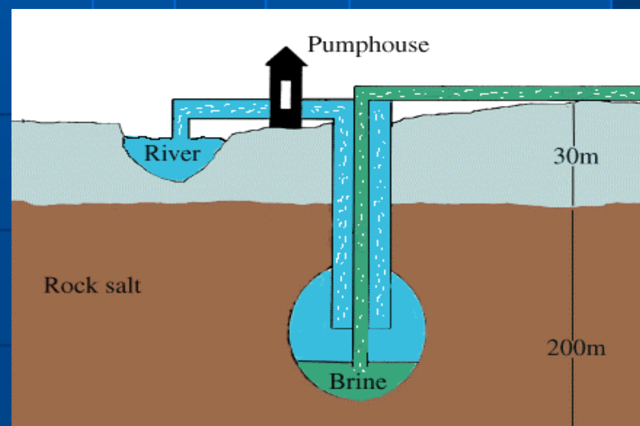
Reserve ➡ **Undeveloped parcel which may have future developmental possibilities**

Typical Mining Methods









Highest and Best Use

Just like any other property

- **Possible:**

–Does the asset exist, is there a sufficient quantity of the appropriate quality of resource, and is it technically possible to use it?

- **Legal:**

–Is it legal or permissible to exploit the asset?

- **Feasible:**

–Can the asset be utilized or exploited in a realistic manner? Is there appropriate access (in mineral properties, this may include rights to mine, rights of ingress and egress, wheelage rights, air shaft, and water control rights)?

- **Economic:**

–Can the resource be exploited in such a way as to return a positive economic return on the investment necessary to exploit the resource? Is there a potential profit in the present or foreseeable market place?

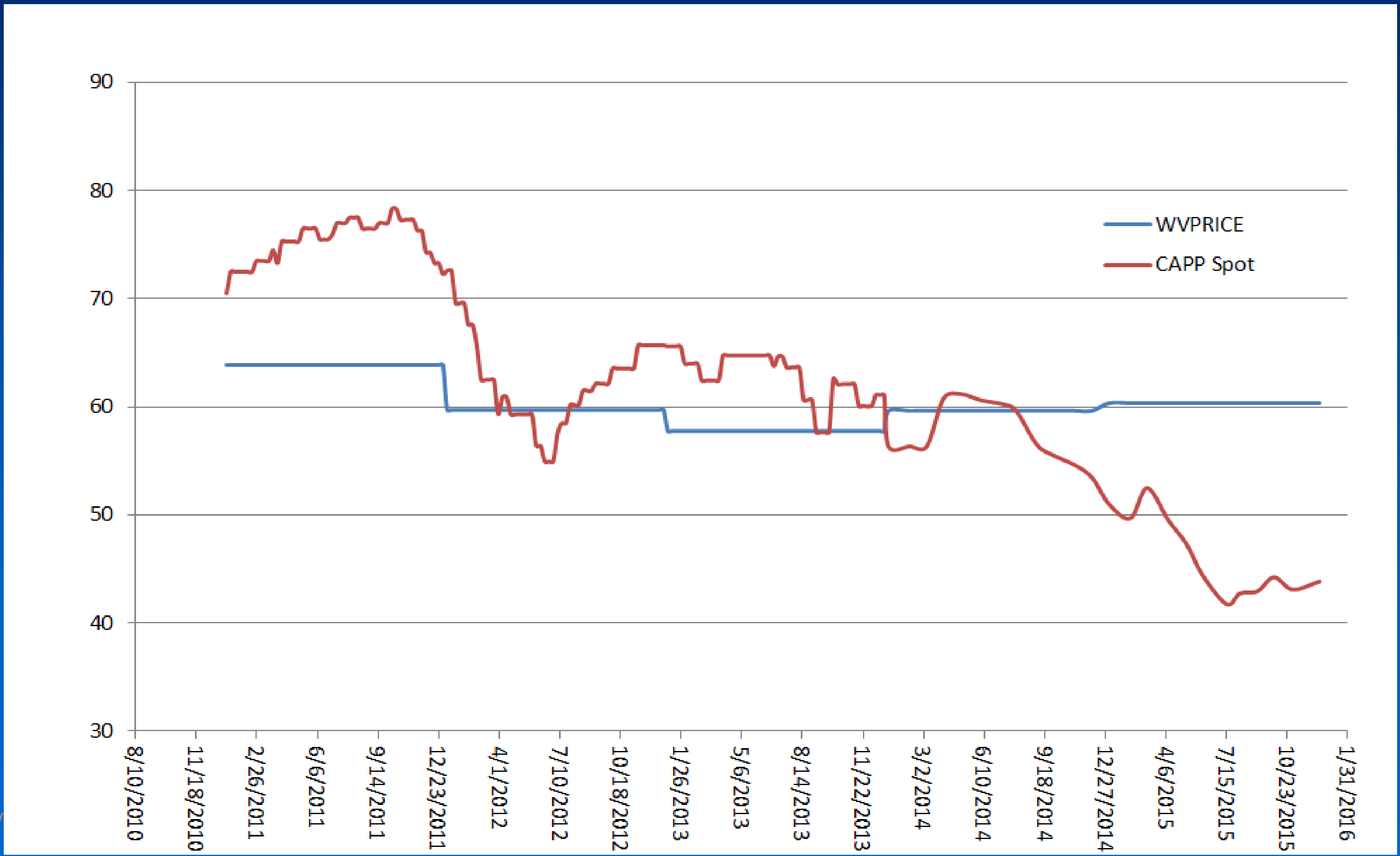
Market

- Reliability of Supplier (Supply)
- Reliability demand by purchaser
- Quantity of Reserve
- Quality of Reserve
- Production Cost vs. Market Price
- Transport Cost
- Delivered Price

Market Prices

- Contract
  - Specific needs of supplier and purchaser
  - May include other factors
- Spot
  - Open market bidding
- Sources of Information
  - Industry Publications
    - Coal Outlook
  - Public Utility Commissions
  - Energy Information Agency (US DOE)
  - UGSS
    - Commodity Surveys

Coal Price



90
80
70
60
50
40
30
WVPRICE
CAPP Spot
8/10/2010
11/18/2010
2/26/2011
6/6/2011
9/14/2011
12/23/2011
4/1/2012
7/10/2012
10/18/2012
1/26/2013
5/6/2013
8/14/2013
11/22/2013
3/2/2014
6/10/2014
9/18/2014
12/27/2014
4/6/2015
7/15/2015
10/23/2015
1/31/2016

Coal Industry Demise

Coal Company Market Captivation				
	5Yr	1Yr	Today	% of 1 Yr Value
NRP	3.76B	864.66M	112.85M	3.00%
CONSOL	12.52B	6.217B	2.70B	21.57%
Peabody	18.97B	1.59B	45.79M	0.24%
ANR	6.63B	207.59M	5.23M	0.08%
Arch	5.70B	201.07M	4.90M	0.09%
Alliance	2.98B	2.61B	956.46M	32.10%

Ownership

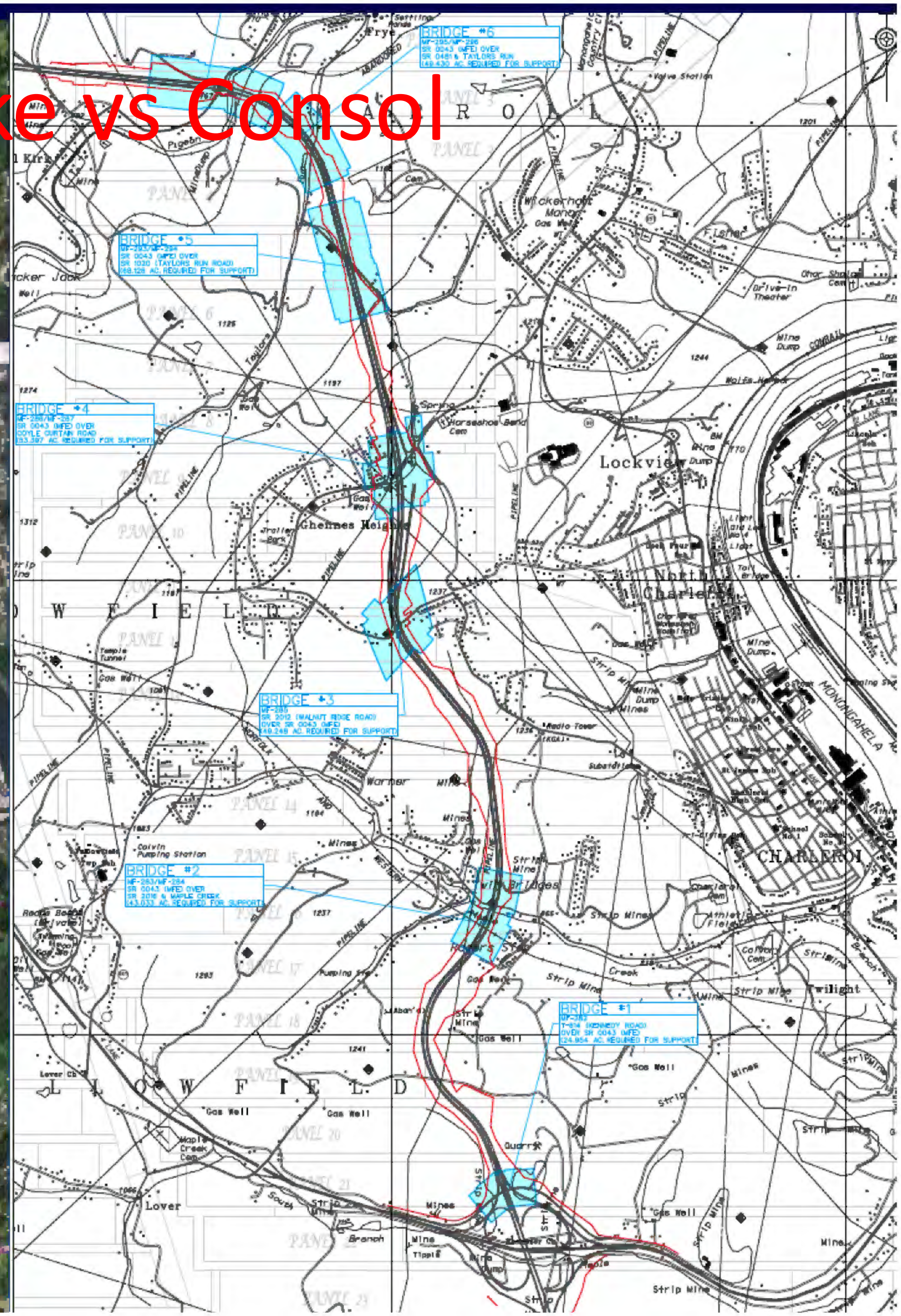
Ownership Defines Use and Availability

- Fee Ownership – **complete mineral and surface rights**
- Surface Lease – **control by lease of surface rights**
- Mineral Lease – **control by lease of mineral rights**
- Surface Only – **ownership of surface rights**
- Mineral Only – **ownership of mineral rights**
- Adverse – **properties not owned or leased**

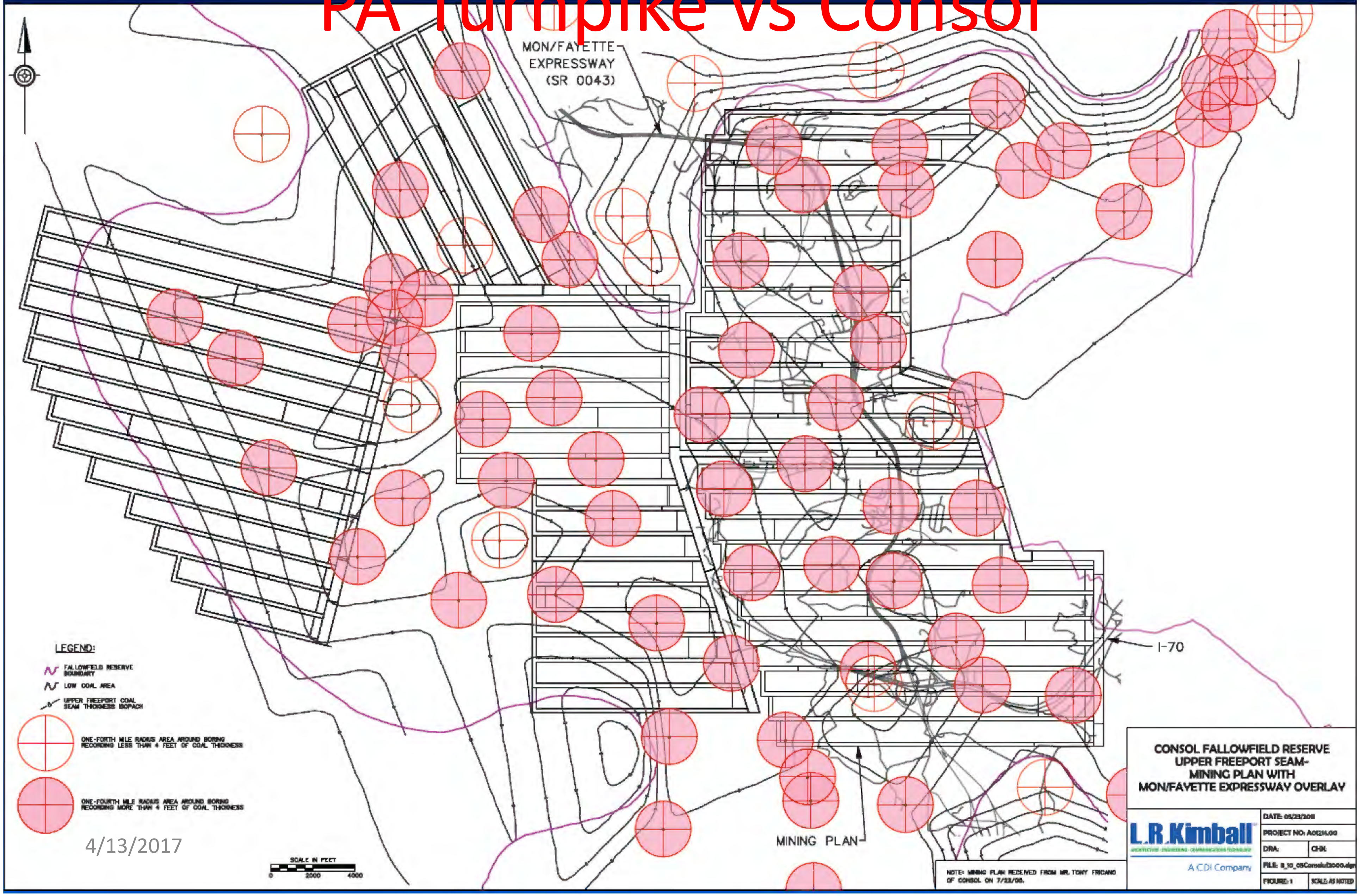
Current / Recent Projects

- PA Turnpike vs CONSOL – Coal Commission
  - Claim = $143,000,000
  - Valued at $7,500,000
  - Settled at $9,000,000 +

PA Turnpike vs Consol

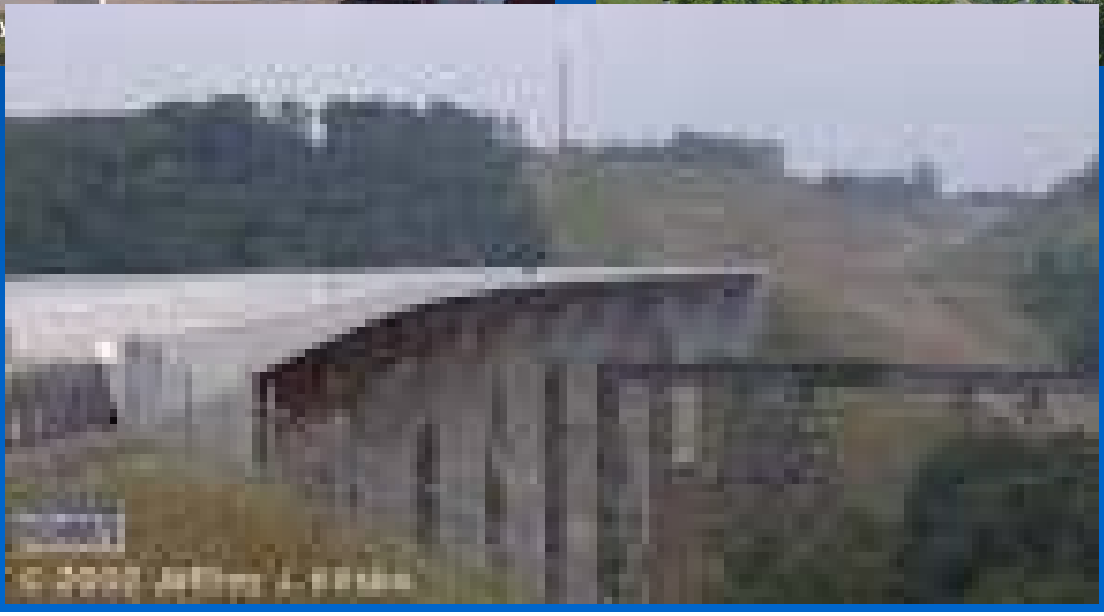


PA Turnpike vs Consol



4/13/2017

PA Turnpike vs Consol



Whitney Benefits
Facts

- Whitney Benefits' land of 1327 acres which were irrigated and subirrigated by the Tongue River alluvial valley floor.
- The land was leased to PKS in 1974, and advanced royalties were paid to Whitney.
- PKS expended exploration costs of $1 million in 1976
- PKS filed a permit application with the Wyoming Department of Environmental Quality (DEQ).

Whitney Benefits Facts

- A year later, SMCRA was enacted.
  - » No permit or application shall be approved if it should "interrupt, discontinue or preclude farming on alluvial valley floors that are irrigated or subirrigated
  - » Thus, Whitney's right to mine the coal on its property was invalidated by the enacted legislation of SMCRA and was the basis for the alleged taking in 1983.

Whitney Benefits Exchange Failed

- SMCRA provided for an exchange mechanism as a "method for ascertaining and paying just compensation”

- 1981: PKS had requested an exchange for federal lands to the BLM:
  - BLM offered Ash Creek PKS spent $130,000 on exploration costs on it.
- BLM also offered the Hidden Water tract, which PKS refused *as it had mined it in the late 40s to early 50s and was not interested in the remaining coal.*

- PKS and Whitney proceeded with their 1983 claim under the Tucker Act for a 5th Amendment regulatory taking

Whitney
Is it a Taking?

Consider three factors:

1 <u>The economic impact of the restriction</u>

The Court found that:

-There was a market for Whitney coal

-The coal was economically and technologically mineable

-SMCRA had a "devastating economic impact on the property“

2 <u>The restriction's interference with investment expectations</u>

-Investors could reasonably expect the returns on investments as projected.

-In-place assigned reserves were valued at $1.01/ton, and residual reserves at $.20/ton.

3 <u>The character of the government's action</u>

-There were no economically viable alternative uses for the property.

Court’s Conclusion: "... the substantial public interest at stake does not outweigh the private interest so that plaintiffs must bear the full burden imposed by the government action".

Whitney Findings

The Court established a final sum of $60,296,000 for the total 1977 value of recoverable Whitney Coal assuming:

- An annual production rate of 2.5 million tons
- Cost of $2 million for backfilling.
- Interest was payable to Whitney from Aug. 3,1977 to date of payment.

The amount was intended to represent what a willing purchaser would have paid Whitney *as a willing seller, to mine the Whitney Coal after calculating all mining related costs.*

The Court held that:

- *the enactment of SMCRA totally eliminated economic value of plaintiffs' coal and constituted a taking under the Fifth Amendment;*
- *the taking occurred at the time SMCRA became effective:*
- *the valuation method incorporating discounted cash flow approach offered reliable method for determining the fair market value of the coal on the day of the taking*
- *the plaintiffs were entitled to pre-judgment interest*

Specific Legal Valuation Requirements

In addition to the prices paid in sales of similar lands, due regard must be given to the physical features of the property to be valued. The formation of the coal strata should be taken into account as well as:

- **number of veins**
- **depth**
- **thickness**
- **pitch**
- **basins**
- **proximity to outcrop**
- **character of the separating rock formation**
- **quality of the coal**
- **gaseous or nongaseous nature**
- **kind of overlying surface**
- **availability of the coal**
- **difficulty in mining it**
- **probable quantity of the merchantable coal in the ground with allowance for loss in mining**
- **demand for the product**
- **all elements which a prudent purchaser would take into consideration**

Factors to be Investigated

- Resource / Reserves
- Quality and Processing
- Environmental Considerations
- Current Operations
- Mining Plans
- Production Costs
- Markets and Transportation
- Valuation Techniques

Resources / Reserves

- Resources
  - Naturally occurring concentration or deposit
  - Economic extraction is potentially feasible
- Reserves
  - Only Potentially Recoverable Mineral
  - Economic exploitation probable
  - Classified as:
    - **Inferred**
    - **Indicated**
    - **Measured**
- Active
  - Current extraction occurring in definable deposit

Reserve Classifications

- IRS
  - Proven Reserves
  - Probable Reserves
  - Possible Reserves
  - Property
    - Recoverable Reserves

- Geophysical
  - Proven Reserves
  - Probable Reserves
  - Possible Reserves
  - Speculative Reserves

Reserve Classification (SEC) Proven Reserves

- "Reasonably Certain" to be producible:
  - Current technology
  - Current prices
  - Current commercial terms
  - Current government consent

  - **P90, having a 90% certainty of being produced.**
  - **Proven reserves are usually applied to:**
    - producing wells
    - single offset wells from the actively producing well

Reserve Classification (SEC) Probable Reserves

- "Reasonably Probable" of being produced:
  - current or likely technology
  - current prices
  - current commercial terms
  - government consent:
    - P50., having a 50% certainty of being produced.
    - Probable reserves are generally applied to single well offsets from Proven Reserves as long as the offset follow known production trends.

Reserve Classification (SEC)

- Possible Reserves :

  "having a chance of being developed"

  under favorable circumstances (3P):

    – P10., having a 10% certainty of being produced.

    – Possible reserves are generally applied to single well offsets from Probable Reserves as long as the offset follow known production trends.

- Speculative (Prospective) Reserves

  less than a 10% probability that reserves will be discovered and developed.

Sand and Gravel Dredge

Reserves

The ore body defines the future use of the deposit

- Geology
  - Thickness and consistency of deposit
  - Overlying strata (roof or overburden)
  - Geologic disturbances or anomalies
- Topography
- Surface features
  - Flood plains
  - Drainage areas
  - Aquifers

Surface Mine Reserves

- Overburden ratio (stripping ratio)
  - Volume of overlying material which must be removed to extract a ton of coal (cu ft / ton)
  - Difficulty in removing overburden
    - Hard rock
    - Difficult access
    - Water
    - Disposal Problems
- Dilution
  - Contamination of ore with overburden during the mining process
- Multiple Seam Mining (e.g. Mountain Top Removal)
  - Improving ratio
  - Able to retrieve otherwise “non-economic” seams

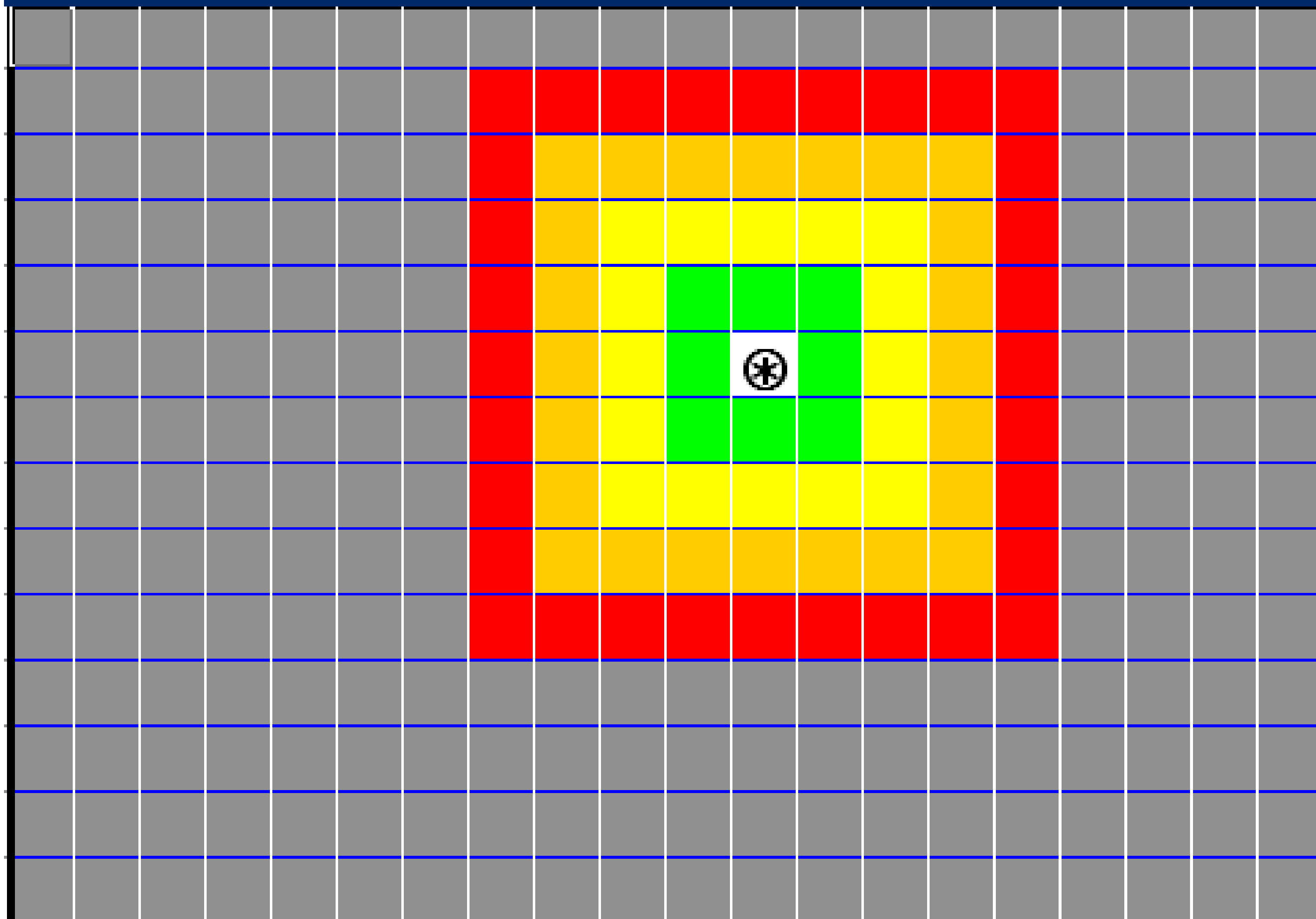
Bucket Wheel Loader

Deep Mine Reserves

- Roof Rock
  - Types of control measures required
  - Control not possible
- Floor Rock
  - Mining equipment moves freely
  - Condition pose problems to movement
- Water
  - Seam above drainage can be mined with water controls
  - Seam below drainage requiring significant water control and treatment
  - Seam can not be mined without significant water drainage problems

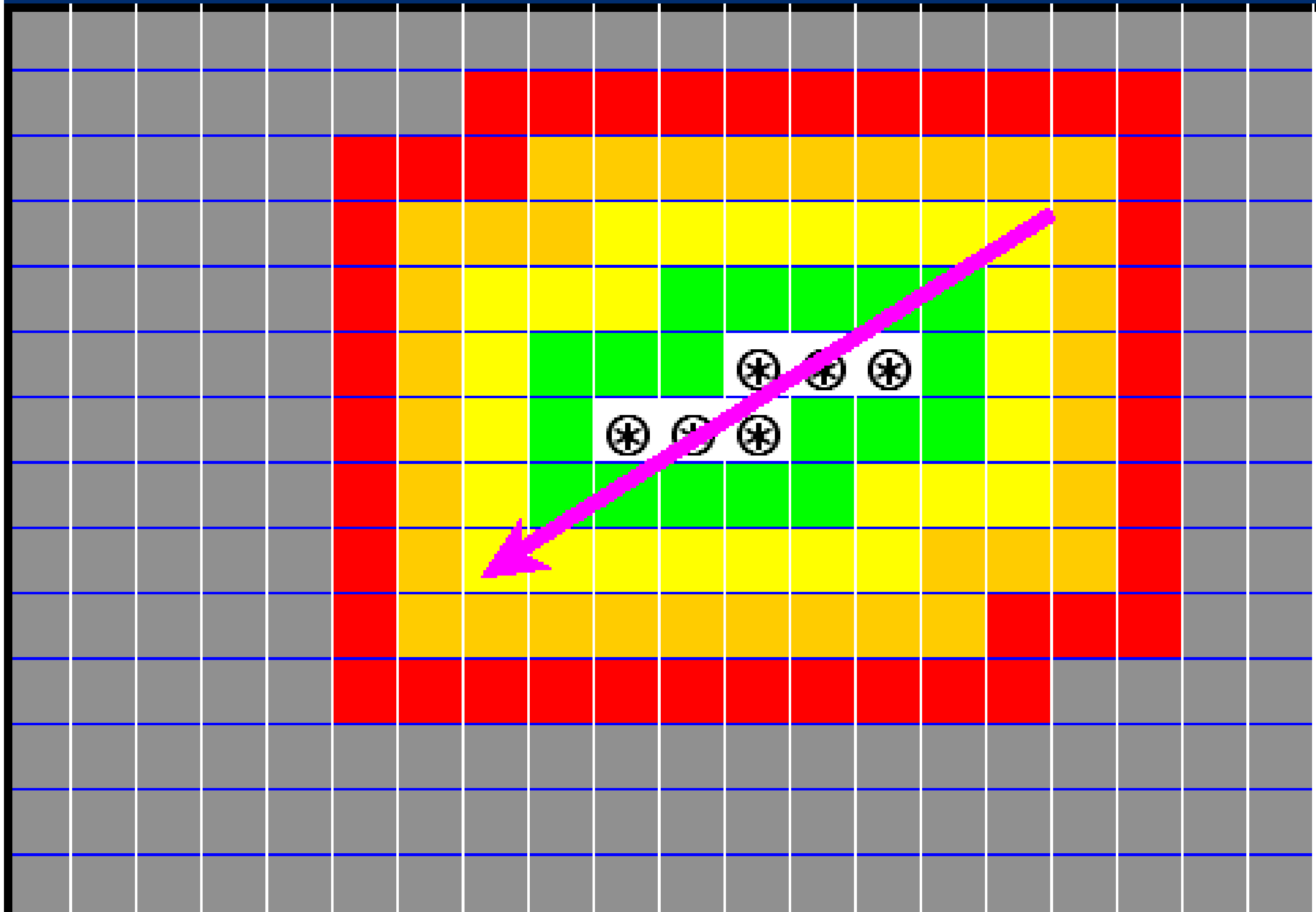
Long Wall Mining Machine

Well Spacing



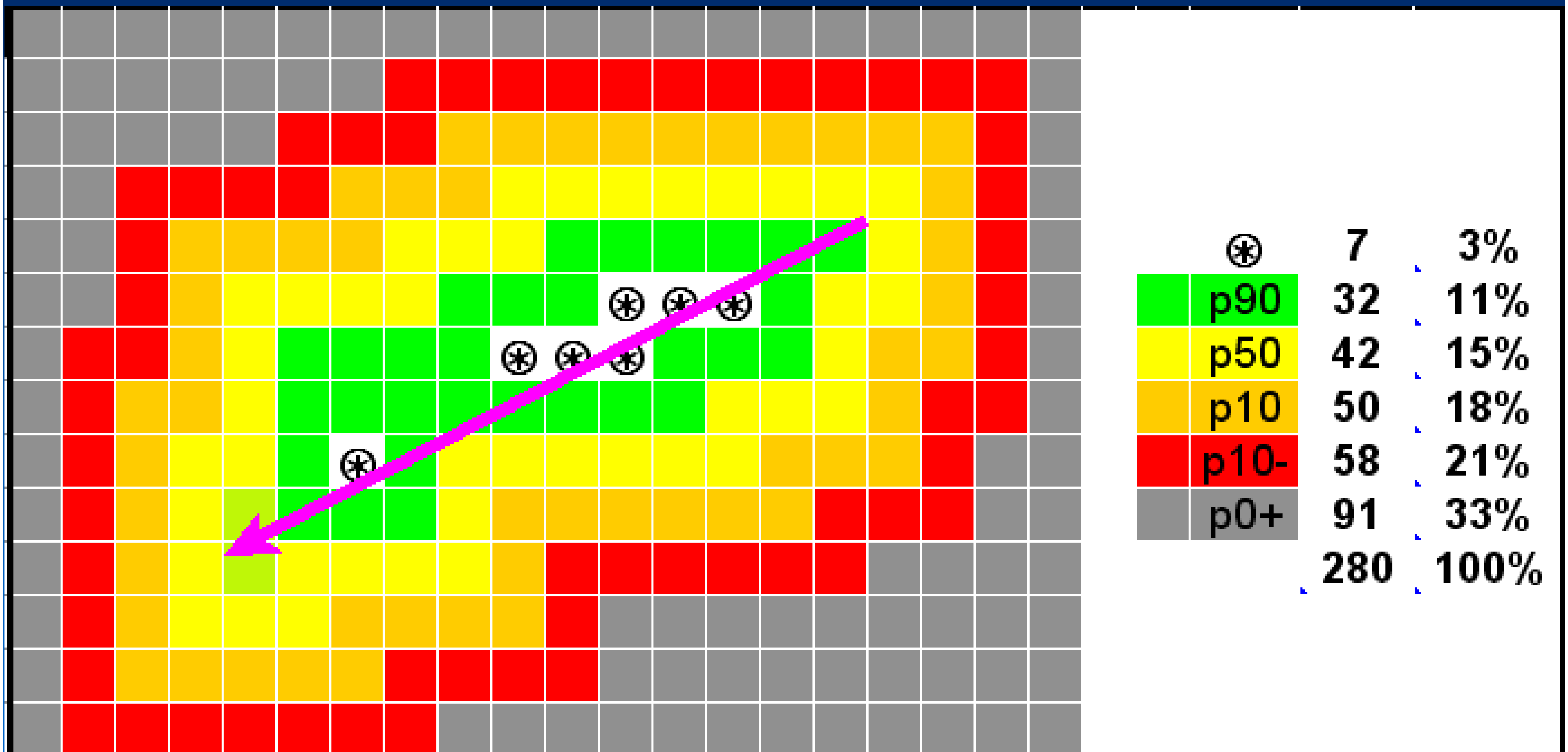
⊛	1	0%
p90	8	3%
p50	16	6%
p10	24	9%
p10-	32	11%
p0+	199	71%
	280	100%

Well Spacing / Offset Interpretation:



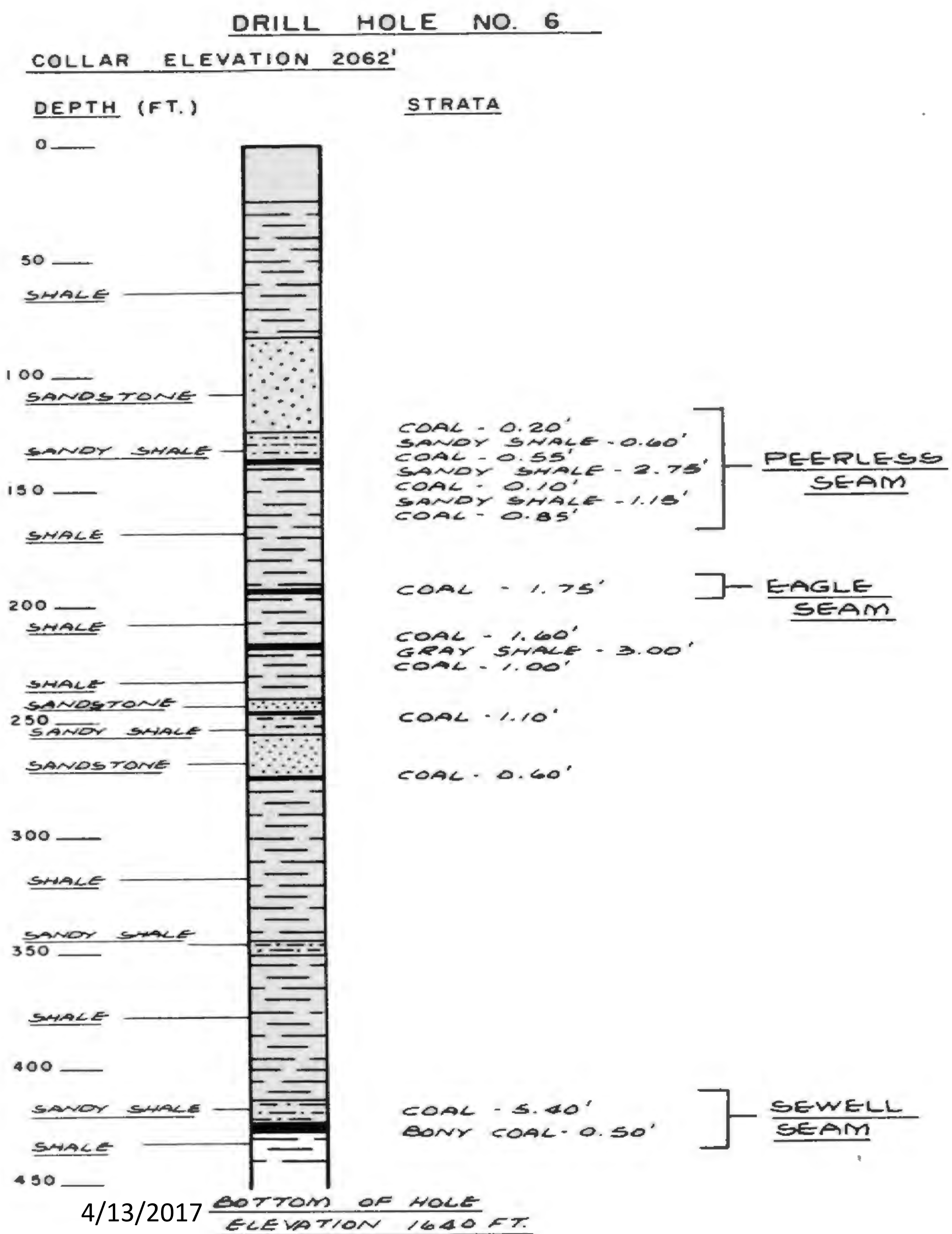
	⊛	6	2%
	p90	18	6%
	p50	26	9%
	p10	34	12%
	p10-	42	15%
	p0+	154	55%
		280	100%

Well Spacing / Offset Interpolation



Reserves: Data Sources

- Geologic maps and Data
  - USGS
  - State Geologic Survey
- Topographic maps
- Permit Data
  - DEP/DNR Offices
  - Court House records
- Public Reports
- Confidential Mining Company Maps and Reports


DRILL HOLE NO. 6
COLLAR ELEVATION 2062'
DEPTH (FT.)
STRATA
0
50
SHALE
100
SANDSTONE
SANDY SHALE
150
SHALE
200
SHALE
SHALE
SANDSTONE
250
SANDY SHALE
SANDSTONE
300
SHALE
SANDY SHALE
350
SHALE
400
SANDY SHALE
SHALE
450
COAL - 0.20'
SANDY SHALE - 0.60'
COAL - 0.55'
SANDY SHALE - 2.75'
COAL - 0.10'
SANDY SHALE - 1.15'
COAL - 0.85'
PEERLESS SEAM
COAL - 1.75'
EAGLE SEAM
COAL - 1.60'
GRAY SHALE - 3.00'
COAL - 1.00'
COAL - 1.10'
COAL - 0.60'
COAL - 5.40'
BONY COAL - 0.50'
SEWELL SEAM
BOTTOM OF HOLE
ELEVATION 1640 FT.


COAL
SANDSTONE
LIMESTONE
SHALE
SANDY SHALE
CLAY
SILTSTONE
BONY COAL
SHALE / COAL
FIRECLAY
UNCONSOLIDATED SURFACE MATERIAL
SHALY SANDSTONE
CLAYSTONE
DOLOMITE
CONGLOMERATE
SANDY LIMESTONE

Ownership Data Sources

- Deeds – **may or may not show considerations**
- Leases – **may or may not show royalty amounts**
- Memoranda – **never shows any $$$**
- Permit files – **will provide details**
- SEC files – **will provide details**
- Assessment files – ???

Quality

- **Market Identification**
  - What market will the commodity serve?
- **Price Estimation**
  - What price will the commodity fetch?
- **Absorption**
  - How much can be sold annually?
- **Production Costs**
  - What is the cost to produce (process)?

Quality and Processing

Coal

- Ash %
- Moisture %
- Heating Value – Btu per pound
- Sulfur %
- Volatile Matter
- Friability
- Grindability
- Fixed Carbon

Sand and Gravel Stackers

Quality and Processing

Aggregate: Crushed Stone, Sand Gravel

- Absorption
- Hardness/Integrity
- Color
- PH
- Fracture
- Skid resistance

Dimension Stone Mine

Dimension Stone Saw Shop

Environmental Considerations

- Air Pollution
- Water Pollution
- Noise and Vibration
- Waste Disposal
- Physical Appearance
- Subsidence
- Reclamation

Environmental Controls

Permits required

- Mine Drainage
- Mining
  - Surface Mine
  - Underground Mine
  - Auger Mine
- Pollution
  - NPDES
- Safety
  - MSHA
- Specific Mining Modules
  - Subsidence
  - Coal Waste Disposal
  - Blasting
  - Sedimentation and Erosion

Current Operations

A key to assessing the future

- Identify likely market
- Furnish insight into operational characteristics
- Provide information concerning resources
- Contribute information concerning location and transportation
- Provide comparative basis for estimating:
  - Absorption // production rates
  - Royalty and discount rates
  - Valuation
    - per acre
    - per unit
    - per operation

Current Operations

Information Sources

- DEP records:
  - Regulatory Files:
    - Inspection reports
    - Permit Files
    - Annual Production reports
  - Environmental Information:
    - Geologic Studies
    - Annual reports
- Industry sources:
  - Keystone Coal Manual/ Coal Outlook
  - Aggregates Manager
- Operator records

Drag Line

Mining Plans

A KEY TO PREDICTING THE FUTURE

- Pre Mine Development
- Mine Life
- Annual production
- Equipment
- Capital Costs
- Production Costs
- Reclamation Procedures

Filed with the state prior to start-up, and periodically during operation

Long Mining Machine

Production Costs

- LABOR COSTS
- SUPPLIES / MATERIALS
- POWER
- ROYALTIES
- PROPERTY TAXES
- INCOME TAXES
- DEPRECIATION
- PENALTIES AND FINES

Transportation

- Transport is a significant cost
- Transport costs can preclude economic viability of a deposit
- The higher the unit value the longer the transport distance:
  - Gold is transported world wide
  - Crushed stone is transported 30 ± miles
- Transport cost relate to methods
  - Conveyor – \$0.07 to 0.13 ± per ton mile
  - Barge – \$0.09 to 0.20 ± per ton mile
  - Rail – \$0.12 to 0.25 ± per ton mile
  - Truck – \$0.17 to 0.30 ± per ton mile

Valuation Methods

Valuing the Property, <u>not</u> the Business

- Comparative Sales
- Royalty Analysis
- Operational Analysis (Residual)
- Mass Appraisal

Comparative Sales

Pros and cons

- **Advantages**
  - Government agencies generally prefer
  - Direct comparison easiest to present

- **Disadvantages**
  - Almost never any really comparable properties – particularly active mines or active reserves
  - Sufficient data may not be available
  - While some properties resemble others in some aspects, they may be extremely dissimilar in other aspects

Operational Analysis (Residual)

- **Mine Life**
- **Annual Production**
- **Cash Flow**
- **Depreciation**
- **Gross Profit before Income tax**
- **Federal Taxes**
- **Net Income after Tax**
- **Capital Expenditures**
- **Sales per Year**
- **Sales Revenue**

Operational Analysis (Residual)

Pros and Cons

- Advantages
  - Method used by most companies
  - Generally considered the preferred method of valuation
- Disadvantages
  - Requires significant information
    - Confidential company data
    - Many business assumptions
  - Time Consuming
  - Subject to considerable interpretation

Continuous Mining Machine

Royalty Analysis

Modified Operational Analysis

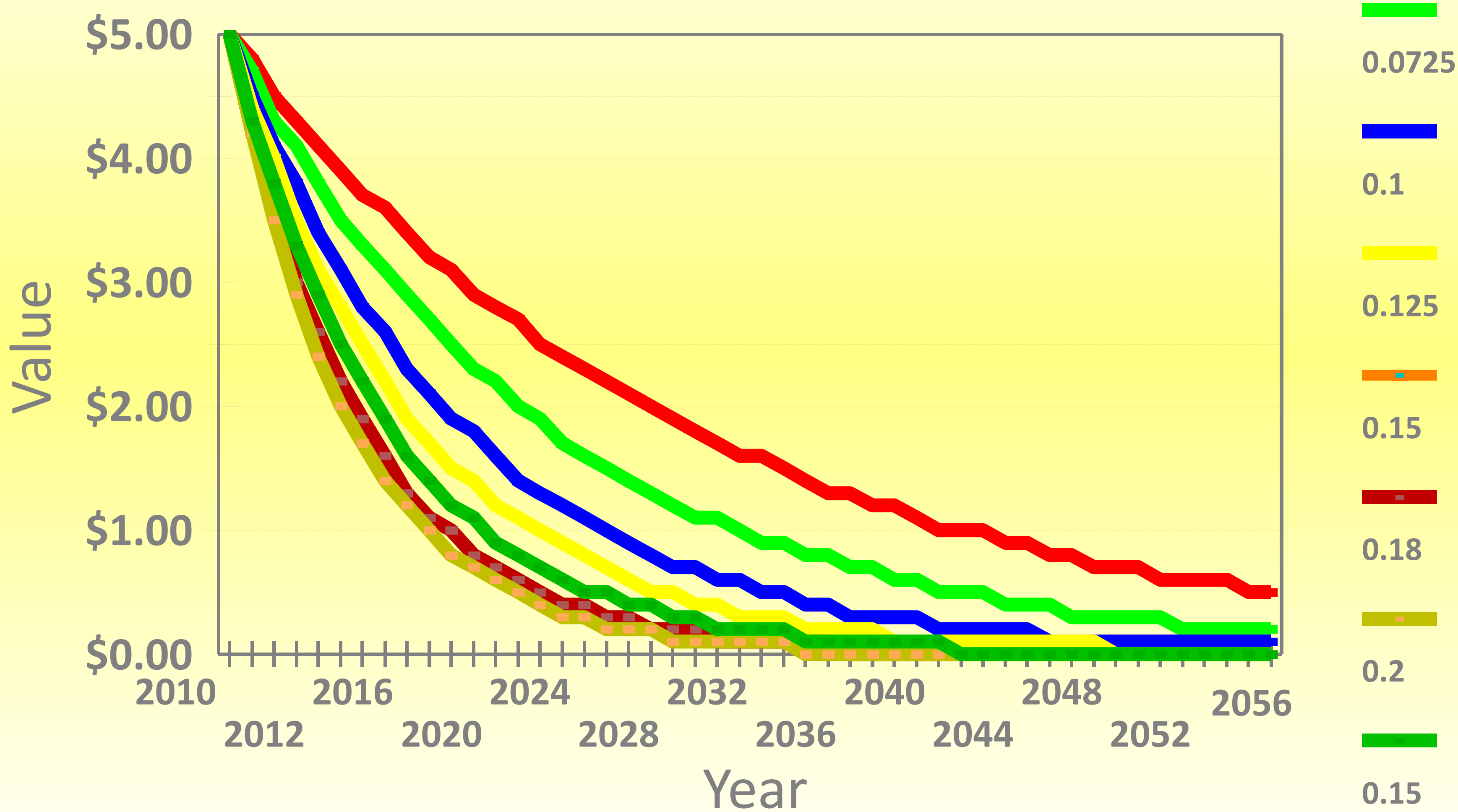
- Seams (deposit)
- Terms
- Selling Prices
- Royalty Payments
  - Advance Minimum royalty
  - Production royalty
- Monthly Production Reports/Estimates

Royalty Analysis

Advantages and Disadvantages

- Advantages
  - Market Driven
  - Comparisons easier
  - Relatively easy to compute
  - Based on common economic and appraisal principles
  - Focuses on resource in-place, not the business
  - Approximates the in-place value of the resource (represents what a will buyer pays a willing seller)
- Disadvantages
  - Not as property specific as operational analysis
  - Requires access to lease royalty comparisons

$5.00 Royalty



$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
Value
2010
2012
2016
2020
2024
2028
2032
2036
2040
2044
2048
2052
2056
Year
0.05
0.0725
0.1
0.125
0.15
0.18
0.2
0.15

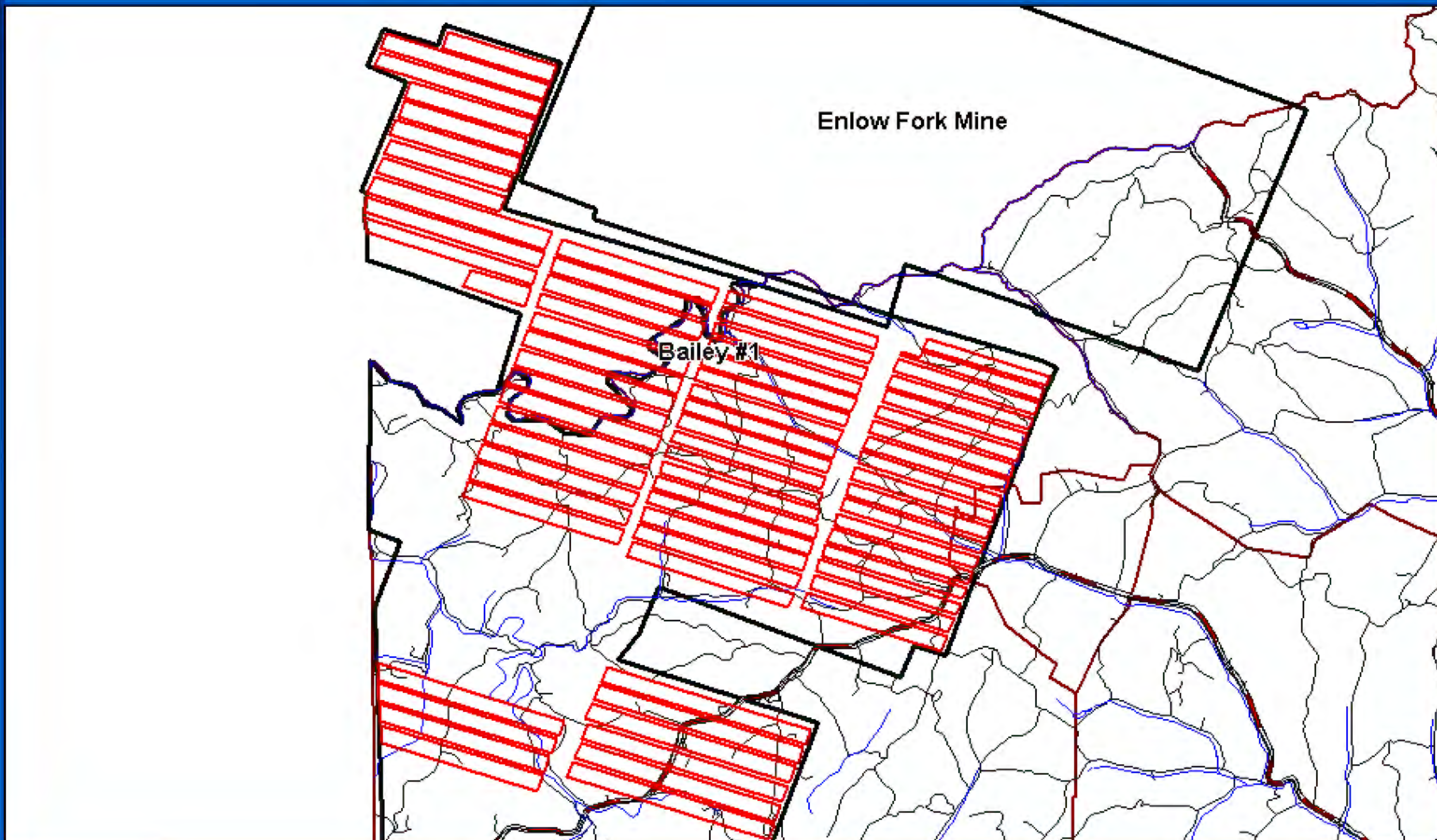
Basic Valuation Principles

- Dollar today is worth more than a dollar tomorrow
- Principle of substitution appropriate
- Production will approximate optimal market absorption rate

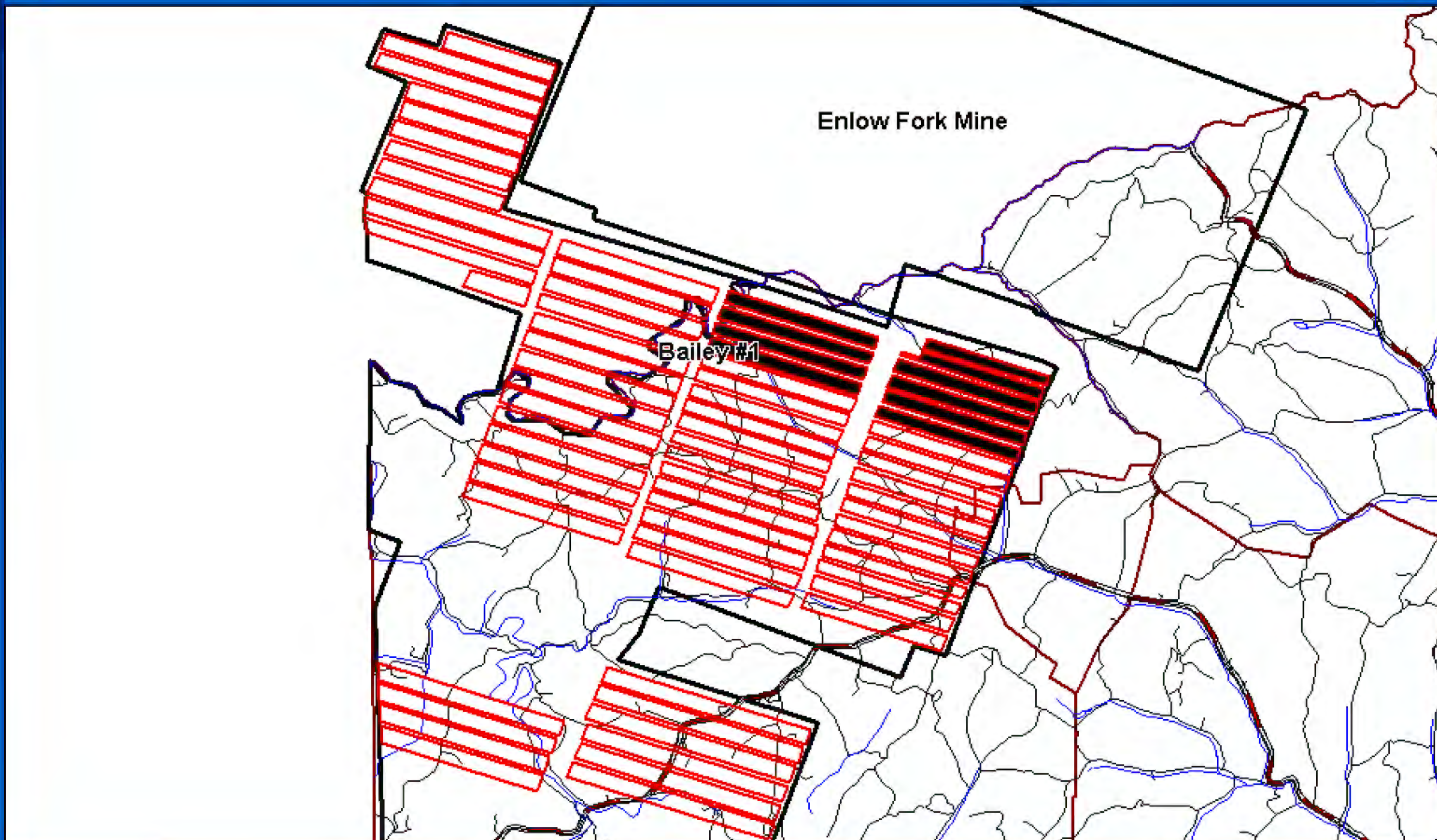
Thick	25		2013	2014	2015	2016	2017	2018	Total		
Weight	2100									Per Acre	Per Ton
Acres	12.0	Mining	100,000	100,000	100,000	100,000	100,000		500,000		
Acres Mineable	11.2	Gross Income	$750,000	$750,000	$750,000	$750,000	$750,000	$250,000	$4,000,000		
Tons in Place	588,235										
Recovery Rate	0.85	Royalty	$37,500	$37,500	$37,500	$37,500	$37,500		$187,500		
Tons Producible	500,000										
		Cost	$1,072,500	$322,500	$322,500	$322,500	$322,500	$25,935	$2,362,500		
Price	$7.50										
Royalty %	5%	Net Operating Income	-$360,000	$390,000	$390,000	$390,000	$390,000	$224,065	$1,200,000		
Royalty $	$0.38										
		Present worth Calculation									
Start up Cost	$750,000	Royalty	$35,576	$32,018	$28,816	$25,935	$23,341	$0	$145,686	$12,140	$0.248
Operating Cost	43%	Business	-$331,904	$305,628	$259,784	$220,816	$187,694	$91,660	$642,018	$53,501	$1.091
	$3.23										
Equipment resale	$250,000	Total	-$296,328	$337,646	$288,600	$246,751	$211,035	$91,660	$787,704	$65,642	$1.339
Annual Production	100,000										
Discount Land	0.1										
Discount Business	0.15										

Present Worth of Future Income

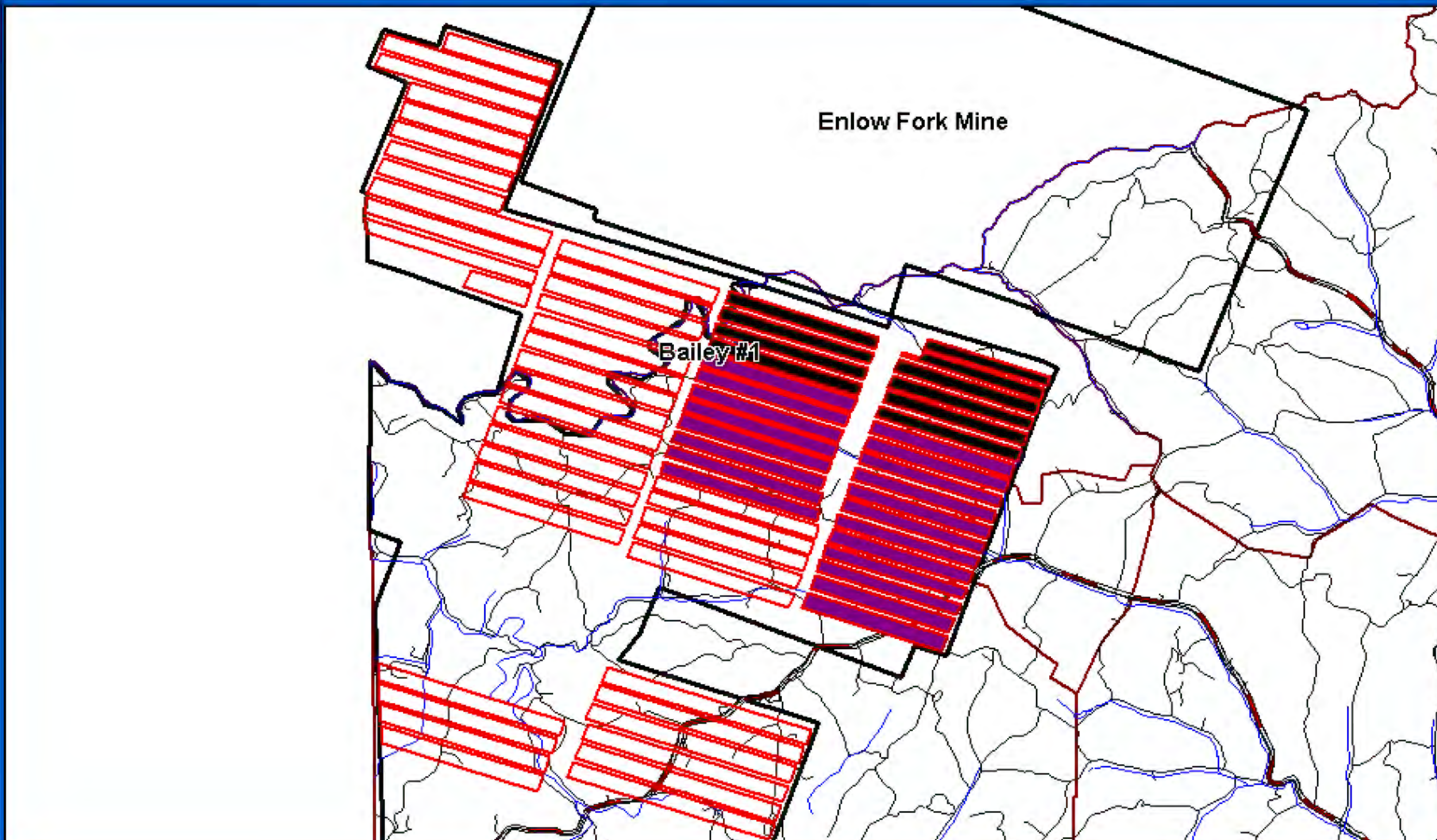
Greene County: Bailey Mine



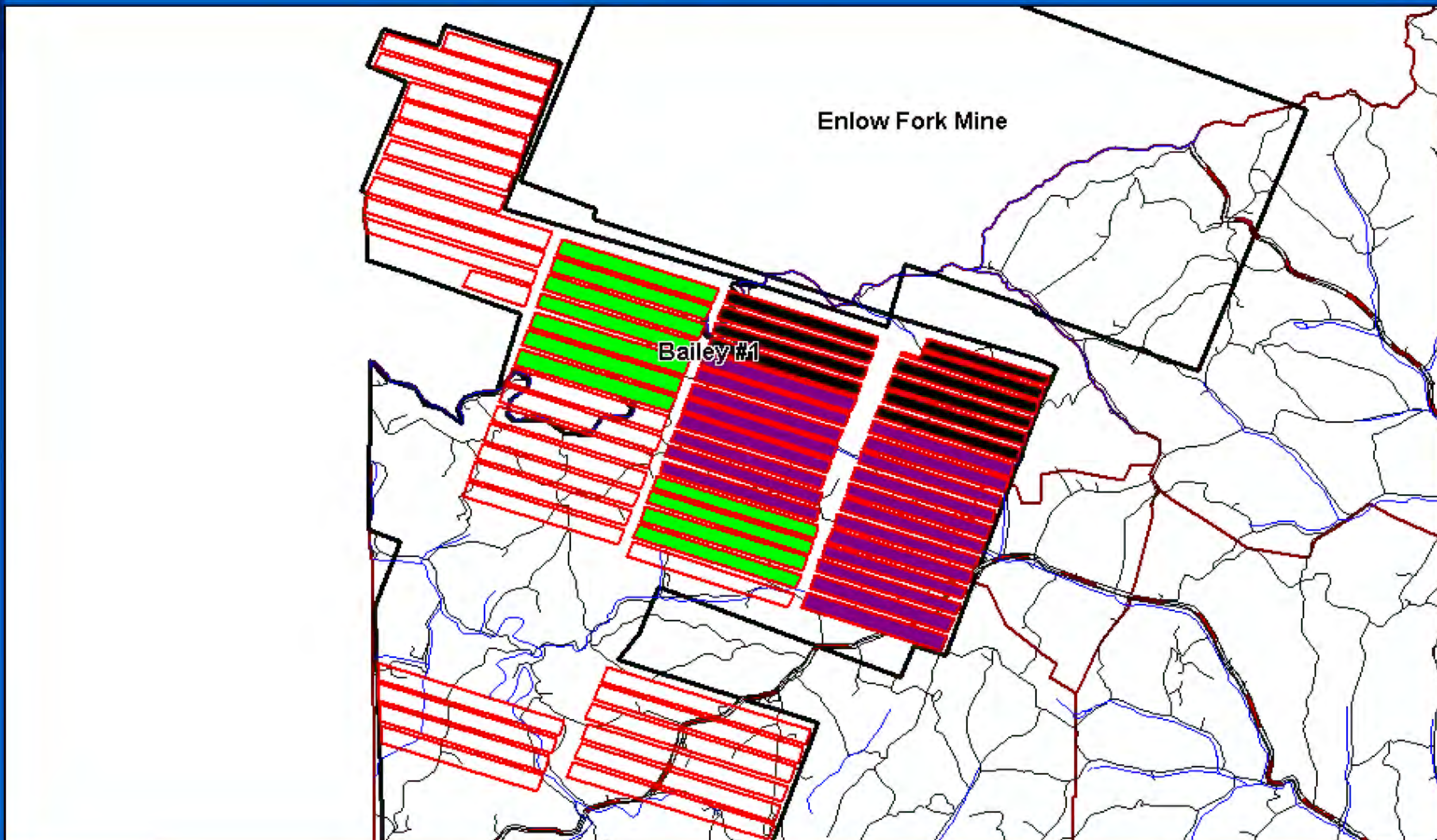
Greene County: Bailey Mine pre 1990



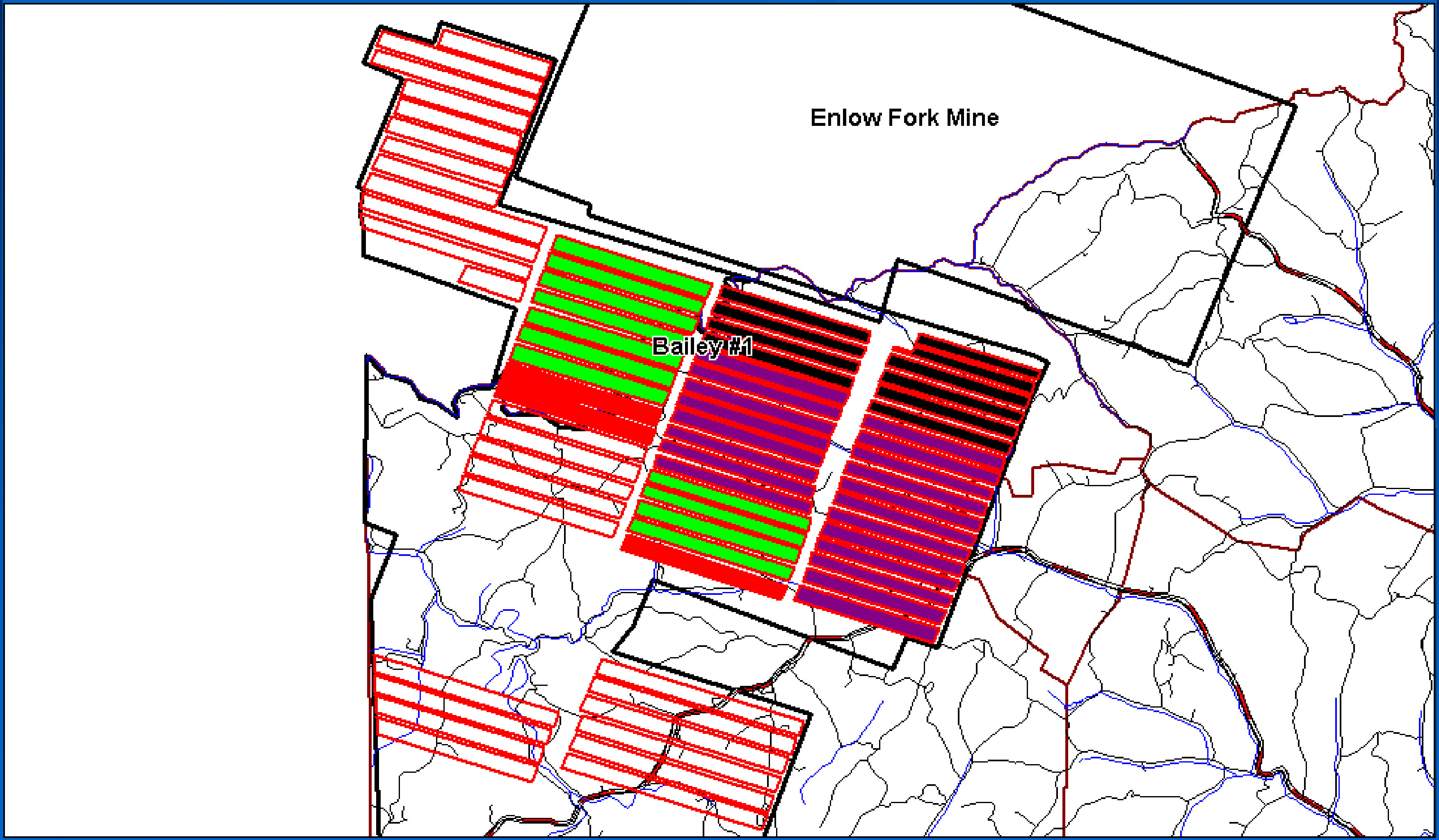
Greene County: Bailey Mine pre 1995



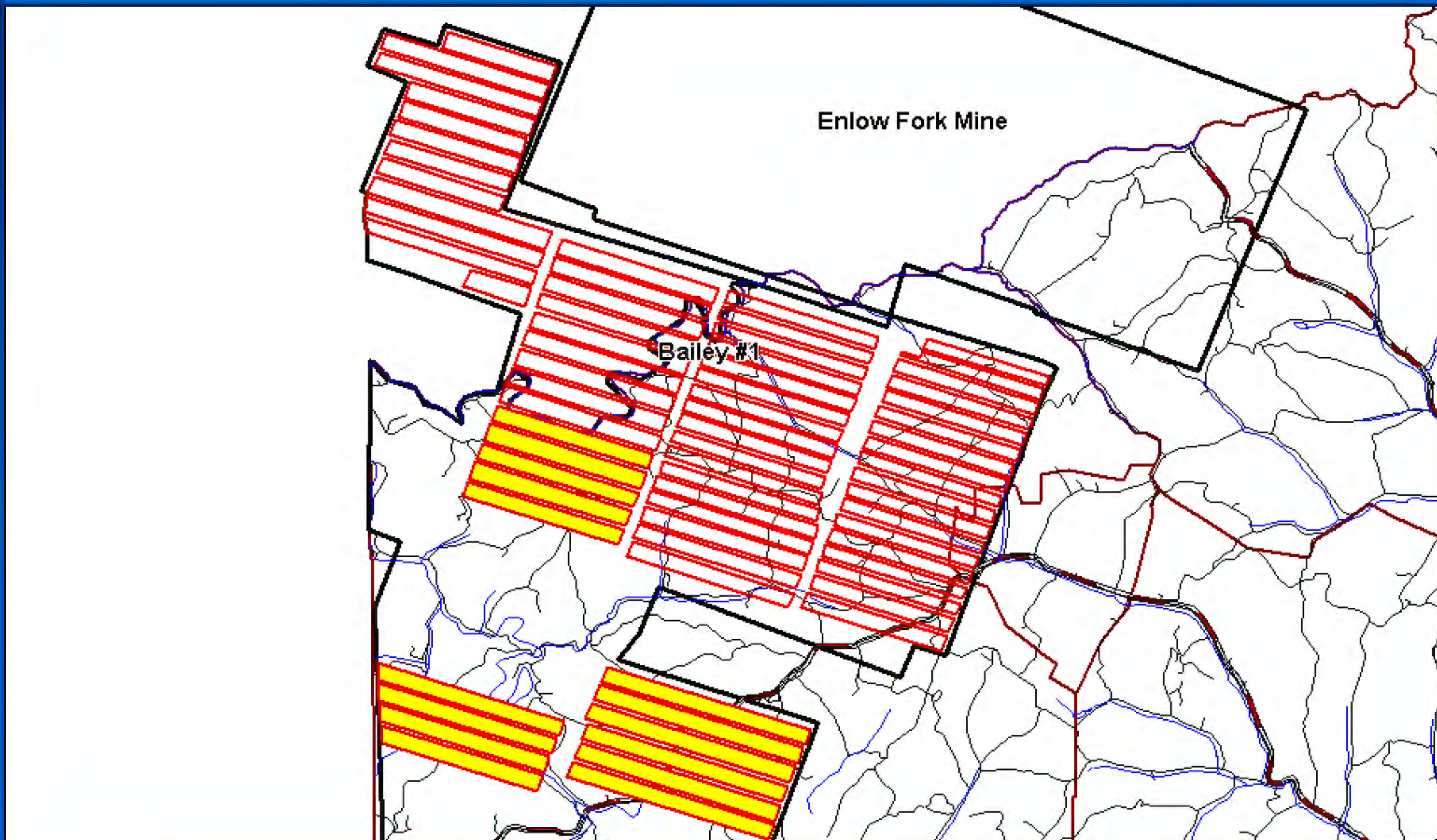
Greene County: Bailey Mine pre 1999



Greene County: Bailey Mine pre 2000



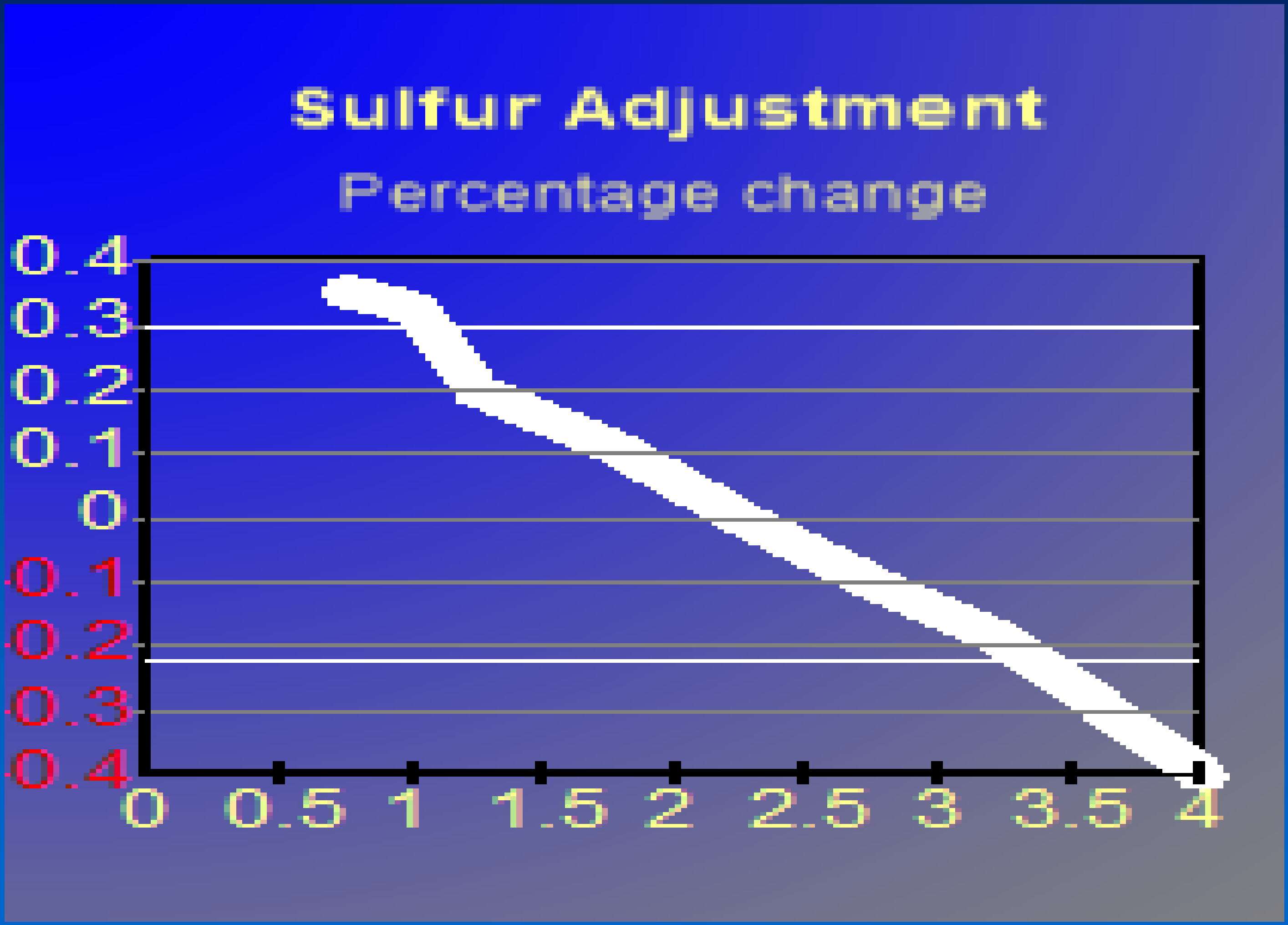
Greene County: Bailey Mine to be completed



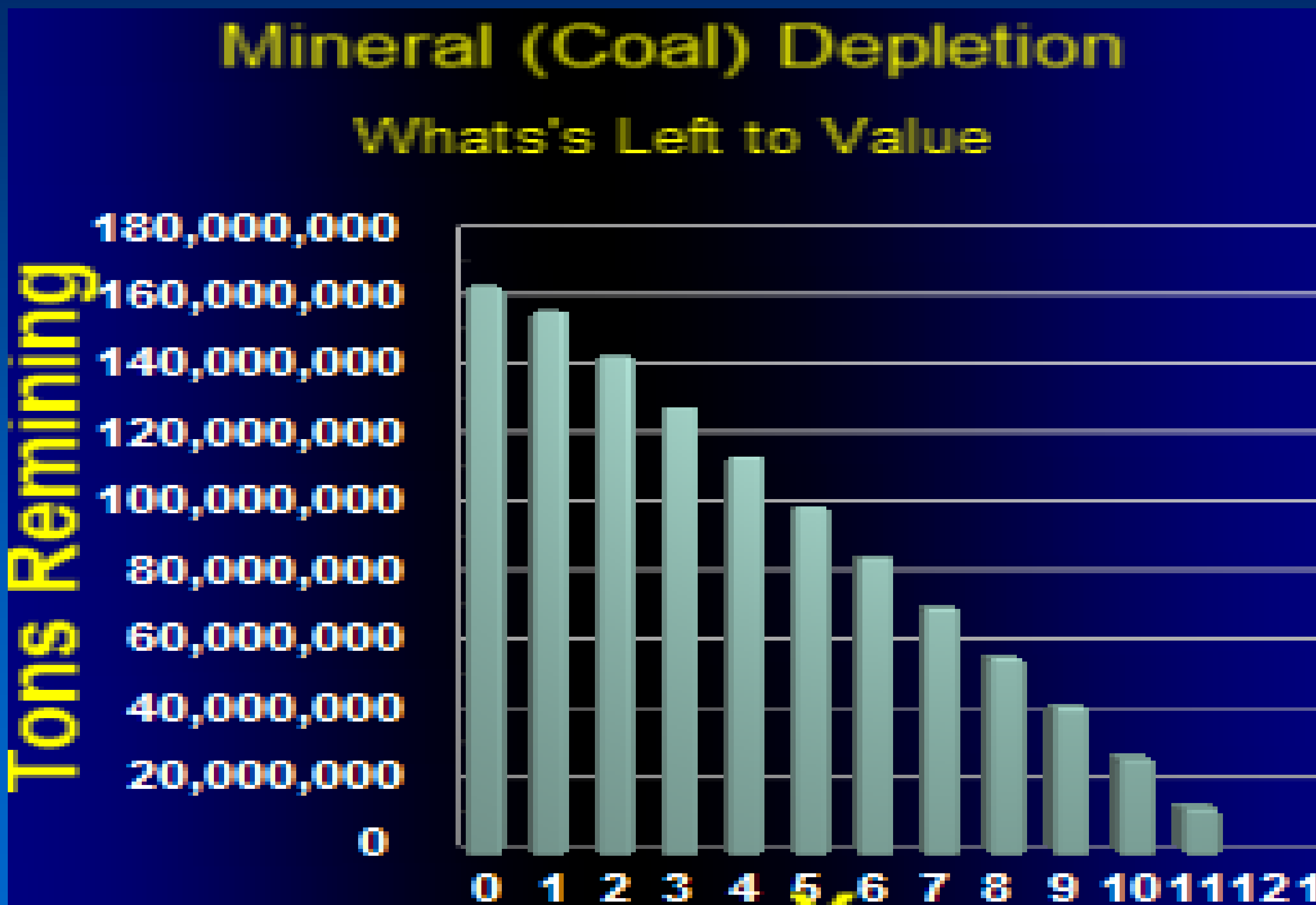
Basic Value Parameters

15,000	Acres
6	Thickness (average)
1,800	Tons per acre foot
162,000,000	Tons in place
70	% Overall Recovery (Mining & Preparation Loss)
113,400,000	Tons producible
10,000,000	Annual Production (Historic / Planned)
11.34	Life
$29.50	Market Price
$30.00	Modified Price Price FOB
5	% Market Royalty
$125,000,000	Start-up Cost
$17.00	Operating Cost to Mine
$1.00	Selling Expenses
$1.50	Administrative Expenses
$75,000,000	Closure (reclamation)
6	% Safe Rate
14.2	% Discount

Example: Price Adjustments



Example: Depletion



Calculation of Discount Rate Eastern Coal 2003

		1999	2000	2001	2002	
2003 Equity Portion						
Risk-Free Rate	20 year t bill	5.4	6.8	5.6	5.8	
	5 year t bill	4.7	6.5	5.1	4.4	
1.6 Equity Risk Premia	30 day t bill	4.5	4.9	4.7		
	Equity Market vs Government Bond	8.0	8.1	7.8	8.0	
Size Premia	3.7 Sub 14 Micro cap	2.5	2.6	3.3		
9.2 Industry Premia	icro cap	7.0	7.0	8.4		
	Coal (bitumino us)	-5.0	-7.3	-2.8	-6.5	
	Weighted R ate	13.1	12.4	16.5	13.7	
Financial Debt Portion	Interest Rate					
Industrial long term mo (10yr+)	rtgage rates	8.2	8.8	8.0	7.3	
Annual Discount Rate		11.7	11.3	14.0	11.8	
Cost of Capital / 12.4 Tax Adjust	3-yr forward weighted average				12.7	
						0.191 4
Tax Adjusted Rate / 16.9 Financed Equity Rate					0.7	
7.8 WAAC					0.3	
						14.2

Discount Rate Procedures

- In order to dampen the effects of market spikes, all measures are based on 3-year forward weighted averaging.
- Ratio of equity to finance is based on Ibbotson surveys.
- The safe rate is based on the 20 year t-bill.
- Equity risk is based on the Ibbotson survey for each year.
- The size premia is based on averaging the micro and sub-micro cap.
- The industry adjustment is based on the Ibbotson calculation based on an examination of industry-specific betas.
- The tax rate is based on the Ibbotson data set for actual taxes paid over a 5-year period.
- The finance rate is based on the information contained in the ACLI quarterly publication concerning relatively high risk industrial loans with long terms: 10-20 years.

Yield (Risk-free Rate)[1]	
Long-term (20-year) U.S. Treasury Coupon Bond Yield	3.67%

Equity Risk Premium[2]	
Long-horizon expected equity risk premium (historical): large company stock total returns minus long-term government bond income returns	6.96
Long-horizon expected equity risk premium (supply-side): historical equity risk premium minus price-to-earnings ratio calculated using three-year average earnings	6.18
Duff & Phelps recommended equity risk premium (conditional): The Duff & Phelps recommended ERP was developed in relation to (and should be used in conjunction with) a 4.0% "normalized" risk-free rate.[3]	5.00

2014 Valuation Handbook – Guide to Cost of Capital

CRSP Deciles Size Premium[4]

Decile	Market Capitalization of Smallest Company (in millions)		Market Capitalization of Largest Company (in millions)	Size Premium (Return in Excess of CAPM)
Mid-Cap 3-5	$2,432.888	–	$9,196.480	1.11%
Low-Cap 6-8	636.747	–	2,431.229	1.98
Micro-Cap 9-10	2.395	–	632.770	3.87
Breakdown of CRSP Deciles 1-10				
1-Largest	$21,753.411	–	$428,699.798	-0.37%
2	9,196.656	–	21,739.006	0.75
3	5,572.648	–	9,196.480	0.86
4	3,581.547	–	5,569.840	1.16
5	2,432.888	–	3,573.079	1.75
6	1,626.386	–	2,431.229	1.86
7	1,056.204	–	1,621.792	1.94
8	636.747	–	1,055.320	2.36
9	339.987	–	632.770	2.81
10-Smallest	2.395	–	338.829	5.99
Breakdown of CRSP 10th Decile				
10a	$184.928	–	$338.829	4.40%
10w	250.656	–	338.829	3.52
10x	184.928	–	250.532	5.67
10b	$2.395	–	$184.865	8.99%
10y	100.933	–	184.865	7.56
10z	2.395	–	100.821	12.12

[1] As of December 31, 2013.

[2] See Chapter 3 for complete methodology.

[3] See Exhibit 3.9.

[4] See Chapter 7 for complete methodology.

Note: Examples on how these variables can be used are found in Chapter 8.

Sources of underlying data: 1.) CRSP U.S. Stock Database and CRSP U.S. Indices Database © 2014 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business. 2.) Morningstar EnCorr database. Used with permission. All rights reserved. Calculations performed by Duff & Phelps LLC.

Exhibit 5.7: Industry Risk Premium (*RP*$_i$)
Through Year-end 2013

SIC Code	Short Description	Number of Companies*	Full-Information Beta (FIB)	Industry Risk Premia (%) using: Long-term Historical ERP (6.96%)	Long-term Supply-Side ERP (6.18%)	Duff & Phelps Recommended ERP (5.00%)†
	Agriculture, Forestry, And Fishing					
01	Agricultural Production Crops	13	1.04	0.30	0.27	0.22
	Mining					
10	Metal Mining	21	1.37	2.57	2.28	1.84
12	Coal Mining	23	1.29	2.02	1.79	1.45
122	Bituminous Coal and Lignite Mining	23	1.42	2.93	2.60	2.10
13	Oil and Gas Extraction	189	1.31	2.17	1.92	1.56
131	Crude Petroleum and Natural Gas	160	1.28	1.96	1.74	1.41
138	Oil and Gas Field Services	42	1.44	3.08	2.73	2.21
1381	Drilling Oil and Gas Wells	19	1.35	2.44	2.16	1.75
1389	Oil and Gas Field Services, Not Elsewhere Classified	19	1.62	4.31	3.83	3.10
14	Mining and Quarrying Of Nonmetallic Minerals, Except Fuels	13	1.16	1.09	0.97	0.78
	Construction					
15	Building Construction General Contractors and Operative Builders	21	1.55	3.81	3.39	2.74
153	Operative Builders	15	1.46	3.18	2.83	2.29
16	Heavy Construction Other Than Building Construction Contractors	27	1.41	2.84	2.52	2.04
162	Heavy Construction, Except Highway and Street	22	1.40	2.82	2.50	2.02
1623	Water, Sewer, Pipeline, and Communications and Power Line Construction	14	1.25	1.74	1.55	1.25
17	Construction Special Trade Contractors	26	1.06	0.40	0.36	0.29
173	Electrical Work	10	0.85	-1.03	-0.92	-0.74
	Manufacturing					
20	Food and Kindred Products	99	0.50	-3.45	-3.07	-2.48
203	Canned, Frozen, and Preserved Fruits, Vegetables, and Food Specialties	13	0.49	-3.52	-3.13	-2.53
204	Grain Mill Products	16	0.52	-3.36	-2.98	-2.41
208	Beverages	29	0.49	-3.58	-3.18	-2.57
2086	Bottled and Canned Soft Drinks and Carbonated Waters	16	0.47	-3.69	-3.28	-2.65

Industry Report

Growth Over Last 5 Years (%)

	Net Sales	Operating Income	Net Income
Median	17.96	29.43	36.56
SIC Composite	21.04	33.40	60.77
Large Composite	22.29	31.61	50.06
Small Composite	9.13	NMF	NMF

Capital Structure Ratios (%)

	Debt/Total Capital		Debt/MV Equity	
	Latest	5-Year Avg	Latest	5-Year Avg
Median	40.89	49.11	69.17	96.51
SIC Composite	43.51	45.89	77.03	84.82
Large Composite	52.76	50.07	111.71	100.30
Small Composite	12.53	12.32	14.32	14.05

Distribution of Sales & Total Capital (million$)

	Distribution of Sales		Total Capital	
	Latest	5-Year Avg	Latest	5-Year Avg
90th Percentile	4,562.3	3285.6	4564.7	2,622.4
75th Percentile	2,523.5	1838.4	2267.9	1,186.4
Median	1,180.6	937.0	664.9	332.2
25th Percentile	178.9	163.1	93.1	87.1
10th Percentile	56.1	36.9	46.0	68.0

Margins (%)

	Operating Margin		Net Margin		Asset Turnover		Return on Inv. Cap.		Return on Assets		Return on Equity	
	Latest	5-Year Avg	Latest	5-Year Avg	Latest	5-Year Avg	Latest	5-Year Avg	Latest	5-Year Avg	Latest	5-Year Avg
Median	10.50	9.22	4.96	4.06	144.10	149.43	8.68	7.35	7.33	6.29	12.19	15.17
SIC Composite	11.49	9.90	5.88	4.72	139.68	146.56	9.23	8.07	8.21	6.92	12.08	11.77
Large Composite	11.67	10.47	5.54	4.77	119.58	133.10	7.21	7.28	6.62	6.35	12.32	11.69
Small Composite	12.46	8.49	15.01	-16.11	42.79	32.13	6.81	-6.20	6.42	-5.18	16.19	-12.17

Equity Valuation Ratios (Multiples)

	Price/Earnings		Market/Book		Price/Sales		Price/Cash Flow		Price/Operating Income		Dividend Yield (% of Price)	
	Latest	5-Year Avg	Latest	5-Year Avg	Latest	5-Year Avg	Latest	5-Year Avg	Latest	5-Year Avg	Latest	5-Year Avg
Median	8.20	6.59	1.61	1.15	0.47	0.31	9.18	6.69	4.54	3.12	0.00	0.00
SIC Composite	8.28	4.83	1.86	1.64	0.49	0.40	8.20	8.26	4.24	4.05	0.37	0.47
Large Composite	8.12	5.13	1.69	1.66	0.45	0.41	7.77	7.92	3.85	3.90	0.31	0.48
Small Composite	6.18	6.48	0.45	0.55	0.93	1.32	4.80	NMF	7.44	15.60	0.00	0.00

	Growth Rates (%)	Cost of Equity Capital (%)					Weighted Average Cost of Capital (%)					Levered Betas		Unlevered Betas
	Analysts' Estimate	CAPM	CAPM + Size Prem	3-Factor Fama-French	Discounted Cash Flow 1-Stage	Discounted Cash Flow 3-Stage	CAPM	CAPM + Size Prem	3-Factor Fama-French	Discounted Cash Flow 1-Stage	Discounted Cash Flow 3-Stage	Raw Beta	Adjusted Beta	Adjusted Beta
Median	13.51	10.71	12.01	14.76	13.51	12.40	11.52	12.98	14.16	13.59	12.57	0.78	0.80	0.41
SIC Composite	13.51	11.14	11.86	15.28	13.54	21.30	12.98	13.42	15.50	14.44	19.17	0.87	0.86	0.57
Large Composite	12.93	11.10	11.10	14.60	13.56	23.10	12.93	12.93	14.69	14.16	18.97	0.89	0.85	0.49
Small Composite	13.51	7.55	10.85	10.55	13.51	6.50	7.87	10.72	10.45	13.01	6.96	0.15	0.37	0.34

Cost of Capital

IbbotsonAssociates

Riskfree rate in US dollars =		3.04%											
Mature market ERP =		5.00%											
Marginal tax rate =		40.00%											
Company Name	Exchange:Ticker	Industry Group	Bottom up Beta for sector	Bottom up levered beta	ERP for Country	Cost of equity in US$	Total Default Spread for cost of debt (Company + Country)	Pre-tax cost of debt in US $	After-tax cost of debt in US $	Cost of capital in US$	ROE - Cost of Equity	ROIC - Cost of Capital	Market Cap (in US $)
Peabody Energy Corp. (NYSE:BTU)	NYSE:BTU	Coal & Related Energy	0.7348	1.6501	5.00%	11.29%	3.00%	6.04%	3.62%	7.04%	-27.53%	-3.20%	$5,269.80
Alpha Natural Resources, Inc. (NYSE:ANR)	NYSE:ANR	Coal & Related Energy	0.7348	2.4006	5.00%	15.04%	4.00%	7.04%	4.22%	7.54%	-32.35%	-12.53%	$1,577.60
CONSOL Energy Inc. (NYSE:CNX)	NYSE:CNX	Coal & Related Energy	0.7348	0.8883	5.00%	7.48%	2.00%	5.04%	3.02%	6.17%	-5.58%	-2.23%	$8,709.00
Arch Coal Inc. (NYSE:ACI)	NYSE:ACI	Coal & Related Energy	0.7348	4.7599	5.00%	26.84%	4.00%	7.04%	4.22%	7.72%	-44.72%	-8.02%	$944.60
Alliance Resource Partners LP (NasdaqGS:ARLP)	NasdaqGS:ARLP	Coal & Related Energy	0.7348	0.9392	5.00%	7.74%	1.50%	4.54%	2.72%	6.65%	20.93%	19.27%	$2,846.20
Alliance Holdings GP, L.P. (NasdaqGS:AHGP)	NasdaqGS:AHG P	Coal & Related Energy	0.7348	0.9006	5.00%	7.54%	1.50%	4.54%	2.72%	6.66%	46.70%	31.06%	$3,509.80
Cloud Peak Energy Inc. (NYSE:CLD)	NYSE:CLD	Coal & Related Energy	0.7348	1.0513	5.00%	8.30%	2.00%	5.04%	3.02%	6.19%	-0.99%	3.46%	$1,089.40
USEC Inc. (NYSE:USU)	NYSE:USU	Coal & Related Energy	0.7348	16.2922	5.00%	84.50%	4.00%	7.04%	4.22%	7.84%	-264.12%	-6.66%	$32.80
James River Coal Co. (NasdaqGS:JRCC)	NasdaqGS:JRCC	Coal & Related Energy	0.7348	7.4328	5.00%	40.20%	4.00%	7.04%	4.22%	7.78%	-67.08%	-26.74%	$47.40
Westmoreland Coal Co. (NasdaqGM:WLB)	NasdaqGM:WLB	Coal & Related Energy	0.7348	1.6684	5.00%	11.38%	4.00%	7.04%	4.22%	7.38%	NA	12.23%	$281.50
Oxford Resource Partners, L.P. (NYSE:OXF)	NYSE:OXF	Coal & Related Energy	0.7348	5.7568	5.00%	31.82%	4.00%	7.04%	4.22%	7.75%	-163.25%	-11.09%	$26.10
Natural Resource Partners LP (NYSE:NRP)	NYSE:NRP	Coal & Related Energy	0.7348	1.1202	5.00%	8.64%	2.00%	5.04%	3.02%	6.71%	22.12%	7.78%	$2,189.70

http://pages.stern.nyu.edu/~adamodar/

Company Name	Peabody Energy Corp. (NYSE:BTU)	Alpha Natural Resources, Inc. (NYSE:ANR)	CONSOL Energy Inc. (NYSE:CNX)
Exchange:Ticker	NYSE:BTU	NYSE:ANR	NYSE:CNX
Industry Group	Coal & Relate Energy	Coal & Relate Energy	Coal & Relate Energy
Bottom up Beta for sector	0.7348	0.7348	0.7348
Bottom up levered beta	1.6501	2.4006	0.8883
ERP for Country	0.05	0.05	0.05
Cost of equity in US$	0.1129	0.1504	0.0748
Total Default Spread for cost of debt (Company + Country)	0.03	0.04	0.02
Pre-tax cost of debt in US $	0.0604	0.0704	0.0504
After-tax cost of debt in US $	0.0362	0.0422	0.0302
Cost of capital in US$	0.0704	0.0754	0.0617
ROE - Cost of Equity	-0.2753	-0.3235	-0.0558
ROIC - Cost of Capital	-0.032	-0.1253	-0.0223
Market Cap (in US $)	$5,269.80	$1,577.60	$8,709.00
PV of lease debt	557.47	202.84	363.27
Total Debt	$6,007.50	$3,373.80	$3,276.50
Total Debt incl leases (in US $)	$6,564.97	$3,576.64	$3,639.77
Firm Value (in US $)	$11,834.77	$5,154.24	$12,348.77
Cash	551.3	668.1	21.1
Enterprise Value (in US $)	$11,283.47	$4,486.14	$12,327.67
Cash/ Firm Value	0.0466	0.1296	0.0017
Liquidity Ratio (Daily trading volume/Shrs outs)	0.03	0.05	0.01
Book Debt to capital ratio	0.5914	0.4499	0.4791
Market Debt to capital ratio	0.5547	0.6939	0.2947
Book Debt to Equity Ratio	1.4477	0.8179	0.9198
Market Debt to Equity ratio	1.2458	2.2671	0.4179
Stock price (Dec 31, 2012)in US$	19.53	7.14	38.04
Beta	1.41	1.49	1.06
Correlation with market	0.4254	0.2898	0.3114
Standard deviation in stock price	0.9402	1.3801	0.7955
HiL0 Risk Measure (Hi- lo)/ (Hi+Lo)	0.32	0.38	0.2
Interest coverage ratio	0.79	NA	1.09
Current PE	NA	NA	22.42
Trailing PE	NA	NA	120.62
Forward PE	152.58	NA	42.13
PEG	NA	NA	1.4
PBV	1.16	0.36	2.2
PS	0.65	0.23	1.73
EV/EBIT	24.04	NA	43.89
EV/EBITDA	6.58	4.34	12.83
EV/Invested Capital	1.07	0.64	1.63
EV/Sales	1.4	0.64	2.44

http://pages.stern.nyu.edu/~adamodar/

Company Name	Peabody Energy Corp. (NYSE:BTU)	Alpha Natural Resources, Inc. (NYSE:ANR)	CONSOL Energy Inc. (NYSE:CNX)
Exchange:Ticker	NYSE:BTU	NYSE:ANR	NYSE:CNX
Payout ratio	NA	NA	1.5817
Dividend Yield	0.0174	0	0.0131
Historical growth in Net Income - Last 3 years	NA	NA	-0.428
Historical growth in Net Income - Last 5 years	NA	NA	-0.234
Historical growth in Revenues - Last 3 years	0.0338	0.127	-0.0102
Historical growth in Revenues - Last 5 years	0.0455	0.178	0.0315
Expected growth rate in EPS- Next 5 years	0.075	0.04	0.16
Expected growth in revenues - Next 2 years	-0.0333	-0.179	-0.147
Return on Equity	-0.1624	-0.1731	0.019
Return on Capital (ROC or ROIC)	0.0384	-0.0499	0.0394
Net Profit Margin	-0.1324	-0.1623	0.0147
Pre-tax Operating Margin	0.0644	-0.0661	0.0573
Effective Tax Rate	0	0	0.5
% held by institutions	0.8596	0.7894	1.031
Net Income	-585.7	-$2,437.10	388.5
Trailing Net Income	-965.2	-882.3	72.2
Operating Income	333.4	-399.7	234.5
Trailing Operating Income (adj for leases)	469.41	-359.27	280.85
Revenues	$8,077.50	$6,974.90	$5,046.50
Trailing Revenues	$7,287.80	$5,437.30	$4,897.30
EBITDA	$1,713.60	$1,032.50	961
Trailing EBITDA	$1,095.80	552.8	886.9
EBIT (1-t)	469.41	-359.27	140.42
Net Debt issued (Debt issued - repaid)	305.3	-357.9	-81.3
Change in non-cash Working capital	187.2	-202.7	40.1
Net Cap Ex	-239.7	-460.4	984.3
Reinvestment Rate	-0.1118	NA	7.2951
FCFF	521.91	303.83	-883.98
FCFE	-$1,218.00	138.7	-870.9
FCFE without debt	-912.7	-219.2	-952.2
Book Value of Equity - 4 qtrs ago	$5,944.60	$5,097.80	$3,796.70
Invested Capital - 4 qtre ago	$12,217.17	$7,197.14	$7,130.07
Current Book Value of Equity	$4,534.90	$4,372.70	$3,957.20

Beta

Company Beta Analysis

Ticker	Company Name
CNX	CONSOL ENERGY INC

CAPM: Ordinary Least Squares

Levered					Unlevered	
Raw Beta	t-Stat	R-sqr	Pr Grp Beta	Ibbotson Beta	Raw Beta	Ibbotson Beta
0.19	0.40	0.00	0.12	0.18	0.14	0.12

Fama-French Three- Factor Model

FF Beta	FF t-Stat	SMB Prem	SMB t-Stat	HML Prem	HML t-Stat	FF R-Sqr
0.22	0.46	1.68	3.03	1.87	4.43	0.04

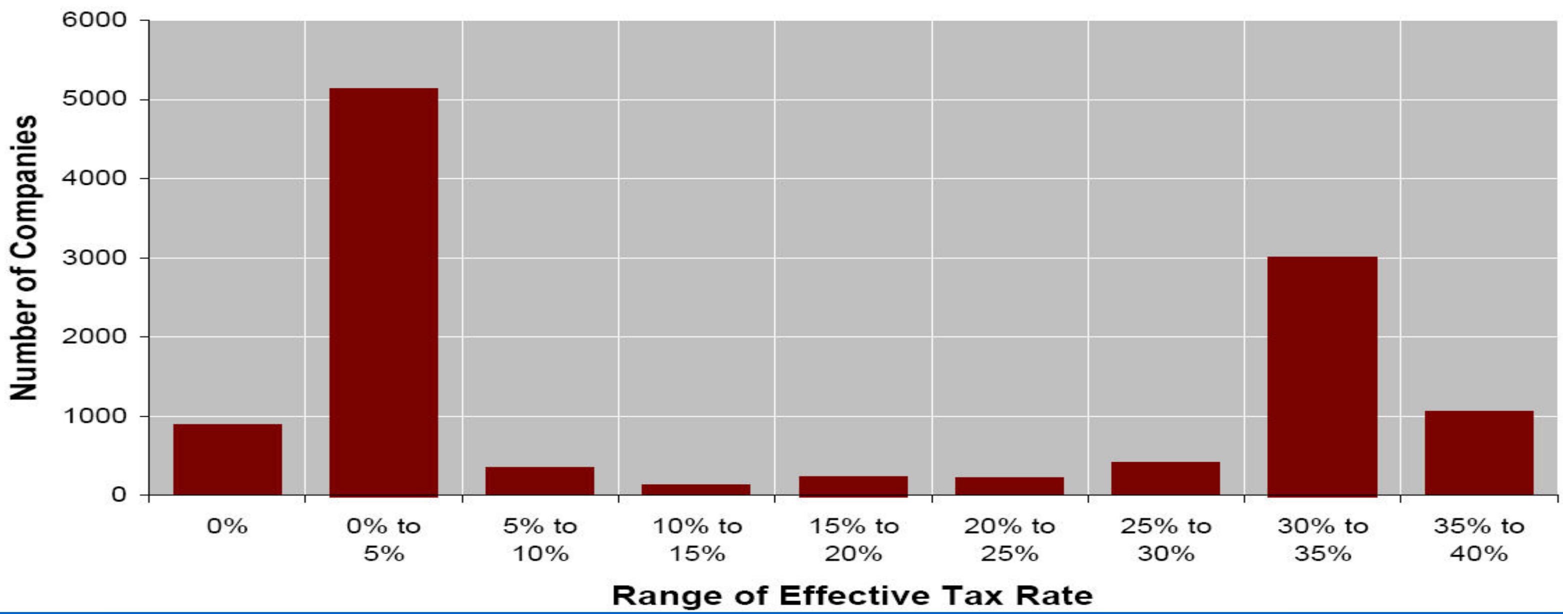
CAPM: Ordinary Least Squares

Tax Rates

Tax Rate Analysis

Ticker	Company Name	Year	Most Recent Tax Rate	Five Year Moving Average
CNX	CONSOL ENERGY INC	2001	18.77%	26.90%

Effective Tax Rate Distribution
Fiscal Year 2001

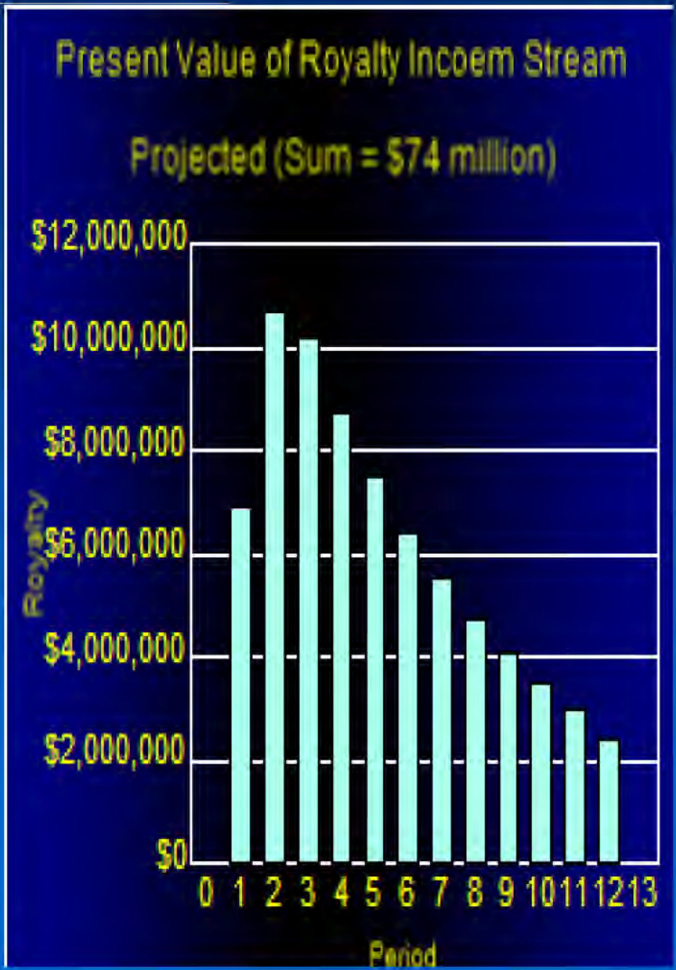


Production & Income Generation

YEAR	Production	Remaining Tons	Remaining Acres	Gross Income	Royalty Income
	0	162,000,000	15,000		0
1	5,000,000	154,857,100	14,000	$150,000,000	$7,500,000
2	9,000,000	142,000,000	13,000	$270,000,000	$13,500,000
3	10,000,000	127,714,300	12,000	$300,000,000	$15,000,000
4	10,000,000	113,428,600	11,000	$300,000,000	$15,000,000
5	10,000,000	99,142,900	9,000	$300,000,000	$15,000,000
6	10,000,000	84,857,100	8,000	$300,000,000	$15,000,000
7	10,000,000	70,571,400	7,000	$300,000,000	$15,000,000
8	10,000,000	56,285,700	5,000	$300,000,000	$15,000,000
9	10,000,000	42,000,000	4,000	$300,000,000	$15,000,000
10	10,000,000	27,714,300	3,000	$300,000,000	$15,000,000
11	10,000,000	13,428,600	1,000	$300,000,000	$15,000,000
12	9,400,000			$282,000,000	$14,100,000
13			$00		$0
14			$00		
16 8 9			0		$0
			0		
24			0		$0
	113,400,000			$3,402,000,000	$170,100,000

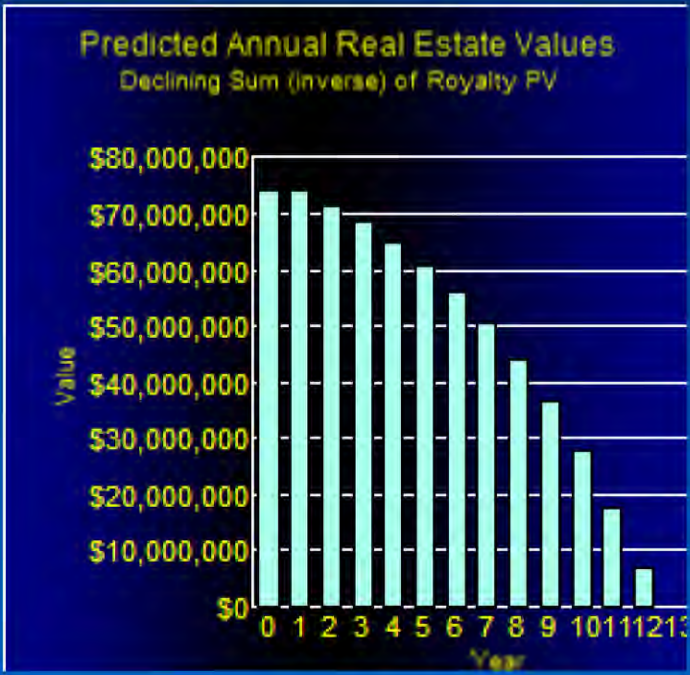
PV: Royalty Income Stream

YEAR	Production	Royalty Income	PV Royalty
		0	$0
1	5,000,000	$7,500,000	$6,947,122
2	9,000,000	$13,500,000	$10,729,135
3	10,000,000	$15,000,000	$10,228,442
4	10,000,000	$15,000,000	$8,776,003
5	10,000,000	$15,000,000	$7,529,811
6	10,000,000	$15,000,000	$6,460,578
7	10,000,000	$15,000,000	$5,543,176
8	10,000,000	$15,000,000	$4,756,045
9	10,000,000	$15,000,000	$4,080,686
10	10,000,000	$15,000,000	$3,501,229
11	10,000,000	$15,000,000	$3,004,054
12	9,400,000	$14,100,000	$2,422,830
13	0		$0



Declining Value

YEAR	Production	Remaining Tons	PV Royalty	RE Value
	0	162,000,000	$0	$73,979,109
1	5,000,000	154,857,100	$6,947,122	$73,979,109
2	9,000,000	142,000,000	$10,729,135	$71,556,279
3	10,000,000	127,714,300	$10,228,442	$68,552,225
4	10,000,000	113,428,600	$8,776,003	$65,050,996
5	10,000,000	99,142,900	$7,529,811	$60,970,310
6	10,000,000	84,857,100	$6,460,578	$56,214,265
7	10,000,000	70,571,400	$5,543,176	$50,671,090
8	10,000,000	56,285,700	$4,756,045	$44,210,512
9	10,000,000	42,000,000	$4,080,686	$36,680,701
10	10,000,000	27,714,300	$3,501,229	$27,904,698
11	10,000,000	13,428,600	$3,004,054	$17,676,256
12	9,400,000	0	$2,422,830	$6,947,122
13			$0	



Valuation/Recalculation Pattern

Year 1			Year 2			Year 3		
Periods	Income	PV	Periods	Income	PV	Periods	Income	PV
1	$15,000,000	$13,870,000	1	$15,000,000	$13,870,000	1	$15,000,000	$13,870,000
2	$15,000,000	$11,859,000	2	$15,000,000	$11,859,000	2	$15,000,000	$11,859,000
3	$15,000,000	$10,139,000	3	$15,000,000	$10,139,000	3	$15,000,000	$10,139,000
4	$15,000,000	$8,669,000	4	$15,000,000	$8,669,000	4	$15,000,000	$8,669,000
5	$15,000,000	$7,412,000	5	$15,000,000	$7,412,000	5	$15,000,000	$7,412,000
6	$15,000,000	$6,337,000	6	$15,000,000	$6,337,000	6	$15,000,000	$6,337,000
7	$15,000,000	$5,418,000	7	$15,000,000	$5,418,000	7	$15,000,000	$5,418,000
8	$15,000,000	$4,633,000	8	$15,000,000	$4,633,000	8	$15,000,000	$4,633,000
9	$15,000,000	$3,961,000	9	$15,000,000	$3,961,000	Value		$68,337,000
10	$15,000,000	$3,387,000	Value		$72,298,000			
Value		$75,685,000						

Mining Cost

YEAR	Mining Expenses	Selling Expenses	Adminsitrative Expenses	Reclamation Set-Aside	Net Pre Tax
0	$125,000,000	$10,000,000	$20,000,000	$0	-$155,000,000
1	$85,000,000	$5,000,000	$7,500,000	$4,810,000	$40,190,000
2	$153,000,000	$9,000,000	$13,500,000	$4,810,000	$76,190,000
3	$170,000,000	$10,000,000	$15,000,000	$4,810,000	$85,190,000
4	$170,000,000	$10,000,000	$15,000,000	$4,810,000	$85,190,000
5	$170,000,000	$10,000,000	$15,000,000	$4,810,000	$85,190,000
6	$170,000,000	$10,000,000	$15,000,000	$4,810,000	$85,190,000
7	$170,000,000	$10,000,000	$15,000,000	$4,810,000	$85,190,000
8	$170,000,000	$10,000,000	$15,000,000	$4,810,000	$85,190,000
9	$170,000,000	$10,000,000	$15,000,000	$4,810,000	$85,190,000
10	$170,000,000	$10,000,000	$15,000,000	$4,810,000	$85,190,000
11	$170,000,000	$10,000,000	$15,000,000	$4,810,000	$85,190,000
12	$159,800,000	$9,400,000	$14,100,000	$4,810,000	$79,790,000
13					$0
14					$0
24					$0
	$2,052,800,000	$123,400,000	$190,100,000	$57,720,000	$807,880,000

Example: Closure

When The Appeal Happens

Processing

Coal Preparation

Lime Kiln

Night Ops

Questions and Answers

Oil & Gas Estate Appraisal

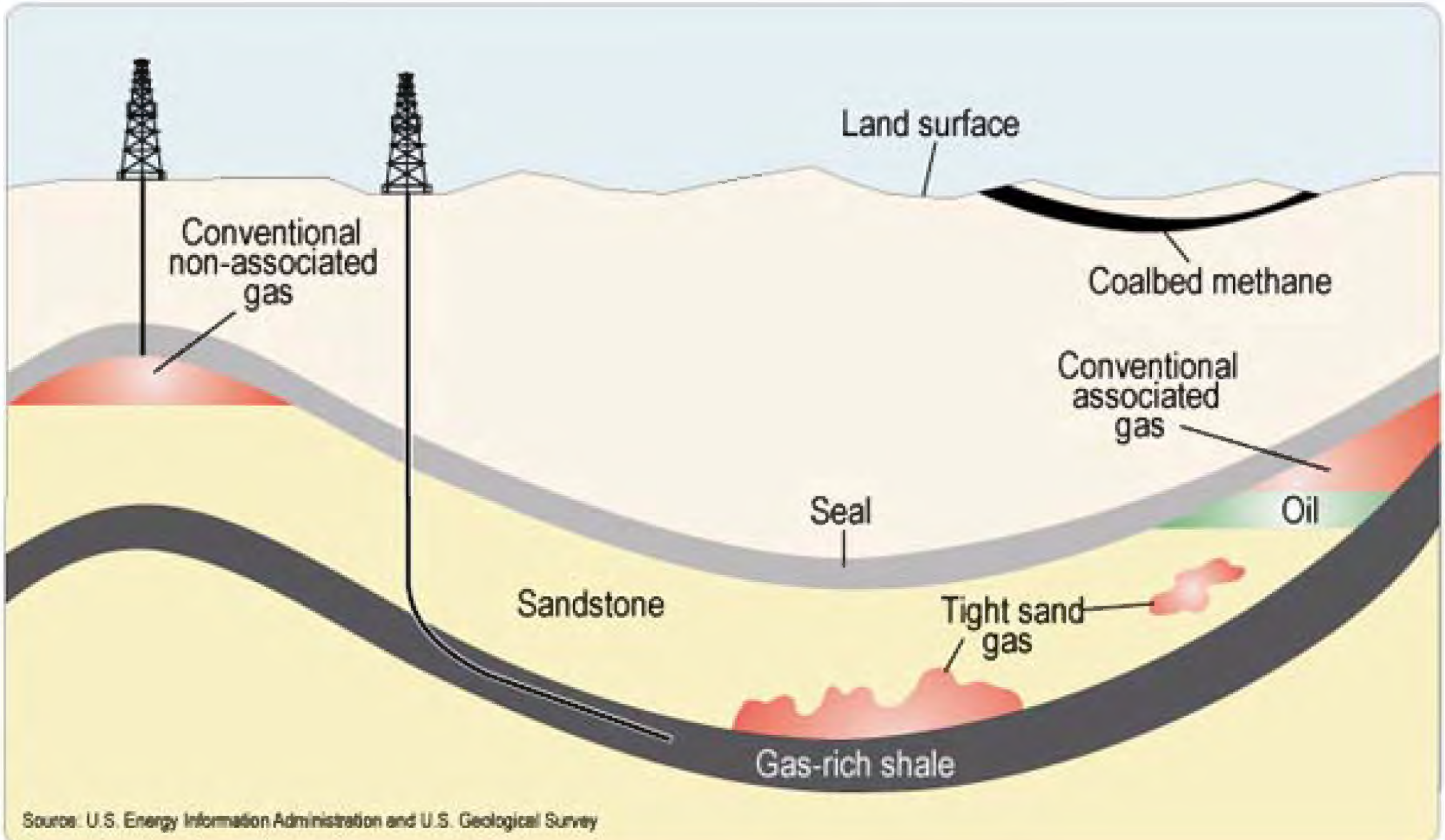
Marcellus & Utica Shale Regions

Fall 2015

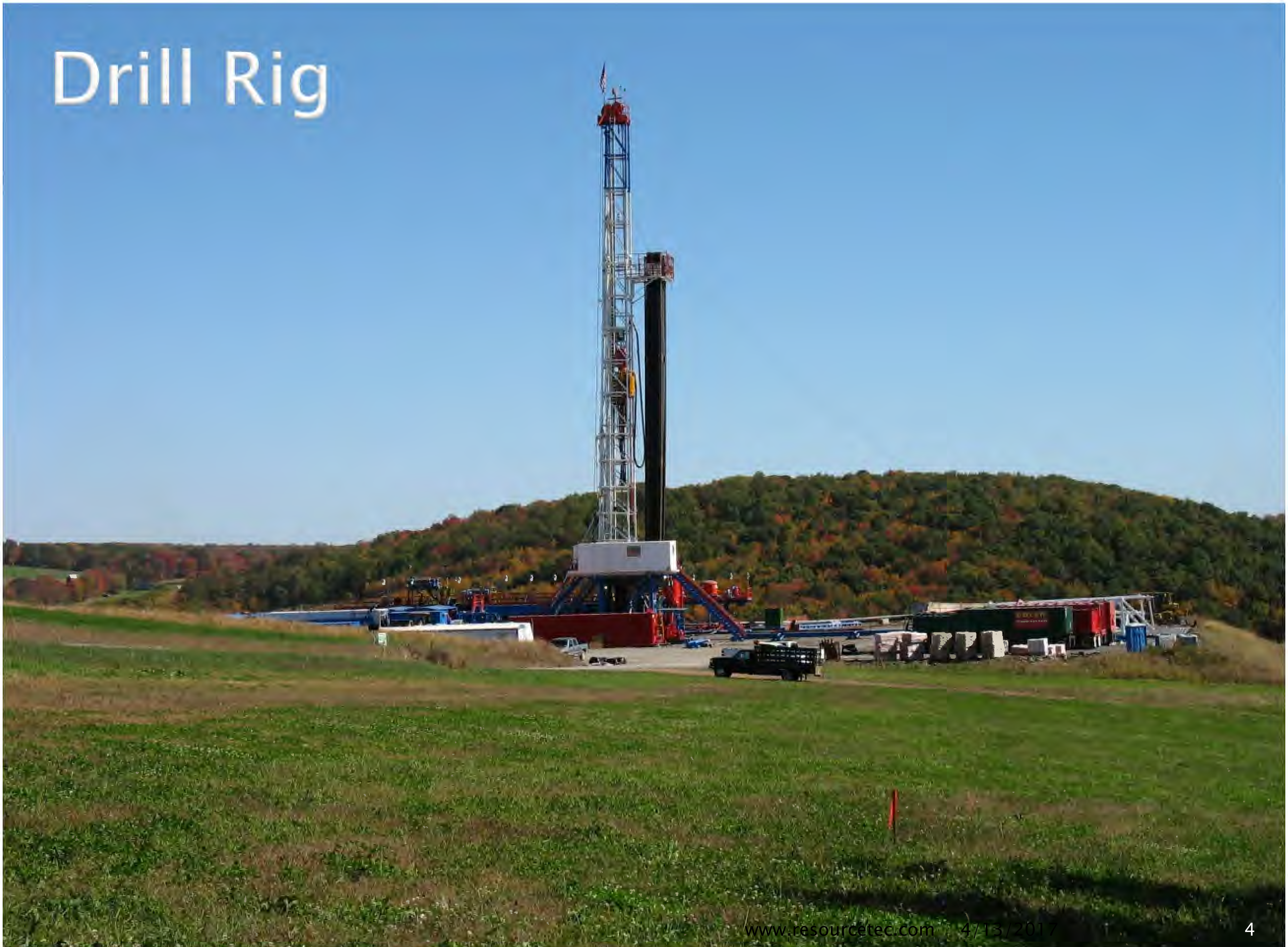
J. R. Kern, ASA, IIMA
Resource Technologies Corporation

Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

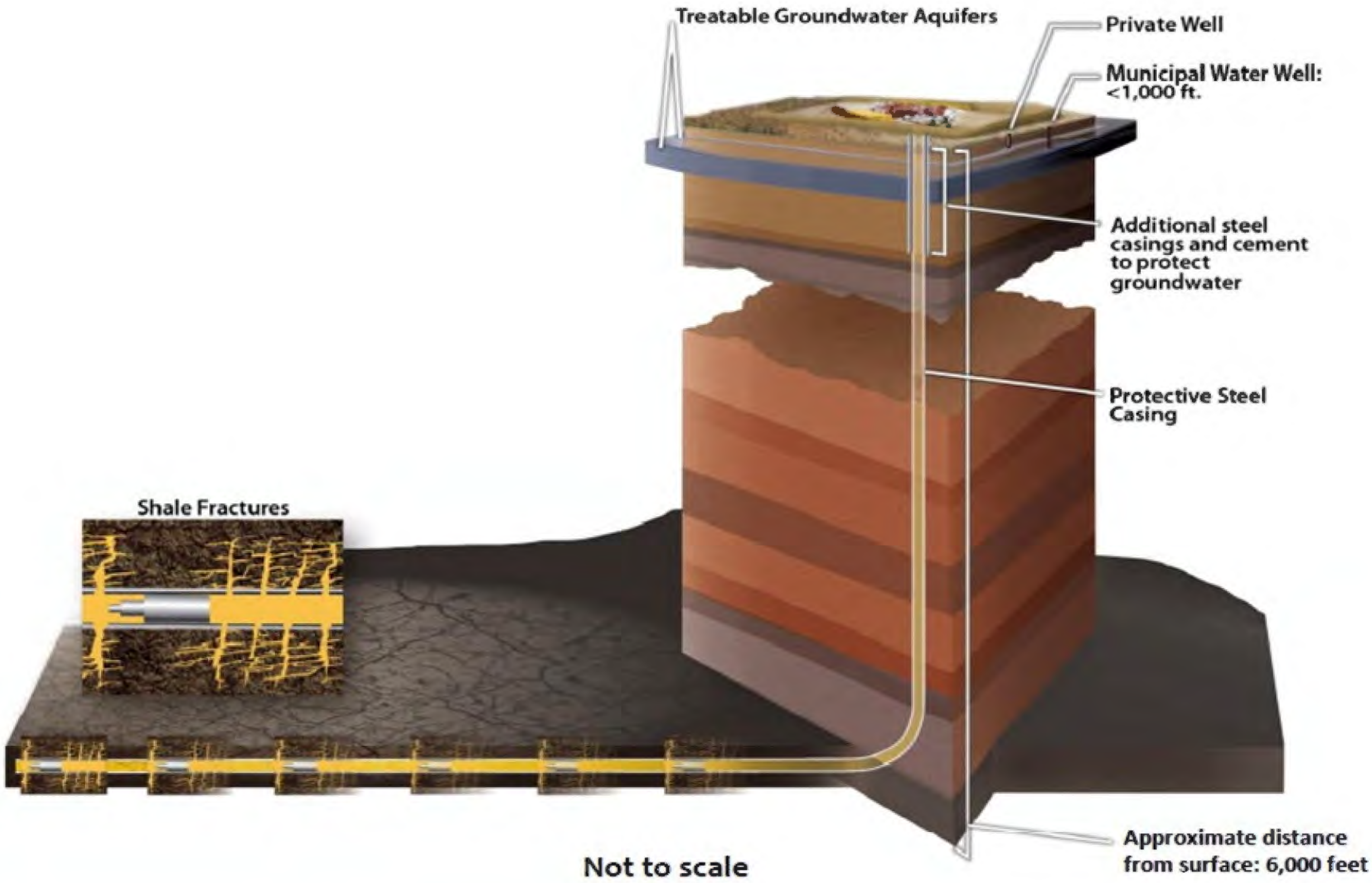
GAS SOURCE TERMINOLOGY



Drill Rig

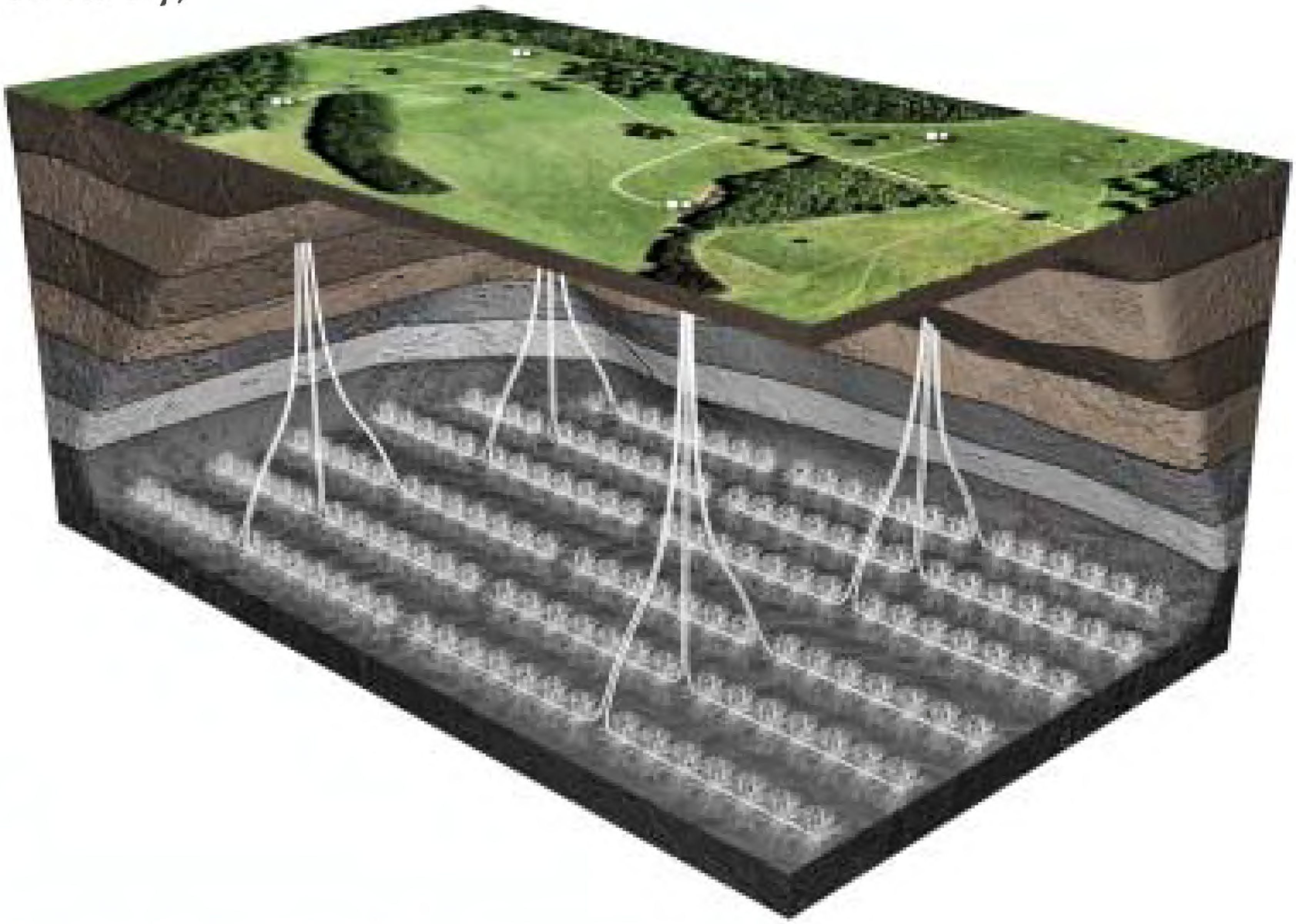


Horizontal Well and Fracing

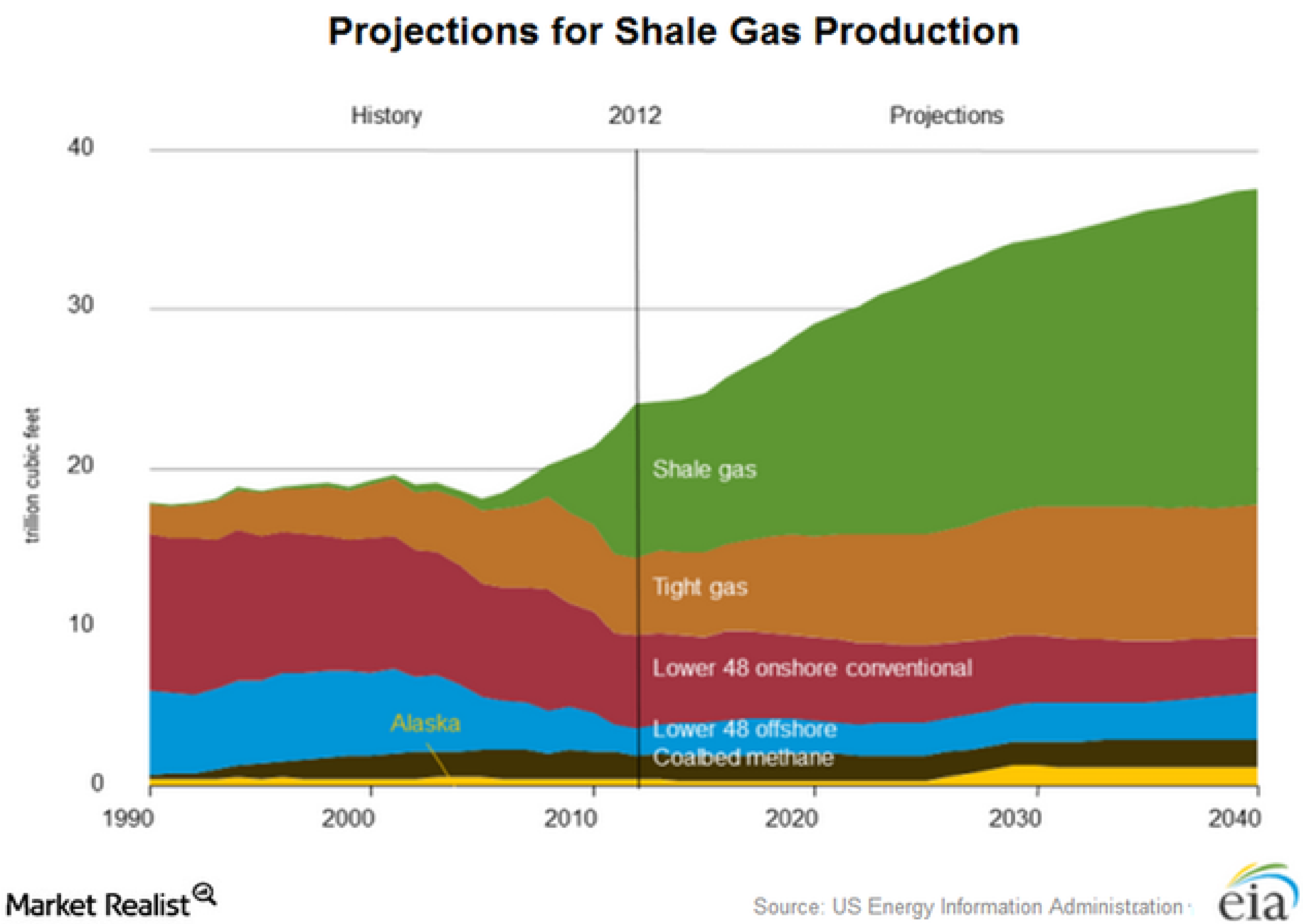


Cross Section of Full Unit Development

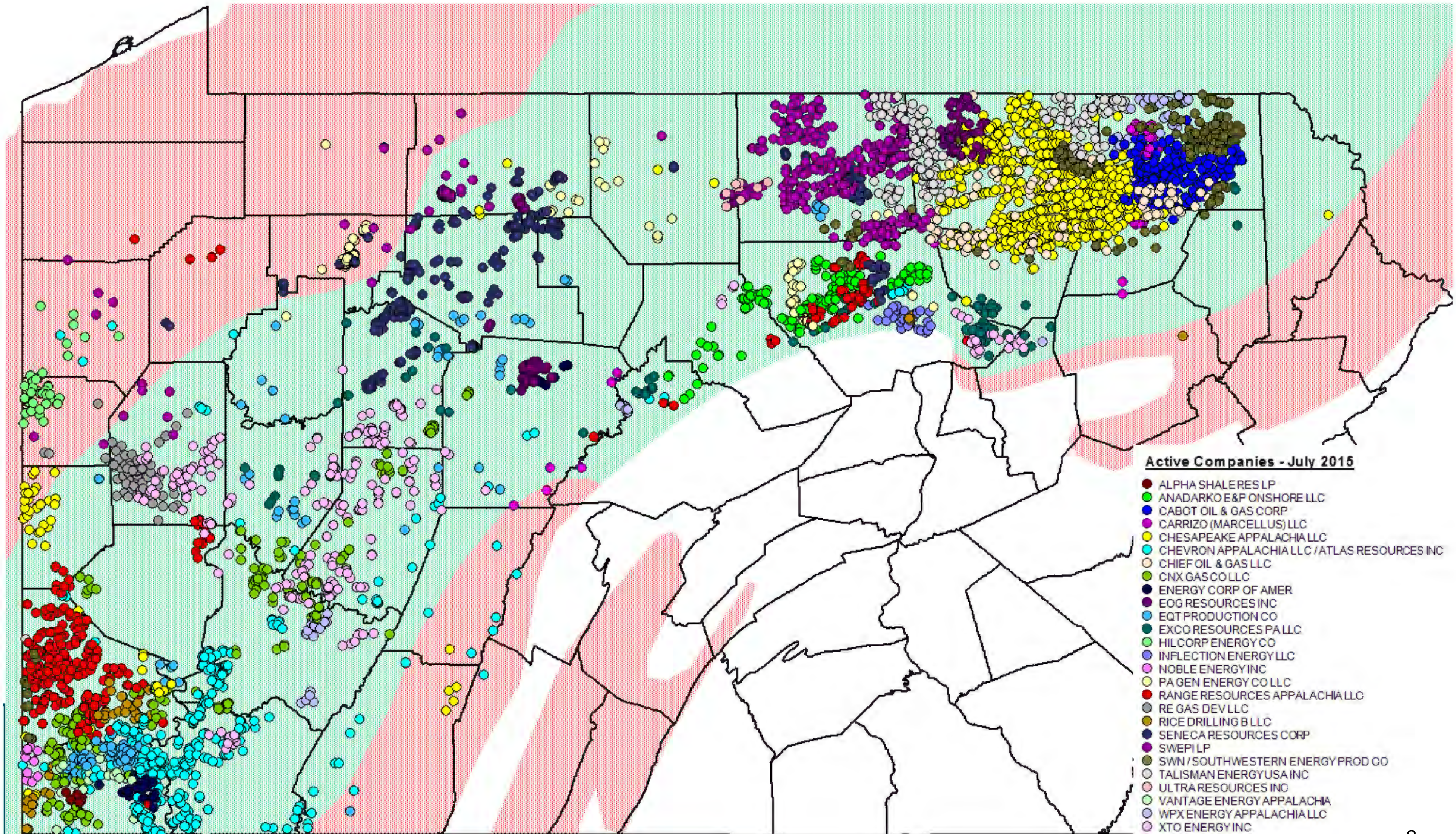
(seen rarely)



2014 EIA Annual Energy Outlook



Pennsylvania Active Companies Marcellus – July 2015

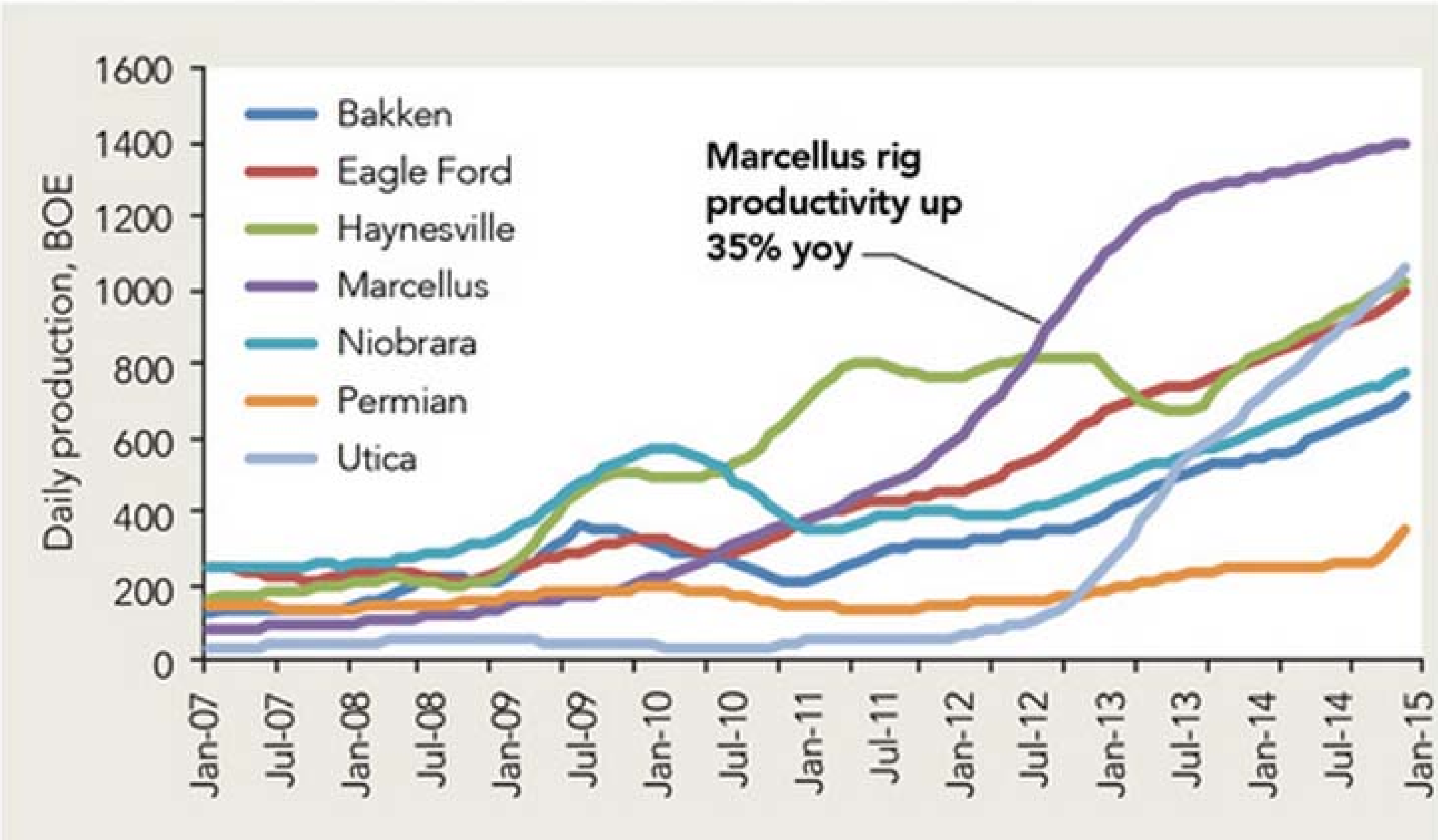


From Oil & Gas Financial Journal

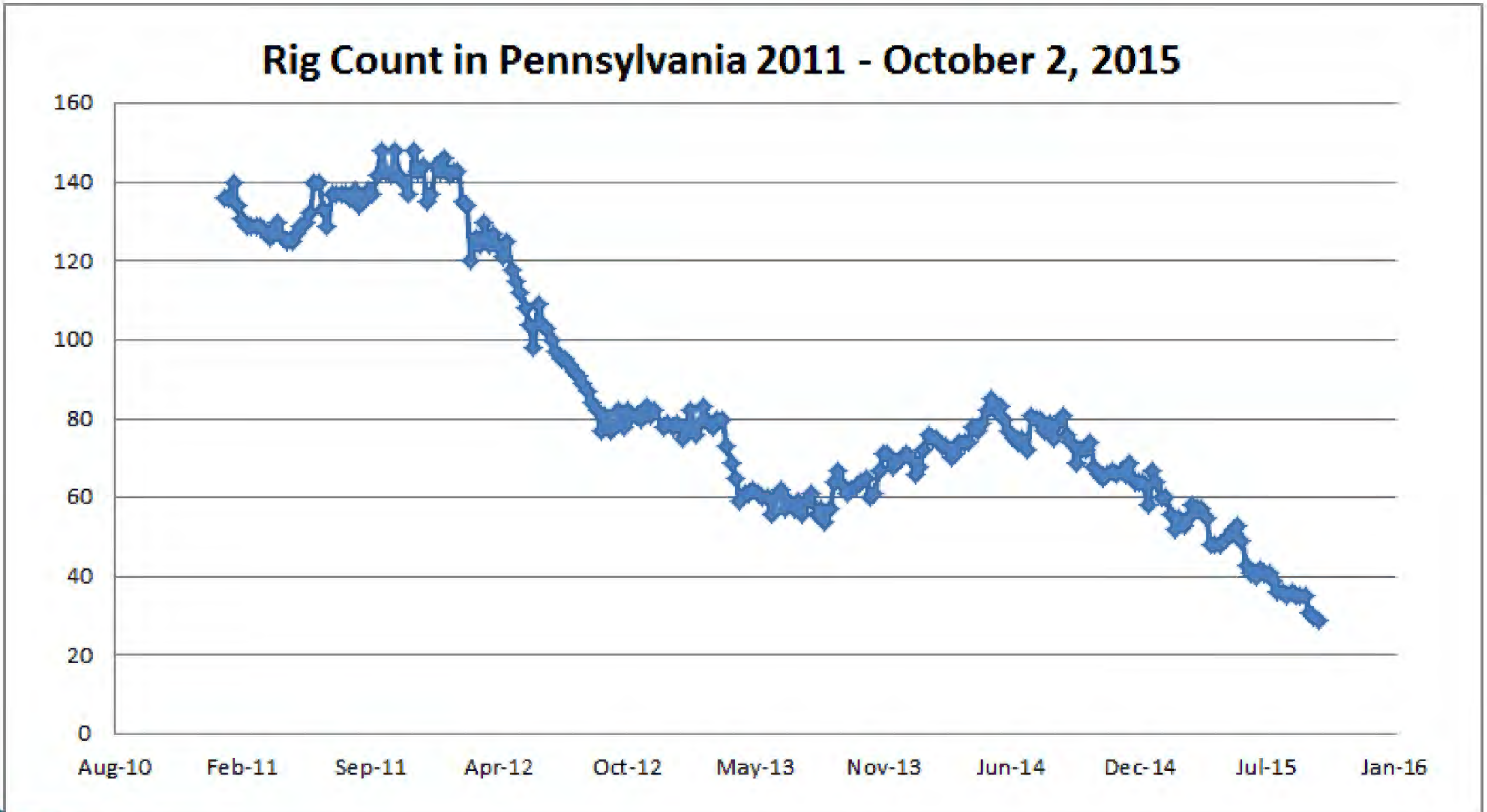
September 15, 2015

- Since January 2012, rigs have increased 38% YOY in efficiency
- Big producers like Cabot still make 10% return on prices as low as $1.75/mcf

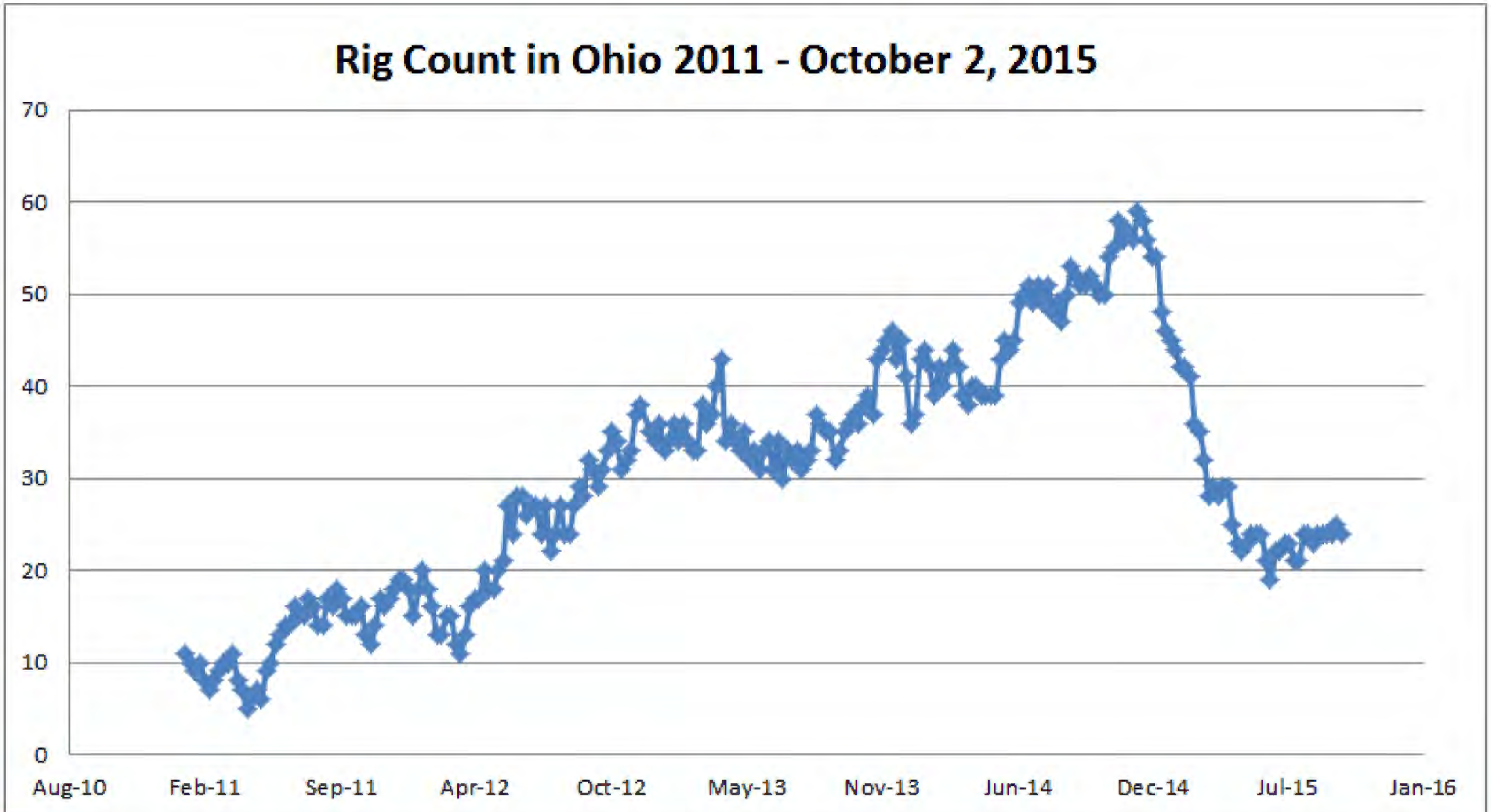
F2: RIG PRODUCTIVITY BY BASIN, 2007-2015, BOE



Rig Activity in PA – dry/wet gas MARCELLUS



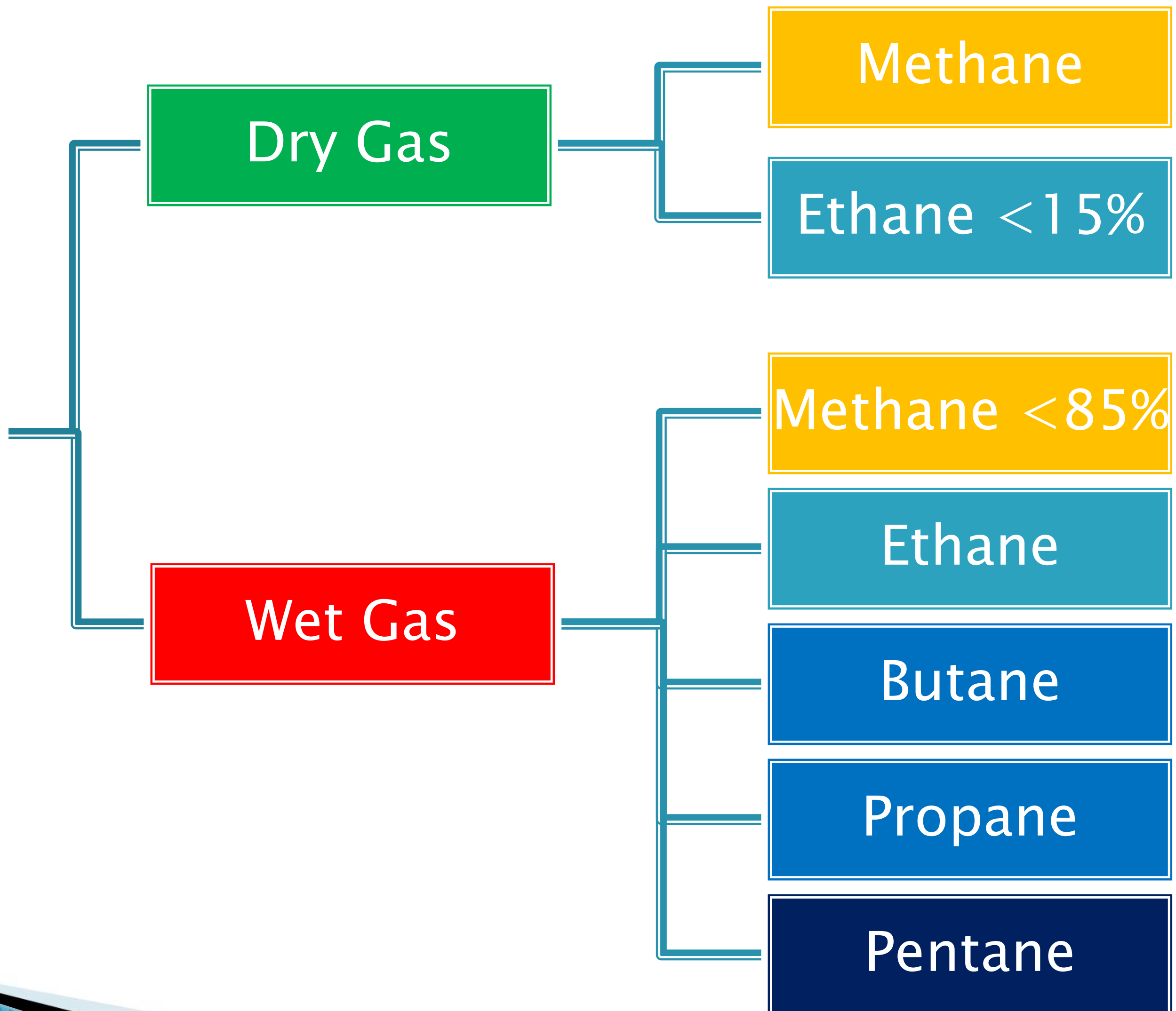
Rig Activity in OH – wet gas/oil UTICA



2014/2015 Thinking
(Dry Gas in NEPA)

4,800	trillion	likely cf in place
25%	likely recovery	
1,200	trillion	recoverable cubic feet
17	million	acres
70,588,235	cubic feet per acre	
70,588	MCF/ Acre	
$2.75	$/ MCF (Wellhead Price)	
$ 194,117	$ Gas per acre	
$15,529,360	per property (80 acre)	
$ 2,717,638	17.50% Royalty (PV @15)	
$ 5,500,000	Drill Cost	
$ 3,812,000	Operating Cost	
$ 3,500,000	Net (PV @15)	

Dry/Wet

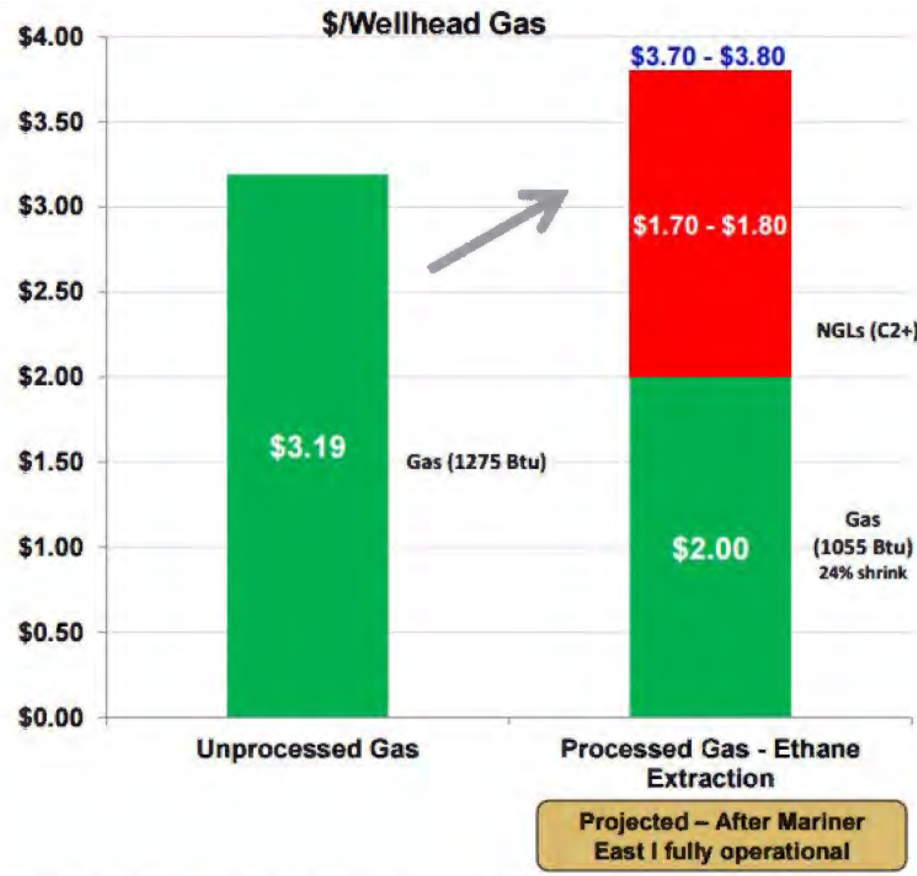


Dry Gas
Methane
Ethane <15%
Wet Gas
Methane <85%
Ethane
Butane
Propane
Pentane

Price Differential

Range's Natural Gas Liquids Provide Revenue Uplift

- Range is one of the largest NGL producers in Appalachia, (56,000 bpd in 2Q15) with the highest Btu inlet gas
- Higher Btu gas receives increased uplift as it contains heavier NGLs
- In 2nd half of 2015, over 85% of ethane is expected to be priced off gas or oil-linked indices, rather than Mont Belvieu ethane index
- This revenue uplift is unique to Range's contracts



Assumptions: $3.00 NYMEX Gas, Local NG differential ($0.50), $55.00 WTI, 30% WTI (C3+), 5.50 GPM (ethane extraction), processing and shrink included, third-party NGL transport reported separately. Based on SWPA wet gas quality (1,275 processing plant inlet Btu). Based on full utilization of current ethane/propane agreements. NOTE: Wet Gas (Ethane Extraction) equals 1.54 mcfe.

2014/2015 Thinking (Wet Gas)

4,800	trillion likely cf in place
25%	likely recovery
1,200	trillion recoverable cubic feet
17	million acres
70,588,235	cubic feet per acre
70,588	MCF/ Acre
$3.80	$/ MCF (Wellhead Price) (20% NGL & Cond 80% Dry)
$ 268,234	$ hydrocarbon per acre
$21,458,752	per property (80 acre)
$ 3,755,282	17.50% Royalty (PV @ 15)
$ 5,500,000	Drill /Complete Cost
$ 7,625,000	Operating Cost
$ 4,600,000	Net (PV @ 15)

Valuation Factors

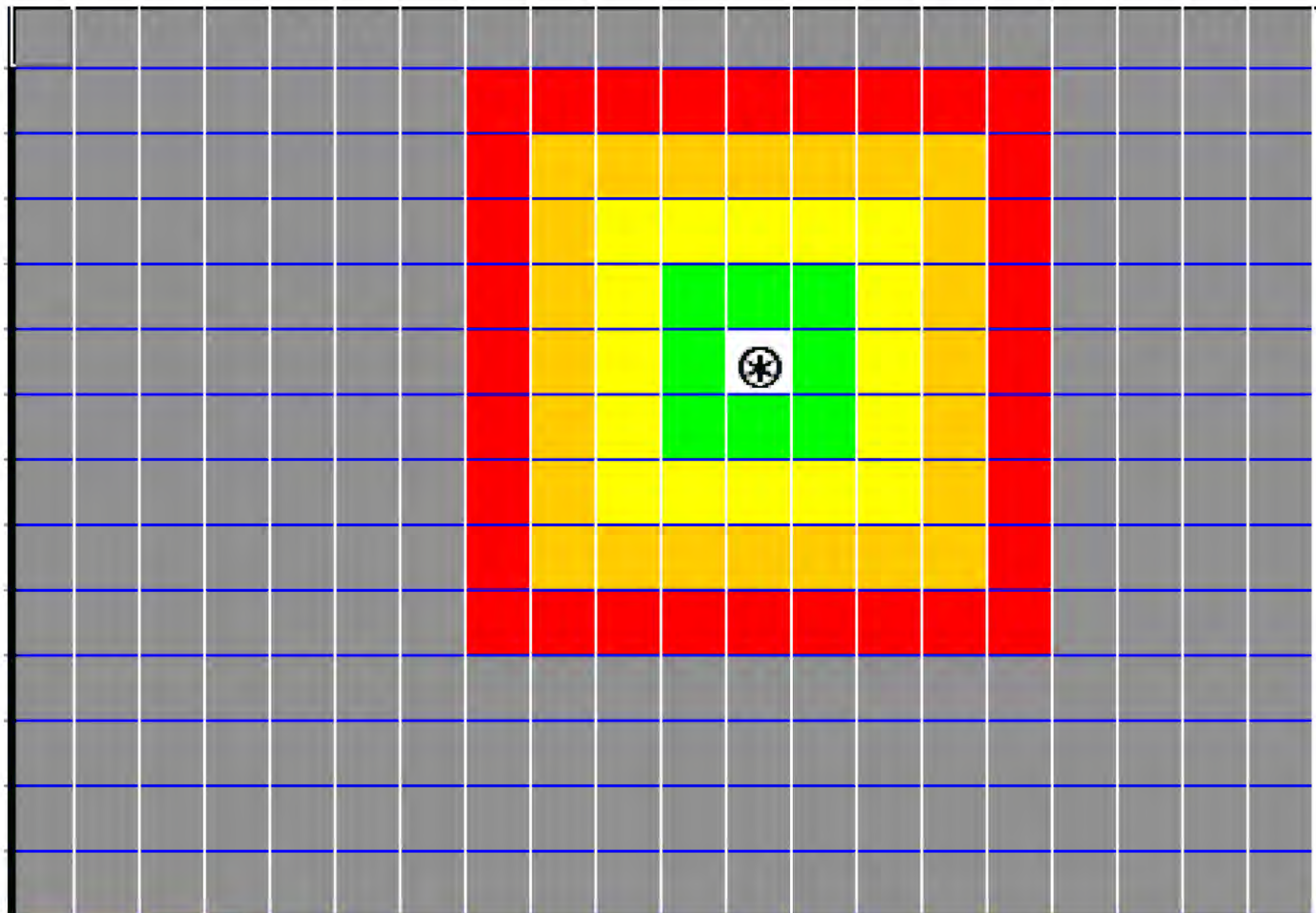
- **Likelihood of development**
  - Absorption (Development Schedule)
    - Acres of resource
    - Acres of subject property
    - Market for gas (Supply/Demand)
    - Access to market/proximity to pipelines
    - Active rigs
  - Lease Control/Ownership
    - Third party lease
    - Active company
    - Pooling practice
- **Reserve Type**
  - Proven
  - Probable
  - Possible/Speculative
- **Volumetric Adjustments**
  - Typical well
    - Nearby well performance
    - Wet vs. dry
  - Property utilization)
- **Market**
  - Price
  - Consumption
  - Timing
  - Accessibility to market
  - Pipelines
  - Capital investments
    - Plants
    - Compressors
- **Capital Investment**
- **Cost to Produce**
  - Acquisition
  - Development
  - Operating/Process
  - Sales
- **Discount Rate**
  - Producer (Lessee) vs.
  - Land Owner (Lessor)

Reserve Classifications

- IRS
  - Proven Reserves
  - Probable Reserves
  - Possible Reserves
  - Property
    - Recoverable Reserves

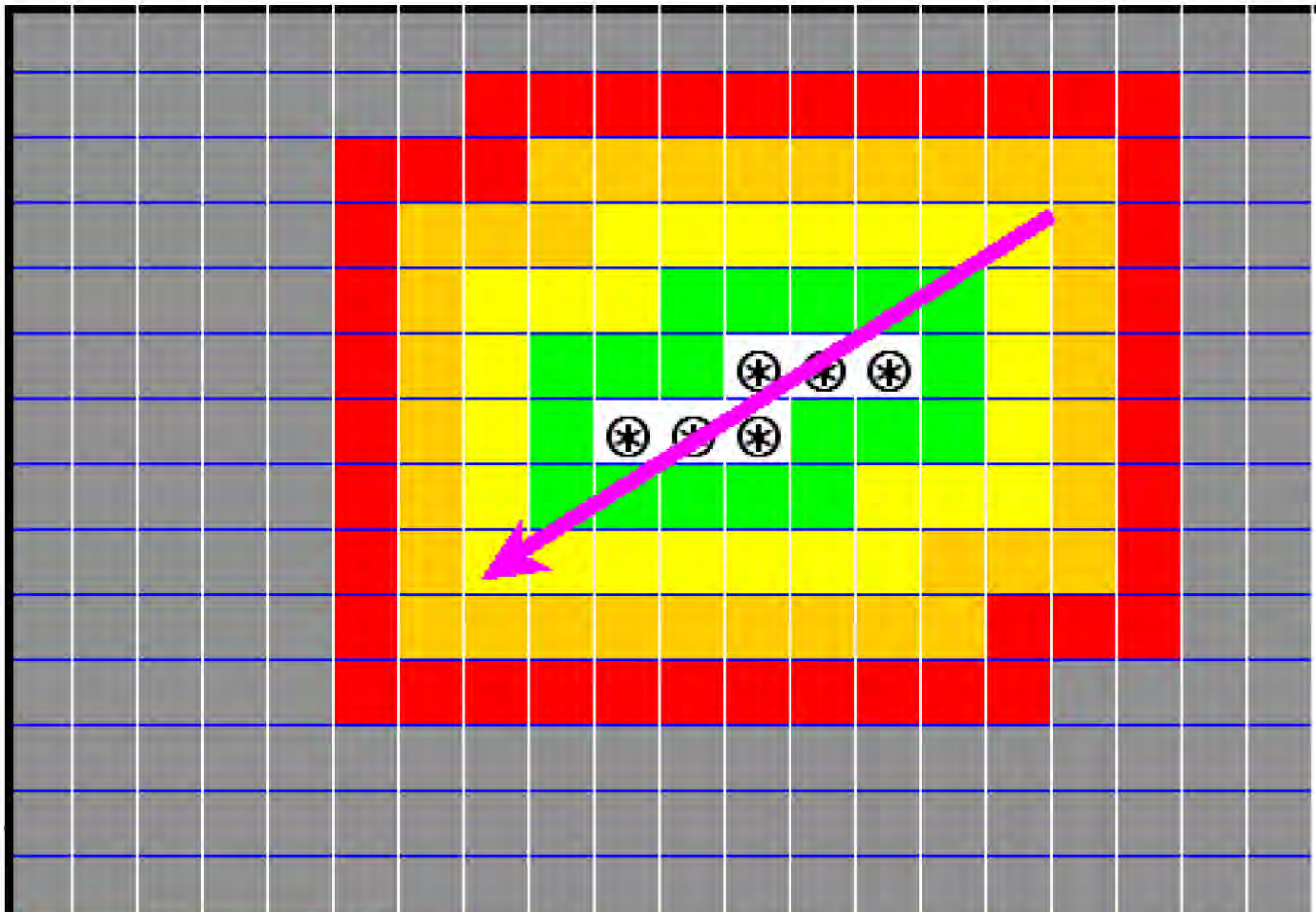
- Geophysical
  - Proven Reserves
  - Probable Reserves
  - Possible Reserves
  - Speculative Reserves

Well Spacing



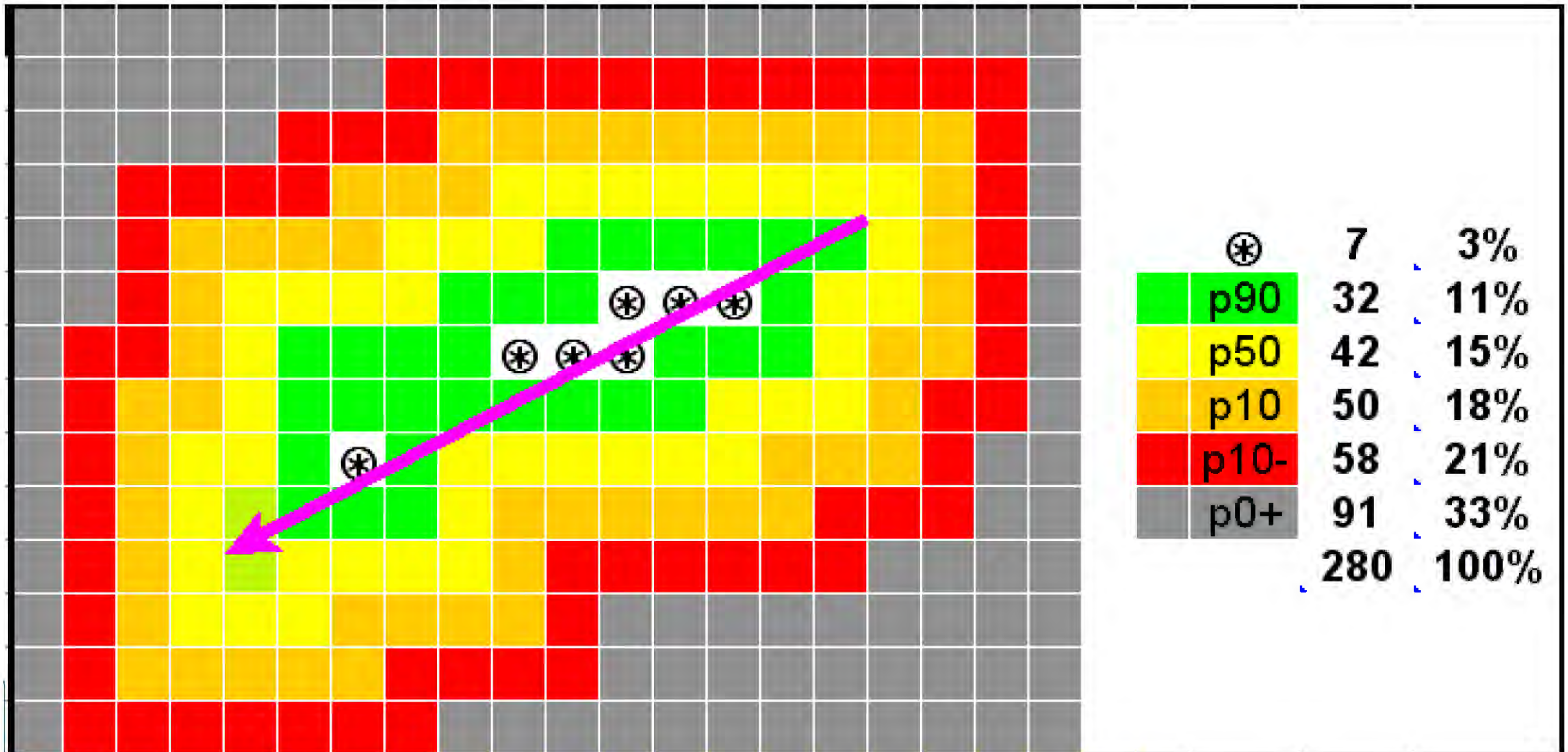
	⊛	1	0%
	p90	8	3%
	p50	16	6%
	p10	24	9%
	p10-	32	11%
	p0+	199	71%
		280	100%

Well Spacing / Offset Interpretation:



	⊛	6	2%
	p90	18	6%
	p50	26	9%
	p10	34	12%
	p10-	42	15%
	p0+	154	55%
		280	100%

Well Spacing / Offset Interpolation



Reserve Classification (SEC) Proven Reserves

- "Reasonably Certain" to be producible:
  - Current technology
  - Current prices
  - Current commercial terms
  - Current government consent

    - **P90, having a 90% certainty of being produced.**
    - **Proven reserves are usually applied to:**
      - producing wells
      - single offset wells from the actively producing well

Reserve Classification (SEC) Probable Reserves

- "Reasonably Probable" of being produced:

- current or likely technology
- current prices
- current commercial terms
- government consent:
  - P50., having a 50% certainty of being produced.
  - Probable reserves are generally applied to single well offsets from Proven Reserves as long as the offset follow known production trends.

Reserve Classification (SEC)

- Possible Reserves :

 "having a chance of being developed"

 under favorable circumstances (3P):

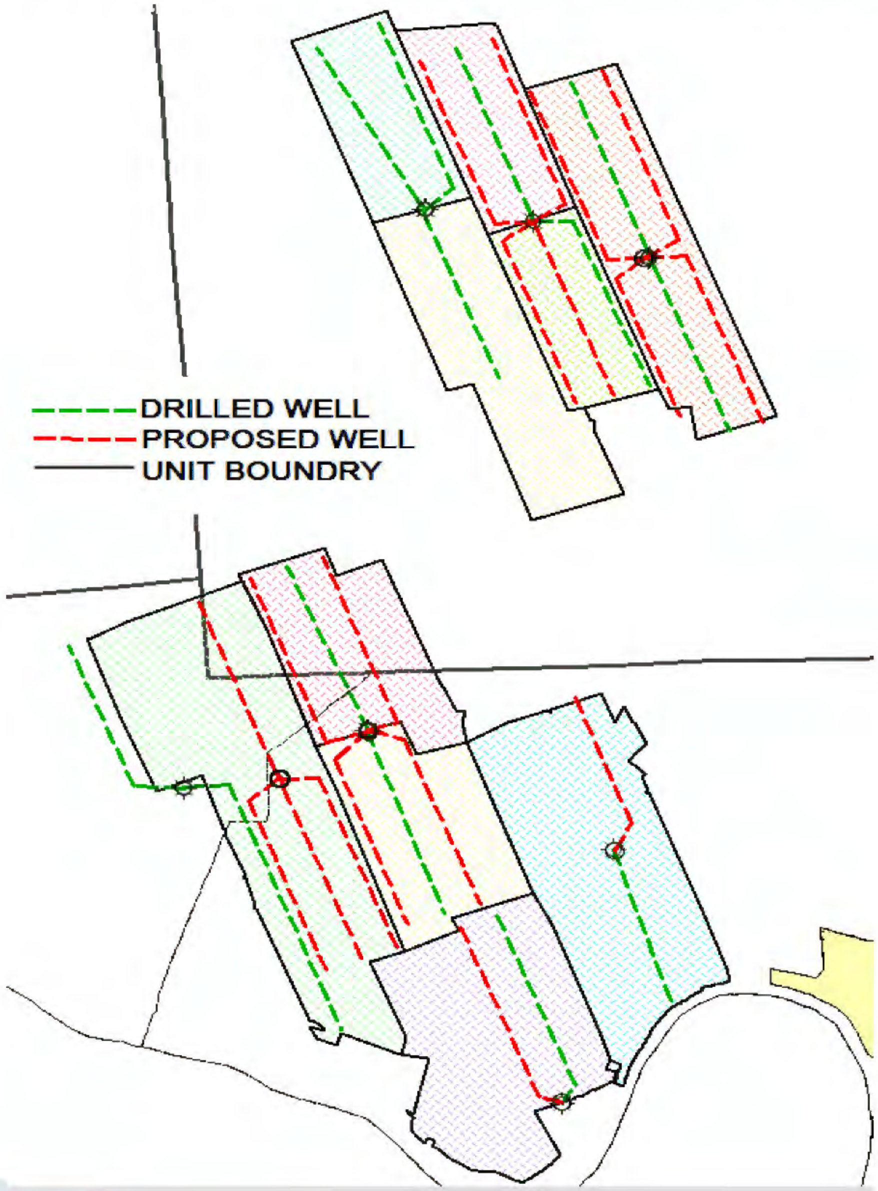
  – P10., having a 10% certainty of being produced.

  – Possible reserves are generally applied to single well offsets from Probable Reserves as long as the offset follow known production trends.

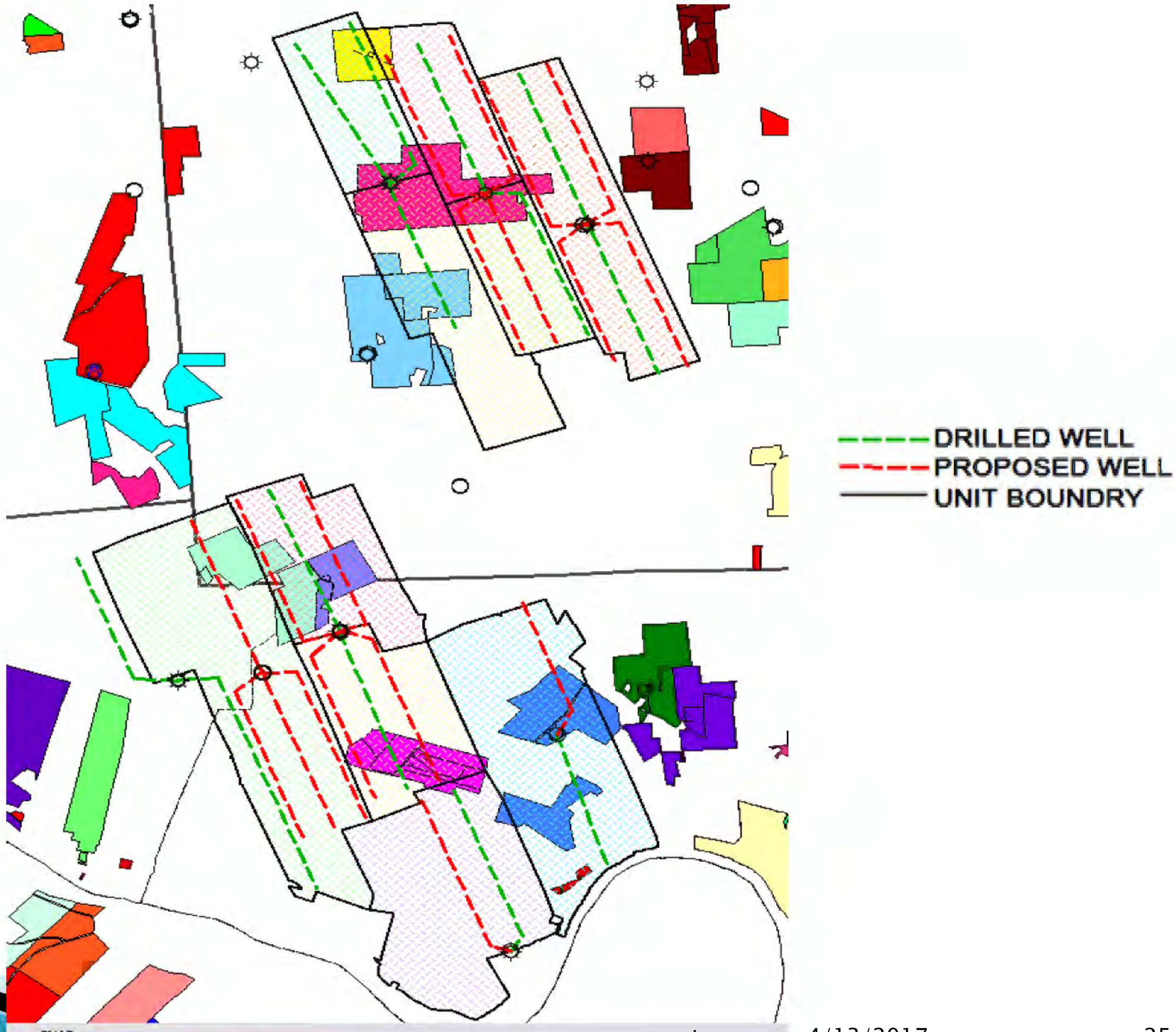
- Speculative (Prospective) Reserves

 less than a 10% probability that reserves will be discovered and developed.

Northeast PA Wells, Horizontals, and Units



Northeast PA Wells, Units, and Properties



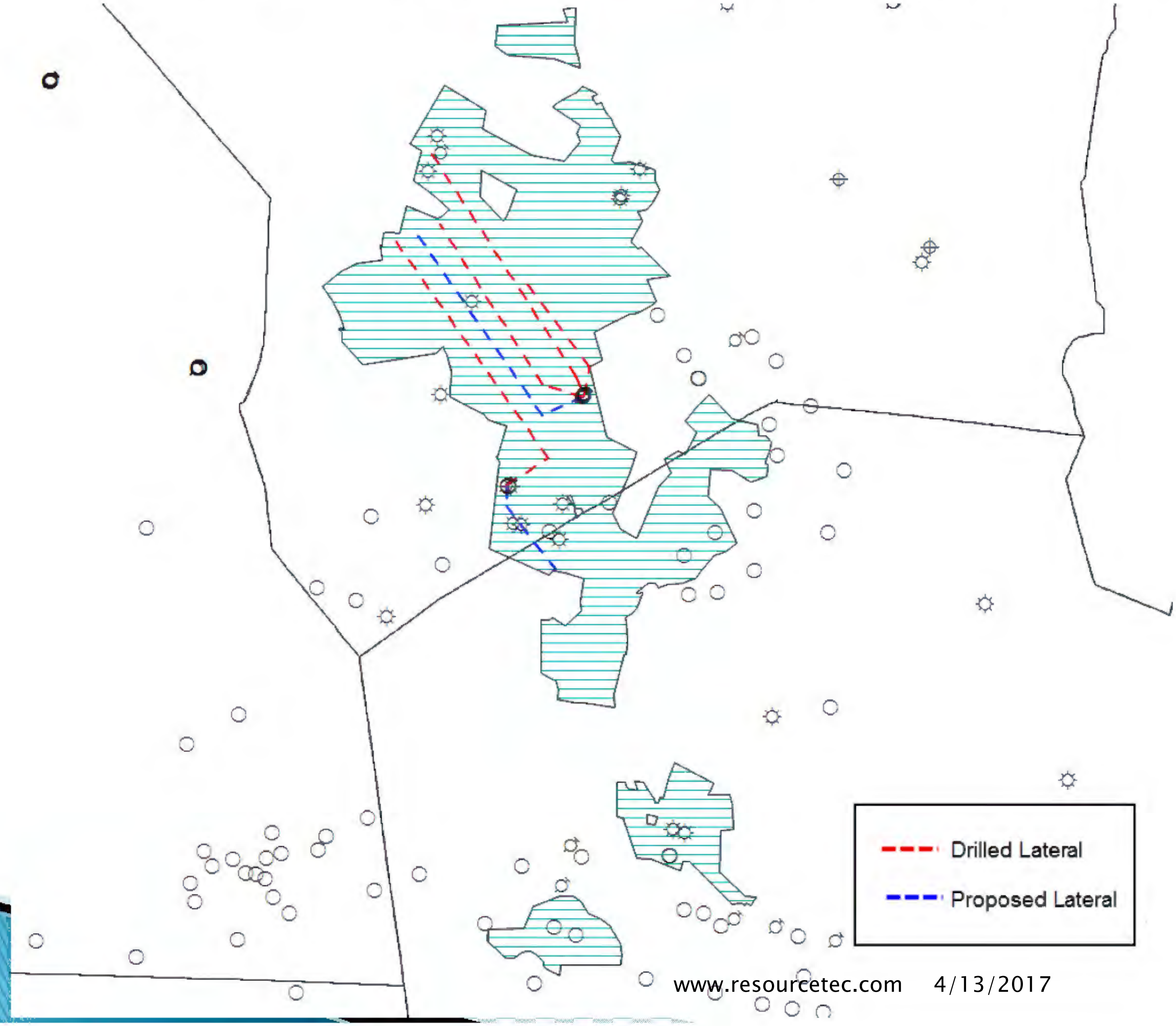
"Held By Production"

- When a well is commenced during the primary term, the leasehold is said to be "held by production."
  - Well doesn't actually have to be producing, can just be drilled and not completed
- So long as a leasehold is held by production, the energy company holds all rights granted through the lease agreement.
  - Thus, the landowner will be limited or prevented from acquiring additional lease bonus payments.

Pooling / Unitization

- Where only a portion of a leasehold is included in a drilling unit, generally all of the leasehold will be held by production.
- A Pugh Clause in the lease agreement can provide for the release of portions of the leasehold that are not included within a drilling unit.
- Some leases have limits on how many acres a unit can be… Otherwise they can be over 2,000 acres

2,000+ Acre Unit in Greene County, PA



Discount Rate

Producer vs. Land Owner
Who has more risk associated with their income?

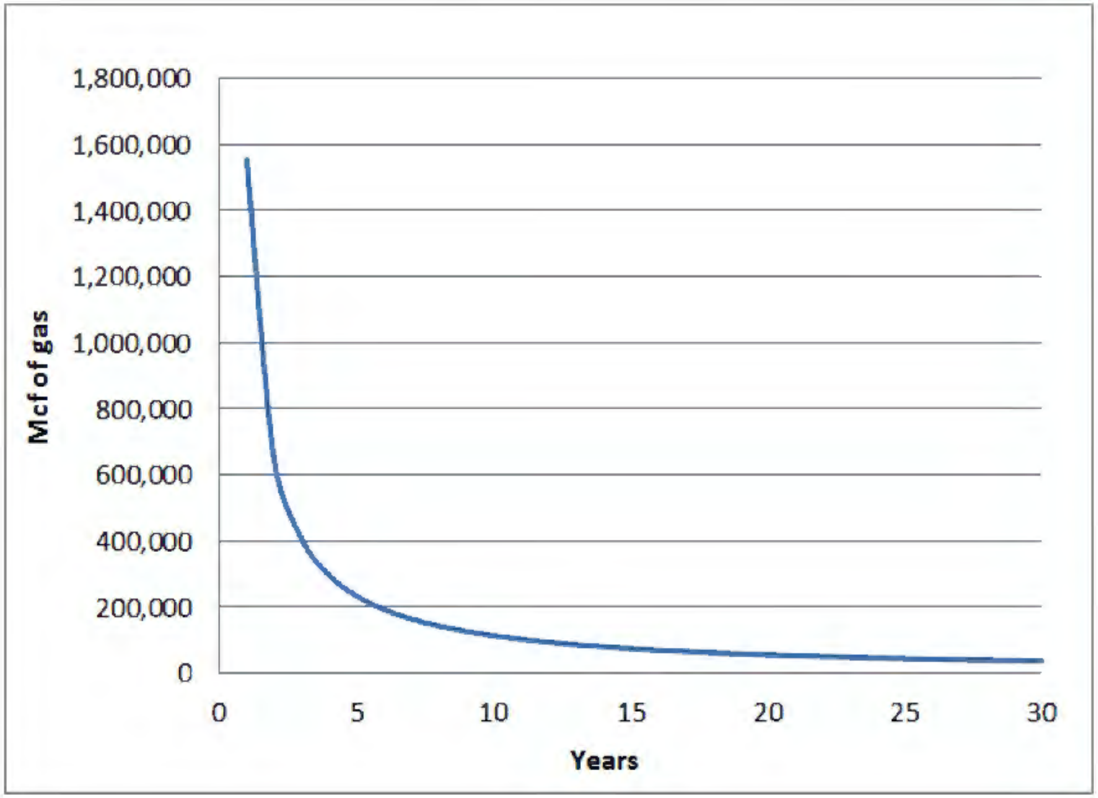
In a field development scenario, the producer/developer continues to drill so that the company can maintain or increase production.

Problem #1:
As older wells de-pressure through production over time, newer wells will dominate the system. This will prematurely decrease production levels from older wells, lowering the land owners income while the overall system maintains or increases total production.

Problem #2:
If petroleum prices falter, wells can be shut in for the benefit of the producer, decreasing income to the land owner to a bare minimum.

Problem #3:
Pooling and the production unit designation and drilling pattern.

Decline Curve



year	annual gas production	annual decline	total decline	percent of total prod
		Base type well production schedule		
	5,077,289			
1	1,553,411			31%
2	645,448	-58.4%	-58.4%	43%
3	407,352	-36.9%	-73.8%	51%
4	297,579	-26.9%	-80.8%	57%
5	234,411	-21.2%	-84.9%	62%
6	193,364	-17.5%	-87.6%	66%
7	164,551	-14.9%	-89.4%	69%
8	143,211	-13.0%	-90.8%	72%
9	126,770	-11.5%	-91.8%	74%
10	113,716	-10.3%	-92.7%	76%
11	103,099	-9.3%	-93.4%	78%
12	94,295	-8.5%	-93.9%	80%
13	86,877	-7.9%	-94.4%	82%
14	80,540	-7.3%	-94.8%	84%
15	75,066	-6.8%	-95.2%	85%
16	70,288	-6.4%	-95.5%	86%
17	66,082	-6.0%	-95.7%	88%
18	62,350	-5.6%	-96.0%	89%
19	59,018	-5.3%	-96.2%	90%
20	56,024	-5.1%	-96.4%	91%
21	53,319	-4.8%	-96.6%	92%
22	50,863	-4.6%	-96.7%	93%
23	48,623	-4.4%	-96.9%	94%
24	46,573	-4.2%	-97.0%	95%
25	44,688	-4.0%	-97.1%	96%
26	42,950	-3.9%	-97.2%	97%
27	41,342	-3.7%	-97.3%	98%
28	39,850	-3.6%	-97.4%	99%
29	38,462	-3.5%	-97.5%	99%
30	37,168	-3.4%	-97.6%	100%

Valuation Spreadsheet
3 year delay, $2.65/mcf dry gas

Year	Gross	Royalty Revenue Stream	Free Gas Revenue Stream	Annual Cost	Working Interest	PV Royalty Interests	PV Free Gas	PV Working
2017				$3,695,000	($3,695,000)	$0	$0	($2,918,235)
2018	$4,115,450	$514,431	$0	$1,825,000	$1,776,019	$334,355	$0	$1,276,308
2019	$1,710,442	$213,805	$0	$10,000	$1,486,637	$122,867	$0	$972,110
2020	$1,079,562	$134,945	$0	$10,000	$934,617	$68,567	$0	$556,091
2021	$788,669	$98,584	$0	$10,000	$680,085	$44,289	$0	$368,195
2022	$621,266	$77,658	$0	$10,000	$533,608	$30,847	$0	$262,869
2023	$512,486	$64,061	$0	$10,000	$438,425	$22,499	$0	$196,524
2024	$436,123	$54,515	$0	$10,000	$371,608	$16,929	$0	$151,568
2025	$379,566	$47,446	$0	$10,000	$322,120	$13,027	$0	$119,548
2026	$335,994	$41,999	$0	$10,000	$283,994	$10,196	$0	$95,904
2027	$301,395	$37,674	$0	$10,000	$253,721	$8,087	$0	$77,962
2028	$273,257	$34,157	$0	$10,000	$229,100	$6,482	$0	$64,055
2029	$249,924	$31,240	$0	$10,000	$208,683	$5,242	$0	$53,091
2030	$230,262	$28,783	$0	$10,000	$191,479	$4,270	$0	$44,326
2031	$213,468	$26,684	$0	$10,000	$176,785	$3,500	$0	$37,238
2032	$198,958	$24,870	$0	$10,000	$164,088	$2,885	$0	$31,450
1st 15 Years	**$11,446,821**	**$1,430,853**	**$0**	**$5,660,000**	**$4,355,968**	**$694,042**	**$0**	**$1,389,004**

Case in Point
Two Views: IRS/Taxpayer

- Estate: Surface and subsurface, less timber

- Date of Transaction:
  - Completed: March 2008
  - Recorded: June 2008

- Size (multiple adjacent tracts):
  - Surface: 9,000
  - Sub surface: 7,500

- Title Issues: some prior old prior claims on Oil and gas (up to 50% on some oil and gas)

- Value Issues: Fee Estate
  - Surface, less timber
    - Subject to wind farm lease
  - Subsurface subject to potential oil and gas lease
    - leased after transaction before recordation
    - No wells, no permits by recordation date

- IRS: Valuation: $28,000,000 to $42,000,000

Case in Point
Two Views: IRS/Taxpayer

- **IRS Value: $28,000,000 to $42,000,000 based on sum of:**

- Land Values
  - Comp Sales

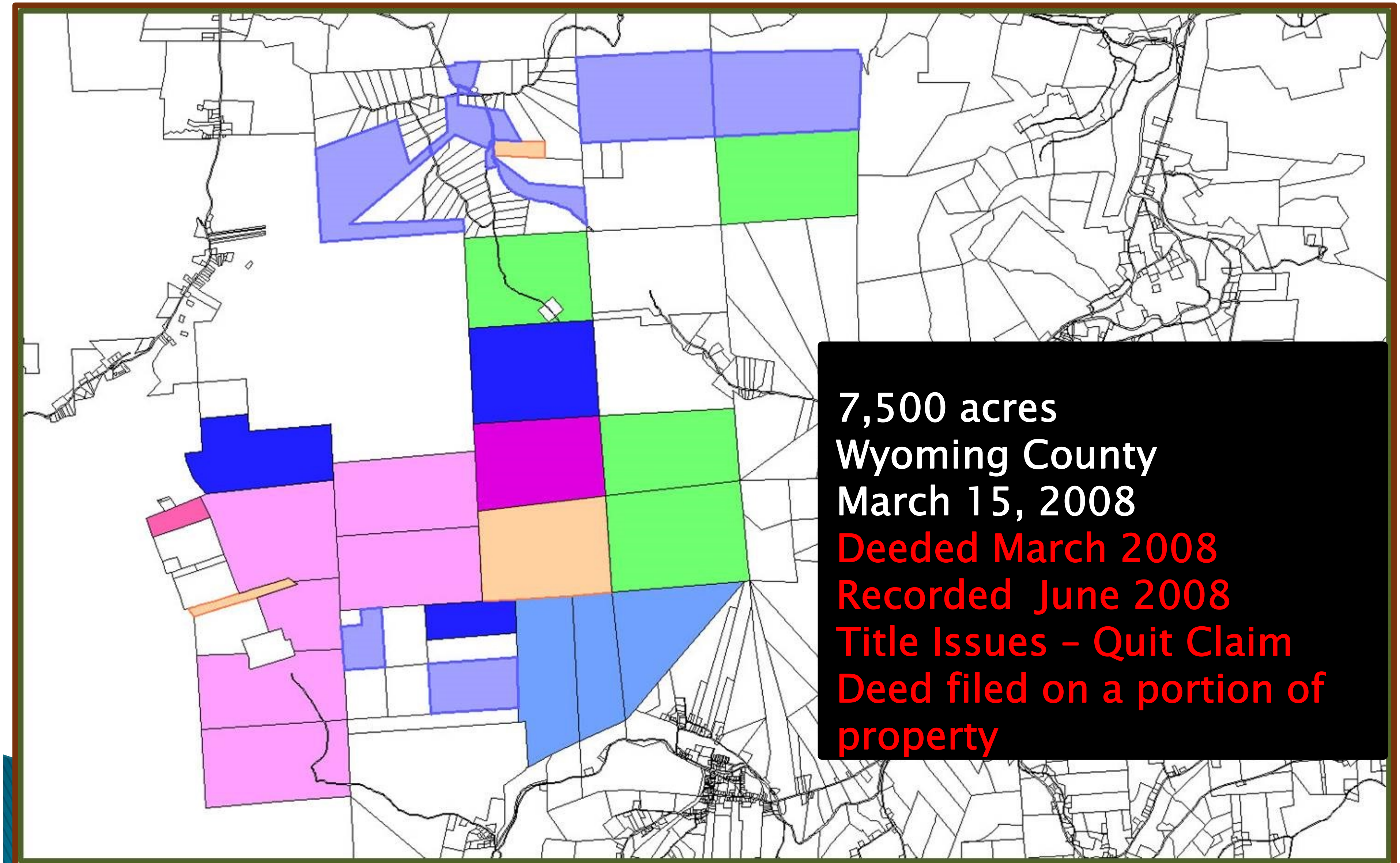
Plus

- Present worth of Wind farm lease payments
  - Signing lease and future rents/royalties

Plus

- Gas Value
  - Lease Bonus Values
    - (County search after transaction before recordation)
  - Present worth of potential gas royalty income
    - established leases, assumed full development

Subject Property



7,500 acres
Wyoming County
March 15, 2008
Deeded March 2008
Recorded June 2008
Title Issues – Quit Claim Deed filed on a portion of property

Case in Point
Two Views: Gas Estate

IRS

- Used High Values
  - Bonus $2,000/acre
  - Royalty value at 20%
  - **Countywide** pattern of leases increases
- Assumed large property could demand favorable terms
- Assumed full development
  - Entire property drilled +-80 wells
  - full production within 5 +- years
- Valued at:
  - $2,800 per acre
  - $21,000,000

RTC View

- Unlikely to be leased at high value
  - Bonus at $500/acre
  - Royalty at 12.5%
  - Local pattern of leases 6 months prior to transaction
- No bargaining power related to size without consideration of location
- Unlikely to be developed soon
  - Only minimal well drilled to hold lease
  - Unlikely to ever see full production
- Value at:
  - $610/acre
  - $4,575,000

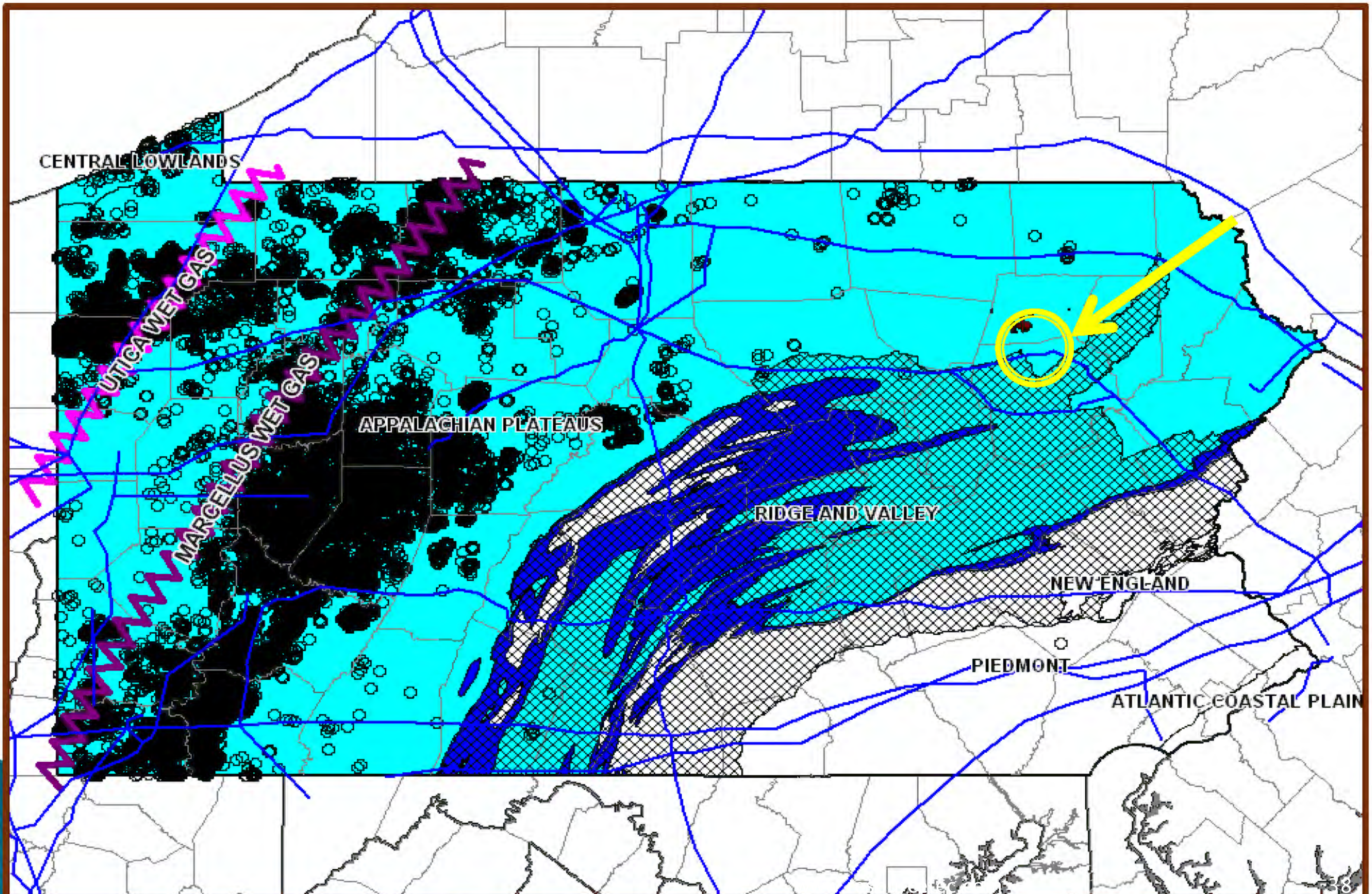
Appraisal Assignment
Retrospective Appraisal: Oil/Gas

- **7,500 acres (not leased at date of transaction)**
- **Located:**
  - **South-central part of Wyoming County, northeastern Pennsylvania**
  - **Within 20 miles of southern Marcellus crop**
- **Regional Production**
  - **No drilling or production within 10 miles prior to 2008**
  - **Successful drilling to the north**
- **Closest pipeline 30 miles north and 15 miles south**
- **Lease activity:**
  - **High Bonus amounts in county to the north**
  - **Non-existent in county to the south**
- **Informal negotiation was going on between transaction date and recording date at a reported $1,500 per acre bonus**
- **Lease survey:**
  - **Sources:**
    - **50+- leases in county, court house, door to door, and phone calls**
    - **Semi-monthly lease reporter**
    - **Other clients**
  - **Results**
    - **$50 to $3,000 per acre bonus, depending on date and location**
    - **12.5% to 20% royalty, , depending on date and location**

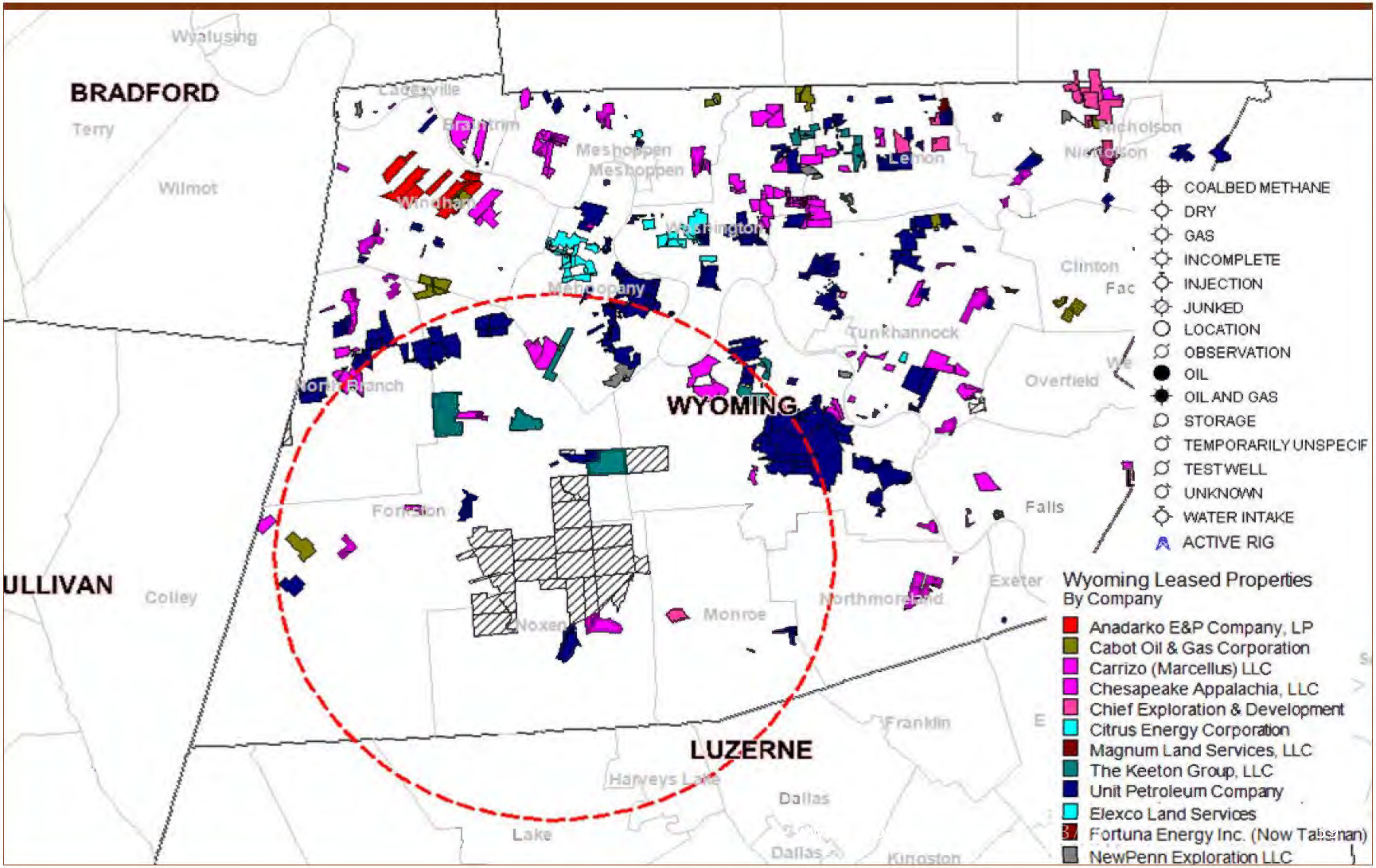
Valuation Factors

- **Likelihood of development**
  - Absorption (Development Schedule)
    - Acres of resource
    - Acres of subject property
    - Market for gas (Supply/Demand)
    - Access to market/proximity to pipelines
    - Active rigs
  - Lease Control/Ownership
    - Third party lease
    - Active company
    - Pooling practice
- **Reserve Type**
  - Proven
  - Probable
  - Possible/Speculative
- **Volumetric Adjustments**
  - Typical well
    - Nearby well performance
    - Wet vs. dry
  - Property utilization)
- **Market**
  - Price
  - Consumption
  - Timing
  - Accessibility to market
  - Pipelines
  - Capital investments
    - Plants
    - Compressors
- **Capital Investment**
- **Cost to Produce**
  - Acquisition
  - Development
  - Operating/Process
  - Sales
- **Discount Rate**
  - Producer (Lessee) vs.
  - Land Owner (Lessor)

All Producing Wells Through Dec. 2007



Leasing Activity ~ Early 2008



Wyoming Leases Prior to Sale

Exhibit 14: Summary of Lease Data

	Company	Township	Acreage	Royalty	Term (Yr.)	Extension Payment/ac (+5 yrs.)
7/3/2007	Magnum Land Services	Forkston/Exeter	145.03	0.125	5	75
9/22/2009	Magnum Land Services	Forkston	276.00	0.125	5	275
10/11/2007	Magnum Land Services	Forkston	82.87	0.125	5	150
11/20/2007	Chesapeake	Forkston	40.00	0.125	10	–
12/12/2007	Chesapeake	Forkston	94.00	0.125	10	–
12/14/2007	Chesapeake	Forkston	113.00	0.125	10	–
7/6/2007	Magnum Land Services	Eaton/Tunkhannock	503.26	0.125	5	75
8/2/2007	Magnum Land Services	Eaton/Tunkhannock	619.00	0.125	5	75
12/12/2007	Magnum Land Services	Eaton	108.00	0.125	5	275
12/13/2007	Magnum Land Services	Eaton	192.50	0.125	5	275
8/27/2007	Chesapeake	North Branch	85.00	0.125	10	–
10/22/2007	Magnum Land Services	Tunkhannock	221.00	0.125	5	150
11/6/2007	Magnum Land Services	Tunkhannock/Washington	113.80	0.125	5	275
11/7/2007	Magnum Land Services	Tunkhannock	25.38	0.125	5	175
11/18/2007	Magnum Land Services	Tunkhannock	97.10	0.125	5	175
9/6/2007	Magnum Land Services	Mehoopany	40.00	0.125	5	125
9/7/2007	Chesapeake	Windham	10.86	0.125	10	–
9/27/2007	Magnum Land Services	Clinton	42.38	0.125	5	125
10/2/2007	Chesapeake	Meshoppen	89.47	0.125	10	–
11/18/2007	Magnum Land Services	Nicholson	41.05	0.125	5	175
3/7/2008	Chesapeake	Lemon/Washington	180.00	0.15	7	–
3/7/2008	Chesapeake	Lemon	61.00	0.15	7	–
3/10/2008	Chesapeake	Nicholson	75.47	0.15	7	–
3/11/2008	Chesapeake	Nicholson/Lemon	66.68	0.15	5	–
4/18/2008	Chesapeake	Lemon	22.09	0.15	5	–
4/24/2008	Chesapeake	Lemon	25.23	0.15	5	–

Marcellus Permit Activity by County

(cumulative)

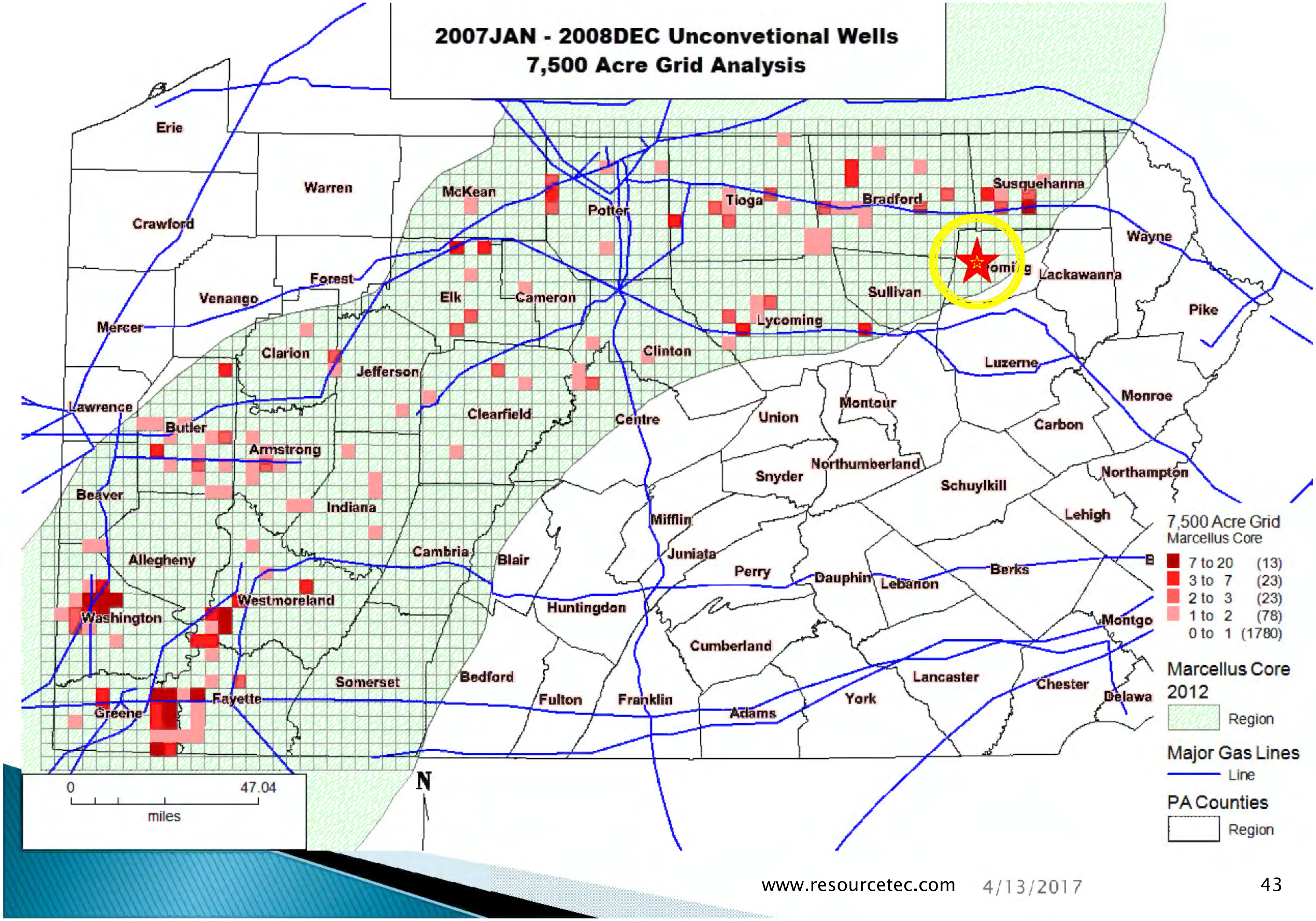
Table 3.4-2 Active Companies: 2006 Through January 31, 2010

Company	Bradford	Lackawanna	Lycoming	Sullivan	Susquehanna	Tioga	Wayne	Wyoming
Allegheny Gas Company	0	0	0	0	0	1	0	0
Alta Opr Co	0	0	0	0	16	0	0	0
Anadarko E&P	0	0	26	0	0	0	0	0
Cabot Oil & Gas	0	0	0	0	138	0	0	0
Central New York Oil & Gas Co	5	0	0	0	0	0	0	0
Chesapeake Appalachia	273	0	1	1	44	0	1	3
Chief Oil & Gas	14	0	29	0	8	0	0	1
Citrus Energy Corp	0	0	0	0	0	0	0	9
Dominion Trans	0	0	0	0	0	8	0	0
East Resources	5	0	14	0	0	221	0	0
Enervest Opr	1	0	0	0	0	0	0	0
EOG Resources	26	0	0	0	0	0	0	0
EXCO North Coast Energy	0	28	6	0	6	0	0	0
Fortuna Energy	197	0	0	0	0	64	0	0
Novus Operating	0	0	0	0	0	8	0	0
PA Gen Energy Co	0	0	16	0	0	0	0	0
Penn Virginia Oil & Gas	0	0	0	0	0	1	0	0
Pennswood Oil & Gas	0	0	0	0	0	0	2	0
Range Resources Appalachia	5	0	88	0	0	0	0	0
Rice Drilling	0	0	4	0	0	0	0	0
Schrader	0	0	0	0	0	0	1	0
Seneca Resources	0	0	2	0	0	31	0	0
Southwestern Energy Production	10	0	5	0	4	0	0	0
Stone Energy	0	0	0	0	3	0	2	0
Turm Oil, Inc.	0	0	0	0	30	0	0	0
Ultra Resources	0	0	0	0	0	53	0	0
VAVCO	10	0	0	0	0	0	0	0
Victory Energy	0	0	0	0	0	2	0	0
XTO Energy	0	0	12	0	0	0	0	0
Total Permitted Sites	546	28	203	1	249	389	6	13
Total Active Rigs - Feb. 1, 2010	16	0	5	0	14	8	0	0

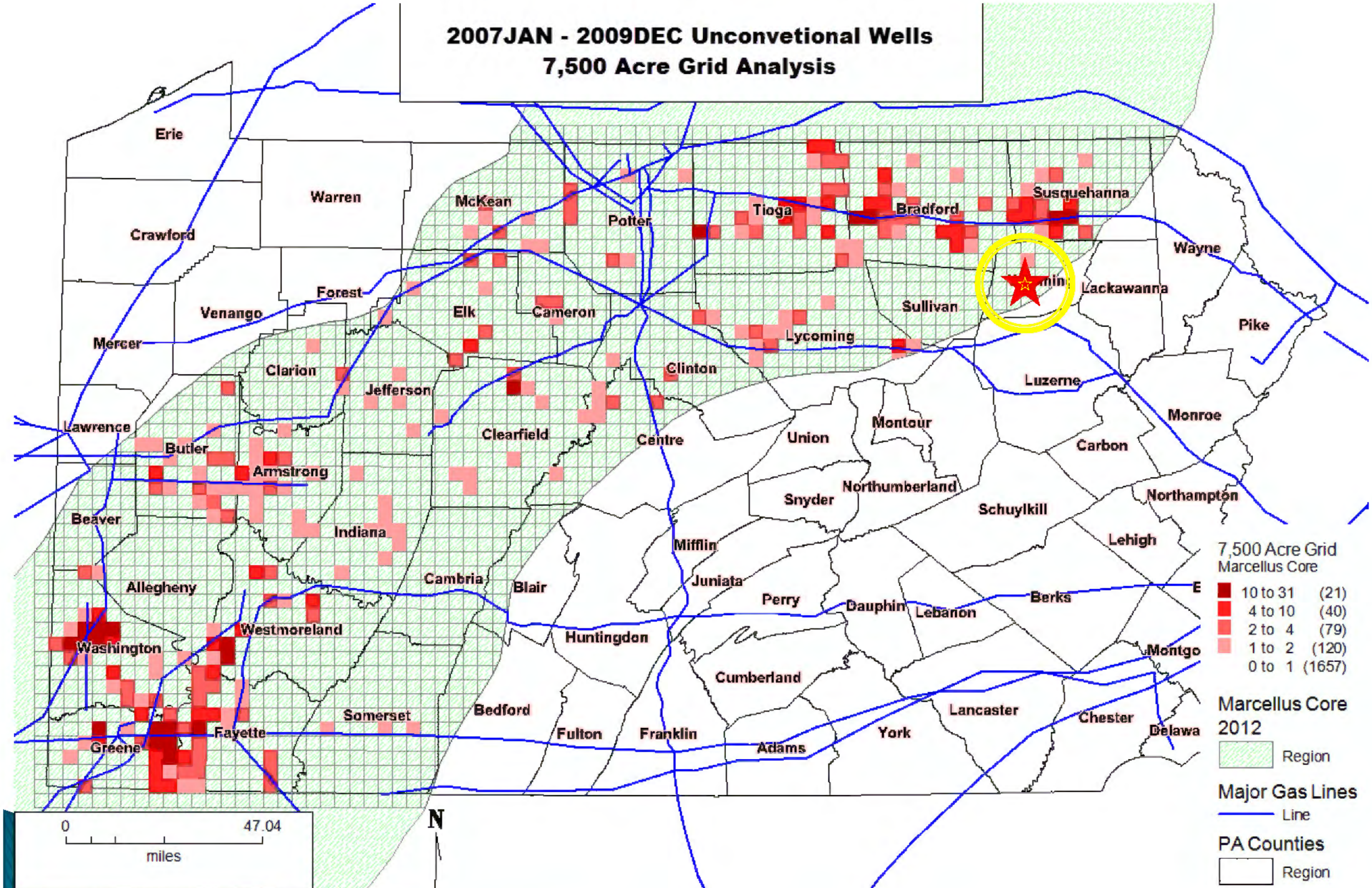
Regional Activity

COUNTY	AC. PRIME MARCELLUS	MAX WELLS @ 80 ACRES	No. OF RIGS JAN	MAX No. of RIGS	12 WELLS/ YEAR/Rig	AC. DRILLED/ YR AT AC SPACING	% OF CTY DRILLED ANNUALY	YRS TO DRILL COUNTY
PENNSYLVANIA								
BRADFORD	743,258	9,291	13	15	180	14,400	1.94%	52
CENTRE	285,379	3,567	2	3	36	2,880	1.01%	99
CLINTON	343,103	4,289	1	2	24	1,920	0.56%	179
LACKAWANNA	297,684	3,721	0	2	24	1,920	0.64%	155
LYCOMING	557,437	6,968	4	5	60	4,800	0.86%	116
LUZERNE	174,002	2,175	4	5	60	4,800	2.76%	36
POTTER	692,659	8,658	1	2	24	1,920	0.28%	361
SULLIVAN	289,441	3,618	0	2	24	1,920	0.66%	151
SUSQUEHANNA	532,836	6,660	15	15	180	14,400	2.70%	37
TIOGA	727,840	9,098	6	8	96	7,680	1.06%	95
WAYNE	288,318	3,604	0	2	24	1,920	0.67%	150
WYOMING	259,270	3,241	1	2	24	1,920	0.74%	135
	5,191,227	64,890	47	63	756	60,480	1.17%	86

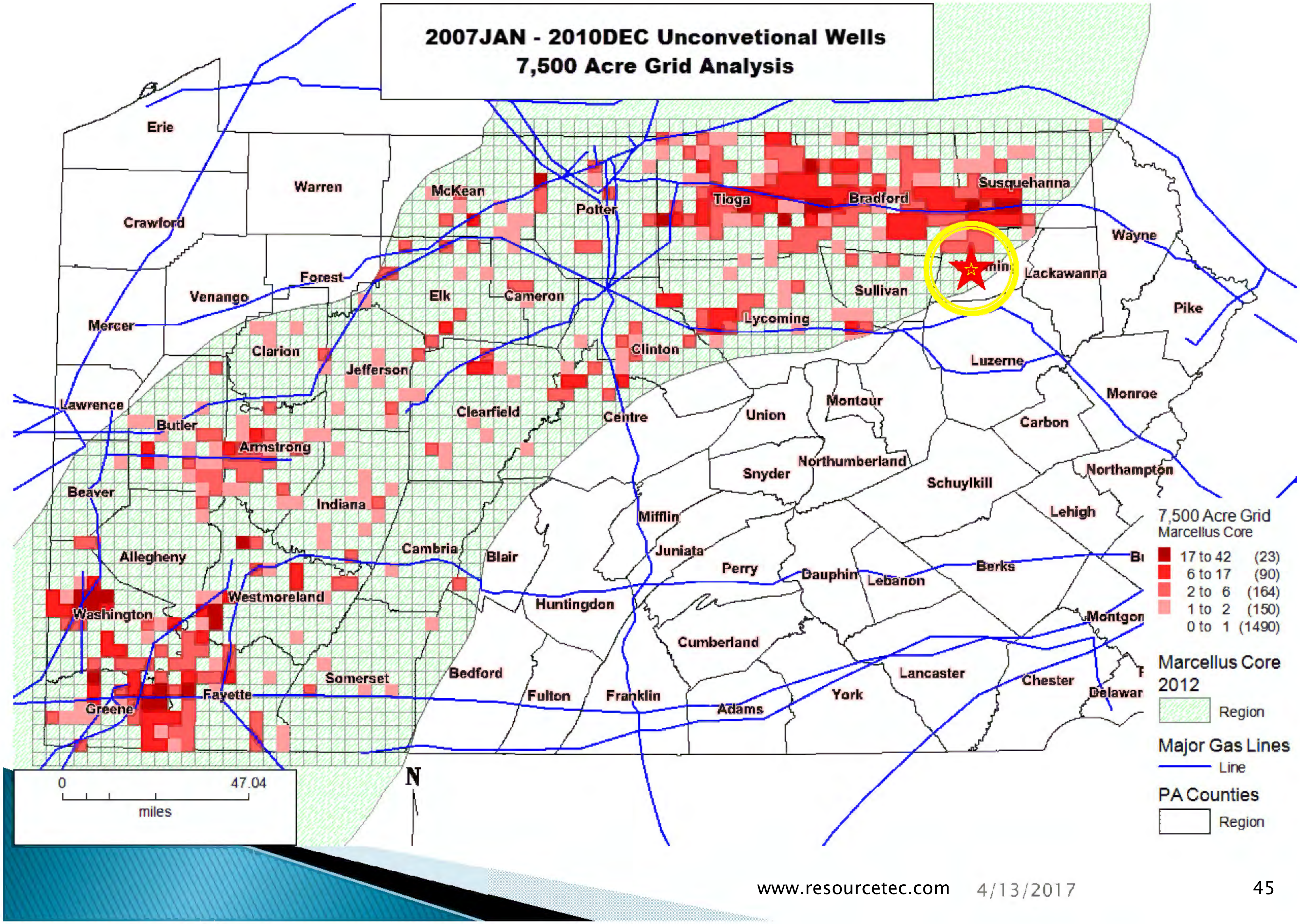
Development of a 7,500 acre area across Pennsylvania



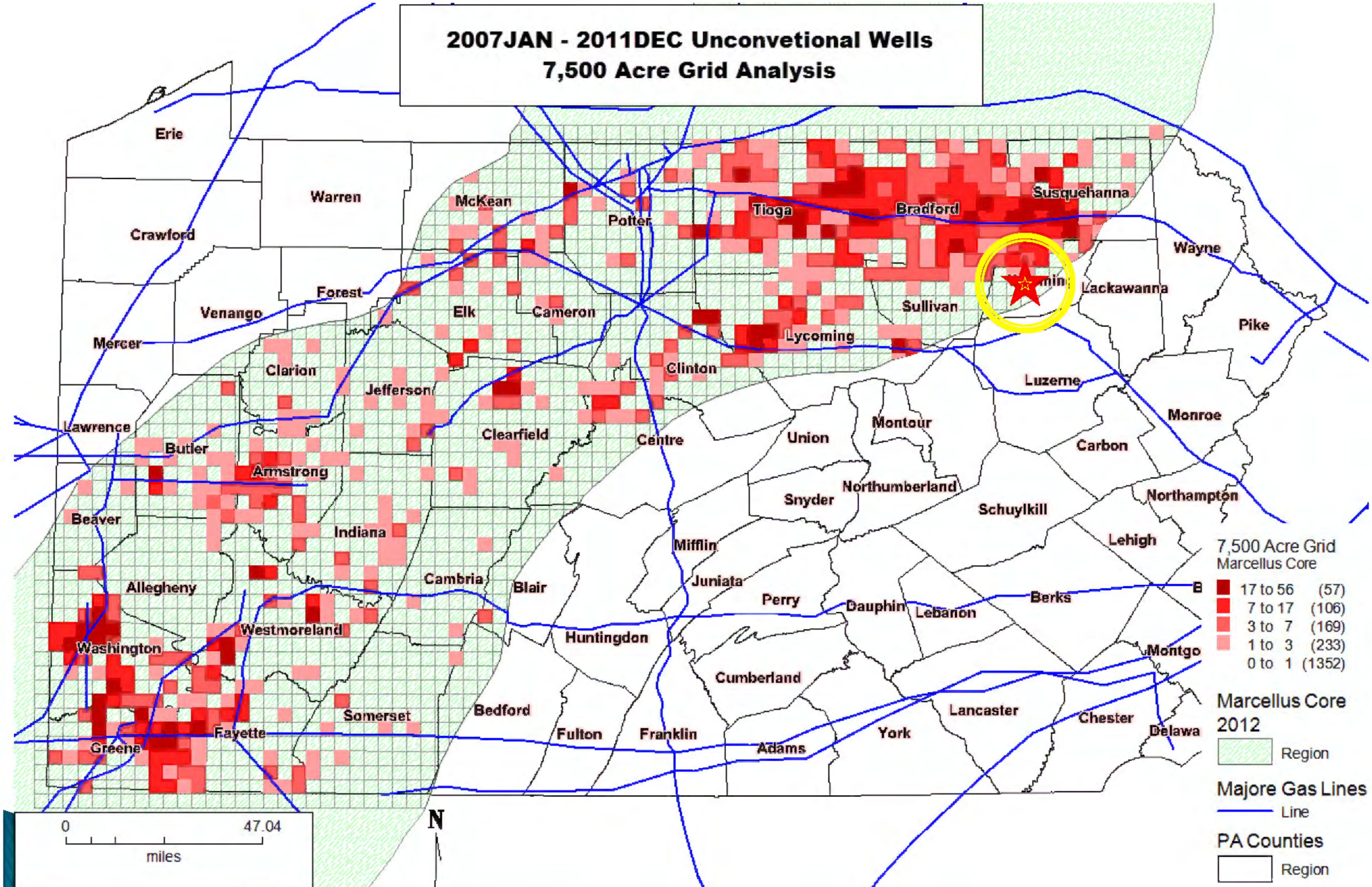
Development of a 7,500 acre area across Pennsylvania



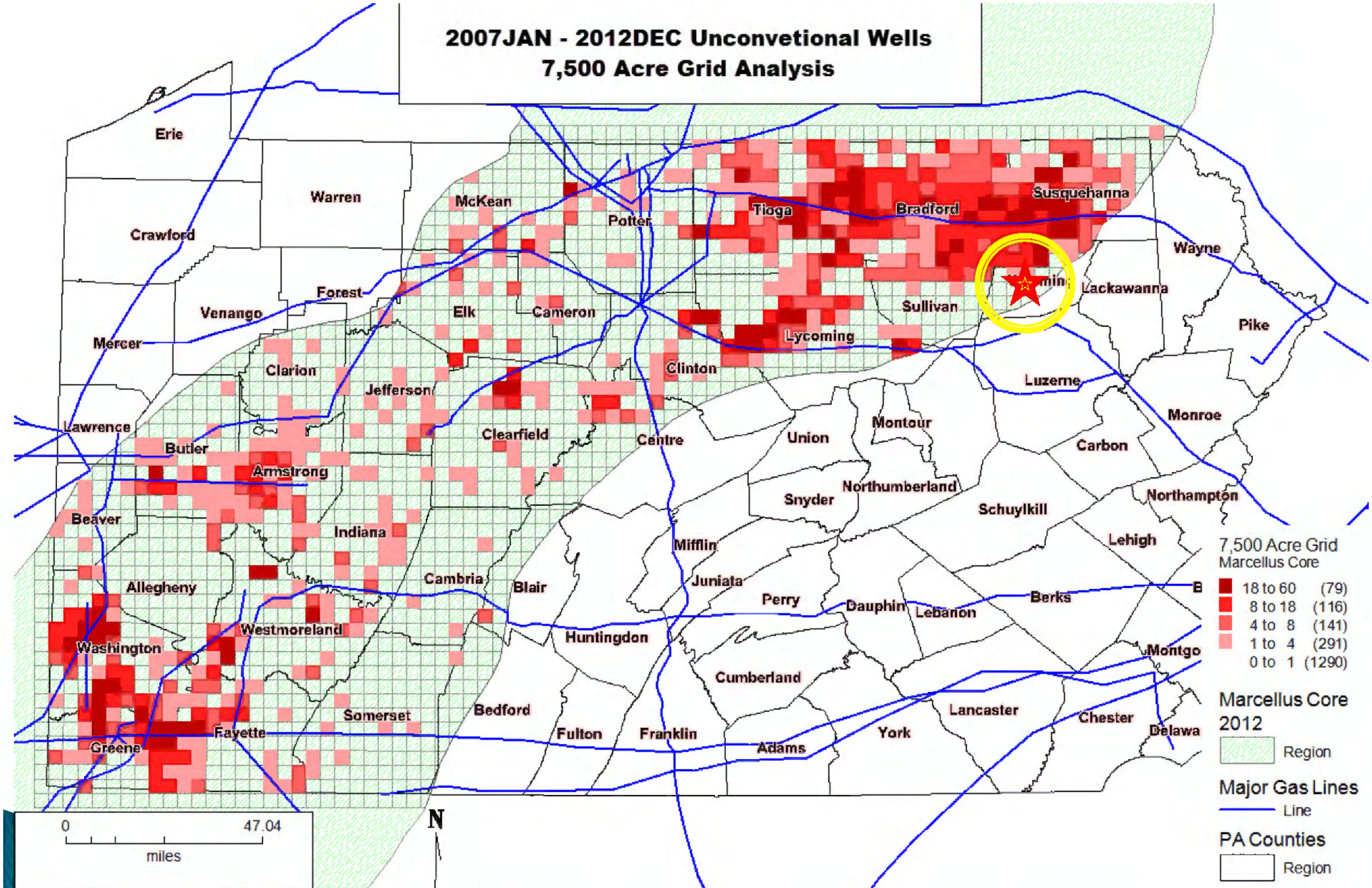
Development of a 7,500 acre area across Pennsylvania



Development of a 7,500 acre area across Pennsylvania



Development of a 7,500 Acre Area Across Pennsylvania



Subsequent Facts 2012

- South of property:
  - Three nearby wells drilled on leases to the south have been abandoned
  - No new leases signed south of property since 2010
- North of property
  - Wells 10 to 20 miles north of property have been successfully drilled
  - lease bonus value continued to climb through 2010
- No additional drilling on or near property since 2008

Case in Point
Two Views: Gas Estate

Value at +- $12,000,000

- Bonus at $1400/acre
  - Based of Recordation
  - Local pattern of leases following transaction and before recording date
  - Effected by cloud on title (50%)
- Perspective Income at $1,500,000
  - Based on unlikely to be developed soon
  - Only minimal well drilled to hold lease
  - High discount rate
  - Unlikely to ever see full production

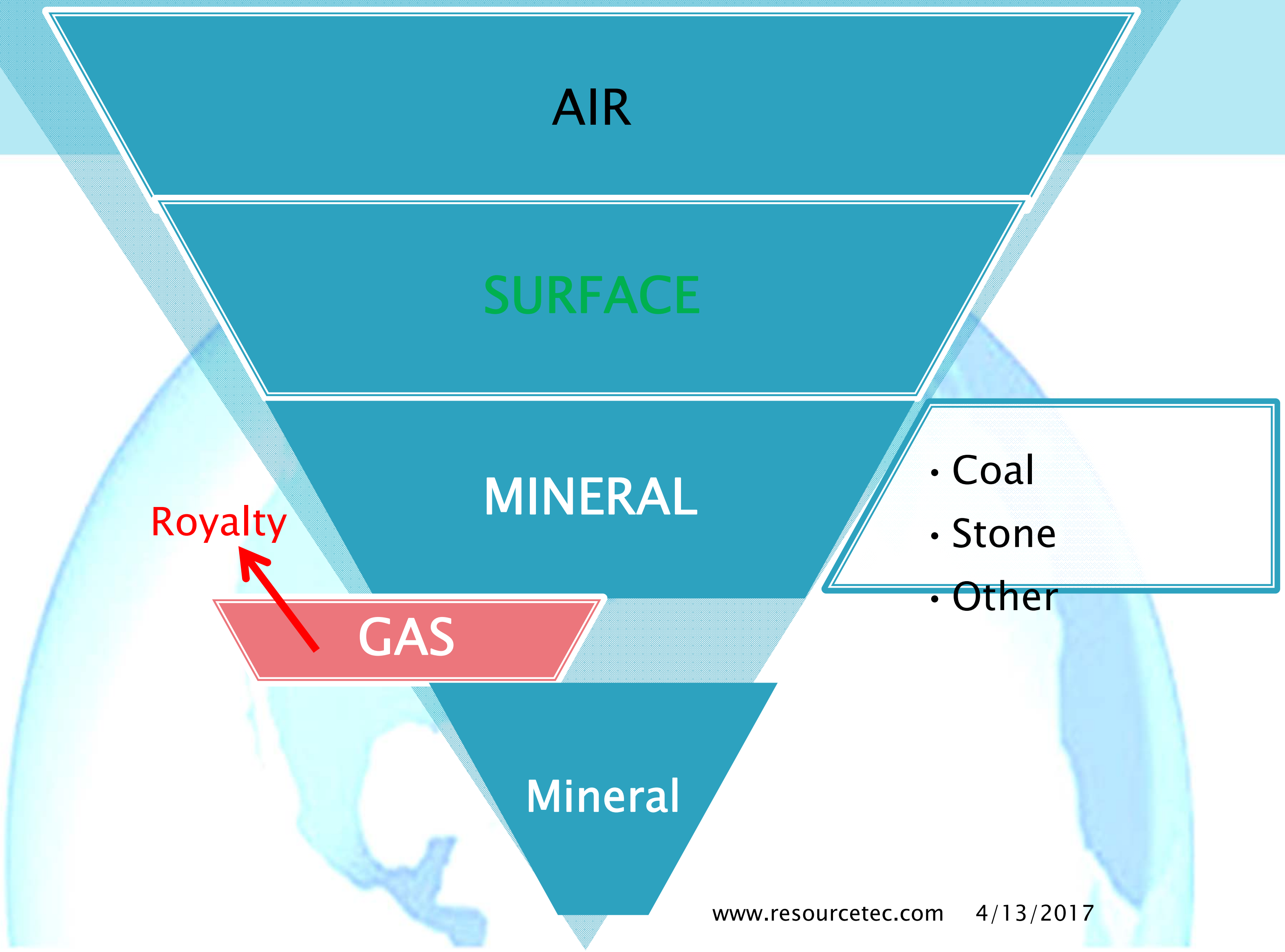
Lessons Learned

- Dates Matter:
  - Gas Lease signed after transaction before recording
  - Comparable “Sales” of contemporaneous date
  - Geology must be considered
- Likelihood of Development Matters
  - Rate of absorption or development is important
  - Discount rates should match risk and circumstances
- Adjustments for reality:
  - Gas lease subsequently found defective because of title issues – discounted heavily

Valuation Factors

- **Likelihood of development**
  - Absorption (Development Schedule)
    - Acres of resource
    - Acres of subject property
    - Market for gas (Supply/Demand)
    - Access to market/proximity to pipelines
    - Active rigs
  - Lease Control/Ownership
    - Third party lease
    - Active company
    - Pooling practice
- **Reserve Type**
  - Proven
  - Probable
  - Possible/Speculative
- **Volumetric Adjustments**
  - Typical well
    - Nearby well performance
    - Wet vs. dry
  - Property utilization)
- **Market**
  - Price
  - Consumption
  - Timing
  - Accessibility to market
  - Pipelines
  - Capital investments
    - Plants
    - Compressors
- **Capital Investment**
- **Cost to Produce**
  - Acquisition
  - Development
  - Operating/Process
  - Sales
- **Discount Rate**
  - Producer (Lessee) vs.
  - Land Owner (Lessor)

FEE -less Oil and Gas



Title Issues
Who owns it?

- Old severance
  - Mineral = all minerals
  - Mineral ≠ oil and gas
  - Old mineral deeds may or may not be recorded (may only be noted as reservations from the fee)
- Divided ownership
  - Heirs and assigns
- Multiple seams / multiple zones
- Old reversions / leases / transfers
- Tax and other quit claim deeds in the past
- Gas Storage rights – precedent ?

Is gas a mineral? Yes / No

Early Pennsylvania case said no!

- Pennsylvania Supreme Court (1882,Dunham and Shortt v. Kirkpatrick) decided that reserving “all the minerals” did **not** include oil and gas,
  - Oil and gas, while minerals, were not regarded as such by most (many) sellers/buyers
  - The intention to reserve oil and gas.
  - For the most part, the Pennsylvania courts have tended to uphold this finding since then, though they are definitely in the minority.

- However, later Pennsylvania cases do classify natural gas as a mineral.
  - In a taxation case, the Pennsylvania Supreme Court (1910) found that the taxation of mineral estates including oil and gas was “well settled” (Rockwell vs. Warren County):
    - “The question involved here is whether the oil, gas and minerals reserved from the grant of the surface of several tracts of unseated land and now in separate ownership can be taxed as real estate.
    - Mere license to mine coal or to drill for oil and gas, unaccompanied by the right of ownership in the <u>minerals</u>, does <u>not</u> constitute an estate in land.
    - O**il, gas, and coal are minerals** when the title to the same is severed from the owner of the surface and is vested in a separate owner
      - an estate in land is thus created
      - if it be of any value, may be taxed.

Gas is or isn't a Mineral

- Pa Com. Pl. 1938: An oil and gas lease, granting the right to take minerals that are exclusive and unlimited in quantity and purpose, is a sale in place. The grantee is vested with a freehold estate in minerals (Brown v. Thompson, 86 P.L.J. 497, I Fay L.J. 178).

- Pa Super. 1975: A lease agreement granting to the lessee the exclusive right to remove all oil and gas on the premises for a term of one year "and as long thereafter as oil or gas is found" results in a separate mineral estate being created. (21 P.S. § 2 see also Baird's Appeal, 132 PA Super. 573, 1 A.2d 485).

- Pa. Com. Pl. 1940: Where a lease gives the right to mine and operate for oil and gas for a definite period and to continue as long as oil and gas should be produced, the lessee acquires an interest in the gas as real estate (Bickerton v. Vaughn, 38 D. & C. 645, 88 P.L.J. 393, # Fay. L.J. 105).

- Section §5020-419 of the PA Assessment Code, the legislature specifically reminded the local assessors to not reduce the assessed value of minerals including oil and gas when reducing forest land values:
  - " All surface land which has, since the fifth day of June 1913, been classified and set apart as auxiliary forest reserves, in the manner provided by law.... be rated in value for the purpose of taxation, not in excess of one dollar .... **Provided, however, that if the said surface land be underlain by coal, iron ore, oil, gas, or other valuable minerals, said minerals may be assessed separately.**"

Types of Estates

- Real estate can be divided into three separate and distinct estates: the surface estate, the mineral rights estate, and the support estate.
- All three estates can be consolidated under one owner or can be severed and held by different owners.
- Oil and natural gas interests are derived from ownership of or rights to subsurface minerals of the mineral rights estate.

Oil and Gas Leases

- Oil and gas companies typically acquire the right to extract and produce subsurface oil and gas through a lease arrangement whereby the lessee is granted what is known as a "working interest" in the oil or gas.
- Under an oil or gas lease, the lessor reserves an interest in the minerals extracted and produced, called a royalty.
- A royalty is a right to a share of the mineral production or income from the mineral production
- The lessor's reservation of a royalty under an oil and gas lease creates an estate in land and not a personal property interest.
- An overriding royalty is also an interest in land and not a personal property interest.
- The royalty payment itself, whether in cash or in-kind, is personal property.

Severed Mineral (Oil and Gas)

The lease creates a fee simple interest (working interest) in the Oil and Gas.

- Pa Com. Pl. 1938 (Brown v. Thompson, 86 P.L.J. 497, I Fay L.J. 178)
- Pa Super. 1975 (21 P.S. § 2 see also Baird's Appeal, 132 PA Super. 573, 1 A.2d 485)
- Pa. Super. 224 (Pennsylvania Bank and Trust Co., Youngville Branch v. Dickey, 355 A. 2d 483, 232 Pa. Super. 224)
- Pa. Com. Pl. 1940 (Bickerton v. Vaughn, 38 D. & C. 645, 88 P.L.J. 393, # Fay. L.J. 105)

Who owns the Gas?

- The leasehold interest is:
  - "working interest" or "operating interest,"
  - conveys a fee simple determinable from the lessor (landowner) to the lessee.
    - Subject to conditions
    - Revocable ownership.

- Chesapeake as an example:
  - "As part of the mineral-leasing process, Chesapeake takes ownership of a percentage of the mineral rights.
  - As the owner, Chesapeake has the legal right to mortgage its leased interest in the minerals.
  - Because Chesapeake cannot mortgage any property interest other than what it already owns, this action should have no effect on any other property owner's ability to act on their own property interests ."[1]

1: Brian Grove, senior director for corporate development at Chesapeake Energy

Creation of an Oil and Gas Estate

PA Supreme Court (1910) found that the taxation of mineral estates including oil and gas was "well settled" (Rockwell vs. Warren County; 228 Pa. 430; 77 A. 665; 1910 Pa. LEXIS 502):

- It should always be borne in mind that real estate is the thing being dealt with, that oil and gas are considered real estate, and if there be no oil and gas there is no real estate.

- A mere naked reservation of oil and gas in a deed without any other facts to base a valuation upon is not sufficient to warrant the assessment of taxes.

- Development in the neighborhood, sales of oil or gas lands in close enough proximity to add value, or any other element of value which may form a basis of valuation may be taken into consideration by the assessor or other taxing authorities.

Ohio: Oil and Gas Estate

Ohio courts have been inconsistent concerning lessee's interest in the oil and gas pursuant to a lease:

- Ohio Supreme Court has held that:
  - "oil and gas in place are the same as any part of the realty, and capable of separate reservation or conveyance." (Pure Oil Co. v. Kindall, 156 N.E. 119, 123 (Ohio 1927).
  - A lessee acquires a "vested, though limited, estate in the lands for the purposes named in the lease" as soon as the lessee takes possession, commences operations, drills wells, and produces oil. (48 N.E. 502, 506 (Ohio 1897))

OR

- Ohio case law also suggest that:
  - Oil or gas belongs to no one until reduced to possession. (Back v. Ohio Fuel Gas Co., 113 N.E.2d 865, 869 (Ohio 1953))
  - The lessee's interest in an oil and gas lease is merely a license to explore with no interest in the oil and gas until reduced to possession. When that occurs, the lessee acquires an interest in the oil and gas as personalty, not realty.

Taxable for transfer

- Taxable documents are those that transfer interests in a mineral rights estate itself or interest in real estate.
- Note: Because an overriding royalty is an interest in real property, a document that conveys an overriding royalty is subject to tax.
- Documents that transfer personal property rights associated with the mineral rights estate are not taxable. For example, the assignment of the right to receive income from an oil or gas lease, payment, would not be taxable.
- However, because the reservation of a royalty creates an interest in real estate, if the royalty itself (that is, if the reservation of the interest to the oil and gas production reserved by the lessor) is conveyed, the document of conveyance is subject to Realty Transfer Tax.

Appraisal

- The taxable value of mineral rights is determined in the same manner as any other real estate interest. For Realty Transfer Tax purposes, taxable value is the actual monetary worth of the real estate determined either by a *bona fide* sale or, if the conveyance is for no or nominal consideration, computed value.

- In the event that there is no sale and no computed value, then the taxable value is the real estate's actual monetary worth. 72 P.S. § 8101-C (definition of "value"). Pennsylvania Department of Revenue ("department") regulations provide that actual monetary worth is to be determined by appraisal when the real estate is not subject to a *bona fide* sale or does not have a computed value. 61 Pa. Code § 91.136.

- In addition to an appraisal, the department may in its discretion accept other credible evidence of the value of mineral rights such as comparable sales. Also see *Inheritance Tax Bulletin 2012-01* for additional acceptable valuation methods for natural gas rights when there is no sale price, appraisal or other credible evidence.

- It is the taxpayer's burden to provide the true, full and complete value of real estate, including the value of mineral rights. 72 P.S. § 8109-C.

Questions

RESOURCE TECHNOLOGIES CORPORATION
248 E Calder Way, Suite 305,State College, PA 16801 814-237-4009 f: 237-1769
PO Box 242, State College, PA 16804 www.resourcetec.com

Report on the Mass Appraisal of Buchanan County, Virginia Mineral Properties for 2013 Reassessment

Prepared For: Ruth Horn, Commissioner of Revenue
Craig Horn, County Administrator
County of Buchanan
Post Office Drawer 950
Grundy, Virginia 24614

Prepared By: Jeffrey R. Kern, ASA
David M. Falkenstern
Resource Technologies Corporation
Post Office Box 242
State College, Pennsylvania 16804

Report Date: March 22, 2013

TABLE OF CONTENTS

1.0 DESCRIPTIONS, ANALYSES, AND CONCLUSIONS

1.1 Introduction

Resource Technologies Corporation (RTC) conducted a countywide reassessment of coal estates in Buchanan County, Virginia. This report is intended to describe the mass-appraisal process and show the overall value of the mineral estates. The value of each individual account will be delivered to the mineral owners as maintained in the County's database.

The County levies a property tax on the value of in-place coal (coal still in the ground). In-place coal is considered a property estate and is subject to property taxation. The County divides in-place coal into three categories:

- Minerals Under Development (i.e. active coal operations)
- Reserve Mineable
- Reserve Unmineable.

After examining County data, RTC determined the prior assessment of active coal operations was below market value. In fact, the total value of active coal was just over a quarter of the reserve coal value. This is unrealistic, as active coal (coal that is being mined today within a legal permit) is always worth considerably more than reserve coal (coal that is not permitted but may be mined sometime in the future). There are several reasons for this discrepancy, which are explained later in this report and corrected in the 2013 reassessment process (See **Exhibit 1.1-1**). The goal of this reassessment is to base the coal value on active market factors, and better capture the value of all mineable coal within a mining project.

Exhibit 1.1-1 Reassessment Value Analysis

	Current Value	Reassessment Value	Difference
Under development	$101,350,000	$386,340,400	$284,990,400
Mineable Reserve	$220,334,600	$74,195,600	($146,139,000)
Unmineable Reserve	$28,142,700	$28,806,000	$663,300
Totals	$349,827,300	$460,536,000	$110,708,700

1.2 Purpose of the Reassessment

The purpose of this mass appraisal is to reassess the value of in-place coal contained in mineral parcels in Buchanan County, Virginia. The County is required to reassess every six years.

1.3 Users and Intended Use of the Appraisal

Buchanan County government and coal property owners in the County are the users of this report.

1.4 Definitions

The purpose of the appraisal drives the criteria considered by the appraiser in the valuation analysis. Clients often need appraisals to answer a variety of questions about the value of assets when they are subjected to different circumstances. RTC is frequently engaged to value assets assuming the conditions discussed in the following subsections. All values are subject to determination of the Highest and Best Use of the asset.

1.4.1 Market Value

According to USPAP: "Market value means the most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:

- buyer and seller are typically motivated;
- both parties are well informed or well advised and acting in what they consider their own best interests;
- a reasonable time is allowed for exposure in the open market;
- payment is made in terms of cash in U.S. dollars or in terms of financial arrangements comparable thereto; and
- the price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale."

For non-real estate, i.e., movable components of value (e.g., machinery and equipment), market value may be divided into market-value if sold and moved and/or market-value in place. Typically, real estate would be related to market value in-place.

1.4.2 Value In-Use/Value In-Exchange

Value in-use is typically defined as the value of an asset to the specific investor that currently owns and operates the asset at the present location. This value, by definition, incorporates the business and entrepreneurial profits and losses inherent to the present management. The value is more often considered in an investment analysis and may be only applicable to a single owner with a single set of financial circumstances.

Value in-exchange is typically defined as the value of the asset that can be transferred. Management and financial benefits are not easily transferred in most asset transactions – they may be transferred in 'stick' transactions that migrate ownership of an operating entity. Value in-exchange is that value that can be realistically transferred.

However, the notion of value in-exchange does not preclude the transfer of a property that may continue to be used as it has been used by a previous owner. The current use may be the Highest and Best Use of the property. The appraiser must be careful not to assume that management, financial factors, and specific elements such as economies of scale and assembly of components will continue.

1.4.3 Highest and Best Use

According to The Appraisal of Real Estate Thirteenth Edition (page 305), Highest and Best Use is: "the reasonably probable and legal use of vacant land or an improved property that is physically possible, legally permissible, appropriately supported, financially feasible, and that results in the highest value."[1] The following criteria are considered in estimating the Highest and Best Use of the subject:

- The use must be within the realm of probability; that is,
  - it must be likely
  - it must not be speculative or conjectural.
- The use must be legal
- There must be a demand for such use
- The use must be profitable
- The use must be such that it provides to the land, and the property as a whole, the highest net return.

Based on this, four stages of analysis are considered:

- Possible: Determine the physically possible use for the subject land.
- Permissible: Determine which uses are legally permitted for the land.
- Feasible: Determine which possible and permissible uses will produce a net return to the subject site.
- Profitable: Determine which uses will provide the highest (largest) return in terms of money to the owner of the property.

> "Fundamentally, the concept of highest and best use applies to land alone because the value of the improvements is considered to be the value they contribute to the land . . . The theoretical emphasis of highest and best use analysis is on the potential uses of the land as though vacant. In practice, though, the contribution of value of the existing improvements and any possible alteration of those improvements must be recognized so the highest and best use of the property as improved is equally important in developing an opinion of market value of the property."[2]

In 1934, the U.S. Supreme Court found that the Highest and Best Use is:

> "The highest and most profitable use for which the property is adaptable and needed or likely to be needed in the reasonably near future..."[3]

[1] The Appraisal of Real Estate, 13th Edition, Appraisal Institute, Chicago, Illinois, 2001, page 305.

[2] Ibid, page 306.

[3] Olson v. United States 292 U.S. 246, 255 (1934).

In short, depending upon market and site conditions, the Highest and Best Use of a property may be:

- The continuation of the existing use as currently improved -- market analysis shows that the existing use is the maximally productive, legal use to which the property is amenable as improved.

- The continuation of the existing use with new or no improvements – market analysis shows that the existing use is the maximally productive use, however, the existing improvements are inadequate requiring cure, demolition, or rebuild.

- The development of a new use that is better suited to existing market conditions. This may include maintenance of existing improvements, alteration of existing improvements, construction of new improvements, and/or demolition of existing improvements.

The Highest and Best Use must be firmly grounded in the reality of market conditions. While various "hypothetical uses" may be considered (and may indeed reflect the considerations of willing sellers and buyers), the hypothetical use does not represent the market value of the property. As an example, a farm field may have a "Highest and Best Use" as subdivided plots. It cannot be valued as though those plots exist. It can, if the current market (typical buyers and sellers in this neighborhood) looks to future development, however, be valued as though the land *could be altered* to include plots after needed improvement costs are taken into account. The market may show that land amenable to future legally permissible development may be more or less valuable than land not amenable to change in use. According to the Appraisal Institute:

> "The conclusion of highest and best use of a parcel should be as specific as the marketplace suggests. General categories such as 'an office building,' 'a commercial building,' or 'a single-family residence' may be adequate in some situations, but in others the particular use demanded by market participants must be specified, such as 'a suburban office building with 10 or more floors' or 'a 3-bedroom single family residence with at least 2,500 square feet."[4]

1.4.4 Reasonable Exposure Time

Reasonable exposure time, for this report, means: "The estimated length of time the property interest being appraised would have been offered on the market before the hypothetical consummation of a sale at market value on the effective date of the appraisal; a retrospective estimate based upon an analysis of past events assuming a competitive and open market."[5]

The concept of reasonable exposure encompasses not only adequate, sufficient, and reasonable time, but also adequate, sufficient, and reasonable effort. This idea also takes into consideration the type of property being appraised, supply/demand conditions as of the effective date of the appraisal, and the analysis of historical sales information (sold after exposure and after completion of negotiations between the seller and buyer).

[4] Appraisal Institute, page 310.

[5] Source: Uniform Standards of Professional Appraisal Practice, 2003 Edition, Washington, DC: The Appraisal Foundation (SMT-6).

The reasonable exposure period is, therefore, a function of price, time, and use, not an isolated estimate of time alone.

Reasonable exposure time is always presumed to precede the effective date of the appraisal and differs for various types of real estate and under various market conditions. Our estimate of exposure time is therefore based on the subject property's determined Highest and Best Use in a market where there is evidence of demand for use of the type of mineral resource being developed.

1.4.5 Marketing Time

Marketing time period, for the purpose of this report, is defined as: "An estimate of the amount of time it might take to sell a property interest in real estate at the estimated market value level during the period immediately after the effective date of an appraisal."[6]

The concept of marketing time encompasses other conditions that may affect the time to sell, such as the identifications of typical buyers and sellers for the type of real estate involved and typical equity investment levels and/or financing terms. The reasonable marketing time, therefore, is a function of price, time, use, and anticipated market conditions, such as changes in the cost and availability of funds, not an isolated estimate of time alone. Marketing time occurs after the effective date of the market value estimate and takes into consideration such brokerage functions as advertising, arranging the financing, and marketing the properties to particular investors. Estimates of marketing time are not predictions but, rather, only judgments made by the appraiser.

1.4.6 Methods of Appraisal

The comparative sales approach, the cost approach, and the income approach constitute the three methods used in estimating market value. As a basis for estimating value, a comparison and analysis of the property are made by as many of these approaches as available data allows. Estimates can be made under each of the approaches defined below:

- **Comparative Sale Approach** - Comparison with similar properties that either have sold or are currently offered in the market. This method is applied to establish the value of the land and can be used for improved properties with proper adjustments.

- **Cost Approach** - An estimate of the current replacement cost of the improvements, less accrued depreciation, plus the land value. Depreciation includes all loss in value of improvements due to physical deterioration and functional and economic obsolescence.

[6] Source: Uniform Standards of Professional Appraisal Practice, 2003 Edition, Washington, DC: The Appraisal Foundation (AO-7).

- **Income Approach** - Capitalization of the net income that the property can produce. This approach, of course, is applicable to properties exhibiting adaptability to other uses and consequently would be desirable on a lease or rental basis.

Depending upon circumstances and the scope of the assignment, one or more traditional approaches may not be appropriate or relevant to the assignment. In such cases, a particular approach should be considered but may be excluded from the report with explanatory comment by the appraiser.

1.4.7 Mass Appraisal

According to USPAP[7], the definition of mass appraisal is:

> ***Mass Appraisal**: the process of valuing a universe of properties as of a given date using standard methodology employing common data and allowing for statistical testing.*
>
> ***Mass Appraisal Model**: a mathematical expression of how supply and demand factors interact in a market.*

In the case of this reassessment, the mathematical model developed to determine the value of all in-place coal in the County is explained in the remainder of this report. The value is based on the capacity of the relevant market to absorb Buchanan County coal production. The mathematical model used is based on a royalty analysis of the entire County. The value was then distributed over the universe of coal properties based on the type of property (active or reserve).

1.5 Property Inspections

Maps, parcel information, financial data, and other materials concerning all active mining operations were requested in March 2012. The response to the request was mixed. Out of the 73 mines where requests were sent:

- 5 reported financial data (royalty, sale price, sale destinations)
- 1 delivered drill core information
- 1 reported data on reserve parcels
- 23 delivered permit maps and active parcel information (this information is delivered to the County every year).

The information that was received was reviewed and incorporated in the reassessment. In the absence of operator-provided information, RTC relied heavily upon the following:

- Reports filed with the Securities and Exchange Commission (SEC) by publically held Coal and Land Companies
- Detailed research of the Central Appalachia Coal Market
- Public data from the Virginia Department of Mines, Minerals and Energy

[7] Uniform Standards of Professional Appraisal Practice, 2012-2013

(VADMME).

1.6 Leases, Agreements, and/or Encumbrances

Property data (i.e. property ownership, deed information, legal size) is maintained by the County and assumed to be correct. Resource Technologies Corporation has not conducted any additional deed research on the subject properties.

1.7 Scope of the Appraisal

The scope of this mass appraisal is to determine the market value of the subject mineral properties in Buchanan County, Virginia, as of December 31, 2012.

The scope of the appraisal report considers (where applicable and when data is available) the cost, income, and comparable sales approaches. In the case of the subject:

- The Comparative Sales Approach is considered an appropriate method in the analysis of vacant land, residential real estate, and to a limited extent, commercial real estate transactions. It is not particular useful in mineral valuation due to the uniqueness of each mineral deposit.

- The Cost Approach is best applied to structural improvements on the site as it mimics the cost to replace the structures. There is nothing in the estate (coal) that could be reproduced. Therefore, the cost approach is not considered useful in this instance.

- The Income Approach is customarily used to value income-generating assets. The income approach values the present worth of the income stream of the operating entity. For coal properties, the income approach can be divided into two categories:

    - Operational Analysis where the value of the entire business is developed and then allocated, by various techniques, to the respective components of value such as land, mineral, machinery and equipment, and intangible assets

    - Royalty Analysis where, using market-based comparables, the cash flow related to the mineral (in-place) is isolated and used to calculate the present value of a deposit.

The subject of this appraisal, each individual coal estate, will be exploited to generate an income stream if mined. Royalties generated from the exploitation of the coal will benefit the owner of the estate. Therefore, the royalty analysis is the primary method considered with this appraisal assignment. The process leading to the final value conclusions utilizes the royalty analysis method of the income approach to valuation.

The presumed royalty income stream generated by the subject can be converted into a net present value which is equal to the market value of the subject estate (taxable coal real estate). In other words, rather than waiting for monthly royalty payments from the mineral miner over a number of years, a mineral owner may opt to take the net present value of those payments today. Since an appraiser is tasked to mimic the actions of market participants, the royalty analysis is an appropriate method to appraise the value of the coal the subject controls.

1.7.1 Basis of the Valuation Approach - Royalty Analysis

The value of in-place coal (still in the ground) is not simply the volume of coal multiplied by the price per ton of coal. The cost to get the coal out of the ground must be considered along with the price per ton determined by economic analysis. The value of a mineral is directly related to its availability for extraction or exploitation. To determine the value of a mineral deposit, the issues concerning the economics of exploiting the deposit, such as the following questions, must be addressed:

- Does the mineral in question represent a marketable commodity?
- Does the geologic strata containing the mineral represent a significant deposit of sufficient concentration?
- Are the strata amenable to mining – can the mineral be economically winnowed from the deposit, or can the strata be economically extracted?
- Can the mineral be economically processed and delivered to market?
- Is the cost of mining (including environmental and reclamation requirements), cost of processing, and cost of delivery less than the price commanded by the mineral commodity?

In the marketplace for mineral properties, typical market participants use some form of an income approach (discounting the future cash flow) to address the above questions for any potential, development, or operating mineral property. A mine operator may develop an operational cash flow by subtracting all costs (O&M, Employment, Taxes, Royalties) from gross receipts to determine the economic potential of a prospective project. The reliance on the income approach is based on two factors:

- A mineral property is only useful to the owner if it can generate current or future income. The potential amount of that income, its duration, and its likelihood are typically measured by the market for the material.

- Mineral properties are unique – each serving a differing market, each possessing differing mineral peculiarities, and each capable of supporting differing levels of development and production. The income approach to valuation provides for the examination of the unique characteristics of a site or operation.

When determining the value of a mineral asset to the mineral owner, the income that should be discounted is the **royalty income**, **and not the income, or profit, generated by**

the business of mining and selling the mineral.[8] The essential factors to be considered in valuation of a royalty income are:

- Royalty rate or amount
- Unit sale price of the mineral
- Projected annual amount of mineral unit production
- Projected number of years of production
- Year when the production will begin
- Discount rate or capitalization rate.

As stated in the Uniform Standards of Federal Land Acquisition:

"In estimating the income stream, the proper royalty rate can be derived from comparable mineral lease transactions, and the mineral unit price to which the royalty rate is applied may be derived from appropriate market transactions. The annual amount of production and the number of years of production are much more difficult to estimate and require as a minimum not only physical tests of the property to determine the quantity and quality of the mineral present, but also market studies to determine the volume and duration of the demand for the mineral in the subject property. (Numerous other factors may have to be considered, as, for example, the amount of overburden, the method of mining (e.g., surface or deep mining), the requirements of applicable reclamation laws, the hauling distance to market, competition from other sites, the size of the investment needed to construct any necessary processing plant, and so on.) Determination of the proper capitalization rate - always a critical element in an income approach - is a challenge as well."[9]

The **Article X of the Constitution of the Commonwealth of Virginia** provides that:

"Real estate, coal and other mineral lands, and tangible personal property, except the rolling stock of public service corporations, are hereby segregated for, and made subject to, local taxation only, and shall be assessed for local taxation in such manner and at such times as the General Assembly may prescribe by general law.[10]"

According to the Virginia Code,[11]

> "Mineral lands to be specially and separately assessed; severance tax. Several Commissioners of the Revenue shall, as soon as practicable after January 1 of each year, specially and separately assess at the fair-market value all mineral lands and the improvements thereon and shall enter the same on the land books of their respective counties separately from other lands charged thereon. The commissioner, in assessing mineral lands, shall set forth upon the land book:
>
> a. The area and the fair-market value of such portion of each tract as is improved and under development;
> b. The fair-market value of the improvements upon each tract; and
> c. The area and fair-market value of such portion of each tract not under development."

Further, according to the code:

[8] Uniform Standards of Federal Land Acquisition, Interagency Land Acquisition Conference, Washington DC, pg 97, 2000

[9] Ibid

[10] Article X, §4 of the Constitution of Virginia

[11] TITLE 58.1. TAXATION, SUBTITLE III. LOCAL TAXES, CHAPTER 32. REAL PROPERTY TAX, ARTICLE 7. REASSESSMENT/ASSESSMENT (VALUATION) PROCEDURE AND PRACTICE, Va. Code Ann. § 58.1-3286

1. If minerals that are severed from the surface (owned by someone other than the service owner) are to be assessed and taxed separately from the surface, multiple assessments are created; a value for the surface is estimated and a value for the minerals is also estimated. Separate tax bills are also created.

2. If minerals are owned together, the surface the assessment valuation will still develop separate valuations from each of the economic minerals as well as the surface.

Section §58.1-3287 of the Code states that

> "whenever there is a general reassessment of real estate in any county or city, mineral lands and minerals shall be included in the general reassessment, but shall be separately assessed from other real estate, and the assessor or assessors shall be governed by the provisions of §58.1-3286 in making the assessment."

The Assessor is required to take into account annual changes in the mineral area not developed, the mineral area under development, changes in improvements, and value.

The Virginia Supreme Court has "defined the fair-market value of a property as its sale price when offered for sale 'by one who desires, but is not obliged, to sell it, and is bought by one who is under no necessity of having it.[12]'" The Virginia Courts have consistently recognized the three generally accepted approaches for ascertaining the fair-market value of real property[13]:

- Cost approach or replacement
- Market or comparative sales approach
- Income capitalization approach or discounted cash flow method.

While the Market or Comparative Sales Approach is the most frequently cited method for common real estate appraisals, their application in the valuation of mineral properties is problematic. It is difficult, at best, to identify each area of similarity and difference, and to make appropriate adjustments. For example, when using comparative sales, the following items are important considerations for adjustments:

- Existing financial condition of each party to the sale
- Motivation of the buyer and seller, for example, the buyer, unlike the seller may have a contract and need material for an immediate project.
- Differences in the market price for the minerals at the time of the supposed comparable sale.

[12] Keswick Club, L.P. v. County of Albemarle, 273 Va. 128, 136, 639 S.E.2d 243, 247 (2007) (quoting Tuckahoe Woman's Club v. City of Richmond, 199 Va. 734, 737, 101 S.E.2d 571, 574 (1958)).

[13] Stephen C. Gara & Craig J. Langstraat, Property Valuation for Transfer Taxes: Art, Science, or Arbitrary Decision?, 12 AKRON TAX J. 125, 143 (1996); see also Keswick Club, 273 Va. at 137, 639 S.E.2d at 248 (recognizing "the cost approach, income approach, and sales approach").

- Locational differences between the sales – some commodities are sold in a global market, e.g., diamond; some are sold in a local market, e.g., crushed stone.
- The actual rights conveyed may differ from sale to sale
- Mining conditions may be extremely different from site to site. For example, in comparing aggregate sites, rock at one site may blast favorably, minimizing crushing, while rock at a nearby site may blast with less favorable outcomes requiring more crushing and creating more waste.
- Access for extraction purposes and transportation for movement of material.
- Topography and cover needed to be removed to expose the deposit.
- Distance and availability to processing plants.

In Virginia, it has been determined that "minerals should be separately and specially assessed upon their discovery, whether that occurs in the course of a general reassessment of real estate or in the years between general reassessments.[14]" This is based on the Virginia Code (§ 58.1-3286) that specifically requires commissioners to determine the "fair-market value of such portions of each tract not under development." Therefore, according to the Attorney General, "the fact that no mining operations have occurred does not shield the minerals underlying a parcel from assessment.[15]"

In Gentry and O'Neil,[16] a basic text in mineral property appraisals, the authors unequivocally put forward that: "... the preferred method for mining property valuation and the one unanimously used in the commercial practice is the income approach." The book states that:

> "Because mines have limited operating horizons and because there are well-established markets for mineral commodities, the income approach is widely used in valuing mineral properties. The approach is used commonly by the mining industry in assessing investment rates of return and determining appropriate purchase prices for mines or mineral prospects."

In discussing the comparable sales approach, Gentry and O'Neil put forward the following:

> "Although this method has been used extensively for estimating the value of residential and agricultural property values, it encounters serious practical problems when applied to mining transactions."

According to the "California Assessors' Handbook,[17]" The method best adapted to valuing mineral producing properties is often an analytical one such as the total property or royalty technique, because of the lack of sales data and the shortcomings of the cost approach. Concerning the comparative sales approach, the Handbook states that:

> "Sales prices of mining property constitute the most reliable indicators of value (as they are

[14] Cuccinelli, Kenneth T., Attorney General, Commonwealth of Virginia, April 26, 2010, letter to Hon. Samuel W. Swanson, Jr., Pittsylvania County Commissioner of Revenue.

[15] ID

[16] Gentry, Donald W. Dr. and O' Neil, Thomas J. Dr. Mine Investment Analysis, Society of Mining Engineers, American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. New York, New York, 1986, page 14.

[17] Assessor's Handbook: Valuation of Mines and Quarries, Assessment Standards Division, Property Tax Department, California State Board of Equalization, January 1973. Page 74 and March 1997

with all types of property), providing they satisfy arms' length conditions. It is seldom that we are blessed with an ideal sale of a mining property, and when we are it will as often as not fail to lend itself to a value conclusion on any other property because of differences in type of material, state of development, etc."

In the latest revision of the California Assessors' Handbook, Assessment of Mining Properties, it is simply stated that:

"The properties that are the subject of this handbook are investment properties. They are bought and sold for the income they are capable of generating in the future. As such, they are appropriately valued by the income approach.

The comparable sales method is an important appraisal tool for appraisers. However, the unique nature of many mining properties makes it difficult to apply. Two mineral properties are seldom alike. Mines differ in ore, reserves, size, ore geology, mining depth, cost, ore benefaction, location, salaries, geologic occurrence, waste, markets, local requirements of government agencies, access, etc. Mining properties can change in value rapidly so that a sale would only be valid for comparison purposes very close to its actual sale date. Many mine sales are often part of a larger, more complex sale so that it becomes difficult to extract data on a single property. Finally, it is rare to find sales of comparable mining properties."

The most recent publication by the International Association of Assessing Officers (IAAO), Property Assessment Valuation[18], states that the Hoskold method of capitalization (a modified version of the income approach) is "currently the best-known method for use with mineral properties because it corresponds closely to the conditions that seem to exist when investments are made on mineral deposits. As a mineral deposit is depleted, the recapture provision should provide a return of the investments, enabling the investor to buy another mineral property when the first is depleted." **It is critical to note that all assessors attempt to follow IAAO standards. These standards are frequently cited in critiques of appraisals completed by county and state assessors.**

According to Stermole and Stermole in Economic Evaluation and Investment Decision Methods[19]:

"Comparable sales often is a poor approach to valuation of natural resource properties. The value of mineral, petroleum, and timber rights varies significantly with sizes of reserves, projected product price at different future points in time related to production, and future salvage value of the assets to name some of the significant parameters to be considered. Usually at least several of these parameters differ significantly for different properties, making comparable sales a very poor approach to valuation of natural resource properties. Different size and quality of natural resource reserves affects the timing and cost of production, which generally makes it imperative to go to discounted cash flow valuation of natural resource investments rather than trying to utilize the comparable sales approach."

Stermole and Stermole teach one of the basic classes in mineral property appraisal and valuation. The course is sponsored by the Colorado School of Mines, a world premier mining College. The book, Economic Evaluation and Investment Decision Methods, is in its eleventh printing, and is used by CSM and numerous short courses taught to industry representatives world wide.

[18]Property Assessment Handbook, Second Edition, International Association of Assessing Officers, 1996, (LOC # 96-075848), page 261.

[19] Stermole, Franklin J. and Stermole, John M., Economic Evalaution and Investment Decision Making, Eleventh Edition, Colorado School of Mines, Investment Evaluations Corporation, Golden Colorado, 2006, (LOC #00-134613) page 501.

As stated in Fundamentals of Coal and Mineral Property Valuation (J.T. Boyd, 1986)[20], many subject areas are investigated prior to assigning a value to a property or an operation, These include:

- Reserves
- Quality and Processing
- Environmental and Reclamation Considerations
- Field Exploration and Mine Inspection
- Current Operations
- Mining Plans
- Production Costs
- Markets and Transportation.

According to Boyd, the major procedures used to develop an accurate estimate of reserves is the discounted cash flow (or operational) analysis and the royalty analysis. In evaluating the valuation techniques available to the mineral appraiser, Boyd states:

- Comparable Sales: "The comparable sales method of valuation requires statistically valid transactions that closely approximate the property being studied. Sufficient data must be available on the sales transaction to provide a valid comparison. Some properties may resemble others in a number of aspects, but it is often difficult to locate properties with sufficient comparability."[21]

- Operational Analysis Discounted Cash Flow: This is "the preferred method of valuation. More than 90 percent of the companies evaluating reserve properties use at least one form of discounted cash flow. It is estimated that over one-half of the companies use the current dollar basis, and from one-third to one half use a constant dollar basis." [22]

- Royalty Analysis: "The royalty method of analysis is based on the premise that a willing buyer purchases the lands under study and, in turn, leases them to a mining enterprise which develops the reserves." [23] The chapter goes on to summarize that the royalty approach is used to develop " ... the property value of owned reserves."[24]

A mineral deposit has virtually no value if it cannot be economically (profitably) developed. The only appropriate analysis available to estimate a deposit's (mineral properties) value is to figure out if the deposit can be economically exploited. Generally, this requires analysis of:

- potential cash flows

[20]Boyd, James W., Fundamentals of Coal and Mineral Valuations, C. J. Krehbeil Co, Cincinnati Ohio, 1986 (LOC # 86-72957), page 2

[21] Ibid, page 113

[22] Ibid, page 116

[23] Ibid, page 120

[24] Ibid, page 122

- previous cash flows on the property and similarly situated properties
- actual and/or hypothetical royalties
- market conditions
- physical attributes of the deposit and the site.

In Mineral Deposit Evaluation, A.E. Annels, 1991[25] states succinctly that:

> "In all but a few exceptional cases, an adequate financial return from a mining project is the essential criterion which must be fulfilled before an affirmative decision to exploit is taken...The vast majority of mineral exploitation projects are therefore undertaken for financial gain and the geological characteristics of the deposit are but one factor of many which collectively determine a project's profitability."

Annels lists the following techniques as applicable to the valuation of mineral properties:

- return on capital employed
- payback period
- discounted cash flow – net present value
- discounted cash flow – internal rate of return.

Paschall [26] states that: "...a mineral properties appraiser is first, last, and always, a mineral industries economist." Later in the article he states that: "The suspicion may have arisen in the readers mind that only the income approach to value is seriously considered in appraising mineral properties. That suspicion is justified." Paschall states that the only real use of sales information is to provide data necessary to characterize the market and to develop income approach rates and schedules.

Similarly, in the Appraisal of Construction Rocks[27], Paschall states:

> "If the appraisal of an active pit or quarry is at issue, and the appraiser is told that local law permits appraisal only by reference to sales comparison, the appraiser should refuse the assignment."
>
> "The capitalized income method is the only method appropriate to appraisal of an active construction-rock operation"

As can be seen, it may be difficult to obtain the data required for each comparative sale – much of the information needed is not published, not visible, and may be considered proprietary. In fact, it may be essential to develop detailed mine and business plans for each sale before they can be thought of as comparable. These and other examples of difficulty in making adequate comparisons and adjustments have led many professional appraisers to focus on alternative methods of estimating value.

Throughout the appraisal and assessment industry, the income capitalization approach to valuation is recognized as the most useful method of ascertaining the fair-

---

[25] Annels, Alwyn, E., Mineral Deposit Evaluation, Chapman and Hall, London, 1991, pages 306-322

[26] Ibid.

[27] Paschall, Robert, H. CPG-00118, Appraisal of Construction Rocks, 2nd, American Institute of Professional Geologists, Arvada, Colorado, 1998.

market value of income-producing properties such as mineral rights. Under this approach, the property's fair-market value derives from an estimate of the net cash flows that the property will generate to which a rate is applied to estimate a present worth. The rate is based on the average rates of return of investment from similar properties/operations.

1.7.2 Appraisal of the Economic Unit

As defined by statute and case law, in order to provide an estimate of market value the assessment must also mimic or approximate the real-world or the market driven activities. In the real world, mines and mining properties are typically bought and sold as assembled economic units. Mineable blocks, mine permit areas, defined mineable units are sold, leased, and traded among the various participants in the market. The subject mine is an assembled economic unit. The subject's highest and best use is as an assembled unit available for mining.

Valuation must be defined and controlled by the concept of Highest and Best Use. Frequently, large shopping centers, large apartment buildings, industrial properties, timber lands, and large farms are comprised of multiple "tax parcels" of land. Yet these properties, when owned or controlled by the same entity and when put to a singular or interdependent use and when contiguous are appraised for banking, for business, for condemnation and for assessment purposes as a single unit. Many mining properties are comprised of multiple tracts or parcels which together must be treated as an economic unit for permitting and for financially viable mining operations. The market as well as the mining economics and legal permitting requirements define the size and extent of the unit. A valid appraisal must reflect these legal conditions because they appear in the marketplace.

For tax assessment purposes, an economic unit is commonly described as property comprised of multiple parcels under the same ownership that is united by an economic function so that it will normally sell as a single property. The Dictionary of Real Estate Appraisal defines economic unit as follows:

> "A combination of parcels in which land and improvements are used for mutual economic benefit. An economic unit may comprise properties that are neither contiguous nor owned by the same owner. However they must be managed and operated on a unitary basis and each parcel must make a positive economic contribution to the operation of the unit.[28]"

The Uniform Standards of Federal Land Acquisitions require that the appraiser consider the value of the economic unit: "Elements of consideration by the appraiser in making a determination in this regard are contiguity, or proximity, as it bears on the highest and best use of the property, unity of ownership, and unity of highest and best use.[29]". Unity is obvious when all parts of the whole are actually devoted to a unitary use [30]. Additionally, the Federal Courts have found that unity can be delineated when contiguous parcels have unitary ownership or control and are subject or part of the same or an integrated, highest

[28] The Dictionary of Real Estate, Fourth Edition, page 92

[29] INTERAGENCY LAND ACQUISITION CONFERENCE, UNIFORM STANDARDS OF FEDERAL LAND ACQUISITIONS, 2000, APPRAISAL INSTITUTE Published by the Appraisal Institute 875 North Michigan Ave., Suite 2400, Chicago, IL 60611-1980 in cooperation with the U.S. Department of Justice

[30] United States v. Honolulu Plantation Co., 182 F.2d 172, 179 (9th Cir. 1950), cert. denied, 340 U.S. 820.

and best use [31]. Likewise, in the condemnation situation, ownership must be related but title may not necessarily be identical [32]. The Federal Standards go as far as cautioning the appraiser that:

> "Failure to value the property as an integrated whole, however, must always be explained and supported.[33]"

1.8 Appraisal Assumptions

- No responsibility is assumed for matters legal in nature, nor do I render any opinion as to the title, which is assumed to be marketable. The property is appraised as though under responsible ownership.
- The sketches and maps included are to assist the reader in visualizing the property but no responsibility is assumed for accuracy. Property lines, land areas, and legal descriptions are assumed to be correct.
- It is assumed that there are no hidden or unapparent conditions of the property subsoil that would render it more or less valuable. This includes the existence of potentially hazardous material, waste material, or dumps. No responsibility is assumed for such conditions, nor for engineering that might be required to discover such conditions.
- RTC believes to be reliable the information identified in this appraisal as being supplied by other parties, but assumes no responsibility for their accuracy.

1.9 General Limiting Conditions

- Possession of this report, or a copy of it, does not include the right of publication. This report may not be used for any purpose, by any person, other than the party to whom it is addressed without the written consent of the appraiser, and in any event, only with proper written qualification and only in its entirety.

- Neither all nor any part of the contents of this report, or copy thereof, will be conveyed to the public through advertising, public relations, news, sales, or other media without the approval and written consent of the appraiser; nor shall the appraisers' firm or professional organizations, of which the appraisers are a member, be identified without written consent.

- The original and authorized copies of this report are affixed with my seal.

- The appraiser reserves the right to alter an opinion as to the current market value on the basis of information that could not be uncovered during the normal course of a diligent investigation.

---

[31] Washington Metropolitan Area v. One Parcel of Land, 691 F.2d 702, 704-705 (4th Cir. 1982); United States v. 158.24 Acres of Land, 515 F.2d 230, 232 (5th Cir. 1975); United States v. Wateree Power Co., 220 F.2d 226, 231-232 (4th Cir. 1955); Baetjer v. United States, 143 F.2d 391 (1st Cir. 1944), cert. denied 323 U.S. 772.

[32] See United States v. 429.59 Acres of Land, 612 F.2d 459, 464 (9th Cir. 1980) and United States v. 57.09 Acres of Land, 706 F.2d 280, 282 (9th Cir. 1983).

[33] UNIFORM STANDARDS OF FEDERAL LAND ACQUISITIONS, page 56

- The fee received for this assignment is in no manner contingent upon the estimate of value.

1.10 Certification and Statement of Disinterest

The appraisal and research team employed to complete this effort are comprised of certified professional appraisers and appraisal assistants and registered and certified professional geologists and geological/geotechnical assistants. Resource Technologies Corporation has completed hundreds of similar appraisal assignments throughout United States and Canada. RTC staff have completed university and professional educational courses leading to certifications and degrees from credited institutions throughout the United States. I, Jeffrey R. Kern, ASA, personally supervised this appraisal effort. My detailed qualifications are attached as an appendix to this report. In brief, my qualifications to complete this assignment include:

- Certified general appraiser (Pennsylvania, Delaware, Indiana, Georgia, New York, West Virginia, and New Jersey) as well as holder of temporary permits in numerous states

- Certified evaluator (Pennsylvania)

- Senior member of the American Society of Appraisers, specialized certification in technical specialties including mineral properties

- Member of the International Association of Assessing Officers

- Previous member of the Board of Directors of the Mineral Economics and Management Society, international professional and academic society

- Certified member of the American Institute of Mineral Appraisers

- Recognized as an expert in property and mineral valuation issues and appraisals in numerous local, state, and federal courts

- Testified before legislative bodies and commissions in Pennsylvania, West Virginia, and Kentucky

- Instructor for continuing education classes for assessor certification on mineral lands, mines and quarries, and oil and gas appraisal techniques for the Assessors Association of Pennsylvania and Assessors Association of Virginia, the Appraisal Institute and other continuing education organizations

- Mineral property valuation consultant to U.S. Departments of Justice, Interior and Army; West Virginia Department of Tax and Revenue; Pennsylvania Department of Transportation; Pennsylvania Economy League; Centre, Clinton, Fayette, Greene, Schuylkill Counties in Pennsylvania; and Common Cause, Southern Poverty Law Center, Wyoming Department of Tax and Revenue, Kentucky Department of Tax and Revenue.

We certify that to the best of our knowledge and belief that:

- The statements of fact contained in this report are true and correct.
- The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and is our personal, unbiased professional analyses, opinions and conclusions.
- We have no present or prospective interest in the property that is the subject of this report, and we have no personal interest or bias with respect to the parties involved.
- We have no bias with respect to the property that is the subject of this report or to the parties involved with this assignment.
- Our engagement in this assignment was not contingent upon developing or reporting predetermined results.
- Our compensation is not contingent upon the reporting of a predetermined value or direction in value that favors the cause of the client, the amount of value estimate, the attainment of a stipulated result, or the occurrence of a subsequent event.
- Our analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the Uniform Standards of Professional Appraisal Practice.
- Other than the designated APPRAISAL ASSISTANTS, no one provided significant real property appraisal assistance to the person(s) signing this certification. The assistants (employees of Resource Technologies Corporation and under my supervision) have signed certifications listing their contribution. These forms are included in the appendices.

The values derived in this mass appraisal are my unbiased opinion of the market value of the subject property. The data used herein are correct to the best of my knowledge. I understand the confidentiality of the facts and opinions of this appraisal. A statement of my qualifications and those of persons who assisted me are included in an appendix to this report. No copy of this report, or portion thereof, is authorized. The original document, and authorized copies of it, contain my signature in blue and my seal.

March 22, 2013

Report Date — Jeffrey R. Kern, ASA

Resource Technologies Corporation

Pennsylvania Certified General Appraiser: GA000447L

March 22, 2013

Report Date — David Falkenstern

Resource Technologies Corporation

Pennsylvania Professional Geologist: PAPG004612

Colorado Registered Appraiser: AR1000035919

2.0 SUBJECT AREA

Located in southwest Virginia, Buchanan County is bordered by Tazewell, Russell, and Dickenson Counties, Virginia; McDowell and Mingo Counties, West Virginia; and Pike County, Kentucky (**Exhibit 2.0-1**). Access to the County seat, Grundy, is on US460 which runs northwest-southeast through the County (**Exhibit 2.0-2**).

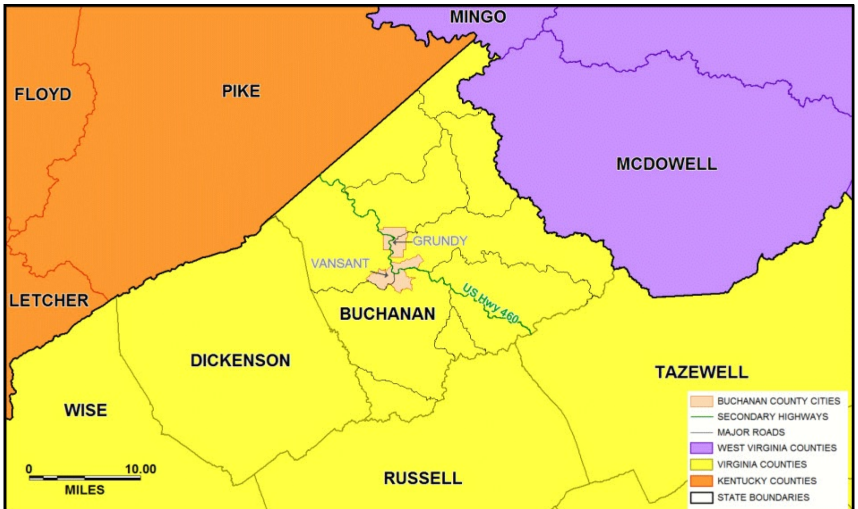


Exhibit 2.0-1: Buchanan County, Virginia

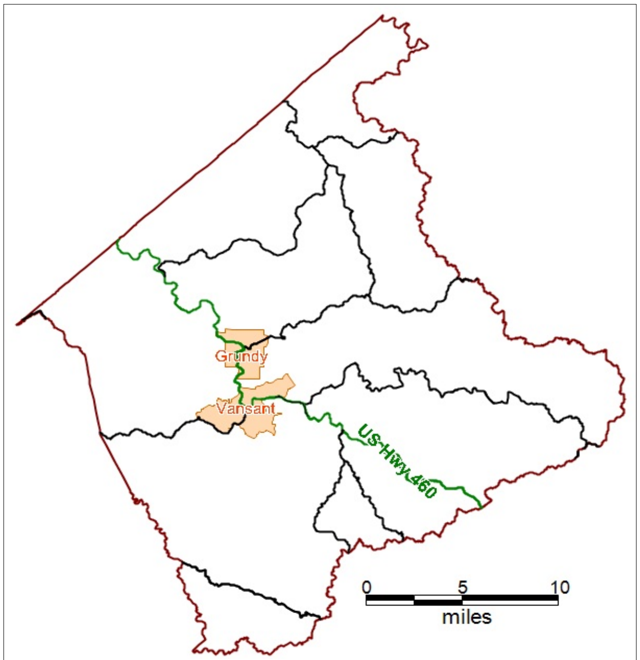


Exhibit 2.0-2: Grundy and Vansant, Virginia

2.1 Coal Mining in Buchanan County and Central Appalachia

Buchanan County, located on the eastern flank of the Central Appalachian Coal Region (**Exhibit 2.1-1**), is an area of Virginia rich in mining history. Historically, coal mined in the County has sold overwhelmingly to the metallurgical (met) coal market.

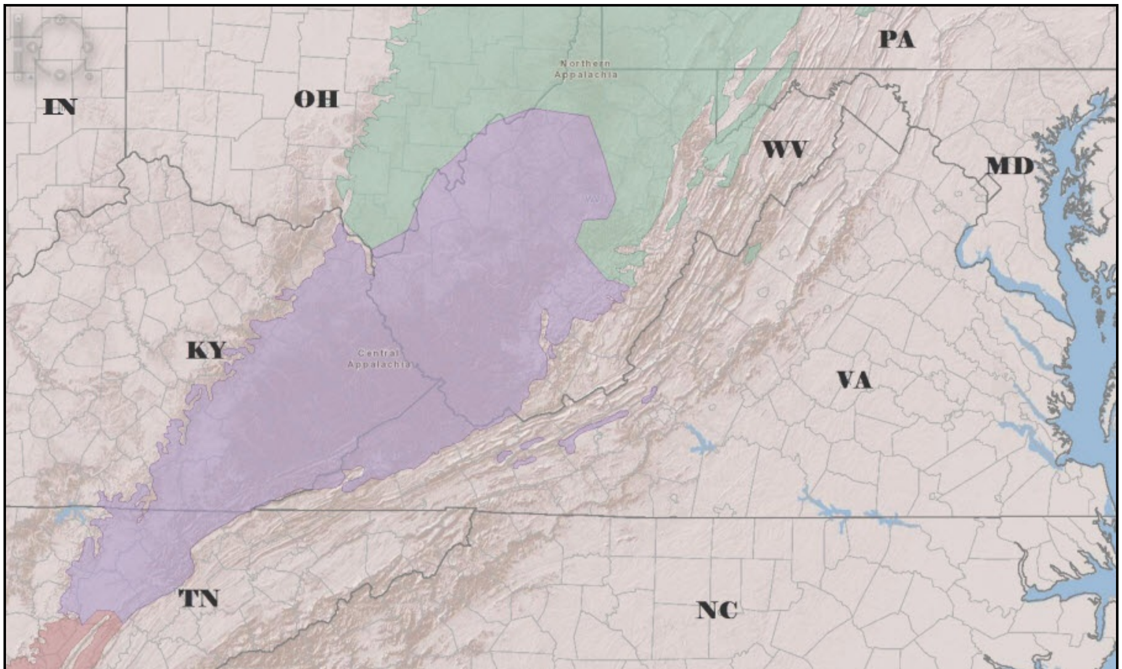


Exhibit 2.1-1: Appalachian Coal Regions (From SNL Energy)
Green: Northern Appalachia - Purple: Central Appalachia - Pink: Southern Appalachia

Coal that is mined and converted to coke (coke is used as part of the steelmaking process), is called metallurgical coal or simply met coal. Buchanan County has many deep mines, surface mines, transportation networks (rail and truck) and preparation plants (**Exhibits 2.1-2 and 2.1-3**).

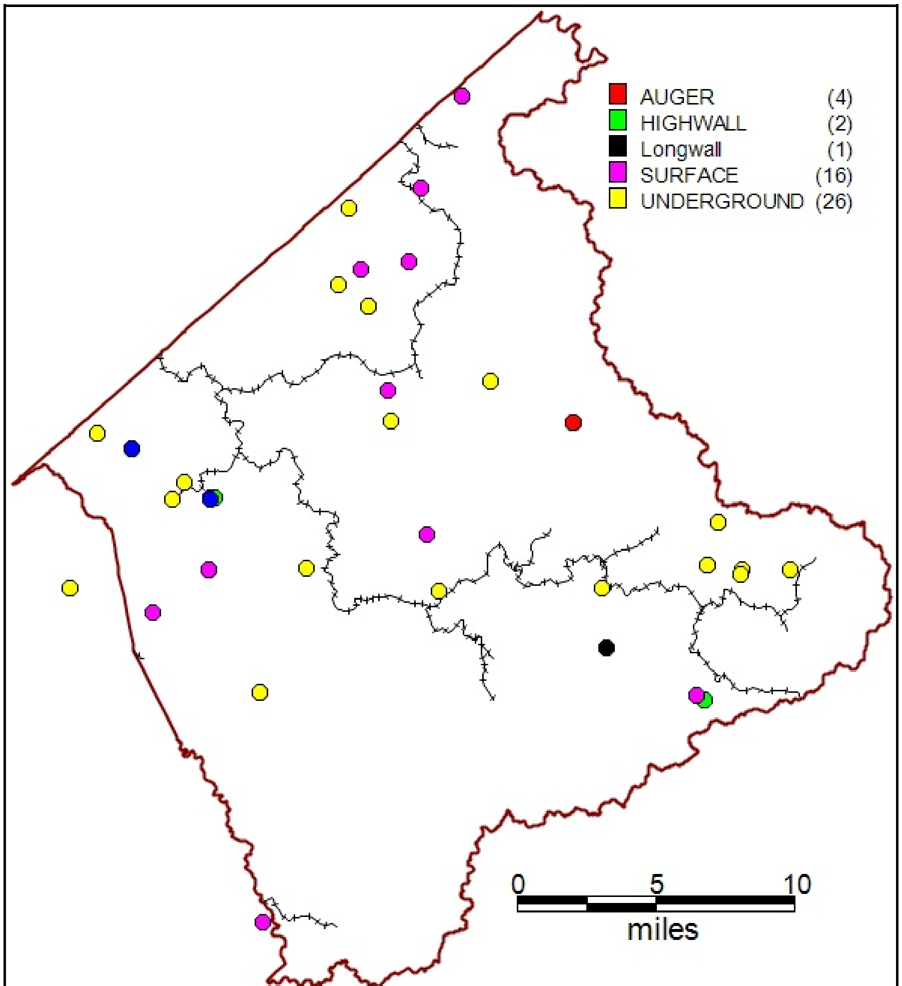


Exhibit 2.1-2: Mine Types in Buchanan County

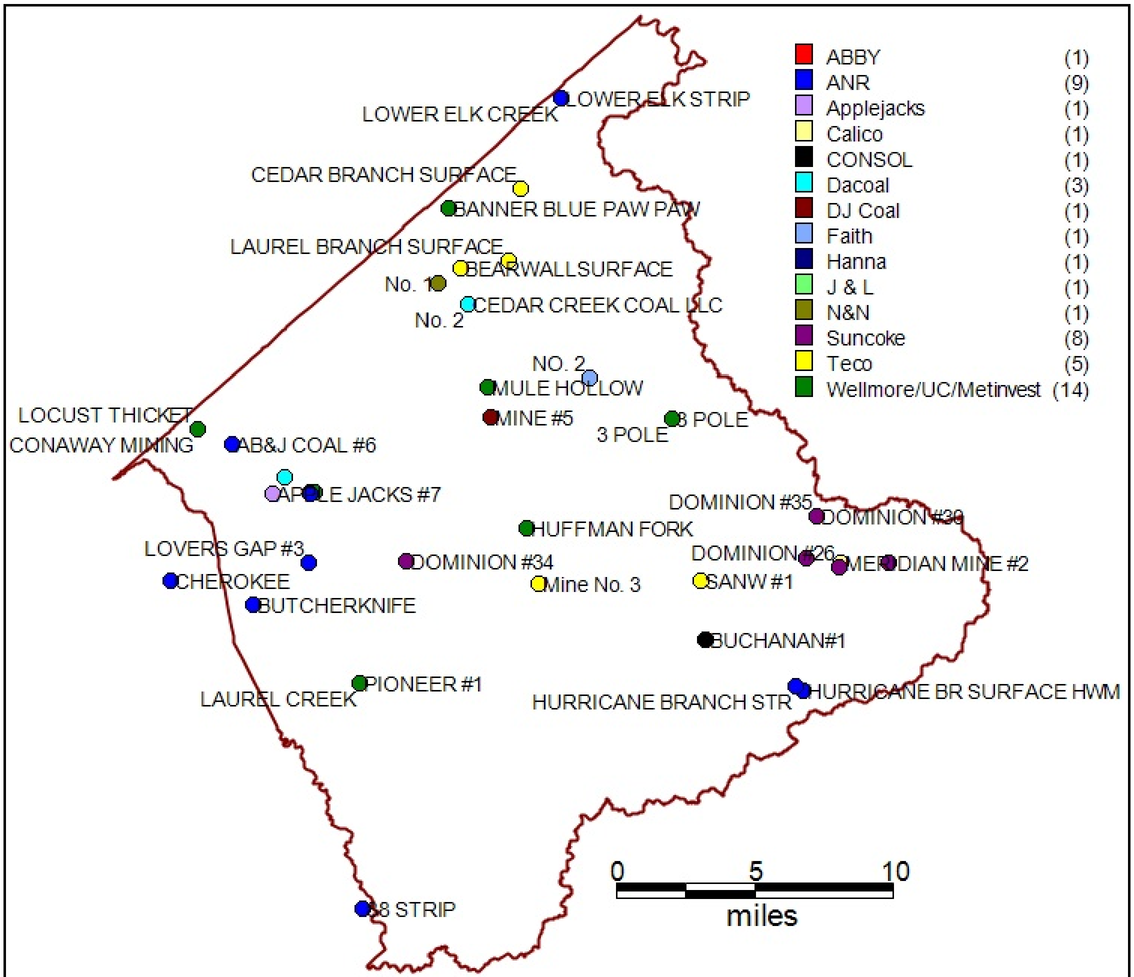


Exhibit 2.1-3: Coal Mines and Coal Companies in Buchanan County

Many different coal seams are mined in Buchanan County. **Exhibit 2.1-4** lists the coal seams, in general stratigraphic order, assessed by the County. The youngest seam found in the County (Pond Creek) at the top, and the oldest (Pocahontas 3) listed at the bottom. Also shown is the County seam id that the County uses to describe ownership in mineral accounts.

Exhibit 2.1-4: Coal Seam List

County Seam ID	Seam Name	County Seam ID	Seam Name	County Seam ID	Seam Name
25	Pond Creek	14	Eagle	9	Upper Banner
20	Cedar Grove	65	Lower Eagle	8	Lower Banner
19	Lower Cedar Grove	38	Little Eagle	7	Big Fork
48	Williamson	13	Blair	6	Kennedy
16	Campbell Creek	44	Blair A	43	Kennedy A
59	Alma A	52	Blair B	42	Kennedy B
55	Alma Rider	57	Blair Floor	5	Aily
17	Little Alma	12	Glamorgan	40	Red Ash A
18	Alma	49	Lower Glamorgan	4	Raven aka Read Ash
60	Alm3	22	Dorchester	39	Raven A
53	Upper Elkhorn #2 Rider	51	Dorchester A	29	Bradshaw
54	Upper Elkhorn #2	11	Hagy	2	Jawbone
21	Upper Elkhorn #3	33	Hagy A	37	Jawbone A
47	Lower Elkhorn Leader	34	Hagy B	41	Jawbone B
28	Lower Elkhorn Rider	35	Hagy C	1	Tiller
26	Lower Elkhorn	30	Splashdam A	66	Tiller A
27	Lower Elkhorn	31	Splashdam B	24	War Creek
15	Clintwood	10	Splashdam	50	Fire Creek
36	Eagle A	32	Splashdam C	3	POCA (Pocahontas 3)
56	Upper Eagle	45	Splashdam D	46	Poca A (Pocahontas 3)

Over 9 million tons of production was reported to Virginia DMME from mines operating in Buchanan County in 2011. Production in Buchanan County has increased in each of the last three years, however, production for 2012 is expected to decrease (**Exhibit 2.1-5**).

Exhibit 2.1.5: Annual Production Reported to DMME

Company	MINE NAME	INDEX #	2008	2009	2010	2011
ABBY	NO. 6	14452AD	47,122	40,974	66,510	65,592
ANR	BUTCHERKNIFE SURFACE	14929AA	0	0	5,623	122,750
ANR	Hurricane Branch HWM	14881AA	94,905	23,121	161,462	34,601
ANR	HURRICANE BRANCH STR	14840AA	0	0	13,180	4,837
ANR	LOVERS GAP #3	14542AB	613,134	538,749	510,534	112,209
ANR	LOWER ELK CREEK	14562AA	320,665	182,068	130,766	200,586
TECO	CEDAR BRANCH #1	14774AA	262,273	190,374	74,073	42,917
TECO	LAUREL BRANCH SURFACE	14863AA	0	421,214	579,130	578,485
Applejacks	NO. 7	08067AL		0	35,585	51,672
Calico	MERIDIAN #2	06721AF	52,963	73,272	63,367	48,849
Cedar Creek	No. 2	14877AA	102,851	115,712	125,579	134,040
CONSOL	BUCHANAN MINE #1	11912AA	3,530,714	2,845,556	4,681,919	5,654,353
Dacoal	NO. 5	14813AB	25,150	39,049	37,353	39,684
DJ Coal	MINE #5	14869AD	0	0	0	19,382
Faith	NO. 2	14505AF	0	0	0	9,704
Hanna	No. 1	14932AB	0	0	23,684	34,825
J & L	#1	14957AA	0	0	0	332
Laurel Creek	NO. 6	14689AB	58,680	62,519	43,536	19,466
N&N	No. 1	14486AF	0	0	0	12,758
Poiner	MINE NO. 1	14688AB	67,901	62,614	58,386	51,040
SANW	MINE NO. 1	14433AI	24,415	28,853	31,947	35,223
SANW	Mine No. 3	14454AB			0	40,037
SunCoke	MINE NO. 26	14260AD	69,219	112,251	152,263	153,729
SunCoke	MINE NO. 30	14293AH	72,508	140,302	120,373	90,671
SunCoke	MINE NO. 34	14401AC	94,756	66,250	67,613	46,050
SunCoke	MINE NO. 36	14314AA	248,956	327,822	251,445	193,150
SunCoke	MINE NO. 44	14909AA	0	0	41,840	164,396
SunCoke	MINE NO. 7	13963AE	310,073	254,863	293,356	226,032
Metinvest	3 POLE	14924AA		77,258	195,257	237,349
Metinvest	CONVICT HOLLOW	14675AC	270,378	88,551	66,303	20,626
Metinvest	HORSE BR.	14395AC	0	0	0	0
Metinvest	HUFFMAN FK.	14889AA	0	73,866	328,414	376,809
Metinvest	LOCUST THICKET	14732AB	178,008	187,781	185,016	125,304
Metinvest	MIDDLE FORK HAGY	14943AA	0	0	2,849	76,156
Metinvest	Mine No. 3 HWM Convi	14826AA	74,579	24,426	29,081	22,182
Metinvest	MULE HOLLOW SURFACE	14887AA	42,232	68,911	14,067	0
Metinvest	NO. 4 AUGER HACKNEY	14908AA	2,709	0	0	0
Metinvest	PAW PAW MINE	14221AH	190,191	183,520	222,756	73,870
Metinvest	SMITH BRANCH	14375AG	10,238	0	0	0
Metinvest	STATE LINE	14825AA	6,384	0	0	0
Metinvest	MULE HOLLOW AUGER NO	14893AA	5,923	12,481	2,062	0
Metinvest	ROCKHOUSE AUGER NO.	14945AA	0	0	839	0
TOTALS			**6,776,927**	**6,242,357**	**8,616,168**	**9,119,666**

3.0 CURRENT TAX ASSESSMENT

3.1 Virginia Tax Code

The Virginia Tax Code (see Section 1.7.1 for more detail) allows for both severance and property taxes on coal. The severance tax is two to three percent of gross receipts. Both minerals under development and not under development are assessed.

3.2 Current County Values

The County has divided coal into three categories:

- Under development (Active)
- Mineable Reserves
- Unmineable Reserves.

The following is a review of current assessed mineral values and valuation procedures in Buchanan County (**Exhibit 3.2-1**). Notice in prior assessments the active value is less than half the mineable reserve value and only twice as much as the unmineable reserves; a situation that does not represent true value of active operations..

Exhibit 3.2-1: Current County Mineral Valuation

Year	Category	Notes	Value Method	Record Count	Acres	Total Value
2012	Under development	Active Mining Operations	$2/mined ton & modified cap rate total	230	1,489 9,769,406 tons mined	$102,651,774
	Mineable Reserve	*Generally:* >28 inches surface >36 inches deep	$10/ac-in	10,598	637,800	$220,202,826
	Unmineable Reserve	>1 to 28 or 36 inches	$10/ac	31,723	2,854,964	$28,127,166
	Total					**$350,981,766**
2011	Under - development	Active mining operations	$2/mined ton & modified cap rate total	224	1,825 10,870,685 tons mined	$60,451,711
	Mineable Reserve	*Generally:* >28 inches surface >36 inches deep	$10/ac-in	10,569	637,188	$220,226,380
	Unmineable Reserve	>1 to 28 or 36 inches	$10/ac	30,848	2,814,140	$28,142,746
	Total					**$308,820,837**

3.3 Prior Assessment Reserve Distribution

Currently, reserve mineable coal is valued at 10/ac-in and 10/ac for unmineable coal (**Exhibits 3.3-1 and -2**). To arrive at the assessed value for reserve mineable, multiply the number of acres of coal by the coal thickness. For example, 10 acres of 36-inch coal (360 acre-inches) would be assessed at $3,600.

Exhibit 3.3-1: Reserve Mineable Valuation by Seam						
Strat-Order	**RASEAM**	**RAMORU**	**SeamName**	**Count**	**Acres**	**Value**
190	25	M	Pond Creek	5	158	$45,505
201	48	M	Williamson	2	13	$2,397
224	17	M	Little Alma	43	1,663	$322,052
224	55	M	Alma Rider	1	1	$133
225	18	M	Alma	91	1,086	$238,749
227	53	M	Lower Elkhorn Leader	1	16	$2,070
228	54	M	Lower Elkhorn Rider	1	3	$698
230	21	M	Lower Elkhorn	328	5,185	$1,561,131
232	26	M	Upper Elkhorn #2	12	300	$60,057
233	27	M	Upper Elkhorn #3	14	326	$277,998
234	15	M	Clintwood	566	21,219	$5,488,886
235	36	M	Eagle A	2	122	$23,125
239	56	M	Upper Eagle	2	9	$1,471
240	14	M	Eagle	836	27,650	$9,564,962
241	65	M	Lower Eagle	2	12	$2,934
245	38	M	Little Eagle	4	376	$92,398
250	13	M	Blair	942	34,170	$11,318,960
251	44	M	Blair A	1	20	$2,996
253	52	M	Blair B	1	16	$1,636
260	12	M	Glamorgan	716	18,534	$5,631,341
261	49	M	Lower Glamorgan	546	18,539	$5,864,340
262	22	M	Dorchester	1	255	$107,298
270	11	M	Hagy	605	25,874	$7,784,406
275	10	M	Splashdam	991	50,133	$15,566,451
278	9	M	Upper Banner	865	47,119	$17,459,077
279	8	M	Lower Banner	251	13,511	$3,843,885
280	6	M	Kennedy	470	32,750	$9,963,707
280	7	M	Big Fork	144	4,861	$1,206,734
283	5	M	Aily	33	1,843	$328,823
285	4	M	Raven aka Read Ash	671	66,209	$23,847,924
300	2	M	Jawbone	458	63,288	$21,076,643
310	1	M	Tiller	435	49,010	$18,217,051
335	24	M	War Creek	334	23,571	$3,121,364
345	50	M	Fire Creek	1	10	$1,962
390	3	M	POCA	1,193	129,255	$57,139,923
391	46	M	Poca A	1	82	$57,293
Totals				**10,569**	**637,188**	**$220,226,380**

Exhibit 3.3-2: Unmineable Valuation by Seam						
Strat-Order	**RASEAM**	**RAMORU**	**SeamName**	**Count**	**Acres**	**Value**
201	48	U	Williamson	206	7,679	$76,799
224	17	U	Little Alma	308	9,691	$96,916
225	18	U	Alma	258	7,936	$79,365
230	21	U	Lower Elkhorn	223	8,190	$81,904
232	26	U	Upper Elkhorn #2	210	7,772	$77,730
233	27	U	Upper Elkhorn #3	205	7,511	$75,121
234	15	U	Clintwood	359	16,029	$160,302
240	14	U	Eagle	374	21,776	$217,781
250	13	U	Blair	406	18,217	$182,195
260	12	U	Glamorgan	845	52,302	$523,052
261	49	U	Lower Glamorgan	1,047	62,358	$623,623
270	11	U	Hagy	1,345	88,735	$887,421
275	10	U	Splashdam	1,059	80,535	$805,393
278	9	U	Upper Banner	1,393	140,520	$1,405,269
279	8	U	Lower Banner	2,094	187,495	$1,875,038
280	6	U	Kennedy	2,105	204,270	$2,042,799
280	7	U	Big Fork	2,331	203,035	$2,030,449
283	5	U	Aily	2,624	273,863	$2,738,758
285	4	U	Raven aka Read Ash	1,924	197,021	$1,970,292
300	2	U	Jawbone	2,290	220,813	$2,208,244
310	1	U	Tiller	2,381	261,338	$2,613,479
335	24	U	War Creek	2,555	281,128	$2,811,387
345	50	U	Fire Creek	2,827	300,536	$3,005,484
390	3	U	POCA	1,470	154,515	$1,545,203
391	46	U	Poca A	9	874	$8,742
Totals				**30,848**	**2,814,141**	**$28,142,746**

3.4 Active Distribution

Currently, active coal is valued using a royalty rate of $2 per mined ton. To value active coal, Buchanan County uses a modified cap rate method (**Exhibit 3.4-1**), which changes the cap rate based on the mine life (a variation of the “Gordon” model). The mine’s annual income (production X coal price) is divided by the cap rate at the given mine life to calculate the mines’ total value:

Active value = (Acres Mined * Clean Coal Thickness * 145 * $2) / Cap Rate, where:

- Acres mined is reported by the operator
- Clean coal thickness is reported by the operator
- 145 is the density of coal in tons/ac-in
- $2 is the royalty per ton of coal mined
- Cap rate is selected from **Exhibit 3.4-1** for the mine life reported by the operator.

Exhibit 3.4-1: Current Cap Rate for a given mine life				
Mine Life	**Percent Mined/Year**	**Discount Factor**	**Taxes**	**Cap Rate**
2	0.500	0.090	0.005	0.595
3	0.333	0.090	0.005	0.428
4	0.250	0.090	0.005	0.345
5	0.200	0.090	0.005	0.295
6	0.167	0.090	0.005	0.262
7	0.143	0.090	0.005	0.238
8	0.125	0.090	0.005	0.220
9	0.111	0.090	0.005	0.206
10	0.100	0.090	0.005	0.195
11	0.091	0.090	0.005	0.186
12	0.083	0.090	0.005	0.178
13	0.077	0.090	0.005	0.172
14	0.071	0.090	0.005	0.166
15	0.067	0.090	0.005	0.162
16	0.063	0.090	0.005	0.158
17	0.059	0.090	0.005	0.154
18	0.056	0.090	0.005	0.151
19	0.053	0.090	0.005	0.148
20	0.050	0.090	0.005	0.145
25	0.040	0.090	0.005	0.135

Exhibit 3.4-2 shows the value of each active mine currently billed by the County. [redacted]

[redacted]

[redacted]					
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]		
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]		
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]		
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]		
[redacted]	[redacted]			[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]		
	[redacted]	[redacted]	[redacted]		
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]		
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]		
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]		
[redacted]	[redacted]	[redacted]	[redacted]		
[redacted]	[redacted]			[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]
[redacted]		[redacted]	[redacted]	[redacted]	[redacted]

4.0 REASSESSMENT METHODOLOGY

An audit of County data by RTC indicated that the assessed value of active coal (minerals under development) was well below market for the amount of production and coal prices in Buchanan County. This was due, in part, to out of date coal market factors (royalty and price). In fact, the total active was just over a quarter of the reserve value. This is unrealistic, as active coal, coal that is being mined today, is always worth considerably more than and drives the value of reserve coal (coal that will be mined in the future). These discrepancies have been corrected in the reassessment process.

4.1 Mineral Value Continuum

Valuations of mineral assets occur along a continuum. While "minerals" are contained within all real estate, their values become apparent and increase when they are:

- discovered
- determined to serve a useful market
- volume and quality quantified
- determined to be exploitable
- legally permitted to mine (increasingly valuable)
- reach a maximum value when mining becomes eminent and they are included in an active mining operation.

The U.S. Securities and Exchange Commission requires that mineral value, when reported as an asset, be delineated as proven, probable, and possible, and speculative. The appraiser and evaluator look at each mineral deposit or property based on the following continuum of risk (least to most) and value (most to least):

- Proven when it is defined by adequate geologic research and delineated on maps, as currently mined, intended to be mined and/or has sufficiently been explored to make mine planning appropriate. This represents the highest value and the lowest risk.

- Probable when it is delineated by geologic and other information and is likely to be mined in the foreseeable future using current prices and current or likely technology.

- Possible when it has been identified as a deposit that could satisfy mining needs but requires further exploration.

- Speculative when the resource is likely to exist and **may** satisfy mining needs at some undefined point the future; representing the highest risk and lowest value.

From the assessment point of view, the mineral begins to show real value when:

- The mineral has been severed from the surface estate by lease, deed, or other mining agreement.
- The land area has been re-zoned and/or permitted to allow mineral extraction.
- Land improvements have been undertaken or proposed and approved that will facilitate mining, processing, and transportation
- Mining is occurring.

Previously, the County went to considerable length to determine the location of mineable and unmineable reserve coal across the County. While still updating information about reserve coal, this reassessment concentrated on the accuracy of the active coal valuation by making the process market driven and better at capturing all mineable coal within a mining project.

In Buchanan County, active mines represent identifiable economic interests in mineral extraction. They are permitted by the state as active mines; the mineral and its area have been identified and quantified; and maps and mining plans have been completed. Permitted resources represent a significant increase in value over un-permitted reserves. For these reasons, this reassessment concentrated on the active mineral value. The goal of this reassessment is to base the coal value on active coal market factors and better capture all mineable coal within a mining project.

4.2 Valuation Theory

The focus of this reassessment is to develop a credible total value for all the in-place coal in the County. That value is then distributed among all the mineral records. The overall County value is based on current market conditions in Buchanan County (see Section 5 for the development of these factors):

- Production capacity of Buchanan County Mines
- Royalty rates received by mineral owners
- Coal selling price
- Coal Destination (metallurgical or steam markets)
- Coal industry rate.

The overall County is then calculated (Section 6) by discounted cash flow analysis of the yearly expected royalty income across the County. Using current market factors and the County's Minerals Under Development database, the new total active value is calculated. The remainder (total-active) is then applied to the reserve records.

5.0 COAL MARKET

The majority of coal mined in Buchanan County serves the metallurgical coal market (both domestic and global). Some coal is sold to CAPP steam market. Both markets have faced headwinds over the last year and a half. The met market has suffered from sluggish worldwide steel demand[34], and the steam market has faced competition from power plants switching to natural gas to produce electricity[35]. Mines in Buchanan County have been idled or closed[36, 37]. This results directly to area job losses or relocations.

However, coal production in Buchanan County continues. Increased environmental regulation in the coal mining permitting process is seen as driving the market down, but recovery in the steam market is more dependant on natural gas prices. As the gas market matures and more industries take advantage of the nation's gas production, gas prices will revert to more traditional prices and thermal coal demand will return[38].

While the met market cannot be displaced by low gas prices, it is also fluid. In fact two articles in the same publication claimed that the met market was anticipated to recover and at the same time SunCoke delayed an IPO because of low met prices[39]. Two more recent articles reported the closing of a SunCoke mine in Buchanan County[40] but the opening of multiple metallurgical mines in surrounding counties[41]. Met prices and production are dependent not only on U.S. steel demand, but also steel demand in China, India, as well as the rest of Asia. In addition, U.S. met coal is in competition with met mining in Australia. For example, floods in Australia late in 2010 crippled that country's mining industry. However, this was a boon for U.S. met coal producers because it increased demand [42,43]. More recently, increased Australian government regulation has given U.S. coal producers an advantage[44].

---

[34] *Top-producing Central Appalachia mines in Q2'12*;Darren Epps and Matthew Scanlonl SNL Energy; July 30, 2012

[35] *CONSOL expects met coal market to remain sluggish for next several months*; Dan Lowrey; SNL Energy; July 26. 2012

[36] *CONSOL again idles met coal production due to weak global steel demand*; Dan Lowrey, SNL Energy, September 4, 2012

[37] *Alpha discloses mine closure details; initial cuts to result in 160 layoffs*; Dan Lowrey, SNL Energy, September 19, 2012

[38] *CONSOL expects rising gas prices to push 2013 coal demand significantly higher*; Dan Lowery, SNL Energy, October 25, 2012

[39] SNL Energy Daily Coal Report, December 4, 2012

[40] *SunCoke Energy idles Va. mine, lays off 90*; Darren Epps, SNL Energy, February 11, 2013

[41] *Va. company hiring 860 miners for metallurgical coal operations;* Darren Epps, SNL Energy, February 22, 2013

[42] *Australian government estimates lost coal exports to floods at 14 million tonnes*; Dan Lowery; SNL Energy; January 21, 2011

[43] Moody's: U.S. met coal producers poised to benefit from Australian supply problems; Dan Lowey; SNL Energy, January 11, 2011

[44] *Australian coal royalty rate hike boosts prospects of U.S. producers*; Darren Epps; SNL Energy; September 11, 2012

5.1 Buchanan County Coal Price and Royalty Rate Survey

As part of this reassessment, questionnaires (**Exhibit 5.1-1**) were sent out to County mines for general information about the mine. Of the 73 questionnaires sent out, 5 mines offered responses to the coal price and royalty information. The average of responses is shown below (**Exhibit 5.1-2**).

Buchanan County Mine Assessment Data Collection

MSHA ID: 44-06830 Index #: 14395AC
Mine Name: HORSE BR.
Status: Rclmg
Mine Type:
Current Permit Acres: ____________
Mineable Acres: ____________
Seam: ____________ (one page per seam)
Mining Thickness (in): ____________
Total Recovery (%): ____________
Yearly Production (tons) ____________
% Sold to Thermal Market: ____________
Thermal Coal Price (FOB) ____________
% Sold to Met Market: ____________
Met Coal Price (FOB): ____________
Royalty Paid to Mineral Owner %: ____________

Exhibit 5.1-1: Sample of Questionnaire

Exhibit 5.1-2: Average Buchanan County Survey Returns	
Thermal Price	$63.48
Met Price	$143.73
Royalty	5.60%

5.2 Mineral Production

Exhibit 5.2-1 shows coal production reported to the Virginia Department of Mines, Minerals and Energy (DMME), for Buchanan County, Virginia. The overall demand for Buchanan County coal has increased over the previous three years. However, production for 2012 is down. The average production of the last three years was used to value the coal in the County.

Exhibit 5.2-1: Annual Production Reported to DMME

Company	MINE NAME	INDEX #	2008	2009	2010	2011
ABBY	NO. 6	14452AD	47,122	40,974	66,510	65,592
ANR	BUTCHERKNIFE SURFACE	14929AA	0	0	5,623	122,750
ANR	Hurricane Branch HWM	14881AA	94,905	23,121	161,462	34,601
ANR	HURRICANE BRANCH STR	14840AA	0	0	13,180	4,837
ANR	LOVERS GAP #3	14542AB	613,134	538,749	510,534	112,209
ANR	LOWER ELK CREEK	14562AA	320,665	182,068	130,766	200,586
TECO	CEDAR BRANCH #1	14774AA	262,273	190,374	74,073	42,917
TECO	LAUREL BRANCH SURFACE	14863AA	0	421,214	579,130	578,485
Applejacks	NO. 7	08067AL		0	35,585	51,672
Calico	MERIDIAN #2	06721AF	52,963	73,272	63,367	48,849
Cedar Creek	No. 2	14877AA	102,851	115,712	125,579	134,040
CONSOL	BUCHANAN MINE #1	11912AA	3,530,714	2,845,556	4,681,919	5,654,353
Dacoal	NO. 5	14813AB	25,150	39,049	37,353	39,684
DJ Coal	MINE #5	14869AD	0	0	0	19,382
Faith	NO. 2	14505AF	0	0	0	9,704
Hanna	No. 1	14932AB	0	0	23,684	34,825
J & L	#1	14957AA	0	0	0	332
Laurel Creek	NO. 6	14689AB	58,680	62,519	43,536	19,466
N&N	No. 1	14486AF	0	0	0	12,758
Poiner	MINE NO. 1	14688AB	67,901	62,614	58,386	51,040
SANW	MINE NO. 1	14433AI	24,415	28,853	31,947	35,223
SANW	Mine No. 3	14454AB			0	40,037
Metinvest	MULE HOLLOW AUGER NO	14893AA	5,923	12,481	2,062	0
Metinvest	ROCKHOUSE AUGER NO.	14945AA			839	0
SunCoke	MINE NO. 26	14260AD	69,219	112,251	152,263	153,729
SunCoke	MINE NO. 30	14293AH	72,508	140,302	120,373	90,671
SunCoke	MINE NO. 34	14401AC	94,756	66,250	67,613	46,050
SunCoke	MINE NO. 36	14314AA	248,956	327,822	251,445	193,150
SunCoke	MINE NO. 44	14909AA	0	0	41,840	164,396
SunCoke	MINE NO. 7	13963AE	310,073	254,863	293,356	226,032
Metinvest	3 POLE	14924AA		77,258	195,257	237,349
Metinvest	CONVICT HOLLOW	14675AC	270,378	88,551	66,303	20,626
Metinvest	HORSE BR.	14395AC	0	0	0	0
Metinvest	HUFFMAN FK.	14889AA	0	73,866	328,414	376,809
Metinvest	LOCUST THICKET	14732AB	178,008	187,781	185,016	125,304
Metinvest	MIDDLE FORK HAGY	14943AA	0	0	2,849	76,156
Metinvest	Mine No. 3 HWM Convi	14826AA	74,579	24,426	29,081	22,182
Metinvest	MULE HOLLOW SURFACE	14887AA	42,232	68,911	14,067	0
Metinvest	NO. 4 AUGER HACKNEY	14908AA	2,709	0	0	0
Metinvest	PAW PAW MINE	14221AH	190,191	183,520	222,756	73,870
Metinvest	SMITH BRANCH	14375AG	10,238	0	0	0
Metinvest	STATE LINE	14825AA	6,384	0	0	0
Total			6,776,927	6,242,357	8,616,168	9,119,666

Due to the expected drop in production in 2012, production through the third quarter of 2012 was researched to estimate overall production in 2012. This value was incorporated into the reassessment. Based on past production and publically available data from CONSOL[45] and NRP,[46] it is expected that 2012 production will be only 71% of 2011 production (**Exhibit 5.2-2**).

Exhibit 5.2-2: Annualized Production Estimate				
Company /(Mine)	2011 Production	Thru Q3 Production	Estimated Annualized 2012	% of previous year's production
CONSOL	5,600,000	2,300,000	3,066,667	54.76%
NRP/ Central App	29,555,000	19,632,000	26,176,000	88.57%
Averages				71.66%
A January 18th press release by CONSOL, reported 700,000 tons in the fourth quarter, confirming 2012 production at 3,000,000 tons. The press release went on to provide a projection of 3.8 - 4.0 million tons for 2013.[47]				

Exhibit 5.2-3 shows production over the last three years, as well as 2012's annualized production. These four values are averaged to determine Buchanan County's production capacity. The average production capacity in this reassessment is 7,628,400 tons.

Exhibit 5.2-3: Production Estimated used for Valuation (Avg. of last 4 years + 2012 estimated)				
2009	**2010**	**2011**	**2012 Annualized**	**Average**
6,242,357	8,616,168	9,119,666	6,535,562	7,628,438

5.3 Royalty Analysis as Valuation Basis

Coal is frequently mined under lease, where the coal owner grants a coal operator the right to extract coal from a specified area in exchange for a royalty. Coal leases take numerous forms. Generally, they allow the miner/operator to remove all of the coal that can be safely and efficiently extracted in a legal and environmentally appropriate manner. Typically, coal leases take the form of contracts where the operator/miner is required to pay the coal owner a percentage (royalty) of the price obtained for the coal. In the royalty analysis, the royalty income steam is converted into a net present value, which is equal to the market value of the mine. In lieu of waiting for each monthly royalty payment, the coal owner would accept the net present value of the royalty income stream. Therefore, the royalty analysis is a version of the income approach that is used to estimate the market value of the mine.

[45] CNX: CONSOL Energy Inc., SEC Form 10-Q, 11/1/2012

[46] Natural Resource Partners L.P. (NRP), SEC Form 10-Q, 11/7/2012

[47] *CONSOL Energy Announces Operations Update*, Press Release, CNX: CONSOL Energy Inc., 1/18/2013

5.4 Royalty Rates

Royalty rates paid by coal operators to coal owners are notoriously hard to find. Case in point, this reassessment only had five mining operations offer a response to the royalty rate question on the reassessment questionnaire. The parties may be under a confidentially agreement or simply wish to maintain privacy.

Based on RTC research, typical leases vary in amounts from 3.5% to 8% of the value of the coal selling price. Typical leases that combine compensation for the coal and the surface (property owned in fee) are found to be in the 10% to 12% range. For competitive reasons, lease amounts are not typically published. Parties generally record a memoranda of a lease with the County Recorders of Deeds Offices without including lease value information.

The State of West Virginia completes an annual survey of all mineral leases. The survey is based on official income and severance tax returns (individual returns are considered confidential). For tax year 2013 (published September 1, 2012), the State found that coal royalty rates varied from a low of 3.5% in the northern part of the State, where large longwall deep mines are operating in the Pittsburgh Seam mining steam coal, to 8.4% in the southern portion of the State (Counties adjacent to Buchanan) where smaller mines are exploiting metallurgical coal (**Exhibit 5.4-1**). Typically, larger mines offer lower rates because their income stream is less risky that small mines.

The coal market in southwestern Virginia and southern West Virginia is very similar. The geology is similar, and the mine types (deep or surface) see similar royalty rates and coal prices. Because of this, royalty information from West Virginia was also considered.

Exhibit 5.4-1: West Virginia Statewide Coal Royalty Averages (Published September 1, 2012 for Tax Year 2013)

Coal Market/Mine Type	Avg % Royalty
Deep Mine:	5.51%
Surface Mine	5.75%

The royalty research generally aligns with the survey results provided. While there were only five responses, this reassessment will use the average of those responses (**Exhibit 5.4-2**).

Exhibit 5.4-2: Buchanan Royalty Survey	
Mine (confidential)	**Royalty**
Mine 1	7.00%
Mine 2	6.00%
Mine 3	5.00%
Mine 4	5.00%
Mine 5	5.00%
Average	5.60%

5.5 Coal Prices

When examining coal prices, it is important to understand where that price is in the delivery stream (**Exhibit 5.5-1**). For typical coal leases, the coal price used to calculate the royalty payment is usually the Freight on Board price (FOB). The FOB price is the price of the coal "loaded on transport at the mine". In other words, the FOB price is the price at which a coal operator can sell coal from the mine mouth after it is loaded on a truck or train ready for delivery.

Exhibit 5.5-1: Price Types for the Coal Delivery Stream		
Type of Coal Price	**Description**	**Price Includes**
In-place	Coal still in the ground.	Coal still in the ground, may or may not be in a mine plan.
Mine Mouth or Run of Mine (ROM)	Raw mined coal at mine site	Mining and placement at central storage location
FOB	Loaded on transport at mine	Mining and loading on transport (usually truck)
Cleaned	Raw coal processed at prep plan	Mining, shipping to prep plant, cleaning, loading for final delivery
Delivered	Coal unloaded at destination	Mining, shipping to prep plant, cleaning, loading for final delivery, transportation to final destination (truck, rail, or barge)

Most pubic data regarding coal prices states the price as "delivered". Delivered price is what a power plant (or any other client) paid for the coal at their location, it is not FOB. The delivered price includes all coal processing, blending, and transportation from the mine mouth to a preparation plant then on to the power plant or other destination. Another price category is the clean coal price. Clean coal has been shipped from the mine mouth (usually by truck) to a central cleaning facility (prep plant), has been cleaned (removing rock within the coal), and loaded (usually on a train or barge) ready to be shipped to its final destination.

If the coal price is reported as cleaned or as delivered, the costs of the additional steps (cleaning, shipping, handling) must be stripped from the coal price to arrive back at FOB price. Cleaning costs can be estimated by the recovery at the prep plant. Shipping costs must be calculated on a per ton per mile (source to destination) basis. Typical shipping costs, including handling, are as follows:

- Barge: $0.08 per ton-mile
- Rail: $0.12 per ton-mile
- Truck: $0.25 per ton-mile.

5.5.1 Metallurgical Coal Pricing

The vast majority of coal mined in Buchanan County is metallurgical quality coal, and therefore not affected by the increasing preference for gas in power generation. CONSOL, SunCoke, and Metinvest mine almost exclusively met coal, and ANR and TECO mine coal for both met and steam purposes. Coal in Buchanan County is considered high in rank, so it is high Btu, low sulfur, and low-volatile matter coal. Coal is ranked from low (lignite) to high (anthracite). Higher ranked coals have higher fixed carbon and lower volatile matter (coveted for coke production). Generally, coals increase rank due to age, deeper deposition, or structural events. Buchanan County coal is relatively old and near the bottom of coal bearing stratigraphy.

In general, there are three separate markets involving met coal depending on the quality of the coal:

1. High-vol (above 30% volatile matter)
2. Mid-vol (19%-30% volatile matter)
3. Low-vol (below 19% volatile matter).

Low-vol met coal is considered the best quality and demands the highest price. This is in part because there is less material to burn off in the coking process so the price reflects more useful material per ton. Low-vol met coal is found in Central Appalachia: southern West Virginia and western Virginia (Buchanan County). Mid-vol and high-vol coals are used 1) when the steel maker wants a specific blend of coke (higher volatile coal is easier to burn) or 2) when the low-vol market is saturated. Recently, low-vol met coal has commanded prices up to $200 per ton, while high-vol coal prices are comparative to steam coal.[48] Central Appalachia dominates the domestic and export met market due to its superior quality low-vol met coal.

The Energy Information Association (EIA) tracks delivered met prices **Exhibit 5.5.1-1** and **Exhibit 5.5.1-2.** Delivered met prices have increased since mid 2010 but have leveled off recently.

[48] *Consol Energy ramping up met coal commitments for 2012*, SNL Energy, Barry Cassell, November 3, 2011.

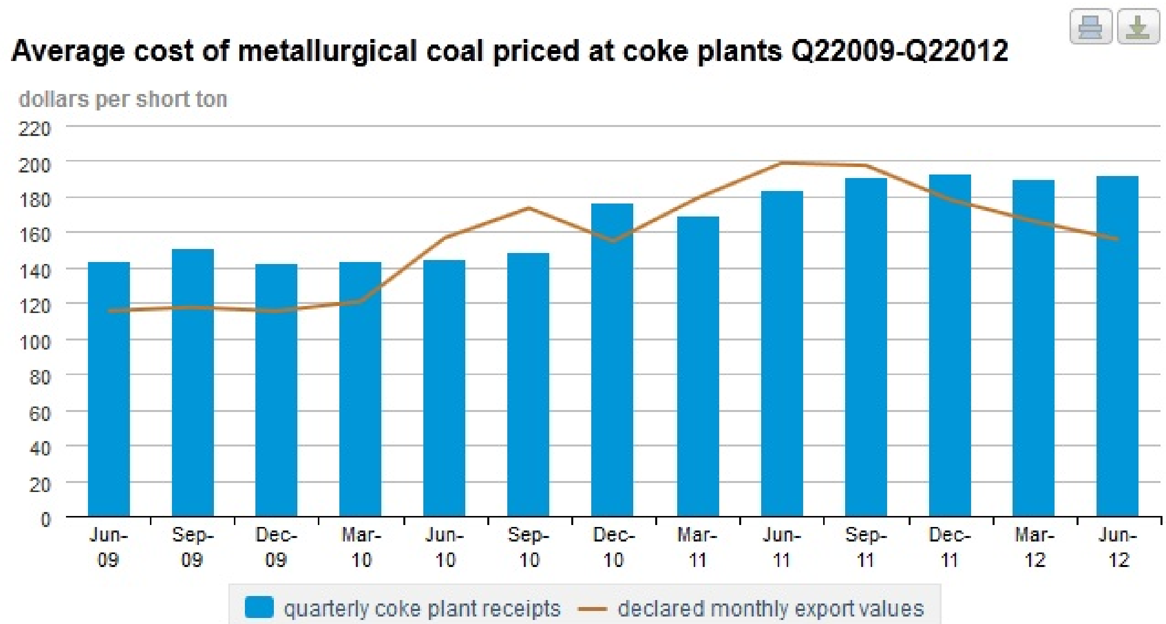


Exhibit 5.5.1-1: Delivered Met Coal Prices (to coke plant or export dock)

Exhibit 5.5.1-2: Recent Delivered Met Coal Prices		
Quarter	**Coke Plant**	**Export Dock**
June 2012	$191.48	$155.61
March 2012	$189.28	$165.87
December 2011	$192.32	$178.06
September 2011	$191.14	$197.24
June 2011	$183.62	$198.57
March 2011	$169.29	$178.99
December 2010	$173.63	$154.76
September 2010	$148.65	$173.24
June 2010	$144.76	$156.59
March 2010	$143.17	$120.70

According to the EIA, the average price for bituminous coal in Virginia was $145.87 for deep mines and $111.15 for surface mines, per ton FOB in 2011.[49] This indicates production heavily weighted to metallurgical coal.

There are five major companies operating in Buchanan County, which represent almost 94% of production (**Exhibit 5.5.1-3**). Furthermore, the majority of coal mined by

[49] Annual Coal Report, EIA, 2011, November 8, 2012 Table 28

these companies are for metallurgical purposes. Due to the lack of data reported by individual companies from the reassessment questionnaires, publicly filed data was used to determine the FOB metallurgical coal sale price in Buchanan County. It is estimated that at least 85% of the coal mined in Buchanan County is mined for met purposes.

Exhibit 5.5.1-3: Company Coal Production		
Company	**Production 2011**	**Percent of Total**
CONSOL	5,654,353	62.00%
Metinvest	932,296	10.22%
SunCoke	874,028	9.58%
TECO	621,402	6.81%
ANR	474,983	5.21%
All Others	562,604	6.17%
Total	9,119,666	

CONSOL

CONSOL's only operation in Buchanan County is the Buchanan #1 deep mine. According to CONSOL's most recent 10-K, the Buchanan Mine is classified as Metallurgical Reserves, and mines the Pocahontas #3 seam. **Exhibit 5.5.1-4** shows coal prices reported to the SEC by CONSOL.[50, 51] The Buchanan mine produces over 60% of all coal in Buchanan County. **Exhibit 5.5.1-5** shows that CONSOL exports met coal as well.

Exhibit 5.5.1-4: Low-Vol Metallurgical Coal Prices			
	2012 thru Q3	**2011**	**2010**
Produced Low Vol Met Tons Sold (in millions)	2.80	5.60	4.60
Average Sales Price Per Low Vol Met Ton Sold	$143.30	$191.80	$146.30
Average Operating Costs Per Low Vol Met Ton Sold	$54.12	$51.57	$49.82
Average Provision Costs Per Low Vol Met Ton Sold	$8.66	$6.84	$5.90
Average Selling, Administrative and Other Costs Per Low Vol Met Ton Sold	$5.64	$4.97	$3.95
Average Depreciation, Depletion and Amortization Costs Per Low Vol Met Ton Sold	$7.90	$6.62	$4.57
Total Average Costs Per Low Vol Met Ton Sold	$84.75	$70.00	$64.24
Margin Per Low Vol Met Ton Sold	$58.55	$121.80	$82.08
3-year Average Sale Price	$160.47		

CONSOL is currently constructing a second entrance one and a half miles closer to the mine face. This will enable miners to spend less time traveling to the face.

50 CNX: CONSOL Energy Inc. SEC Form 10-K, 2/10/2012

51 CNX: CONSOL Energy Inc., SEC Form 10-Q, 11/1/2012

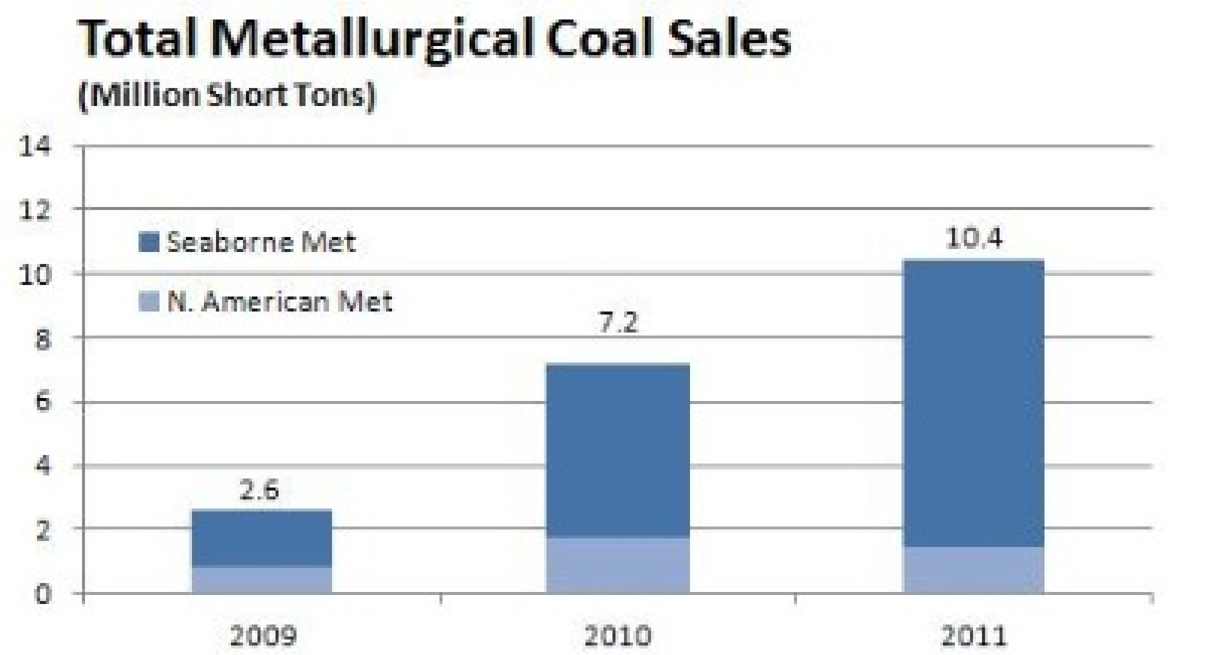


Exhibit 5.5.1-5: CONSOL Met Sales

METINVEST

Metinvest, a Ukranian steel-making company, controls United Coal and Wellmore Coal. However, because it is not a public company in the United States, Metinvest is not required to file 10-K or 10-Qs. Pubic statements by Metinvest provide guidance to their operations in Buchanan County.

According to their website (www.metinvestholdings.com), Metinvest is a vertically integrated company that controls production and sales at every link of the supply chain: from mining coal (metallurgical) and iron ore reserves to production and sales of finished rolled (steel) products.

Metinvest's website states:

> *United Coal is the sixth-largest metallurgical coal producer in the U.S...UCC's proven and probable coal reserves, as defined by U.S. Securities Exchange Commission standards, as of December 31, 2009 totaled 151 million metric tonnes of high quality coking and steam coal, with most of these reserves representing premium grade coking coal.*

Further research showed:[52]

> *United Coal's metallurgical coal customers are primarily steel companies and merchant coke producers in the U.S. Northeast and Midwest, although nearly half of metallurgical coal volumes were exported, primarily to South America and Europe. Some of those exports went to the parent company, Metinvest Holding LLC.*

United Coal's final operating subsidiary is Wellmore Coal Co. LLC, which has several operating surface and deep mines in southwestern Virginia. Wellmore produces approximately 1.8 million tons of coal and "is poised to re-emerge as a dominant supplier

[52] Metinvest targets 1.9 million tonnes per year out of revived coal mine; SNL Energy; Barry Cassell; July 19, 2011.

of mid/high-volatile metallurgical coal," according to the website. Metinvest is controlled by System Capital Management Group.

The website also described which seams are mined in Buchanan County (http://ucc.metinvestholding.com/en/activity/facilities):

In 2006, United Coal Company purchased The Rapoca Group, LLC, headquartered in Bristol, Va., and renamed the operation Wellmore Coal Company in recognition of United Coal's origins in Buchanan County.

Wellmore has both company-owned and contract operations that include two company-operated underground mines, five company-operated surface mines, seven contract mines, three shops, two preparation plants and rail-loading facilities, a lab and administration office – for a total of 360 employees.

The company's reserves, which total more than 55 million tons, are primarily mid/high-volatile metallurgical reserves and low-sulfur steam reserves in the Splashdam, Banner, Glamorgan, Jawbone and Hagy seams. Wellmore's deep and surface mining operations are located throughout Buchanan, Tazewell and Dickenson counties in Southwest Virginia, with additional reserves located in Pike County, Ky., and McDowell County, WV..

The company's Splashdam reserves are some of the most sought-after mid/high-volatile metallurgical coals in the Central Appalachian basin – supplying both domestic and international markets. Wellmore produces approximately 1.8 million tons of coal and is poised to re-emerge as a dominant supplier of mid/high-volatile metallurgical coal.

SUNCOKE

For all intents and purposes, SunCoke is the mining arm of Jewell. Jewell produces coke for steelmaking at several plants including a large plant in Vansant. SunCoke does not file documents with the SEC, but they do provide timely press releases of their business activities. Most coal sales are internal, but press releases by SunCoke state the sales are at market value and are based on outside sales or Jewell SunCoke (**Exhibit 5.5.1-6**) [53, 54, 55, 56, 57, 58]

SunCoke mines the Hagy, Kennedy, Red Ash, Splashdam, Jawbone, and Tiller seams for metallurgical coal, and Upper and Lower Banner for steam coal.[59] Outside sales costumers include ArcelorMittal, U.S. Steel, and AK Steel.

Exhibit 5.5.1-6: SunCoke FOB Prices				
		2012	**2011**	**2010**
Q4	Price	n/a	$156.00	$104.00

[53] SunCoke Energy Inc., Earnings Release, 10/24/2012

[54] SunCoke Energy Inc., Earnings Release, 7/26/2012

[55] SunCoke Energy Inc., Earnings Release, 5/1/2012

[56] SunCoke Energy Inc., Earnings Release, 2/2/2012

[57] SunCoke Energy Inc., Earnings Release, 11/2/201

[58] SunCoke Energy Inc., Earnings Release, 8/3/2012

[59] SunCoke striving to expand US coal, coke production; Barry Cassell, SNL Energy, April 14, 2011

Exhibit 5.5.1-6: SunCoke FOB Prices				
		2012	**2011**	**2010**
	Sales (000)	n/a	363	321
Q3	Price	$165.17	$154.85	$104.00
	Sales (000)	392	371	314
Q2	Price	$166.73	$161.79	$103.90
	Sales (000)	365	334	314
Q1	Price	$171.39	$151.70	
	Sales (000)	373	386	
	Yearly Average	$167.76	$156.09	$103.97
	3-year Average	$142.61		

TECO

TECO has a mining division as well as an electric generation division (Tampa Electric Company). TECO's latest 10-K described the company's mining activity. [60, 61]

Overview

TECO Coal, with offices located in Corbin, Kentucky, is a wholly-owned subsidiary of TECO Energy, Inc. and through its subsidiaries operates surface and underground mines as well as coal processing facilities in eastern Kentucky, Tennessee and southwestern Virginia.

TECO Coal owns no operating assets but holds all of the common stock of Gatliff Coal Company, Rich Mountain Coal Company, Clintwood Elkhorn Mining Company, Pike-Letcher Land Company, Premier Elkhorn Coal Company, Perry County Coal Corporation and Bear Branch Coal Company. The TECO Coal subsidiaries own, control and operate, by lease or mineral rights, surface and underground mines and coal processing and loading facilities. TECO Coal produces, processes and sells bituminous, predominately low-sulfur coal of metallurgical, pulverized coal injection (PCI), steam and industrial grades.

TECO Coal is a supplier of metallurgical and PCI coal for use in the steel-making process and a supplier of thermal coal to electric utilities and manufacturing industries. TECO Coal subsidiaries also export metallurgical and PCI coals internationally, primarily to European markets.

*Metallurgical, PCI and industrial stoker coals accounted for approximately **46%** of 2011 coal sales volume. Steam coal accounted for approximately 54% of 2011 coal sales volume.*

Mining Operations

TECO Coal currently has four mining complexes, mostly operating in Kentucky with a portion of Clintwood Elkhorn Mining Company operating in Virginia. A mining complex is defined as all mines that supply a single wash plant, except in the case of Clintwood Elkhorn Mining Company, which provides production for two active wash plants. These complexes blend, process and ship coal that is produced from one or more mines, with a single complex handling the coal production of as many

[60] TE: TECO Energy, Inc, SEC Form 10-K, 2/24/2012

[61] TE: TECO Energy, Inc, SEC Form 10-Q, 11/2/2012

as 11 individual underground or surface mines. TECO Coal uses two distinct extraction techniques: continuous underground mining and dozer and front-end loader surface mining, sometimes accompanied by highwall mining.

*Prices for metallurgical coal rose in 2010, driven by increased demand from expanding economies in China and India, and recovering demand in the U.S. and Europe. The U.S. steel industry operated at about a 70% utilization rate in 2010, compared to a 40% utilization rate for most of 2009. During 2010, spot price for various grades of metallurgical coal produced by TECO Coal and others reportedly ranged from $110 per ton to $180 per ton. (***Average $145***)*

That trend continued in the first half of 2011, as monsoon rains in Australia caused disruptions in supplies from that important provider of metallurgical coal to Asian markets. In mid-2011, prices for certain grades of Australian metallurgical coal peaked at $335 per metric ton. Subsequent to that peak, coal prices declined as supplies from Australia returned to the market and concerns related to worldwide demand for steel in the weakening international economy became more pronounced. In January 2012, prices for the same grade of Australian metallurgical coal were $235 per metric tonne. In the U.S., the steel industry continued to operate above a 70% utilization rate in 2011 and demand for metallurgical coal remained stable. However, weaker demand in the international market and increased supply of metallurgical coal for the domestic markets caused prices for most grades of metallurgical coal to decline.

In 2012, third quarter results reflect an average net per-ton selling price, excluding transportation allowances, of more than $96 per ton, more than 7% higher than in 2011. In the third quarter of 2012, the all-in total per-ton cost of production was 3% higher than 2011 at approximately $84 per ton, which is below the middle of the cost guidance range previously provided. The 2012 per-ton cost of production increase was driven by spreading fixed costs over fewer tons. TECO Coal's effective income tax rate in the third quarter of 2012 was 26%, compared with 22% in the 2011 period.

TECO Coal has 2.5 million tons of thermal coal contracted for 2013 at prices between $75 and $82 per ton. Total expected volume, selling price and cost of production for 2013 will be determined at the conclusion of the metallurgical coal contracting cycle, which is currently under way but proceeding more slowly than in recent years. The general expectation in the current coal market environment is that average prices for metallurgical and PCI coal will be lower in 2013 than in 2012. TECO Coal will mine to profitably meet demand for its products, which may result in fewer total tons being mined in 2013 than in 2012.

ALPHA NATURAL RESOURCES (ANR)

According to reports filed with the SEC, Alpha produces the most metallurgical coal in the U.S. [62, 63]. In Buchanan County, they produce both steam and met coal. **Exhibit 5.5.1-7** shows FOB prices consolidated from all sales reported by ANR to the SEC. ANR's most recent 10-K describes mining in Buchanan County as part of their southern Central Appalachian region:

CAPP South

Our CAPP South region consists of three business units, Northern Kentucky, Southern Kentucky and Virginia. Coal is mined primarily using continuous miners employing the room-and-pillar mining method at our underground mines, the truck and front-end loader and highwall mining methods at our surface mines. We control approximately 1,026.6 million tons of coal reserves through our CAPP South region. Approximately 461.2 million tons are assigned to active mines and approximately 565.4 million tons are unassigned. There are approximately 3,887 salaried and hourly employees in our CAPP South region.

Virginia produces coal from twenty-three underground mines, four of which are operated by independent contractors. Virginia also has seven surface mines, one of which is operated by an

[62] ANR: Alpha Natural Resources, Inc., SEC Form 10-K, 2/29/2012

[63] ANR: Alpha Natural Resources, Inc., SEC Form 10-Q, 11/8//2012

independent contractor. These mines sell high Btu, low sulfur steam coal primarily to eastern utilities and metallurgical coal to steel companies. The coal produced by the underground mines is transported by truck to the Pigeon Creek preparation plant operated by Cumberland Resources, the Toms Creek preparation plant operated by Paramont and the McClure preparation plant operated by Dickenson Russell, where it is cleaned, blended and loaded onto rail for shipment to customers. The coal produced by the surface mines is transported to one of our preparation plants where it is blended and loaded onto rail for shipment to customers. During 2011, Virginia shipped 6.8 million tons.

Northern Kentucky produces coal from eight underground mines. Northern Kentucky also operates three surface mines. These mines sell high Btu, low sulfur steam coal primarily to eastern utilities. The coal produced by the underground mines is transported by truck and overland belt to the Long Fork, Martin County, Sidney or Sprouse Creek preparation plants. At the preparation plant, the coal is cleaned, blended and loaded onto rail for shipment to customers. The coal produced by the surface mines is transported to one of our preparation plants or raw coal loading docks where it is blended and loaded onto rail for shipment to customers. During 2011, Northern Kentucky shipped 2.3 million tons.

Exhibit 5.5.1-7: ANR Average Consolidated Coal Sales

		2012 thru Q3	2011	2010
Metallurgical	Prices	$129.96	$161.85	$113.89
	Production (000)	4,860	19,117	11,871
Eastern Thermal	Prices	$66.40	$66.92	$67.07
	Production (000)	9,849	37,192	24,001
	Average Met	$135.23		
	Average Steam	$66.80		

NATURAL RESOURCE PARTNERS (NRP)

NRP owns property in Buchanan County. NRP does not mine coal but is a large landholder that leases to mining operations. A review of their public documents follows[64, 65]. (**Exhibits 5.5.1-8 and -9**)

VICC/Alpha.

The VICC/Alpha property is located in Wise, Dickenson, Russell and Buchanan Counties, Virginia. In 2011, 4.9 million tons were produced from this property. We primarily lease this property to a subsidiary of Alpha Natural Resources. Production comes from both underground and surface mines and is trucked to one of four preparation plants. Coal is shipped via both the CSX and Norfolk Southern railroads to utility and metallurgical customers. Major customers include American Electric Power, Southern Company, Tennessee Valley Authority, VEPCO and U.S. Steel and to various export metallurgical customers.

Exhibit 5.5.1-8: NRP Partners Central Appalachia Production

	Coal Royalties (000)	Production (000)	$/ton
2011	$196,789	29,555	$6.66

[64] Natural Resource Partners L.P. (NRP), SEC Form 10-K, 2/29/2012

[65] Natural Resource Partners L.P. (NRP), SEC Form 10-Q, 11/7/2012

Thru Q3 2012	$119,880	19,632	$6.11
Annualized		26,176	
% of 2011		88.57%	

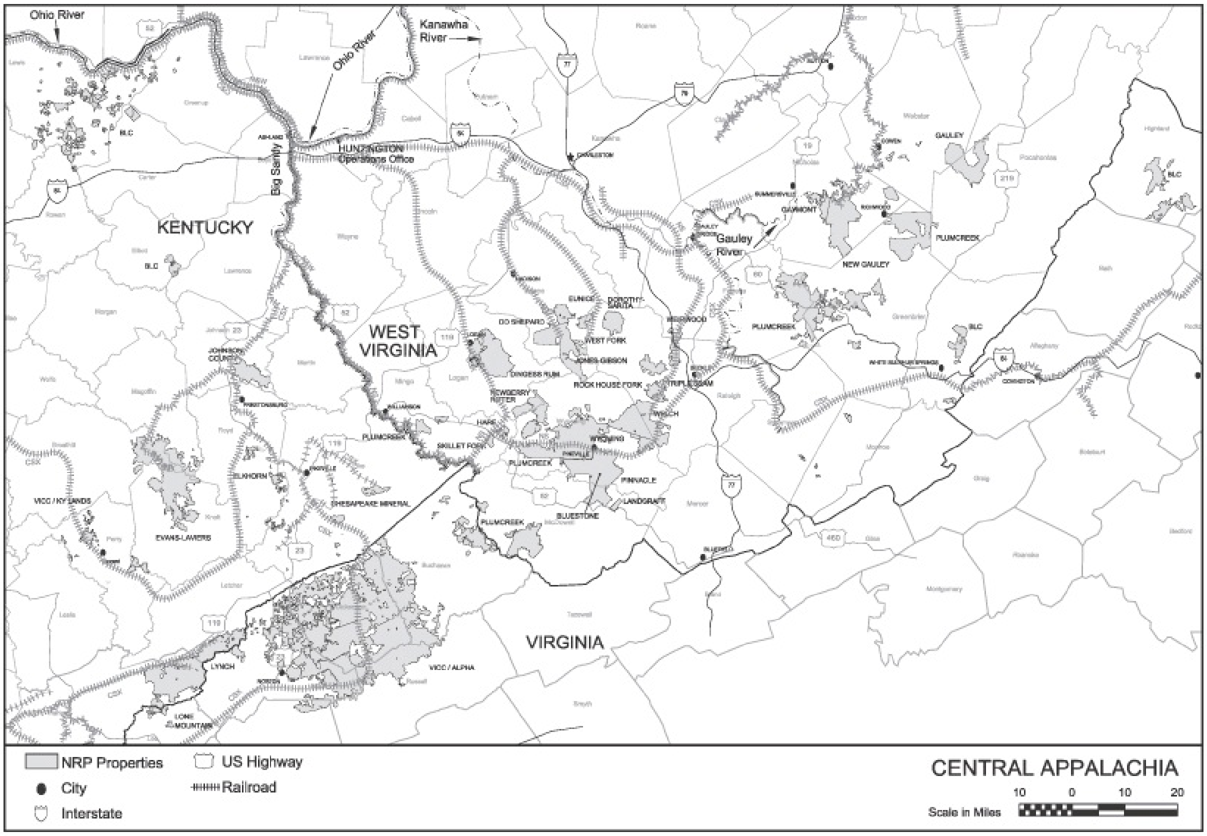


Exhibit 5.5.1-9

5.5.2 Steam Coal Market Pricing

Although in the minority, there is steam coal mined in Buchanan County. While not a major factor in overall pricing, the steam market is examined here. Steam coal demand has been displaced by natural gas, as described in **Exhibit 5.5.2-1**.[66] Below $2.70/MMBtu, significant coal resources are affected as natural gas is preferable. Above $4.70/MMBtu, coal becomes the fuel of choice for power generation.

[66] SNL article

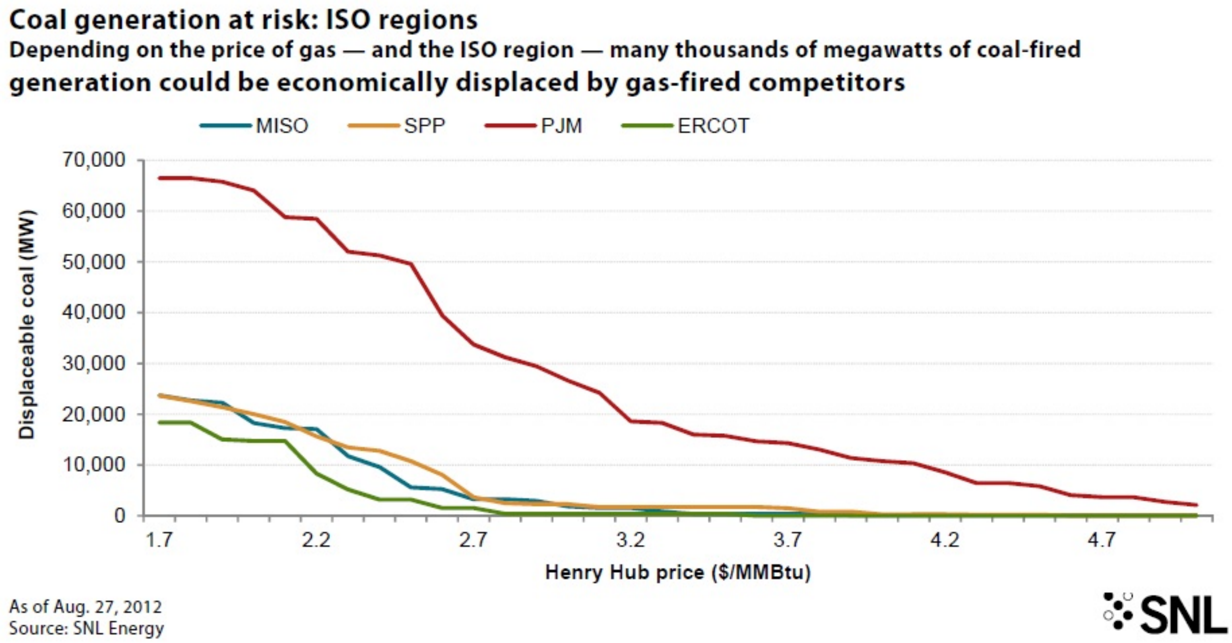


Exhibit 5.5.2-1: Coal to Natural Gas Switching ins Depend on Natural Gas Prices

Exhibits 5.5.2-2 through -4 show CAPP steam prices over the last few years. Notice the price drop in 2012.

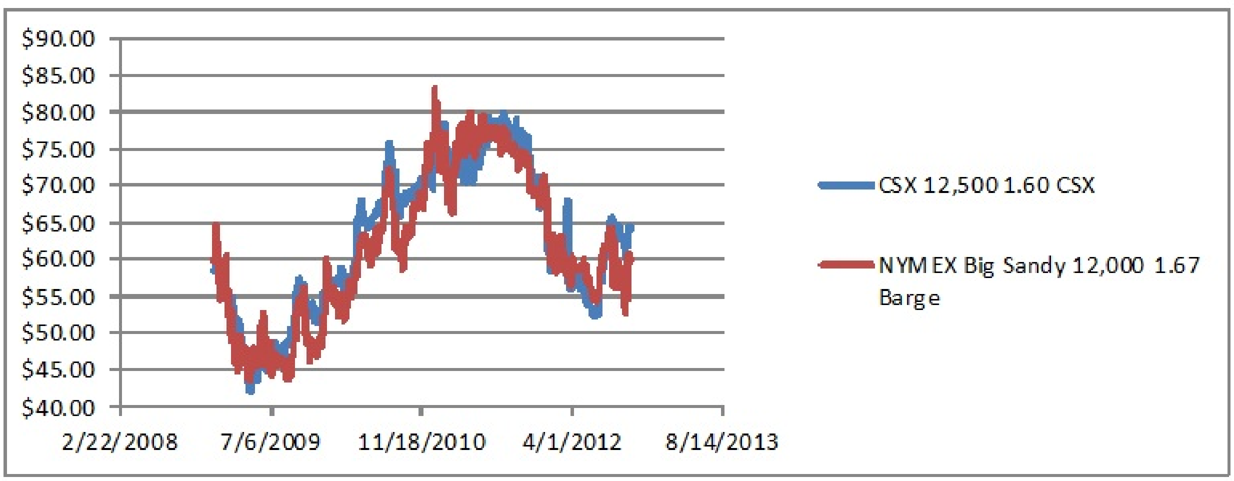


Exhibit 5.5.2-2: OTC (Spot) Delivered Prices (From SNL Energy)

Exhibit 5.5.2-3: OTC Delivered Averages, CAPP (From SNL Energy)		
	CSX	**NYMEX**
2012	54.49	54.29
2011	74.68	74.48
2010	65.30	62.65
2009	50.71	49.36

.

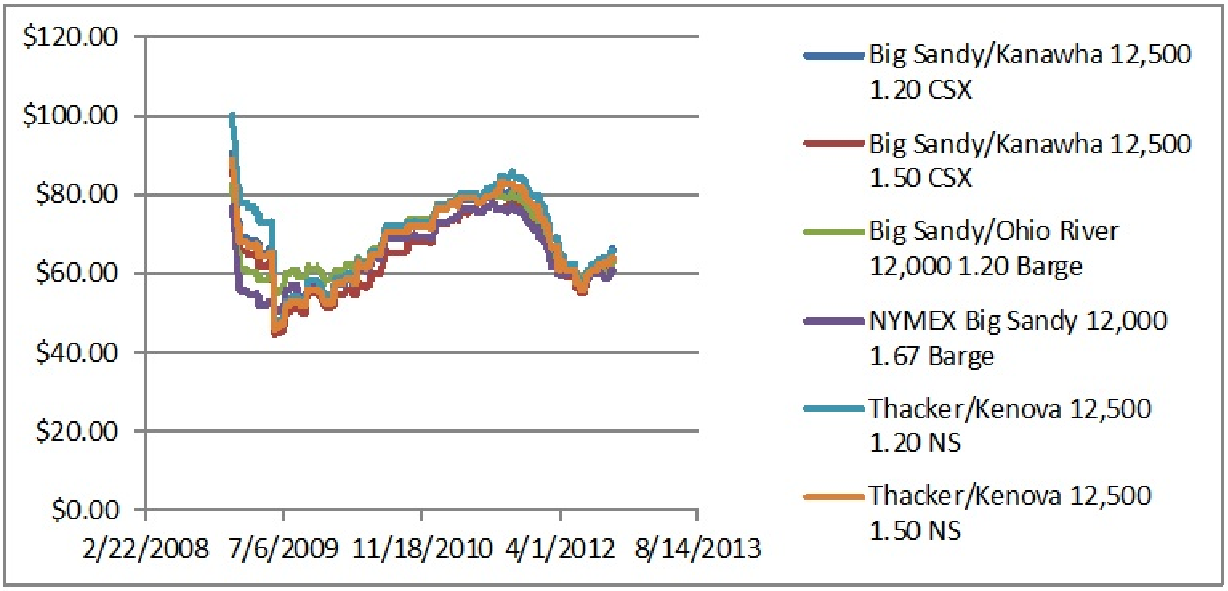


Exhibit 5.5.2-4: Physical Survey Prices (From SNL**)**

Exhibit 5.5.2-5 shows SNL Energy's predicted coal futures into 2014. Prices steadily rise into the $70/ton region.

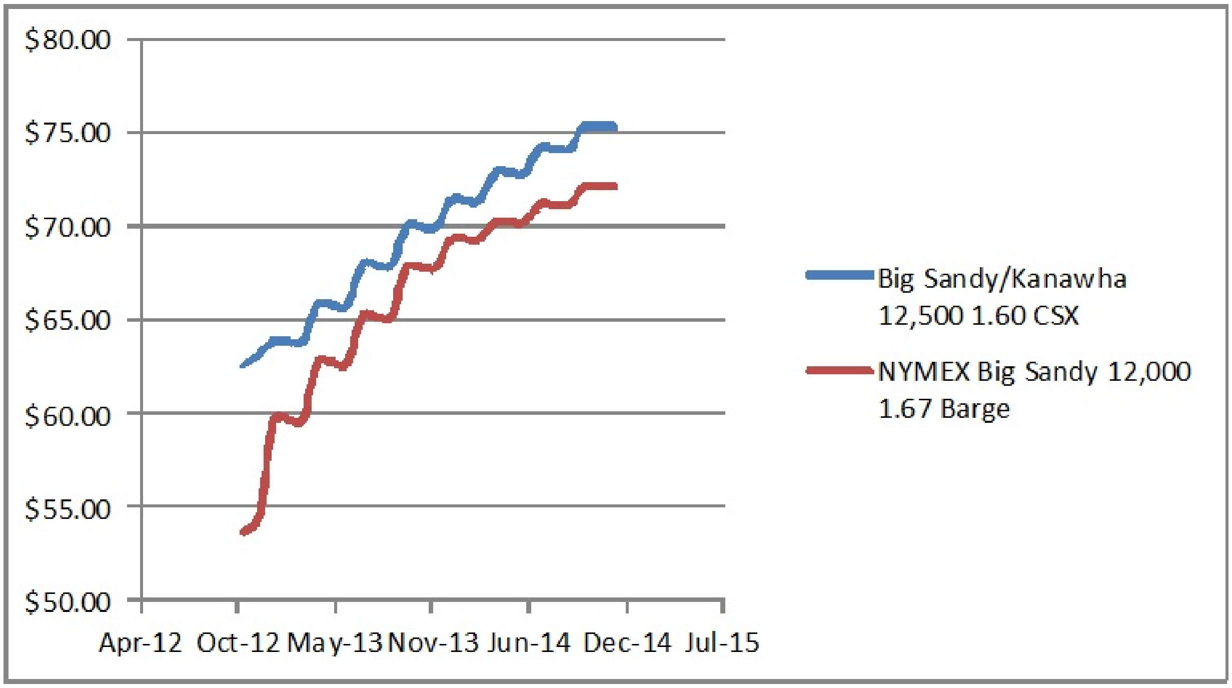


Exhibit 5.5.2-5 Steam Coal Futures (From SNL**)**

The West Virginia Public Utility Commission tracks contract, spot, mine-mouth, FOB, and delivered coal sales from mines located in the state and from mines outside of the state that sell to utilities located within the state. The state publishes a compilation of these statistics. The latest published prices (as of September 1, 2012) are shown in **Exhibit 5.5.2-6.**

Exhibit 5.5.2-6: West Virginia Statewide FOB Price Averages ($/ton) Published September 1, 2012 for Tax Year 20123	
State Steam Price	$61.86
State Steam Spot Price	$59.72

While CONSOL does not produce steam coal in Buchanan County, their latest 10-Q (Q3 2012) states an average selling price of thermal coal at $61.79 per ton. As shown above, ANR's three year average is $66.80 per ton.

5.5.3 Final Coal Price

Almost all coal in Buchanan County is mined for metallurgical purposes. All of CONSOL and SunCoke's production are earmarked for metallurgical purposes, and the majority of ANR, TECO, and Metinvest coal is mined for metallurgical use as well. **Exhibit 5.5.3-1** shows the estimated coal price for this reassessment.

Exhibit 5.5.3-1: Coal Price for Reassessment		
	Met	Steam
CONSOL	$160.47	$61.79
ANR	$135.23	$66.80
SunCoke	$142.61	
TECO	$145.00	
Survey Response	$143.73	$63.48
Average	$145.83	$64.02
Royalty	5.60%	5.60%
Dollar Royalty	$8.17	$3.59
Production Mix	85.00%	15.00%
Final Price - Dollar Royalty	$7.48	

5.6 Cost and Price Increases

As stated by the Federal Office of Management and Budget (OMB)[67]: "Future inflation is highly uncertain and analysts should avoid having to make an assumption about the general rate of inflation whenever possible." This statement is particularly applicable to today's economy, where economists project an uncertain future. There is some wariness of inflation at some point in the future. However, because of continued recessionary pressure, global market displacement, and unstable monetary exchange rates, there is also fear of the development of a deflationary cycle. In this climate, it is nearly impossible to predict inflation or general economy based on cost or price increases or decreases.

According to the OMB:

- Real or Nominal Values: Economic analyses are often most readily accomplished using real or constant-dollar values, i.e., by measuring benefits and costs in units of stable purchasing power. (Such estimates may reflect expected future changes in relative prices, however, where there is a reasonable basis for estimating such changes.) Where future benefits and costs are given in nominal terms, i.e., in terms of the future purchasing power of the dollar, the analysis should use these values rather than convert them to constant dollars as, for example, in the case of lease-purchase analysis. Nominal and real values must not be combined in the same analysis. Logical consistency requires that analysis be conducted either in constant dollars or in terms of nominal values. This may require converting some nominal values to real values, or vice versa.

[67] Circular No. A-94 Revised, (Transmittal Memo No. 64), MEMORANDUM FOR HEADS OF EXECUTIVE DEPARTMENTS AND ESTABLISHMENTS, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs , October 29, 1992.

- Recommended Inflation Assumption: When a general inflation assumption is needed, the rate of increase in the Gross Domestic Product deflator from the Administration's economic assumptions for the period of the analysis is recommended. For projects or programs that extend beyond the six-year budget horizon, the inflation assumption can be extended by using the inflation rate for the sixth year of the budget forecast. The Administration's economic forecast is updated twice annually, at the time the budget is published in January or February and at the time of the Mid-Session Review of the Budget in July. Alternative inflation estimates, based on credible private sector forecasts, may be used for sensitivity analysis.

The use of general cost and price trends (increasing) nearly always results in inflated values. Since the economic viability of any operation is based on the difference between cost and gross income, with increasing cost and income scenarios, each succeeding year can show an ever-increasing Net Operating Income (NOI). History does not show any industry with an ever-expanding NOI – market adjustments take place to negate the artificial trend.

Based on the above discussion, this appraisal uses the constant dollar approach in this valuation. The net cash flows used to calculate the present worth are the expected pretax net operating income.

5.7 Discount Rate

Discounting can be thought of as the reverse of the compounding of savings – where interest is paid into the account periodically. The interest is paid by the "bank" to compensate the owner of the account for the forbearance of allowing the money to be used by the bank rather than the owner. In compounded savings, the interest payment is credited to the account – last year's interest becomes this year's additional principal, then it too accumulates interest in the subsequent year. Discounting reflects the cost of deferring that interest. In short, the concept is based on the assumption that it is worth more to receive income today then to wait for payment. Today's payment could be invested today and be used to earn further income. On the other hand, tomorrow's payment can not be used to earn income until the date of its realization. This assumption is tempered with any expected increase or decrease in the amount of the future payment.

A discount rate is composed of market-based expectations of future returns that are expected on money invested. Tying up money while waiting for coal to be mined means not using the money or equity on anything else – this is the "opportunity cost" of money. Tying up money and equity in the coal market means exposing the investment to risk associated with the coal market. Tying up money for some period of time means exposing the capital to the risk associated with a loss of liquidity.

The cost of capital is always an expected or forward-looking return. It is the competitive return available in the market on a comparable investment, with risk being the most important component in comparability. "The opportunity cost of capital is equal to the return that could have been earned on an alternative investment at a specific level of risk."[68] The term is applied differently to the various perspectives of a firm's assets:

[68] Ibbotson, Roger, Ibbotson Associates, Chicago, Ill, Cost of Capital Workshop, 1999.

- "On the asset side of a firm's balance sheet, it is the rate that should be used to discount to a present value the future expected cash flow.

- On the liability side, it is the economic cost to the firm of attracting and retaining capital in a competitive environment, in which investors (capital providers) carefully analyze and compare all return-generating opportunities.

- On the investor's side, it is the return one expects and requires from an investment in a firm's debt or equity.

- While each of these perspectives might view the cost of capital differently, they are all dealing with the same number."[69]

It is important to note that the cost of capital "comes from the investment not the investor."[70] In other words, it is derived from the market-place where the market-place is the universe of investors who are actively pricing the risk associated with a particular class of assets. The rate represents investors expectations of future performance. There are two elements of these expectations:

- The Risk-free rate (or 'time-value' of money) includes:

  - The 'real' rate of return – the amount (excluding inflation) investors expect to obtain in exchange for letting someone else use their money on a risk free basis.
  - Expected inflation – the expected depreciation in purchasing power while money is in use.

- Risk rate which includes:

  - The uncertainty as to when and how much cash flow or other economic income will be received.

  - The loss of opportunity related to the loss of liquidity – the loss of options in moving money to alternative investments.

The cost of capital, as derived from the consensus of investor's expectations, is applied to the expected income to estimate present value. The cost of capital or discount rate, in this context, is derived from an analysis of comparative investments in the open market. Present value in this context refers to the dollar amount that a rational and well-informed investor would be willing to pay today for the stream of future expected economic income. Expected income in this context refers to estimates of periodic and terminal cash flows. The calculated present value is used to compare investment alternatives of similar or differing levels of risk.

The discount rate used to calculate the present worth of the future income in this report is estimated to be 12.39%, compounded annually (**Exhibit 5.7-1**). This value is

---

[69] Stocks, Bonds, Bills, and Inflation, Valuation Edition, 2008 Yearbook, Ibbotson, Morningstar, Chicago, Il, 2008, page 23.

[70] Ibbotson, Roger, Ibbotson Associates, Chicago, Ill, Cost of Capital Workshop, 1999.

based on research using Morningstar Cost of Capital averaged over the last four years for coal mining companies. Morningstar publishes data concerning the cost of capital, the return expected by investors, and the interest rates demanded by lenders for money needed by various businesses.

Exhibit 5.7-1: Discount Rate

Period	Discount Rate*	Yearly Average
2012 Q3		9.77%
2012 Q2	9.30%	
2012 Q1	10.23%	
2011 Q4	11.97%	12.45%
2011 Q3	11.71%	
2011 Q2	12.64%	
2011 Q1	13.48%	
2010 Q4	13.32%	13.04%
2010 Q3	12.19%	
2010 Q2	12.81%	
2010 Q1	13.85%	
2009 Q4	14.38%	14.32%
2009 Q3	13.90%	
2009 Q2	14.45%	
2009 Q1	14.53%	
Average		12.39%

* Morningstar Weighted Average Cost of Capital (%), CAPM, SIC Composite, + Size Prem, for Coal Mining (SIC 12)

Most Recent Companies Surveyed: Alliance Resource Partners LP, Alpha Natural Resources Inc, Arch Coal Inc, China Energy Corp, Consol Energy, Hallador Energy, James River Coal Company, Kentucky Energy, Natural Resource Partners, Patriot Coal Corporation, Peabody Energy Corporation, Sinocoking Coal and Coke Chemicals, US China Mining Group, Walter Energy, Westmoreland Coal Co.

To value active coal, Buchanan County uses a modified cap rate method which changes the cap rate based on the mine life. The mine's annual income (coal price multiplied by production) is divided by the cap rate at the given mine life to calculate the mines' total value. Modifying the discount factor to 9.5% from 9.0% best matches using a 12.39% discount rate for discounted cash flow analysis (**Exhibit 5.7-2**).

Exhibit 5.7-2: 2013 Reassessment Active Cap Rate				
Mine Life	**Percent Mined per Year**	**Discount**	**Taxes**	**Cap Rate**
2	0.5000	0.0950	0.0043	0.5993
3	0.3333	0.0950	0.0043	0.4326
4	0.2500	0.0950	0.0043	0.3493
5	0.2000	0.0950	0.0043	0.2993
6	0.1667	0.0950	0.0043	0.2660
7	0.1429	0.0950	0.0043	0.2422
8	0.1250	0.0950	0.0043	0.2243
9	0.1111	0.0950	0.0043	0.2104
10	0.1000	0.0950	0.0043	0.1993
11	0.0909	0.0950	0.0043	0.1902
12	0.0833	0.0950	0.0043	0.1826
13	0.0769	0.0950	0.0043	0.1762
14	0.0714	0.0950	0.0043	0.1707
15	0.0667	0.0950	0.0043	0.1660
16	0.0625	0.0950	0.0043	0.1618
17	0.0588	0.0950	0.0043	0.1581
18	0.0556	0.0950	0.0043	0.1549
19	0.0526	0.0950	0.0043	0.1519
20	0.0500	0.0950	0.0043	0.1493

Exhibit 5.7-3 shows the comparison using Buchanan County's (red line) Gordon Method and the discounted cash flow analysis (blue line). In conclusion, Buchanan County's current method can accurately match the discounted cash flow analysis.

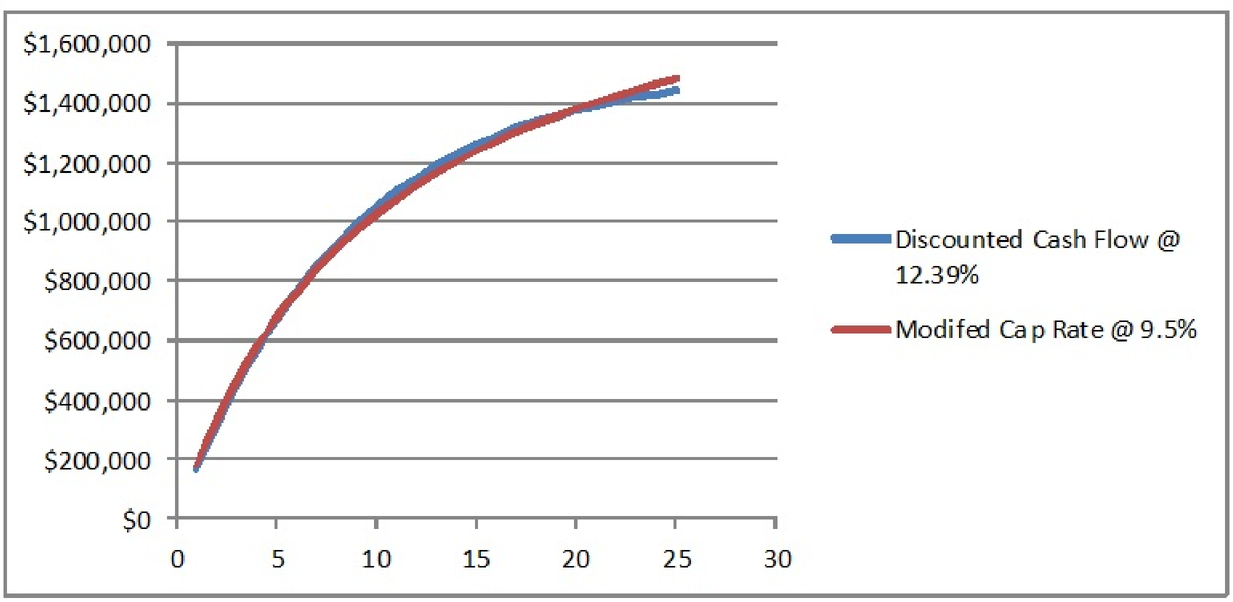


Exhibit 5.7-3: Total Value Comparison per Mine Life
(Example: 100,000 tons mined for 25 years at $2/ton)

6.0 VALUE RECONCILIATION

6.1 Valuation Target

Exhibit 6.1-1 shows the valuation parameters used to calculate the expected total value based on the conclusions developed above.

Exhibit 6.1-1: Valuation Parameters - County Target Value	
Unit	**Value**
Production Capacity Per Year (Tons)	7,628,400
Steam Price	$64.02
Metallurgical Price	$145.83
Coal Royalty	5.60%
Met Production Mix (%)	85.00%
Average Royalty $	$7.48
Discount Rate	12.39%
Target Value Estimated value of all in-place coal in Buchanan County Production X Royalty $) / Discount Rate (as years increase the discount rate can applied as a cap rate, being equal at year 127)	$460,536,000

Exhibit 6.1-2 shows the yearly royalty income stream expected from all mining in Buchanan County over the next 20 years. Notice that 90% of the value is coal that will be mined within the first 20 years which can be thought of as the active portion: this is the projected mine life of the largest underground mines in the County; 99% of the value is reached at year 40.

Exhibit 6.1-2: Coal Income Stream showing 90% of the Value is from Coal Mined in the Next 20 Years				
Year	**Royalty Value**	**PV Royalty**	**Total**	**% of Total**
1	$57,060,432	$50,770,026	$50,770,026	11.02%
2	$57,060,432	$45,173,081	$95,943,107	20.83%
3	$57,060,432	$40,193,150	$136,136,257	29.56%
4	$57,060,432	$35,762,212	$171,898,468	37.33%
5	$57,060,432	$31,819,745	$203,718,214	44.24%
6	$57,060,432	$28,311,901	$232,030,115	50.38%
7	$57,060,432	$25,190,765	$257,220,880	55.85%
8	$57,060,432	$22,413,707	$279,634,586	60.72%
9	$57,060,432	$19,942,795	$299,577,381	65.05%
10	$57,060,432	$17,744,278	$317,321,659	68.90%
11	$57,060,432	$15,788,129	$333,109,788	72.33%
12	$57,060,432	$14,047,628	$347,157,417	75.38%
13	$57,060,432	$12,499,002	$359,656,418	78.10%
14	$57,060,432	$11,121,098	$370,777,516	80.51%
15	$57,060,432	$9,895,095	$380,672,612	82.66%
16	$57,060,432	$8,804,249	$389,476,860	84.57%
17	$57,060,432	$7,833,659	$397,310,519	86.27%
18	$57,060,432	$6,970,067	$404,280,587	87.78%
19	$57,060,432	$6,201,679	$410,482,266	89.13%
20	$57,060,432	$5,517,999	$416,000,265	90.33%

6.2 Active Valuation

The active value for 2013 was determined by using the 2012 “Mineral Under Development Reports”. The 2013 economic data (royalty price and cap rate) replaced data from the last reassessment (**Exhibit 6.2-1**). Due to the dearth of data supplied by the operating sites, the percentage of coal sold to either the met or thermal market was estimated from company to company. The 2013 Mineral Under-Development Value is estimated at $386,340,400, up from 2012 Mineral Under Development of $101,350,000.

[redacted]

Exh[redacted]6[redacted]1[redacted]201[redacted]Mi[redacted]al U[redacted]der [redacted]opm[redacted]Valu[redacted]

[redacted]mpany [redacted]	Mine2 [redacted]	Mined T[redacted]	Met [redacted]	Met [redacted]	Steam F[redacted]	Steam F[redacted]	Royalty P[redacted]	Annual I[redacted]	Mine Life[redacted]	New [redacted] Rate	New Value [redacted]	Old [redacted]	2012 Ass[redacted] Income	2012 [redacted] Rate	2012 Total V[redacted]
[redacted]	[redacted]	1[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	$[redacted]	[redacted]	$[redacted]
[redacted]OAL	[redacted]733AE	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	88 STRIP #14823AA	162,866	80%	$8.17	20%	$3.59	$7.25	$1,181,427	4	0.3493	$3,382,270	$2.00	$325,729	0.3450	$944,142
[redacted]	BUTCHERKNIFE #14929AA	122,754	20%	$8.17	80%	$3.59	$4.51	$553,128	2	0.5993	$922,957	$2.00	$245,507	0.5950	$412,617
[redacted]	[redacted]4424AB	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
ANR [redacted]	HURRICANE BR HIGHWALL [redacted]	35,399	50%	$8.17	50%	$3.59	$5.88	$208,147	2	0.5993	$347,317	$2.00	$70,79[redacted]	0.5950	$75,599
[redacted]	HURRICANE BR SURFACE [redacted]	5,857	50%	$8.17	50%	$3.59	$5.88	$34,442	2	0.5993	$57,470	$2.00	$11,714	0.5950	$75,599
[redacted]	[redacted]B	1[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]R	[redacted]ELK STRIP #14562AA	1[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	$1[redacted]	[redacted]	$[redacted]	[redacted]	$[redacted]
[redacted]ACKS [redacted]	[redacted]08067AL	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	$[redacted]	[redacted]	[redacted]
[redacted]D	LAUREL CREEK MINIMG #6 [redacted]	29,386	50%	$8.17	50%	$3.59	$5.88	$172,789	5	0.2993	$577,311	$2.00	$58,772	0.2950	$199,227
CALICO COAL	MERIDIAN MINE #2 #06721AF	48,764	50%	$8.17	50%	$3.59	$5.88	$286,729	6	0.2660	$1,077,930	$2.00	$97,527	0.2620	$15,672
CEDAR CREEK COAL [redacted]	#2 14877AA [redacted]	225,229	50%	$8.17	50%	$3.59	$5.88	$1,324,344	8	0.2243	$5,904,341	$2.00	$450,458	0.2200	$2,047,538
[redacted]OAL [redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
CONSOL	[redacted]N #1	5,334,991	100%	$8.17	0%	$3.59	$8.17	$43,586,874	20	0.1493	$291,941,557	$2.00	$10,669,980	0.1450	$73,588,718
DACOAL [redacted]	DACOAL #5 14813AB [redacted]	77,181	50%	$8.17	50%	$3.59	$5.88	$453,822	9	0.2104	$2,156,948	$2.00	$154,361	0.2060	$749,325
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
HANNA COAL	HANNA COAL #1 14932AB	85,219	50%	$8.17	50%	$3.59	$5.88	$501,090	14	0.1707	$2,935,501	$2.00	$170,439	0.1660	$1,026,741
J&L	14957AA	23,345	50%	$8.17	50%	$3.59	$5.88	$137,269	2	0.5993	$229,048	$2.00	$46,690	0.5950	$78,471
LAUREL CREEK MINIMG	MINE #6 14689AB	19,639	50%	$8.17	50%	$3.59	$5.88	$115,476	2	0.5993	$192,686	$2.00	$39,278	0.5950	$199,227
SunCoke	DOMINION #30 #14293AH	90,666	90%	$8.17	10%	$3.59	$7.71	$699,215	14	0.1707	$4,096,164	$2.00	$181,331	0.1660	$1,092,355
SunCoke	DOMINION #36 #14314AA	160,991	90%	$8.17	10%	$3.59	$7.71	$1,241,563	20	0.1493	$8,315,891	$2.00	$321,982	0.1450	$2,220,565
SunCoke	DOMINION #44 #14909AA	164,398	90%	$8.17	10%	$3.59	$7.71	$1,267,834	15	0.1660	$7,637,557	$2.00	$328,795	0.1620	$699,208
SunCoke	DOMINION #7 #13963AE	226,047	90%	$8.17	10%	$3.59	$7.71	$1,743,273	5	0.2993	$6,495,679	$2.00	$452,094	0.2950	$1,710,202
SunCoke	DOMINION MINE #34 #14401AC	45,731	90%	$8.17	10%	$3.59	$7.71	$352,679	5	0.2993	$1,178,346	$2.00	$91,462	0.2950	$310,041
SunCoke	MINE #26 14260AD	153,724	90%	$8.17	10%	$3.59	$7.71	$1,185,518	3	0.4326	$2,740,448	$2.00	$307,447	0.4280	$718,334
SunCoke	MINE #3 14454AB	40,039	50%	$8.17	50%	$3.59	$5.88	$235,428	10	0.1993	$1,181,275	$2.00	$80,077	0.1950	$410,651
SunCoke	MINE NO.1 14433AI	36,410	50%	$8.17	50%	$3.59	$5.88	$214,093	25	0.1393	$1,536,922	$2.00	$72,820	0.1350	$539,407

Ex[redacted] Mi[redacted]al [redacted]der [redacted]opm[redacted] Valu[redacted]

[redacted]pany	Mine2	Mined To[redacted]	Met	Met	Steam [redacted]	Steam [redacted]	Royalty [redacted]	Annual In[redacted]	Mine Life[redacted]	New [redacted] Rate	New Value	Old [redacted]	2012 Ass[redacted] Income	2012 [redacted] Rate	2012 Total Va[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Wellmore/UC/ etinvest	CONAWAY MINING #1 #14732AB	[redacted]	75%	$8.17	25%	$3.59	$7.03	$102,372	2	0.5993	[redacted]	$2.00	$29,145	0.5950	[redacted]
Wellmore/UC/ etinvest	CONVICT HOLLOW 14675AC	30,993	75%	$8.17	25%	$3.59	$7.03	$217,726	2	0.5993	$363,301	$2.00	$61,986	0.5950	$104,178
Wellmore/UC/ etinvest	DJ#5 14869AD	3,896	75%	$8.17	25%	$3.59	$7.03	$27,373	4	0.3493	$78,365	$2.00	$7,792	0.3450	$22,587
Wellmore/UC/ etinvest	HUFFMAN FK 14889AA	330,694	75%	$8.17	25%	$3.59	$7.03	$2,323,122	2	0.5993	$3,876,393	$2.00	$661,389	0.5950	$1,111,579
Wellmore/UC/ Metinvest	LOCUST THICKET #14732AB	324,196	75%	$8.17	25%	$3.59	$7.03	$2,277,477	2	0.5993	$3,800,228	$2.00	$648,394	0.5950	$1,089,739
Wellmore/UC/ Metinvest	MIDDLE FK	63,580	75%	$8.17	25%	$3.59	$7.03	$446,653	4	0.3493	$1,278,708	$2.00	$127,161	0.3450	$690,173
Wellmore/UC/ Metinvest	MIDDLE FORK	7,618	75%	$8.17	25%	$3.59	$7.03	$53,519	4	0.3493	$153,217	$2.00	$15,237	0.3450	$44,165
Wellmore/UC/ Metinvest	PAW PAW 14221AH	15,912	75.00 %	$8.17	25%	$3.59	$7.03	$111,784	9	0.2104	$531,292	$2.00	$31,825	0.2060	$154,490
Wellmore/UC/ Metinvest	PIONEER #1 #14688AB	51,044	75%	$8.17	25%	$3.59	$7.03	$358,585	5	0.2993	$1,198,078	$2.00	$102,088	0.2950	$346,061
		9,769,408									$386,340,400				$101,350,000

6.3 Reserve Coal Valuation

Exhibit 6.3-1 shows the remainder value distributed among the mineable reserve. The mineable acres-inches were determined from the previous reassessment and newly submitted data for this reassessment; 19,753,000 mineable reserve acre-inches are estimated to be remaining in the County.

Exhibit 6.3-1: Reserve Valuation Settings	
Target Value	$460,536,000
Minerals Underdevelopment	$386,340,400
Remainder (Reserve Coal)	$74,195,600
Reserve Mineable Acres-Inches	19,753,000
$/ac-in	$4.00
Unmineable Acres	2,880,600
$/ac (unmineable)	**$10/ac**
Unmineable Value	$28,806,000
Total	$494,158,400

6.4 Value Comparison

Exhibits 6.4-1 and **6.4-2** show the differences between the 2013 reassessment and the prior County values.

Exhibit 6.4-1: Coal Rates		
	Prior	**2013**
Under development ($/mined ton)	$2.00	$7.48
Discount Factor	0.090	0.095
Reserve Mineable ($/ac-in)	$10.00	$4.00
Reserve Unmineable ($/ac)	$10.00	$10.00

Exhibit 6.4-2: Reassessment Value Analysis			
	Prior Value	**2013 Value**	**Difference**
Under development	$101,350,000	$386,340,400	$284,990,400
Mineable Reserve	$220,334,600	$74,195,600	($146,139,000)
Unmineable Reserve	$28,142,700	$28,806,000	$663,300
Totals	$349,827,300	$460,536,000	$110,708,700

7.0 ADDITIONAL ACTIVE REPORTING REQUIREMENTS

In the course of this reassessment, it became clear that the active valuation could be improved with a few more, but simple, reporting requirements from coal operators. Currently, each operator reports the following to the County on each mined parcel:

- Account Number
- Map Number
- Parcel Owner
- Tract Acres
- Mined Acres
- Seam Height
- Mined Tons.

From this data, the County re-calculates mined tons and determines the active parcel value by the formula:

- *Seam Height X Mined Acres X 145 (tons/ac-in) = Mined Tons*
- *Mined Tons X $2/ton = Annual Income (Royalty)*
- *Mined Tons / Cap Rate Factor (@ Given Mine life) = Active Mineral Value*

To more accurately reflect the selling price and make the County proactive to reflect changes in the coal market over the next six years, the following columns will be reported by the operators:

- Percentage of tonnage sold to the Metallurgical Market (metpct)
- Percentage of tonnage sold to the Steam Market (steampct)

One of the most influential factors affecting active value is mine life. A review of the mine life reported by the operators indicate there is some confusion about what to report. The mine life reported by the operator should be the total remaining mine life in the entire mining plan not just the remaining time on any given parcel. Reporting the mine life within a permit **captures the entire value of the active mine at the time the mine is developed** not just the parcels on which operations are currently occurring. Currently, operators report mine life but that value is not audited by the County. To make the mine life value more accurate and accountable, operators will be required to report the following:

- Remaining permit acreage (on all parcels (*i.e. the economic unit*)
  - County will be able to audit value with VADMME
  - Should exclude support areas
- Total yearly acreage mined through on all active parcels
  - This includes acres mined and sterilized in the course of mining (i.e. pillars left behind)
  - County will be able to audit values with reported mine tons.

In general, the formulas to calculate active parcel mineral values will remain the same but there will be changes based on the new information:

- *Seam Height X Mined Acres X 145 (tons/ac-in) = Mined Tons*
- *Mined Tons X ($8.17 X met pct + $3.59 X steam pct) = Annual Income*
- *Permit Acres / Yearly Mined Acres= Mine life*
- *Annual Income/ Cap Rate Factor (@ Given Mine life) = Active Mineral Value*

7.1 Sample Active Reporting Sheet

Each operator in the County has a different format for reporting data concerning their mine. The County then enters each report into their computer system. While this is expected to continue, **Exhibit 7.1-1** shows an example of an active report including the new reporting requirement.

Exhibit 7.1-1: Required Reporting Data for Active Mineral Parcels

Account #	Map #	Tract Acres	Mined Acres	Clean Coal Height (in)	Mined Tons	Met Pct	Steam Pct	Yearly Mined Acres	Remaining Project Acres

Exhibit 7.1-2 shows example data and how that data will be used to calculate mineral parcel data.

Exhibit 7.1-2: Example Active Mineral Parcel Valuation

Account #	Map #	Tract Acres	Mined Acres	Clean Coal Height (in)	Mined Tons	Met Pct	Steam Pct	Yearly Mine Acres	Remaining Mineable Project Acres
1	A	50	10	48	64,800	90	10	30	500*
2	B	25	15	48	97,200	90	10	30	500*
3	C	10	5	48	32,400	90	10	30	500*
Notice the remaining mineable acres is much greater than acres of the currently mine parcels									

Valuation Parameters:

- Royalty Dollars = 0.90 X $8.17 + 0.10 X $3.59 = $7.71
- Mine life = 500ac / 30ac/yr = 16.67 years
- Cap Rate @ 17 years = 0.1581 (Exhibit 5.6-2)

Account #1 Valuation:

- Mined Tons = 10ac * 48in * 145 tons/ac-in = 69,600 tons
- Annual Royalty Income = 69,600 ton * $7.71= $536,488
- Mineral Value = $536,488 / 0.1581 = $3,393,349

7.2 Suggested Active Audit

An audit of current data by RTC showed there could be upwards of $40 million in assessed value from under-development records that are not being captured. RTC conducted an audit of permit information and data supplied to the County. It appears some operators are under reporting mine life. For example, an operator will report two years, when the permit shows it is more like five to ten. The mine life can greatly affect the overall value of the mine. The source of this discrepancy may be benign, as operators may be reporting mine life on the individual property where they are working rather than the entire operation. RTC suggests implementing an audit program when the active returns arrive in June, rather accepting the information directly reported on the return.

8.0 QUALIFICATIONS OF RTC STAFF

Jeffrey R. Kern, MRP, ASA
State Certified, General Appraiser

EDUCATION

Degrees

Masters of Regional Planning: The Pennsylvania State University. Resource Economics. Emphasis on land use planning and resource management (1980)

Bachelor of Arts: Dickinson College. Political Science, minor in Geology. Emphasis on land use planning and resource management (1973)

Graduate Work in Public Administration: The Pennsylvania State University. Focus on public finance and land use management (1977 - 1981)

Appraisal and Real Estate Courses

National USPAP Update Equivalent (2012-2013), McKissock, 2012
Pennsylvania State Mandated Law, McKissock, 2012
Deriving and Supporting Adjustments, McKissock, 2011
Even Odder: More Oddball Appraisals, McKissock, 2011
National USPAP Update Equivalent (2011-2012), McKissock, 2011
Foundations in Sustainability: “Greening” the Real Estate and Appraisal Industries, McKissock, 2010
National USPAP Update Equivalent (2010-2011), McKissock, 2010
Income Capitalization, McKissock, 2009
Forecasting Revenue, Appraisal Institute, 2009
Office Building Valuation: A Contemporary Perspective, Appraisal Institute, 2008
Condemnation Appraising, Appraisal Institute, 2008
USPAP Update, McKissock, 2008
Real Estate Finance, Statistics, & Valuation Modeling, Appraisal Institute, 2006
Partial Interest Valuation - Divided, Appraisal Institute, 2005
USPAP Update, McKissock, 2005
Limited Appraisals and the Scope of Work Decision, McKissock, 2005
USPAP, McKissock, 2004
Valuation of Regional Malls & Golf Courses, IAAO, 2004
Complex Industrial Property, IAAO, 2004
Minerals & Golf Courses, IAAO, 2004
Electric Asset Valuation, CBI, 2003
Business Valuation - Selected Advanced Topics, ASA, 2002
Electric Asset Valuation, CBI, 2002
Minneapolis Assessor’s Info. & CAMA System Migration, IAAO, 2001
Alternative Valuation Methods for Downtown Office Properties, IAAO, 2001
PariTop: A Decision Support System for Mass Appraisal, IAAO, 2001
First Application of Modern Location Adjustments to Cost Approach, IAAO, 2001
Improving Location Analysis by Integrating GIS & CAMA Methods, IAAO, 2001
Regional Models for Valuation & Ratio Studies, IAAO, 2001
Analyzing Sales Using GIS & Technology, IAAO, 2001

The Appraisal of Health Care Facilities and Retirement Housing, IAAO, 2001
USPAP, McKissock, 2001
Managing Your Mineral and Real Estate Assets, SME, 2000
USPAP, ASA, 2000
Market Approach to Valuing Businesses, ASA, 1999
Geostatistical Simulation for Mineral Deposit Modeling & Mining Application, Colorado School of Mines (CSM), 1999
APCOM '99 Computer Applications in the Minerals Industries, CSM, 1999
Marshall & Swift Residential Costing, AAP, 1999
Valuation of Pennsylvania Minerals, AAP, 1999
Mining In a Volatile World, MEMS, 1999
Due Diligence Review and Valuation of Industrial Mineral Acquisitions, SME, 1999
USPAP, McKissock, 1998
Economic Globalization of the Mining Industry, MEMS, 1998
Economic Evaluation and Investment Decision Methods, CSM, 1997
USPAP, McKissock, 1997
Income Capitalization, McKissock, 1997
Coal Taxation, Virginia Polytechnic Institute State University, 1997
Evaluating, Buying, & Selling Coal Properties, Coal Outlook, 1997
Coal Taxation, Virginia Technical Institute, 1996
USPAP, ASA, 1996
Regression Analysis as an Appraisal Tool, McKissock, 1995
USPAP, ASA, 1994
Real Property Appraisal, Income Producing Properties III, ASA, 1992
Fundamentals of Real Estate, Polley School, 1991 (State Certification Requirement)
Real Estate Practice, Polley School, 1991 (State Certification Requirement)
Appraisal Ethics and Practice, Polley School, 1991
Real Property Appraisal II, ASA, 1990
Real Property Appraisal, Income Producing Properties I, ASA, 1990
Value-Tape Series, ASA (self-study materials for certification examinations) Including:

- Cost Manuals and Cost Data
- Depreciation Recapture
- Mobile Home Park Appraisals
- Cost Is Not Always Value
- Market Approach to Basic Rural Appraisal
- Partial Acquisition of a Farm Property
- Appraisal Practices in the Army Corps of Engineers
- Appraisal of Machinery and Equipment
- Ad Valorem Taxes & Real Property Appraising
- Income Properties for Mortgage Loans
- Eminent Domain: Principals of Fixtures Appraisal
- How to Determine the Feasibility of an Apartment Project
- Valuation of Public Utilities for Ad Valorem Taxation

CERTIFICATIONS AND ACTIVITIES

Certifications

Certified General Appraiser:

Pennsylvania, GA 000447-L
New Jersey, 42RG00083000
New York, 46000021412
Georgia, 343350
Indiana, CG41100044
Delaware, X1-0000593
West Virginia, 226

Certified Evaluator:
Pennsylvania, AV 000790-L

Held Previous Licenses In:
Alaska, Arkansas, Connecticut, Delaware, Illinois, Florida, Maine, Maryland, Massachusetts, Michigan, Mississippi, North Carolina, South Carolina, Ohio, Tennessee, Virginia

Member of:
American Society of Appraisers, Real Property, Natural Resources, Technical Valuations Discipline (Senior Member)
American Institute of Mineral Appraisers (Certified Member)
National Association of Realtors
National Association of Independent Fee Appraisers
International Association of Assessing Officers
American Coal Council
Society for Mining, Metallurgy, and Exploration
Mineral Economics Management Society (Previous Board Member)

GUEST SPEAKER/ LECTURER

Oil and Gas Valuation, PICPA, 2011
Specialized Oil and Gas Valuation, Appraisal Institute, 2011
Mineral Valuation, Assessors Association of Pennsylvania, 2011
Forest Resource Appraisal, Assessors Association of Pennsylvania, 2011
Oil and Gas Valuation, PICPA, 2010
Oil and Gas Valuation, Penn State Extension Education, 2010
Oil and Gas Valuation, Appraisal Institute, 2010
Valuation of Pennsylvania Minerals, AAP, 2010
GIS for Assessment, AAP, 2009
Taxation of Pennsylvania Minerals, PA Aggregate and Concrete Associations, 2008
Geographic Information Systems and Assessment, AAP, 2008
Valuation of Pennsylvania Minerals, AAP, 2008
Valuation of Timberlands, AAP, 2008
Statistics to Support and Analyze Assessment, Highmark Institute, 2007
Using GIS in the Appraisal Process, Highmark Institute, 2007
Soil Characteristics and Influence on Valuation, AAP, 2006
Appraisal of Mineral Property, IAAO, Indianapolis, 2004
Appraisal of Mineral Property, IAAO, Boston, 2004
GIS for Assessment, AAP, 2004
Advanced GIS and Property Assessment, AAP, 2003
Advanced Tax Mapping, AAP, 2003
Auditing the Reassessment, AAP, 2002
Assessment of Forest Lands/Timber Resources, AAP, 2002
Valuation of Pennsylvania Minerals, AAP, 2001
Valuation of Pennsylvania Minerals, AAP, 2000
USPAP, ASA, 2000
Mineral Valuation, SME, 2000
GIS, Tax Assessment, and Local Government, AAP, 2000
GIS and Real Estate Tax Assessment, AAP, 2000
Reserve Coal Appraisal Methodology, Virginia Tech, 1999

Valuation of Pennsylvania Minerals, AAP, 1999
GIS and Property Tax Appraisals, AAP, 1999
Business Management, Rehabilitation Services, PSU, 1993
Business Management, Rehabilitation Services, PSU, 1992
Business Management, Rehabilitation Services, PSU, 1991
Business Management, Employee Assistance Plan Opportunities, PSU, 1990
Business Management, Rehabilitation Hospital Locations, PSU, 1990
Hospital Location, Development, and Administration in the For-Profit Sector, PSU, 1989
Rehabilitation Environment, Council on Disabilities, 1988
Remote Sensing Workshop, PSU, 1982
Careers in Geography Workshop, PSU, 1982
Remote Sensing Workshop, PSU, 1981

EXPERIENCE

President, Senior Appraiser of Resource Technologies Corporation (1980 - Present)

Commercial, Industrial, and Mineral Appraisal Projects Include:

- Natural resources such as coal, oil, gas, sand, gravel, clay, limestone, and other minerals
- Energy production facilities
- Environmentally-sensitive properties
- Technical and business properties including associated equipment
- Mass appraisal technology

Many of these efforts have involved condemnation and/or taxation and many have required court presentation with values up to $2,500,000,000
Annual Appraisals exceed $5 billion in market value.

Expert Testimony

Expert Testimony has been Accepted in Numerous Courts:

- United States District Court, Northern District of West Virginia
- United States District Court, Middle District Court of Pennsylvania
- United States District Court, Western District of Pennsylvania
- United States District Court, Eastern District of Kentucky
- United States Bankruptcy Court, Wilkes-Barre, Pennsylvania
- Various State and Local Courts

APPRAISAL CLIENTS

Federal Clients

U.S. Department of Defense, Army Corps of Engineers
U.S. Department of Interior, Office of Surface Mining
U.S. Department of Treasury, Internal Revenue Service
U.S. Department of Justice, various divisions

State, Local, and Private Clients

21st Century Appraisals
Adams County, Pennsylvania
AMFIRE Mining Company
Amoco Oil Company
Arthur Andersen, LLP
AT&T Capital
Atlantic County NJ Utilities Authority
B.S. Quarries, Inc.
Bank of America
Banyan Street Partners
Barclays Business Credit
Bedford County, Pennsylvania
Beltrami Enterprises, Inc.
Berg, Klein, Salomon, LLP
Blair County, Pennsylvania
Blaschak Coal
Blue Coal Corporation
BNYH Real Estate Management
Borough of Gibbsboro, New Jersey
Cambria County, Pennsylvania
Carter Lake Enterprises, Inc.
Centre County, Pennsylvania
Centre Lime & Stone
Chernau, Chaffin & Burnsed, PLLC
Chicago Title Insurance Company
CIB Bank
City of Concord, NC
City of Springfield, Ohio
Clarion County, Pennsylvania
Clean Streams Foundation
Clinton County, Pennsylvania
Coast Business Credit
Common Cause of West Virginia
CONSOL
Curry Lumber
Cyprus Emerald Resources
Diversified Energy Ventures, Inc.
Dominion Transmission
DoveBid Valuation Services, Inc.
Dragon Products
E.R. Linde Construction Corporation
Erie County, Pennsylvania
Ernst & Young, LLP
Essroc Materials, Inc.
Fayette County, Pennsylvania
FDIC-NE Service Center
First Indiana Bank
First National Bank
First Union Bank
Fleet Bank
Fleet Capital Corporation
Fifth Third Bank
Fosbel, Inc.
Glenn O. Hawbaker, Inc.
Grafton Coal
Greene County, Pennsylvania
Hampton and Hampton
Harper & Marti
Hilco Appraisal Services
Holland Energy, LLC
Hook and Hook, PC
Huntingdon County, Pennsylvania
International Appraisal Company
J.C. Hill Tree Farms, Inc.
Jehl and Fabian
Jerrold F. Janata, Attorney at Law
Jireh Corporation
Karl D. Kammer, Attorney at Law
Kentucky Revenue Cabinet
KMG Minerals, Inc.
L. Robert Kimball & Associates, Inc.
LaFarge Canada, Inc.
Lehigh Cement Company
M&I Bank
M&T Bank
MacDonald, Illig, Jones & Britton LLP
Marshall & Stevens, Inc.
McElroy Coal Company
McGuffey School District
MD Associates
Melcroft Coal Company
Mid-State Bank and Trust Company
Midland International Tileworks
National Bank of the Commonwealth
Natural Lands Trust
NBT Bank
NJ Department of Transportation
NJ Department of Environmental Resources
Omega Bank
OldCastle Minerals
Ogle Bay Norton
PA Department of Environmental Protection
PA Department of Transportation
Pennsy Supply
PA General Energy Corporation
Pennsylvania State University
Peoples National Bank
Perry Pines, LLC
Philpott & Prosser, LLP
PNC Bank
RCC Consulting, Inc.
Reliance Bank
Reliant Energy Wholesale Generation
Rhoads and Sinon, LLP
S&B Industrial Minerals
Schuylkill County, Pennsylvania
Somerset County, Pennsylvania
Somerset Trust Company
State of Ohio
State of West Virginia
Steptoe & Johnson
Stone Consulting and Design, Inc.
Sun National Bank
SunTrust Bank
Tarasi, Tarasi & Fishman, PC
The Foundation of Monongalia General Hospital
Thomas, Thomas, Armstrong & Niesen
Town of Adams, Massachusetts

Tri-County Habitat for Humanity
United Miners' Workers
Venango County, Pennsylvania
Victor Oolitic Stone Company
Wachovia Corporation
Warren County, Pennsylvania
West Virginia Department of Tax and Revenue
West Virginia Education Association
Western Pennsylvania Conservancy
Wilmington Trust Company
Wolf, Block, Schorr & Solis-Cohen
WY Department of Tax and Revenue

RECENT APPRAISAL PROJECTS

Appraisal of Various Oil and Gas Properties Throughout New York, Ohio, Pennsylvania, and West Virginia, Clients: Private and Various Law Firms
Assessment for Tax Purposes of All Minerals, Clients: Pennsylvania Counties of Cambria, Centre, Fayette, Greene, and Schuylkill
Appraisal of Oil, Gas, Coal, Limestone, and Surface Rights CDC NIOS site, Client: Center for Disease Control
Appraisal of Brick Plant and Quarry in North Carolina, Client: Wells Fargo
Appraisal of Oil and Gas Properties in New York, Client: Bank of America
Appraisal of a World Famous Quarry Operation, Client: Private
Continuing Consulting of a reserve coal and oil and gas assessment system and procedures for West Virginia, Client: State of West Virginia
Appraisal of Construction Materials Operations in Pennsylvania, Client: Wells Fargo
Appraisal of Sand and Gravel Operation in Florida, Client: Fifth Third Bank
Appraisal of Sand and Gravel Operation in Florida, Client: Brooklyn New York Private Equity
Appraisal of Coal Waste Recovery Operation, Client: M & T Bank
Appraisal of Gas-Fired Power Generation Facility, Client: County of Fayette, PA
Appraisal of Coal Mining and Power Generation Operation, Client: M & T Bank
Appraisal of Met Coal Operation, Client: Private
Appraisal of Oil and Gas Interests, Client: Private
Appraisal of Coal in Mine Area in West Virginia, Client: CONSOL
Appraisal of Sand and Gravel Operation in Delaware, Client: Wilmington Trust
Appraisal of Limestone Quarries, Client: OldCastle
Appraisal of Various Mineral Parcels, Client: Dominion Natural Gas
Consulting on Sale of Anthracite Operation
Mining and Mineral Processing Business in Pennsylvania, Client: NBT Bank
Mineral Rights in Pennsylvania, Client: Western Pennsylvania Conservancy
Mineral Rights in Arkansas, Client: Chicago Title Insurance Company
Mineral Rights in Pennsylvania, Client: Private
Mineral Rights in Mississippi, Client: S&B Industrial Minerals
Mining and Mineral Processing Business in Pennsylvania, Client: M&T Bank
Mining and Mineral Processing Business in Pennsylvania, Client: First National Bank
Mining and Mineral Processing Business in Pennsylvania, Client: Private
Mining and Mineral Processing Business in Indiana, Client: M&I Bank
Current Vacant Land Appraised as a Sand and Gravel Quarry In New Jersey, Client: Borough of Gibbsboro, New Jersey
Mining and Mineral Processing Business in Pennsylvania, Client: Somerset Trust Company
Mining and Mineral Processing Business in New Jersey, Client: Wachovia Corporation
Shale Pit Before-and-After-Taking in Pennsylvania, Client: Interstate Acquisition Services
Current Vacant Land Appraised as a Limestone/Limerock Quarry in Florida, Client: Banyan Street Partners
Mine Refuse Site in Pennsylvania, Client: The Clean Streams Foundation
Glenn O. Hawbaker Properties: Big Flats, Brokenstraw, Canoe Valley, Canton, Clarion, Cove Forge, Erwin, Hagermans Run, Hostetler Bonson, Lawrenceville, Mammoth Latimore, Pleasant Gap, Sandy Ridge, Shinglehouse, Shrader, Waterstreet, Youngs Farm, Client: M&T Bank
Sand and Gravel Operation in Ohio, Client: Private
Mineral Appraisal in Ohio, Client: Private

Limerock Operation in Florida, Client: Bank of America
Limerock Operation in Florida, Client: BNYH Real Estate Management
Sandstone Quarry in Colorado, Client: Carter Lake Enterprises
Sand and Gravel Operation in Massachusetts, Client: Bank of America
Sand and Gravel Operation in New Jersey, Client: Sun National Bank
Appraisal Review of Vulcan Materials Property and Concord Regional Airport, Client: City of Concord, North Carolina
Sand and Gravel Operation in Delaware, Client: Wilmington Trust Company
Allegheny Energy Power Plant in Pennsylvania, Client: Greene County, Pennsylvania
Coal Fines Recovery Facilities, Lands, and Operations in West Virginia, Client: Ernst and Young, LLP
Hard Rock Quarry Operation in Colorado, Client: Fleet Bank
Aggregate Operation in British Columbia, Client: Arthur Anderson
Federal Acquisitions including Coal, Oil, Gas, Other Minerals and Rural Lands in Various States for Federal Prison Construction, Client: U.S. Bureau of Prisons
Clay Mine and Manufacturing Facility, Midwest United States, Client: Coast Business Credit
Sodium Sulfate Deposit and Processing Operation in Texas, Client: Fleet Bank
Limestone and Aggregate Mine in British Columbia, Canada, Client: Arthur Andersen, LLP
Slate Mine and Processing Operation in Pennsylvania, Client: Confidential
Bus Station and Garage in Pennsylvania, Client: Confidential
Paper Production Plant, Client: West Virginia Department of Tax and Revenue
Limestone and Aggregate Mine and Cement Production Facility in Pennsylvania, Client: Essroc Materials, Inc.
Limestone and Aggregate Mine and Cement Production Facility in Missouri, Client: RESCO
Limestone and Aggregate Mine and Cement Production Facility in British Columbia, Client: LaFarge Canada, Inc.
Coal Reserves in Western Pennsylvania, Client: Greene County, Pennsylvania
Gas Storage Field in Western and Central Pennsylvania, Client: Confidential
KMG Minerals, Inc., Client: Confidential
All Reserve Mineral Properties in West Virginia, Client: West Virginia Department of Tax and Revenue
All Reserve Mineral Properties in Fayette County, Pennsylvania, Client: West Virginia Department of Tax and Revenue
Dimension Stone Reserves in South Dakota, Minnesota, and Texas, Client: Confidential
Sand, Gravel, and Dolomite Operation in Florida, Client: Barclays Business Credit
Oil and Gas and Other Minerals in Centre, Greene, and Clinton Counties, Pennsylvania, Client: Various County Real Estate Tax Departments
Damages Caused by Undermining of Cemetery, Client: Hook and Hook, PC
Review of Coal Reserve Assessment System in West Virginia, Client: Common Cause, Federation of Teachers, et. al.
Wood Product Reprocessing Business, Client: Keystone Financial Services
Scenic Easement and Rights-of-Way, Youghogeny River, Client: Curry Lumber Company
Selection of Potential Mineral Sites, Client: Glenn O. Hawbaker, Inc.
Nursing Home, Greene County, Pennsylvania, Client: Greene County Commissioners
Coal and Oil and Gas Reserves and Rural Lands in four Pennsylvania Counties, Client: United Properties Group
Condominium and Vacation Complex in Pennsylvania, Client: GE Capital Credit
Coal Refuse Processing Operation in Pennsylvania, Client: Comerica Bank
Four Operating Deep Mines in Pennsylvania, Client: Fleet Financial Services
Coal Refuse Resources in Pennsylvania, Client: Rhoads & Sinon, LLP
Nursing Home in Jefferson County, Pennsylvania, Client: Nursing Home Corporation
Large Bankrupt Coal and Land Estate, Client: Beltrami Enterprises, Inc.
Lands and Resources Associated with a 20-Mine Holding Company, Client: Schuylkill County, Pennsylvania
Coal Reserve Values, Client: Wheeling Creek Water Shed

Granite Mining Operations, Minnesota and Texas, Client: Barclays Business Credit
Coal Processing Plant, Coal Tipple, Rail and River Load-out, Client: Confidential
Sand, Gravel, and Dolomite Operation in Florida, Client: Barclays Business Credit
Sand and Gravel Operation in Pennsylvania, Client: First Bank
Sand and Gravel Operation in New Jersey, Client: Atlantic Counties Utilities Authority
Silverbrook Anthracite, Coal, Culm, and Land Resources, Client: Bank of Seoul, Korea
Consolidation Coal Co., Greene County Coal Properties, Client: Greene County, Pennsylvania
Consolidated Coal/Monongahela Railway Rail Spur, Client: Tarasi and Johnson, PC
Uranium Mine Tailings Depository, Client: U.S. Corps of Engineers
Coal Reprocessing Facility, Client: Pressed Steel, Inc.
Coal Processing and Shipping Facility, Client: Hook and Hook, PC
Coal and Oil and Gas Reserves and Operations, Stonewall Jackson Lake, West Virginia, Client: U.S. Army Corps of Engineers

ADDITIONAL EXPERIENCE

Peer Reviewer, SME

Pennsylvania Oil and Gas Task Force, County of Centre, Pennsylvania

Technical Advisor, Participant: National Conference on U.S. Coal Reserves, U.S. Department of Energy. Provide input concerning criteria to determine U.S. coal reserves, volumes, and value.

Technical Advisor, Senior Economics Analyst: "Defining the Anthracite Resources" for the U.S. Department of Energy. Economic analysis focused on the national and world coal market to the year 2010 as well as the local economic, regulatory, labor, and transportation situation.

Principal Investigator: "Concepts for the Protection Against Catastrophic Events" for the U.S. Department of the Interior. Project involved extensive interviews, literature searches, and analyses concerning various legal, financial, and other instruments potentially available to avoid, mitigate, or abate problems that are associated with the long-term effects of mining. Instruments evaluated included bonding, local planning options, insurance programs, surety arrangements, regulatory programs, legal restrictions and covenants, and disaster assistance programs. Both a policy and economic analysis were included in the report.

Principal Investigator: Development and publication of a self-instructional aerial photographic and inspection handbook for federal, state, local, and private environmental personnel. The 150+ page textbook includes numerous "hands-on" learning exercises and case studies.

SELECTED PUBLICATIONS AND REPORTS

2011, **Appraisal Report of Norlite Expanded Shale Mine and Processing**, Prepared for Charter One Bank

2011, **Appraisal Report of Miller Brothers Masonry Sand & Gravel in Harrington, Delaware**, Prepared for Wilmington Trust

2011, **Appraisal Report of PPL Substation Acquisition, Summit Hill Borough, Pennsylvania**, Prepared for PPL Services Corporation

2011, **Appraisal of Harleysville Quarry in Pennsylvania**, Prepared for Univest National Bank and Trust Company

2011, **Appraisal of Phoenix Business Park**, Prepared for Redevelopment Authority of the County of Washington

2011, **Appraisal of Millville Asphalt Unit and Appraisal of Rosano Asphalt Unit**, Prepared for Stavola Construction Materials Company

2011, **Appraisal of North Church Sand and Gravel**, Prepared for Mizzone & Associates

2010, **Appraisal of Buckeye Industrial Mining**, Prepared for Evergreen Energy, Inc.

2010, **Appraisal of Haines & Kibblehouse, Cornwall & Chalfont, PA and Belvidere, NJ**, Prepared for Bank of America

2010, **Appraisal of Cedar Rock Materials Corporation Stone & Gravel Pit**, Prepared for Appraisal & Marketing Associates, Inc.

2010, **Appraisal of Horsey Family in Sussex County, Delaware**, Prepared for Wilmington Trust

2010, **Appraisal of Lake Point Holdings**, Prepared for Bank of America

2010, **Appraisal of Coral Rock**, Prepared for Fifth Third Bank

2010, **Appraisal of Colver Limestone Grinding Facility**, Prepared for Wells Fargo

2008, **Appraisal Report of Garrett Limestone Company, Inc., in Somerset County, Pennsylvania**, Prepared for Somerset Trust Company

2008, **Appraisal Report of Belle Mead Quarry in Belle Mead and Hillsborough, New Jersey**, Prepared for Wachovia Corporation

2008, **Appraisal Report of Perry Pines Project in Taylor County, Florida**, Prepared for Banyan Street Partners

2008, **Appraisal/Consulting Report of LTV Russellton Mine Site in Allegheny County**, Pennsylvania, Prepared for The Clean Streams Foundation

2007, **Mineral Appraisal of North Church Gravel, Inc., Franklin, New Jersey**, Prepared for Sun National Bank

2007, **Mineral Appraisal Report of the Youngquist Limerock Quarries, Lee County, Florida**, Prepared for Bank of America

2007, (and Falkenstern, DM) **Mineral Appraisal of the Colletti Sand Pit, Nantucket, Massachusetts**, Prepared for Bank of America

2007, (and Stingelin, RW, **Mineral Appraisal of Lucky Sand & Gravel, Inc., Mantua, Ohio**, Prepared for Karl D. Kammer, Esq., Atty At Law, Cleveland, Ohio

2007, (and Stingelin, RW) **Mineral Appraisal of Como Stone, Wayne, Susquehanna, and Pike Counties, Pennsylvania,** Prepared for B.S. Quarries, Inc.

2006, (and Stingelin, RW) **Appraisal of the Miller Brothers Masonry Sand & Gravel Operation, Kent County, Delaware**, Prepared for Wilmington Trust Company

2006, (and Falkenstern, DM) **Appraisal of the Cole Water Company, LLC, Peru, Indiana (Aquifer Only),** Prepared for MD Associates, Marietta, Georgia

2006, (and Stingelin, RW) **Mineral Appraisal of the B.S. Quarries Damascus 535 Bluestone Quarry, Broome County, N.Y.**, Prepared for Peoples National Bank

2005, **Methods for Determining Discount Rates**, Newsletter of the Mineral Economics and Management Society (MEMS)

2005, **Mineral Appraisal of Donald and Evelyn Stein Placer Claims, Gilmore, Tom and Pat Creeks, Alaska**, Prepared for U.S. Army Corps of Engineers, Alaska District, Elmendorf AFB, AK

2005, (and Falkenstern, DM) **Limited Appraisal of Penn-Ohio Coal Company and Kimble Sanitary Mining Operations in Tuscarawas County, Ohio**, Prepared for Keith Kimble, Penn-Ohio Coal Company, Dover, OH

2005, (and Stingelin, RW) **Appraisal Report, Fee Estate, Surface and Minerals (Coal, Oil, and Gas) in Approximately 378.9 Acres Located in McDowell County, West Virginia**, Prepared for U.S. Federal Bureau of Prisons, Washington, DC

2005, (and Stingelin, RW, Falkenstern, DM) **Appraisal Review Report, PG Hemlock Property, South Canaan Township, Wayne County, PA**, Prepared for NexxusSoft Corporation.

2005, (and Kern, J.R.) **Appraisal of the J.D. Materials Co. Quarry, Gibbsboro, N.J.**, Prepared for Borough of Gibbsboro, N.J.

2004, **Tax Assessment of Mineral Property**, Proceedings of IAAO Conference, Boston, MA, Valuation Sessions, International Association of Assessing Officers

2004, Contributing Author, **Property Taxation, 3rd Edition**, Institute for Professionals in Taxation. This textbook serves as a manual or desk reference for the business property tax practitioner/professional. It provides an in-depth analysis compiled and edited by experienced property tax practitioners.

2004, (and Stingelin, RW) **Appraisals of the Shore Sand & Gravel, LLC Mining Operations in Barnegat and Eaglesworth Townships, Ocean County, N.J**, Prepared for Sun National Bank, Vineland, NJ

2004, (and Stingelin, RW, Falkenstern, DM) **Appraisal of Mineral Parcels Located Within U.S. Route 22 Section 491, Indiana County, Pennsylvania**, Prepared for The Pennsylvania Department of Transportation, District 10, Indiana, PA

2004, (and Stingelin, RW) **Appraisal of the Barrick Limestone Quarry, Woodsboro, Frederick County, Maryland**, Prepared for SunTrust Bank, Laurel, MD

2004, (and Stingelin, RW) **Appraisal of the Walter Quarries, Wilmot Township, Bradford County, Pennsylvania**, Prepared for PNC Bank, Scranton, PA

2004, (and Stingelin, RW, Falkenstern, DM) **Appraisal of the R.T.G. Inc. Mineral Estates, Guernsey County, Ohio**, Prepared for The State of Ohio, Office of the Attorney General, Columbus, OH

2003, (and Stingelin, RW) **Appraisal Report of the Dragon Products Company Thomaston Cement Plant & Quarry, Knox County, Maine**, Prepared for Fleet Bank, Waltham, MA

2002, (and Stingelin, RW) **Appraisal of the Victor Oolitic Stone Company, Monroe & Lawrence Counties, Indiana**, Prepared for CIB Bank, Indianapolis, IN

2002, (and Stingelin, RW) **Appraisal of the Leeward Quarry, Lackawaxen Township, Pike County, Pennsylvania**, Prepared for Leeward Construction Inc., Honesdale, PA

2002, (and Stingelin, RW, Falkenstern, DM) **Effects of Longwall Mining on Real Property Value and the Tax Base of Greene and Washington Counties, Pennsylvania**, Prepared for the Pennsylvania Department of Environmental Protection, Bureau of Mining and Reclamation

1999, (and Torries, TF) **Use of Geographic Information Systems Technology to Value for Ad Valorem Tax Purposes Coal Reserves Deposit**, Prepared for Society of Mining Engineers, Denver, CO

1998, (and Torries, TF) **Use of Geographic Information Systems Technology to Evaluate Large Mineral Deposit**, Prepared for Minerals Economics and Management Society, Calgary, Canada

1989, (and Stingelin, RW) **Analysis of Coal Tipple And Loadout Needs Along the Monongahela River From Milepost 60 Below the Maxwell Lock And Dam to Milepost 100 Above Lock And Dam Number 8**, Prepared for U.S. Army Corps of Engineers, Huntington District, Huntington, WV

1984, (and Stingelin, RW, McGrory, BJ) **Defining the Anthracite Resources of Northeastern Pennsylvania**, Prepared for U.S. Bureau of Mines, Pittsburgh Mining Research Center

1983, (and Evans, BM, Stingelin, RW) **Low Altitude Photointerpretation Manual for Surface Coal Mining Operations**, Prepared for U.S. Geological Survey, U.S. Office of Surface Mining

1981, **Concepts for Protection Against Catastrophic Events Resulting from Coal Mining**, Prepared for Office of Surface Mining, U.S. Dept. of the Interior, Washington, DC

1981, **Semi-Automated Land Cover Change Detection from Sequential Aerial Imagery as a Resource Planning Tool**, MRP Dissertation, The Pennsylvania State University

1980, **SWMIS - Solid Waste Management Information System - Specifications**, Prepared for The Pennsylvania Department of Environmental Resources, U.S. Environmental Protection Agency

1979, (and Stingelin, RW) **Premining Identification of Hazards Associated with Coal Mine Roof Measures**, Prepared for U.S. Bureau of Mines, Pittsburgh, PA

1979, (and Armstrong, RM) "**SUMIS - Surface and Underground Mine Management Information System - Specifications**", Prepared for The Pennsylvania Department of Environmental Resources, U.S. Office of Surface Mining

1978, "**Evaluation of Color Infrared Aerial Photography Data for Regional Wildlife and Land Use Inventory and Analysis**", Prepared for U.S. Fish and Wildlife Service, Fort Collins, CO

1978, (and Stingelin, RW) "**Impact of Coal Gasification and Mine Degasification on Appalachian Coal Production**", Prepared for Battelle Columbus Laboratories

1979, (and HRB Singer, Inc.) "**Digital Mapping for Waterways Monitoring and Surveillance**", Prepared for U.S. Army Corps of Engineers, Cincinnati, OH

1977, (and Stingelin, RW) "**A Bibliography of Appalachian Coal Resources and Reserves**", Prepared for Battelle Columbus Laboratories

1976, (and Stingelin, RW) "**The Impact of Overmining and Undermining on the Eastern Underground Coal Reserve Base**", Prepared for U.S. Bureau of Mines, Pittsburgh, PA

David M. Falkenstern
Resource Technologies Corporation
davemf@resourcetec.com
814-237-4009

EDUCATION
Master of Science (2000) - Environmental and Engineering Geosciences, Radford University, Radford VA; Final Project: *Determining Sediment Yields in the Valley Creek Watershed, Scott County, Virginia, using the Universal Soil Loss Equation linked to a Geographic Information System*

Bachelor of Science (1997) - Geosciences, Hydrogeology Option, The Pennsylvania State University, University Park PA; Thesis: *The Use of Seismic and Direct Observations to Study the Shallow Ground Water Flow Regime at an USDA Experiment Site along Spring Creek, Hershey, PA*

EXPERIENCE
Resource Technologies Corporation, Geologist - Mineral Valuation Specialist (2000-Present) State College, PA

National Renewable Energy Lab, Geologist - Geothermal Technologies Program (2010) Golden, CO

CERTIFICATIONS
Registered Appraiser (2011) - Colorado License #AR100035919
Professional Geologist (2005) - Pennsylvania License #004612
Professional Geologist (2005) - American Institute of Professional Geologists

CONTINUING EDUCATION
- Using Dynamic DCF and Real Options to Value and Manage Mining & Petroleum Projects (2012) Colorado School of Mines, Golden, CO
- Fundamentals of Separating Real Property, Personal Property and Intangible Business Assets (2012) Appraisal Institute, Denver, CO
- Environmental Statistics in Pennsylvania (2011) Pennsylvania Council of Professional Geologists, Monroeville, PA
- Surface Geophysics for Hydro-Geological and Geotechnical Applications (2011) Pennsylvania Council of Professional Geologists, Harrisburg, PA
- Basic Appraisal Principles (2011) Kaplan Professional Schools, Denver, CO
- Geophysical Well Logging & Imaging (2011) Pennsylvania Council of Professional Geologists, Malvern, PA
- Basic Appraisal Procedures (2010) Kaplan Professional Schools, Denver, CO
- Appraisal Standards and Ethics - USPAP (2008) Kaplan Professional Schools, Denver, CO
- Economic Evaluation and Investment Decision Methods (2007) Colorado School of Mines, Golden, CO
- Appraisal of Oil and Gas Properties (2007) University of Tulsa and Gustavson Associates, Denver, CO
- Mineral Appraisal (2003) The American Society of Farm Managers and Mineral Appraisers, Denver, CO

CURRENT RESPONSIBILITIES

- Appraisal of minerals(coal, oil and gas, aggregates) and mineral rights for taxation, purchase, and collateral purposes
- Maintain mineral economic databases to on mineral prices, royalty rates, and discount rates
- Conduct mineral reserve studies on coal and aggregate resources
- Create digital map data to assist in mineral assessment including geology, mineral quality, environmental impacts, and transportation factors
- Maintain mineral economic databases to keep current mineral prices, royalty rates, discount rates and present worth values
- Research deeds to determine surface ownership, mineral ownership, and mineral rights ownership
- Investigate mineral lease terms to check that bonus payments, royalty rates, and wheelage rates are upheld
- Recommend favorable lease terms to mineral owners exercising mineral leases or selling mineral rights
- Negotiate lease terms with mineral extraction companies on behalf of clients
- Program custom GIS and database packages to create easy to use systems for clients
- Sustain working relationships with county and state mineral assessment staff employees
- Interact with tax payers at County Commission hearings

CURRENT PROJECTS

West Virginia Reserve Coal Valuation (2000-Present) - Prepared for the West Virginia Department of Tax & Revenue; Since 2001, assisted on a multifaceted GIS program that determines the fair market value of coal beds based on coal volume, coal quality, property rights, ownership interests, proximity to current mining, and coal prices derived from lease, FERC, and PSC data. Serves as the liaison between coal companies and state tax department to aid in the transfer of data. Appears at County Board of Review and Equalization hearing as the State representative to assist County Commissions when addressing tax payer questions and resolving disputes. Assists in active and reserve oil and gas valuations.

County Mineral Taxes (2000-Present) - Prepared for Cambria, Centre, Clinton, Fayette, Greene, Luzerne and Schuylkill Counties, Pennsylvania; Manages the fair market valuation of mineral properties using a GIS linked to mineral information databases. Serves as the County representative at County Commission appeal hearings and informal data sharing sessions.

Estimation of Reserve Coal Value Beneath the Pennsylvania Turnpike, Route 43 Extension, Washington County, PA - Prepared for the Pennsylvania Turnpike Commission

APPRAISALS

Appraisal of Big Island Mine, OCI Chemical Company (In-place Trona), Green River Wyoming (2012 - with J. Kern) - Prepared for Wells Fargo Bank, Summit, NJ

Appraisal of 377.6 Acres at the CDC/NIOSH Lake Facility (Including Land, Mineral, Gas and Gas Storage Estates) (2012 - with J. Kern) - Prepared for the Center for Disease Control, National Institute for Occupational Safety and Health, Atalanta, GA

Appraisal of Coal Ownership in 2,200 acres in Somerset County Pennsylvania (2012 - with J. Kern) - Prepared the Pennsylvania Department of Transportation, Hollidaysburg, PA

Appraisal of Mineral Parcels in Active Mines in Somerset County Pennsylvania (2012 - with J. Kern) - Prepared Shade-Central City School District

Appraisal of Coal Ownership in 3,700 acres in Indiana County Pennsylvania (2012 - with J. Kern) - Prepared for PPL, Allentown, PA

Appraisal of Coal Ownership Rights in 7.87 acres in Marshall County, West Virginia (2011 - with J. Kern) - Prepared for Steptoe & Johnson, PPLC, Canonsburg, PA

Appraisal of Coal Ownership in 874 acres in Schuylkill County Pennsylvania (2011 - with J. Kern) - Prepared for PPL, Allentown, PA

Appraisal of Coal Ownership in 9,000 acres in Somerset County Pennsylvania (2009 - with J. Kern) - Prepared the Pennsylvania Department of Transportation, Hollidaysburg, PA

Appraisal of Coal Ownership in 423 acres in Lackawanna County Pennsylvania (2009 - with J. Kern) - Prepared for PPL, Allentown, PA

Appraisal of Coal Ownership Rights in 3 acres in Marshall County, West Virginia (2009 - with J. Kern) - Prepared for Steptoe & Johnson, PPLC, Canonsburg, PA

Appraisal of Coal Ownership Rights in 61 acres in Marshall County, West Virginia (2009 - with J. Kern) - Prepared for Steptoe & Johnson, PPLC, Canonsburg, PA

Appraisal of Coal Estate in 19.66 acres in Greene County, Pennsylvania (2009 - with J. Kern) - Prepared for CONSOL Energy, Canonsburg, PA

Appraisal of Oil and Gas Rights in 1,144 acres in Warren County, Pennsylvania (2009 - with J. Kern) - Prepared for The Western Pennsylvania Conservancy, Pittsburgh, PA

Appraisal of Oil and Gas Rights in 2,382 acres in McKean County, Pennsylvania (2008 - with J. Kern) - Prepared for The Western Pennsylvania Conservancy, Pittsburgh, PA

Appraisal of Sandstone Mineral Reserves at Carter Lake Enterprises, Larimer County Colorado (2007 - with J. Kern) - Prepared for Carter Lake Enterprises, Masonville, CO

Appraisal of the Mineral Assets of GOH Inc., 19 sites throughout Pennsylvania and New York (2007 - with J. Kern) - Prepared for GOH Inc., State College, PA

Appraisal of Coal Ownership in 300 acres in Indiana County Pennsylvania (2005 - with J. Kern) - Prepared the Pennsylvania Department of Transportation, Indiana, PA

Appraisal of Millard, Prescott, and Fontana Quarries, Lebanon County, Pennsylvania (2004 - with J. Kern) - Prepared for International Appraisal Associates, New York, NY

Appraisal of Mineral Parcels Located Within U.S. Route 22 Section 491, Indiana County, Pennsylvania (2004 - with J. Kern) - Prepared for the Pennsylvania Department of Transportation, District 10, Indiana, PA

PAST PROJECTS

Estimation of Coal Bed Methane Derived from the Pittsburgh Coal Seam - Prepared for David Hook, Esq.; Using a GIS, determine the percentage of gas removed from the Pittsburgh coal seam or surrounding rock by horizontal drilling.

Estimation of Coal Value along the Somerset County Route 219 Corridor - Prepared for the Pennsylvania Department of Transportation; Assessing the volume and value of mineable coal, unmineable coal and the location of mined-out coal along the U.S. Route 219 expansion corridor through Somerset County, Pennsylvania. Includes determining the surface estate ownership, mineral estate ownership, and mining rights of the coal. In conjunction with Kimball Engineers and Associates.

Land Acquisition Studies - Prepared for GOH Inc.; Participated in land acquisition research for future mining sites. Field research to identify mineral reserves, deed research to find willing sellers and zoning ordinance compliance.

Effects of Longwall Mining on Real Property Value and the Tax Base of Greene and Washington Counties, Pennsylvania (2002) - Prepared for the Pennsylvania Department of Environmental Protection, Bureau of Mining and Reclamation: Built a GIS to investigate the relationship between surface property value and longwall coal mining.

Economic Impacts of Environmental Constraints on Mountain Top Coal Removal in West Virginia (2001) - Prepared for U.S. Environmental Protection Agency; Estimated mineable coal resources remaining in West Virginia using changing environmental scenarios for Phase I of Mountain Top Removal/Valley Fill Environmental Impact Statement. Considered mountain top removal mining, contour mining, auger mining and deep mining.

INVITED SPEAKER

Effects of Longwall Mining on Real Property Value and the Tax Base of Greene and Washington Counties, Pennsylvania (2003) - Society for Mining Metallurgy and Exploration, Pittsburgh Section

PUBLICATIONS

An Estimate of the Near-Term Electricity Generation Potential of Co-produced Water from Active Oil and Gas Wells (2012 - with C. Augustine (NREL)) - Submitted Society of Petroleum Engineers

Effects of Longwall Mining on Real Property Value and the Tax Base of Greene and Washington Counties, Pennsylvania (2003) - PADEP

VOLUNTEERING

Volunteer Ski Instructor, Adaptive Ski Program, Breckenridge Outdoor Education Center, Breckenridge, CO (2005-Present) - Teach skiing to challenged youth and adults. PSIA License #197053, Alpine and Telemark Level I

Mount Nittany Medical Centre, State College, PA (2003-2005) – Assisted nurses and hospital staff with routine duties.

RESOURCE TECHNOLOGIES CORPORATION
248 E Calder Way, Suite 305, State College, PA 16801 814-237-4009 f: 237-1769
PO Box 242, State College, PA 16804 www.resourcetec.com

Appraisal Report

John & Jane Doe
Oil & Gas Estate
Approximately 45.7 Acres
Bradford County, Pennsylvania

Prepared For:

John & Jane Doe
1234 No Name Road
Towanda, PA 18630

Prepared By:

Jeffrey R. Kern, MRP, ASA
State Certified, General Appraiser

Patrick J. Federinko
State Certified, General Appraiser
Registered Professional Geologist

Report Date: February 2, 2017

Effective Date: February 1, 2017

Summary of Appraisal Report

Oil and Gas Estate of Tax Parcel 99-005.00-009-000-000, totaling approximately 45.7 acres in Bradford County, Pennsylvania, as of February 1, 2017. This report was prepared at the request of John & Jane Doe, 1234 No Name Road, Towanda, PA 18603, the owners of this Estate.

RTC has specialized in the appraisal of mineral, mining, oil and gas, mineral processing, energy, industrial, transportation, and unique assets for over 30 years. The fee for this report is for the expressed opinion of value as of the date of the report, without warranties or guarantees of the outcome if values are tested at any future date. Information that is not contained within this document, but used as reference, is maintained in the project files in RTC's offices.

The report is subject to the Assumptions and Limiting Conditions and Definitions contained herein. Unless the reader considers the Assumptions, Limiting Conditions, and Definitions, the report may be erroneously interpreted. This appraisal report is prepared for the sole and exclusive use of the appraiser's clients, John & Jane Doe. No third parties are authorized to rely upon this report without the express written consent of the appraiser and the client.

In addition to the completion of continuing education programs, the signatory appraiser is competent to undertake this assignment by virtue of prior experience in the valuation of this type of real estate and business. He is a senior member of the American Society of Appraisers, a member of the Governing Board of the International Mineral Economics and Management Society, a certified member of the American Institute of Mineral Appraisers, a member of the Society of Mining Engineers, and a member of the International Association of Assessing Officers. He has written text book materials on the appraisal of industrial and energy mineral assets and industrial mineral operations. The appraiser is licensed/certified as a general appraiser in numerous states including Pennsylvania, Delaware, West Virginia, New Jersey, Indiana, Georgia, Arkansas, New York, Virginia, Ohio, Maryland, and Kentucky, as well as holder of temporary permits in numerous states. For more information refer to the Appendix of this report.

Based on available public information, there is no oil or gas currently being produced from the subject property. Current trends and activity suggest the potential for the production of gas does exist. The most likely target for production in the area around the subject property is the Marcellus Shale; although the Marcellus Shale is the most likely target, this appraisal report values the entire oil and gas mineral property as of the date of the appraisal. Determining the Net Present Value of the lease and royalty stream from future oil and gas production is the purpose of this report.

The report contains the most pertinent data assembled and the analysis and conclusions of the same. In addition, this report is based on the following documents provided by the owners of the Estate, John & Jane Doe:

1. Deed of Tax Parcel 99-005.00-009-000-000, totaling 45.7 acres located in the Township of Wysox, Bradford County, Pennsylvania, consisting of: Parcel 1, 27.50 acres of land; Parcel 2, 11.68 acres of land; Parcel 3, 6.52 acres of land.
2. Oil and Gas Lease, dated June 4, 2007, between John & Jane Doe, Lessors, and Anadarko E&P Company, Lessee, for which the Memorandum of Lease was recorded on December 17, 2007, in the office of the Recorder of Deeds of Bradford County, Pennsylvania, Instrument #20100000. This lease provided and Lessor was paid by the Lessee the sum of $418,025, which represents the bonus consideration for the said oil and gas lease. This lease provides for a royalty of 21%.
3. The Declaration of Pooling and Unitization for J. Thomas Unit No. 1, PA-U-793 was recorded on August 9, 2013 in the Office of the Recorder of Deeds of Bradford County, Pennsylvania, Instrument #20130000. This land of about 542 acres will be used by Anadarko E&P Company to drill gas wells. The full 45.7 acres owned by John & Jane Doe constitutes about 13.41% of the J. Thomas Unit No. 1.

The net present value of the oil and gas estate for the subject property is $22,000.

Jeffrey R. Kern, ASA, President Resource Technologies Corporation	*February 1, 2017* Effective Date

TABLE OF CONTENTS

1.0 DESCRIPTIONS, ANALYSES, AND CONCLUSIONS

1.1 Summary of Facts and Conclusions

Resource Technologies Corporation (RTC) was requested to determine the value of the Oil & Gas Estate of 45.7 acres in Bradford County, Pennsylvania. The estate underlies the surface parcel listed as Tax Parcel 99-005.00-009-000-000, as referenced by the County of Bradford, Pennsylvania.

As the subject is a subsurface oil and gas estate, and as its development would not significantly impede the use of the surface or other estates, the Highest and Best Use of the property was determined to be the potential development of the gas reserves. One known gas bearing formation, the Marcellus Shale, has become the primary regional focus for reservoir development. The Marcellus Shale is a fairly deep gas-bearing horizon that is undergoing significant development in Pennsylvania.

The geographic region near the subject has not experienced significant development of this oil or gas play until recently. The local shallow oil & gas bearing formations exhibit no potential for development at this time. The main focus of current oil & gas exploration and development are the deep oil and gas bearing formations with particular emphases on the Marcellus Shale. Though the Marcellus Shale is considered an unconventional reservoir, it holds the greatest potential for significant development in this part of the state.

1.2 Purpose of the Appraisal

The purpose of this appraisal is to estimate the market value of the undivided oil and gas estate as of February 1, 2017.

1.3 Users and Intended Use of the Appraisal

The users of the report are John & Jane Doe. The appraisal will be used in estate planning.

1.4 Definitions

The purpose of the appraisal drives the criteria considered by the appraiser in the valuation analysis. Clients often need appraisals to answer a variety of questions about the value of assets when they are subjected to different circumstances. RTC is frequently engaged to value assets assuming the conditions discussed in the following subsections. All values are subject to determination of the Highest and Best Use of the asset.

1.4.1 Market Value

According to USPAP: “Market value means the most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:

- buyer and seller are typically motivated;
- both parties are well informed or well advised and acting in what they consider their own best interests;
- a reasonable time is allowed for exposure in the open market;
- payment is made in terms of cash in U.S. dollars or in terms of financial arrangements comparable thereto; and
- the price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale."

For non-real estate, i.e., movable components of value (e.g., machinery and equipment), market value may be divided into market-value if sold and moved and/or market-value in place. Real estate is defined by market value in-place.

1.4.2 Value In-Use/Value In-Exchange

Value in-use is typically defined as the value of an asset to the specific investor that currently owns and operates the asset at the present location. This value, by definition, incorporates the business and entrepreneurial profits and losses inherent to the present management. The value is more often considered in an investment analysis and may be only applicable to a single owner with a single set of financial circumstances.

Value in-exchange is typically defined as the value of the asset that can be transferred. Management and financial benefits are not easily transferred in most asset transactions – they may be transferred in stick transactions that migrate ownership of an operating entity. Value in-exchange is that value that can be realistically transferred.

However, the notion of value in-exchange does not preclude the transfer of a property that may continue to be used as it has been used by a previous owner. The current use may be the Highest and Best Use of the property. The appraiser must be careful not to assume that management, financial factors, and specific elements such as economies of scale and assembly of components will continue.

1.4.3 Highest and Best Use

According to The Appraisal of Real Estate Thirteenth Edition (page 305), Highest and Best Use is: "the reasonably probable and legal use of vacant land or an improved property that is physically possible, legally permissible, appropriately supported, financially feasible, and that results in the highest value."[1] The following criteria are considered in estimating the Highest and Best Use of the subject:

[1] The Appraisal of Real Estate, 13th Edition, Appraisal Institute, Chicago, Illinois, 2001, page 305.

- The use must be within the realm of probability; that is,
  - it must be likely
  - it must not be speculative or conjectural.
- The use must be legal
- There must be a demand for such use
- The use must be profitable
- The use must be such that it provides to the land, and the property as a whole, the highest net return.

Based on this, four stages of analysis are considered:

Possible:	Determine the physically possible use for the subject land.
Permissible:	Determine which uses are legally permitted for the land.
Feasible:	Determine which possible and permissible uses will produce a net return to the subject site.
Profitable:	Determine which uses will provide the highest (largest) return in terms of money to the owner of the property.

"Fundamentally, the concept of highest and best use applies to land alone because the value of the improvements is considered to be the value they contribute to the land . . . The theoretical emphasis of highest and best use analysis is on the potential uses of the land as though vacant. In practice, though, the contribution of value of the existing improvements and any possible alteration of those improvements must be recognized so the highest and best use of the property as improved is equally important in developing an opinion of market value of the property."[2]

In 1934, the U.S. Supreme Court found that the Highest and Best Use is:

"The highest and most profitable use for which the property is adaptable and needed or likely to be needed in the reasonably near future..."[3]

In short, depending upon market and site conditions, the Highest and Best Use of a property may be:

- The continuation of the existing use as currently improved - market analysis shows that the existing use is the maximally productive, legal use to which the property is amenable as improved.

- The continuation of the existing use with new or no improvements – market analysis shows that the existing use is the maximally productive use, however, the existing improvements are inadequate requiring cure, demolition, or rebuild.

- The development of a new use that is better suited to existing market conditions. This may include maintenance of existing improvements, alteration of existing improvements, construction of new improvements,

[2] Ibid, page 306.

[3] Olson v. United States 292 U.S. 246, 255 (1934).

and/or demolition of existing improvements.

The Highest and Best Use must be firmly grounded in the reality of market conditions. While various “hypothetical uses” may be considered (and may indeed reflect the considerations of willing sellers and buyers), the hypothetical use does not represent the market value of the property. As an example, a farm field may have a “Highest and Best Use” as subdivided plots. It cannot be valued as though those plots exist. It can, if the current market (typical buyers and sellers in this neighborhood) looks to future development, however, be valued as though the land *could be altered* to include plots after needed improvement costs are taken into account. The market may show that land amenable to future legally permissible development may be more or less valuable than land not amenable to change in use. According to the Appraisal Institute:

> “The conclusion of highest and best use of a parcel should be as specific as the marketplace suggests. General categories such as ‘an office building,’ ‘a commercial building,’ or ‘a single-family residence’ may be adequate in some situations, but in others the particular use demanded by market participants must be specified, such as ‘a suburban office building with 10 or more floors’ or ‘a 3-bedroom single family residence with at least 2,500 square feet.”[4]

Many oil and gas transactions are based on potential future use, i.e., the well is not yet drilled as of the date of the transaction. Typically, these transactions are leases that include 1) ‘up-front’ or bonus payments (option payments) and 2) percentage of the future income if a well is produced. There has been a lively market for oil and gas leases in Pennsylvania particularly in the Marcellus Shale region. This market has frequently included consideration the present value of likely future oil and gas development:

- Fee estates where the oil and gas estate remain intact with the surface and where potential future production exists generally command a premium that is expressed as a lease bonus.
- Oil and gas estates, separate from the surface, generally command significant considerations in the open market.
- Future likely royalties from leased producing and non producing properties are frequently purchased by royalty traders.
- Bundles of leased and undeveloped oil and gas interests are frequently resold, re-leased, or subject to royalty or production overrides.

1.4.4 Reasonable Exposure Time

Reasonable exposure time, for this report, means: “The estimated length of time the property interest being appraised would have been offered on the market before the hypothetical consummation of a sale at market value on the effective date of the appraisal; a retrospective estimate based upon an analysis of past events assuming a competitive

[4] Appraisal Institute, page 310.

and open market."[5]

The concept of reasonable exposure encompasses not only adequate, sufficient, and reasonable time, but also adequate, sufficient, and reasonable effort. This idea also takes into consideration the type of property being appraised, supply/demand conditions as of the effective date of the appraisal, and the analysis of historical sales information (sold after exposure and after completion of negotiations between the seller and buyer). The reasonable exposure period is, therefore, a function of price, time, and use, not an isolated estimate of time alone.

Reasonable exposure time is always presumed to precede the effective date of the appraisal and differs for various types of real estate and under various market conditions. Our estimate of exposure time is therefore based on the subject property's determined Highest and Best Use in a market where there is evidence of demand for use of the type of mineral resource being developed.

1.4.5 Marketing Time

Marketing time period, for the purpose of this report, is defined as: "An estimate of the amount of time it might take to sell a property interest in real estate at the estimated market value level during the period immediately after the effective date of an appraisal."[6]

The concept of marketing time encompasses other conditions that may affect the time to sell, such as the identifications of typical buyers and sellers for the type of real estate involved and typical equity investment levels and/or financing terms. The reasonable marketing time, therefore, is a function of price, time, use, and anticipated market conditions such as changes in the cost and availability of funds, not an isolated estimate of time alone. Marketing time occurs after the effective date of the market value estimate and takes into consideration such brokerage functions as advertising, arranging the financing, and marketing the properties to particular investors. Estimates of marketing time are not predictions but, rather, only judgments made by the appraiser.

1.4.6 Methods of Appraisal

The three methods used to estimate market value are the comparative sales approach, the cost approach, and the income approach. As a basis for estimating value, a comparison and analysis of the property are made by as many of these approaches as available data allows. Estimates can be made under each of the approaches defined below:

- **Comparative Sale Approach** - Comparison with similar properties that either have sold or are currently offered in the market. This method is applied to establish the value of the land and can be used for improved properties with

---

[5] Source: Uniform Standards of Professional Appraisal Practice, 2003 Edition, Washington, DC: The Appraisal Foundation (SMT-6).

[6] Source: Uniform Standards of Professional Appraisal Practice, 2003 Edition, Washington, DC: The Appraisal Foundation (AO-7).

proper adjustments.

- **Cost Approach** - An estimate of the current replacement cost of the improvements, less accrued depreciation, plus the land value. Depreciation includes all loss in value of improvements due to physical deterioration and functional and economic obsolescence.

- **Income Approach** - Capitalization of the net income that the property can produce. This approach is applicable to properties exhibiting adaptability to other uses and consequently would be desirable to lease or rent.

Depending upon circumstances and the scope of the assignment, one or more traditional approaches may not be appropriate or relevant to the assignment. In such cases, a particular approach should be considered but may be excluded from the report with explanatory comment by the appraiser.

1.5 Property Inspection

The subject is the mineral estate and does not include the surface. A site visit of the surface was conducted on February 1, 2017, however, there is no way to “see” the subject subsurface estate. During the inspection, RTC personnel observed very little oil and gas activity immediately surrounding the subject estate.

1.6 Leases, Agreement and/or Encumbrances

The property was leased by Anadarko E&P Company LP on December 8, 2012. The original lease term is for five years. Title work was completed by Anadarko E&P Company LP at the Bradford County Courthouse, Towanda, PA.

No additional deed research involving the subject property has been conducted by Resource Technologies Corporation. Numerous data sets were collected from the Pennsylvania Department of Environmental Protection, including permit records, gas well locations, and production records through January 2017.

1.7 Scope of the Appraisal

This appraisal deals with the oil & gas estate. The surface estate is not considered other than to determine the existence of any conflicts that might affect the use of the subject estate. The scope of the appraisal report considers, where applicable and when data is available, the cost, income, and comparable sales approaches. In the case of the subject:

- The Comparative Sales Approach is considered an appropriate method in the analysis of vacant land, residential real estate, and to a limited extent commercial real estate transactions. This is an inappropriate and unreliable method when the mineral estate is involved, therefore, the comparative sales approach was not pursued.

- The Cost Approach is best applied to structural improvements on the site.

The estate, natural gas, does not involve structures other than the well, and typical equipment (including Flow Lines and Connections, Production Package, and Storage Tanks). These items are machinery and equipment and are not considered other than as a plugging expense and salvage value in the income approach. While used to exploit the gas contained within the subject estate, these items are part of the estate being assessed. Therefore, the cost appraisal is not considered useful in this instance.

- The Income Approach is customarily used to value income generating assets. The oil and gas estate is owned and exploited to generate an income stream. Royalties generated from the exploitation of the oil & gas reserves is income benefitting the owner of the mineral estate, therefore the income approach is the primary method considered with this appraisal assignment.

1.7.1 Basis of Income Analysis

IRS Treasury Regulation 1.611–2(d) prioritizes methods used to determine the market value of mineral properties. Section 1.611–2(d)(2) provides that the present value method will not be used in either of the following situations:

1. Value can be determined based on cost or comparative values and replacement value of equipment
2. Value can reasonably be determined by any other method.[7]

However, according to section 1.611-2(e)(4), the value of a mineral deposit may be most appropriately determined as follows:

- Measured by expected gross income less the estimated operating cost
- Reduced to present value at the rate of interest commensurate with the risk for the operating life
- Reduced by the value of the improvements and of capital additions, if any, necessary to realize the profits.

According to the IRS, the following factors should also be considered in the mineral appraisal:

- Proper royalty rate which can be derived from comparable mineral lease transactions
- Mineral unit price to which the royalty rate is applied may be derived from appropriate market transactions
- Annual amount of production and the number of years of production.

There are two potential income streams to be examined in the valuation of a mineral asset: 1) Royalty or mineral in-place and 2) working or producing interest. The royalty interest represents the value of the mineral in-situ; generally a portion of the overall gas in-place or percentage of the income produced by the efforts of the working interest. The

[7] *Green v. United States* , 460 F.2d 412 (5th Cir. 1972); 29 AFTR 2d 72–1138; 72–1 USTC 84,494

working or producing interest is the value of the gas owned by the operators less the expenses of producing it (finding, drilling, completing, producing, transporting, an d selling). In many cases these interests are divided by ownership or lease, in other cases the 'royalty' and working are on in the same.

1.7.1.1 Royalty Interest

When determining the value of a royalty interest, the only income that should be capitalized is the **royalty income**, **and not the income, or profit, generated by the business of mining and selling the mineral**.[8] Although this valuation focuses only on the royalty interest, the working interest is modeled to ensure an appropriate estimation of the life of the well and to ascertain potential profitability – an unprofitable well will not pay a royalty. The essential factors to be considered in valuation of a royalty income are:

- Royalty rate or amount
- Unit sale price of the mineral
- Projected annual amount of mineral unit production
- Projected number of years of production
- Year when the production will begin
- Capitalization rate

As stated in the Uniform Standards of Federal Land Acquisition:

> "In estimating the income stream, the proper royalty rate can be derived from comparable mineral lease transactions, and the mineral unit price to which the royalty rate is applied may be derived from appropriate market transactions. The annual amount of production and the number of years of production are much more difficult to estimate and require as a minimum not only physical tests of the property to determine the quantity and quality of the mineral present, but also market studies to determine the volume and duration of the demand for the mineral in the subject property. (Numerous other factors may have to be considered, as, for example, the amount of overburden, the method of mining (e.g., surface or deep mining), the requirements of applicable reclamation laws, the hauling distance to market, competition from other sites, the size of the investment needed to construct any necessary processing plant, and so on.) Determination of the proper capitalization rate - always a critical element in an income approach - is a challenge as well."[9]

> "Just as the preferred way of appraising a fee estate is to use comparable sales transactions, the preferred way of appraising a leasehold estate is to use comparable lease transactions. Elements of comparability in leasehold valuations include, in addition to the usual elements of size, time, location, and so forth, the basic term of the lease, the number and term of the options to renew, if any, tenant build-out, and the extent services are provided by the lessor and/or lessee. Under this approach, the appraiser will attempt to find leases of similar premises, near in location and time, that reflect as near as possible the terms of the lease and conditions of the premises being acquired."

1.7.1.2 Working Interest

---

[8] U.S. vs 103.38 Acres of Land, Cloverport Sand & Gravel Co., Inc., v. U.S., 6 Cl. Ct. 178, 191-194 (1984).

[9] Uniform Standards of Federal Land Acquisition.

Assuming the working interest is profitable, it too has a value, usually more than simply the business value. This value is typically referred to as the value of “the right to produce” oil and gas at the location. The working value is calculated as the present worth of the future probable income less the costs of production (finding, drilling, completing, producing, transporting, and selling) and less the amount typically paid to operators for the management, expertise, and investment needed to operate the well.

The essential factors to be considered in valuation of a working income are:

- Unit sale price of the mineral
- Royalty rate or amount
- Cost to produce
- Unit sale price of the mineral
- Projected annual amount of mineral unit production
- Projected number of years of production
- Year when the production will begin
- Capitalization rate

1.7.2 Summary of the Scope of the Appraisal Project

The scope of this appraisal is to estimate the market value of the royalty interest of the entire oil and gas estate as defined, currently developed, and potentially exploitable, including the:

- Bonus Lease Value
- Royalty Interest
- Free Gas Value.

1.8 Appraisal Assumptions

- No responsibility is assumed for matters legal in nature nor do we render any opinion as to the title which is assumed to be marketable. The property is appraised as though under responsible ownership.
- The sketches and maps included are to assist the reader in visualizing the property but no responsibility is assumed for accuracy. Property lines, land areas, and legal descriptions are assumed to be correct.
- RTC believes to be reliable the information identified in this appraisal as being supplied by other parties, but assumes no responsibility for their accuracy.

1.9 General Limiting Conditions

- Possession of this report, or a copy of it, does not include the right of publication. This report may not be used for any purpose, by any person, other than the party to whom it is addressed without the written consent of the appraiser, and in any event, only with proper written qualification and only in its entirety.
- Neither all nor any part of the contents of this report, or copy thereof, will be conveyed to the public through advertising, public relations, news, sales, or other media without the approval and written consent of the appraiser; nor shall the appraisers' firm or professional organizations, of which the appraisers are a member, be identified without written consent.
- The original and authorized copies of this report are affixed with my seal.
- The appraiser reserves the right to alter an opinion as to the current market value on the basis of information that could not be uncovered during the normal course of a diligent investigation.

1.10 Certification and Statement of Disinterest

The appraisal and research team employed to complete this effort are comprised of certified professional appraisers and appraisal assistants and registered and certified professional geologists and geological/geotechnical assistants. Resource Technologies Corporation has completed hundreds of similar appraisal assignments throughout United States and Canada. RTC staff have completed university and professional educational courses leading to certifications and degrees from credited institutions throughout the United States. I, Jeffrey R. Kern, ASA, personally supervised this appraisal effort. My detailed qualifications are attached as an appendix to this report. In brief, my qualifications to complete this assignment include:

- Certified general appraiser (Pennsylvania, Delaware, West Virginia, New Jersey, Indiana, Georgia, Arkansas, New York, Virginia, Ohio, Maryland, and Kentucky) as well as holder of temporary permits in numerous states
- Certified evaluator (Pennsylvania)
- Senior member of the American Society of Appraisers, specialized certification in technical specialties including mineral properties
- Member of the International Association of Assessing Officers
- Member of the National Association of Independent Fee Appraisers
- Previous member of the Board of Directors of the Mineral Economics and Management Society, international professional and academic society
- Certified member of the American Institute of Mineral Appraisers
- Recognized as an expert in property and mineral valuation issues and appraisals in numerous local, state, and federal courts
- Testified before legislative bodies and commissions in Pennsylvania, West Virginia, and Kentucky
- Instructor for continuing education classes for assessor certification on mineral lands, mines and quarries, and oil and gas appraisal techniques for the Assessors Association of Pennsylvania and Assessors Association of Virginia, the Appraisal Institute, Penn State Extension Education and other continuing education organizations

- Mineral property valuation consultant to U.S. Departments of Justice, Interior and Army; West Virginia Department of Tax and Revenue; Pennsylvania Department of Transportation; Pennsylvania Economy League; Centre, Clinton, Fayette, Greene, Schuylkill Counties in Pennsylvania; and Common Cause, Southern Poverty Law Center, Wyoming Department of Tax and Revenue, Kentucky Department of Tax and Revenue.

I certify that, to the best of my knowledge and belief:

- The statements of fact contained in this report are true and correct.
- The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions and are my personal, impartial, and unbiased professional analyses, opinions, and conclusions.
- I have no present or prospective interest in the property that is the subject of this report and no personal interest with respect to the parties involved.
- I have not performed an appraisal service regarding the subject within the past three years.
- I have no bias with respect to the property that is the subject of this report or to the parties involved with this assignment.
- My engagement in this assignment was not contingent upon developing or reporting predetermined results.
- My compensation for completing this assignment is not contingent upon the development or reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal.
- My analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the Uniform Standards of Professional Appraisal Practice.
- The reported analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the Code of Professional Ethics and Standards of Professional Appraisal Practice of the Appraisal Institute.
- Patrick J. Federinko provided significant real property appraisal assistance to the person signing this certification. Mr. Federinko is a Certified General Appraiser, and Registered Professional Geologist in the State of Pennsylvania.
- This appraisal assignment was not made, nor was the appraisal rendered on the basis of a requested minimum valuation, specific valuation, or an amount which would result in approval of a loan.

The data used herein are correct to the best of my knowledge. I understand the confidentiality of the facts and opinions of this appraisal. No copy of this report, or portion thereof, is authorized. The original document, and authorized copies of it, contain my signature in blue.

February 1, 2017
Effective Date

Jeffrey R. Kern, ASA
Resource Technologies Corporation
PA Certification Number: GA000447L

February 1, 2017
Effective Date

Patrick J. Federinko
Resource Technologies Corporation
Licensed Professional Geologist (PA), PG002008G
Certified General Appraiser (PA), GA004119

2.0 OWNERSHIP AND LOCATION

2.1 Subject Property

The subject is approximately 45.7 acres of oil and gas estate. The subject is located in Wysox Township, Bradford County, Pennsylvania. Said oil & gas estate underlies the surface parcel referenced as Tax Parcel 99-005.00-009-000-000 by the County of Bradford, Pennsylvania, and is generally depicted on the following map (**Exhibit 2.1-1**). The oil and gas is owned by the owner of the surface estate.

Exhibit 2.1-1

2.2 Regional Geologic Targets

Historically, Pennsylvania has had numerous productive oil and gas bearing formations. These are considered conventional horizons and have typically been shallow, Pennsylvanian and Mississippian aged coal and sandstones, respectively. These are not typical targets for present day drilling. Another commonly drilled horizon was the Oriskany sandstone which is a deeper and older formation that is part of the Lower Devonian. This formation is currently largely utilized for gas storage.

Recently, much attention has been given to highly profitable unconventional reservoirs, such as the Marcellus and Utica Shales. Drilling into the Middle Devonian aged Marcellus Shale became much more widespread across southwest and northeast Pennsylvania after the first successful well was drilled by Range Resources in the mid-2000's. The Utica Shale is deeper, deposited in the Ordovician, and has been receiving increasing attention since 2011. The activity in the Utica Shale is mostly focused in eastern Ohio where the highest likelihood of producing lucrative natural gas liquids and oil exists.

3.0 OIL & GAS ASSET CLASSIFICATION

When appraising a mineral property, it is important to note the difference between mineral “reserves” and mineral “resources”. Broadly defined, mineral resources are estimates of the actual quantity of mineral in the ground. However, reserves are the measured mineral resource that can be economically recovered under current economic conditions, utilizing standard industry techniques. Further refinement of these two classification schemes has been independently done by the multiple groups, including the United States Geologic Survey (USGS), the Society for Mining Metallurgy & Exploration (SME), and the Society of Petroleum Engineers (SPE). Terminology between all the groups that use a classification scheme isn’t always consistent; different nomenclature appears often. However, the U.S. IRS depletion standards and the U.S. Security and Exchange Commission’s (SEC) reporting standards are similar and can be summarized as follows.

The reserve classification with the highest likelihood of production, whereby production is “reasonably certain,” is Proven Reserves, also known as 1P or P90 (90% probability of production). ‘Proven Reserves’ is also applied to wells that are producing and wells that are one offset away from a producing well. The next, or “reasonably probable” is Probable Reserves, also known as 2P or P50 (50% chance of production). This classification applies to single well offsets, from Proven, provided that the offset follows known production trends. Possible Reserves are the third type of classification, also known as 3P or P10. This is applied to single well offsets, from Probable, provided the offset follows known production trends. Finally, the last classification is Speculative or Prospective. This is the least likely to be produced (less than 10%) within a predictable time frame.

If a company wishes to report undeveloped reserves as assets, the SEC has requirements that must be met. For example, the company must show that effort is being made to execute a plan for the reserves’ development, that plan has to be updated annually for SEC filings, and any additional reserves have to be economically producible, using an average of the previous 12 months’ natural gas price and assume only reasonable and likely development and production technology. The SEC does not recognize Speculative Reserves.

RTC uses these guidelines from the SEC as the basis of our reserve estimation in oil and gas estate appraisals. The logical and clear language, when based on the data and maps that are available, helps direct RTC to a defensible and reasonable value conclusion that is forward-looking and in compliance with the IRS and the SEC, and within the guidelines of SPE, USGS, SME, and appraisal standards as promulgated under USPAP.

4.0 REGIONAL ACTIVITY

Talisman Energy USA, Inc., Chesapeake Appalachia, LLC, EOG Resources, Inc., Range Resources - Appalachia, LLC, and Cabot Oil & Gas Corp., have all completed gas wells in the Marcellus shale during the past decade in northeastern Pennsylvania.

The northeastern portion of Pennsylvania has been the focus of a considerable amount of permitting and drilling activity. **Table 4.0-1** is a summary of well-site permitting activity in the northeastern portion of Pennsylvania.

Table 4.0-1 - Permitted Locations 2007 through January 31, 2017

County	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bradford	11	57	431	787	689	315	401	376	88	32	0
Lycoming	8	47	110	208	372	286	311	142	71	26	0
Sullivan	0	0	0	81	40	53	53	90	19	14	1
Susquehanna	6	49	170	232	356	259	512	326	203	126	0
Tioga	2	33	302	552	309	198	57	81	68	51	0
Wyoming	0	0	11	85	116	22	117	113	32	12	0
Total	**27**	**186**	**1,024**	**1,945**	**1,882**	**1,133**	**1,451**	**1,128**	**481**	**261**	**1**

Table 4.0-2 lists permitted locations for companies active in the Marcellus shale in the northeast Pennsylvania region. **Table 4.0-3** shows the number of rigs actively drilling in each County listed. **Table 4.0-1**, **4.0-2**, and **4.0-3** are updated monthly by RTC.

Table 4.0-2 Active Companies: 2006 through January 31, 2017						
Company	**Bradford**	**Lycoming**	**Sullivan**	**Susquehanna**	**Tioga**	**Wyoming**
Anadarko E&P	0	501	0	0	0	0
Cabot Oil & Gas	0	0	0	845	0	4
Carrizo (Marcellus) LLC	0	4	9	71	0	50
Chesapeake Appalachia	1,834	1	214	333	7	315
Chief Oil & Gas	170	102	108	125	0	66
Citrus Energy Corp	0	0	0	0	0	52
East Resources / SWEPI	14	41	0	0	965	0
EQT Production	0	0	0	0	80	0
EXCO	0	90	15	6	0	0
Fortuna Energy/Talisman Energy	777	0	0	71	154	0
Inflection Energy	0	105	0	0	0	0
Range Resources Appalachia	5	269	0	0	0	0
Seneca Resources	0	108	0	0	158	0
Southwestern Energy Production/SWN	223	35	2	460	34	13
Stone Energy	0	0	0	6	0	0
Ultra Resources	0	0	0	0	183	0
Williams Production Appalachia / WPX	0	0	0	240	0	0
XTO Energy	0	65	0	0	0	0
Total Permitted Sites	**3,023**	**1,321**	**348**	**2,157**	**1,581**	**500**

Table 4.0-3 Active Rigs by County as of February 3, 2017					
Bradford	**Lycoming**	**Sullivan**	**Susquehanna**	**Tioga**	**Wyoming**
2	**0**	**1**	**4**	**2**	**3**
Rig count data obtained from RigData subscription					

The appraiser and estate owner must realize that even though a well site is permitted for drilling, there is no guarantee that a well will be drilled at that location. Below, in **Table 4.0-4**, is a summary of well locations permitted and gas well completions for Bradford, Susquehanna, and Tioga Counties. The lower portion of the table calculates the ratio, as a percent, of wells completed to locations permitted for five years.

Table 4.0-4 Well Permitting and Drilling Rates				
Well Locations Permitted by Year and County				
Year	**BRADFORD**	**SUSQUEHANNA**	**TIOGA**	**Grand Total**
2012	315	259	198	772
2013	417	514	69	1,000
2014	487	444	113	1,044
2015	218	266	85	569
2016	36	187	103	326
Five Year Total	1,473	1,670	568	3,385
Wells Drilled				
YEAR	**BRADFORD**	**SUSQUEHANNA**	**TIOGA**	**Grand Total**
2012	316	164	144	624
2013	82	175	24	281
2014	94	238	30	362
2015	43	151	17	211
2016	17	84	31	132
Five Year Total	552	812	246	1,478

Ratio of wells drilled to well locations permitted by Year and County				
Year	**BRADFORD**	**SUSQUEHANNA**	**TIOGA**	**Grand Total**
2012	100.32%	63.32%	72.73%	80.83%
2013	19.66%	34.05%	34.78%	28.10%
2014	19.30%	53.60%	26.55%	34.67%
2015	19.72%	56.77%	20.00%	37.08%
2016	47.22%	44.92%	30.10%	40.49%
Five Year Total	37.47%	48.62%	43.31%	43.66%

As illustrated in the table above, only a fraction of the permitted wells, in any of the three counties analyzed, have been drilled. The drilling rate of the three counties over the five year period is 44%. Likely explanations for this low drilling rate include:

- No completion report submitted to the state DEP. A delay in submitting completion reports will artificially and potentially drastically deflate the drilling/completion rate.
- A delay between when the state receives a completion report and when it is publically available
- Multiple permits were submitted for strategic planning purposes

The Marcellus Shale is considered a statistical play, meaning that a large number of wells must be drilled and completed to generate an accurate model of well performance (exploration, development, stimulation, and ultimate production). The percentage of wells completed and successfully produced is expected to rise as the knowledge base of the Marcellus Shale increases. Knowledge will allow the operators to more systematically locate and complete wells.

Exhibit 4.0-5 is a rig density map showing the relative density of rigs, as of February 3, 2017, within a 10 mile radius from the center of each one square mile grid. Major pipelines are shown as blue lines.

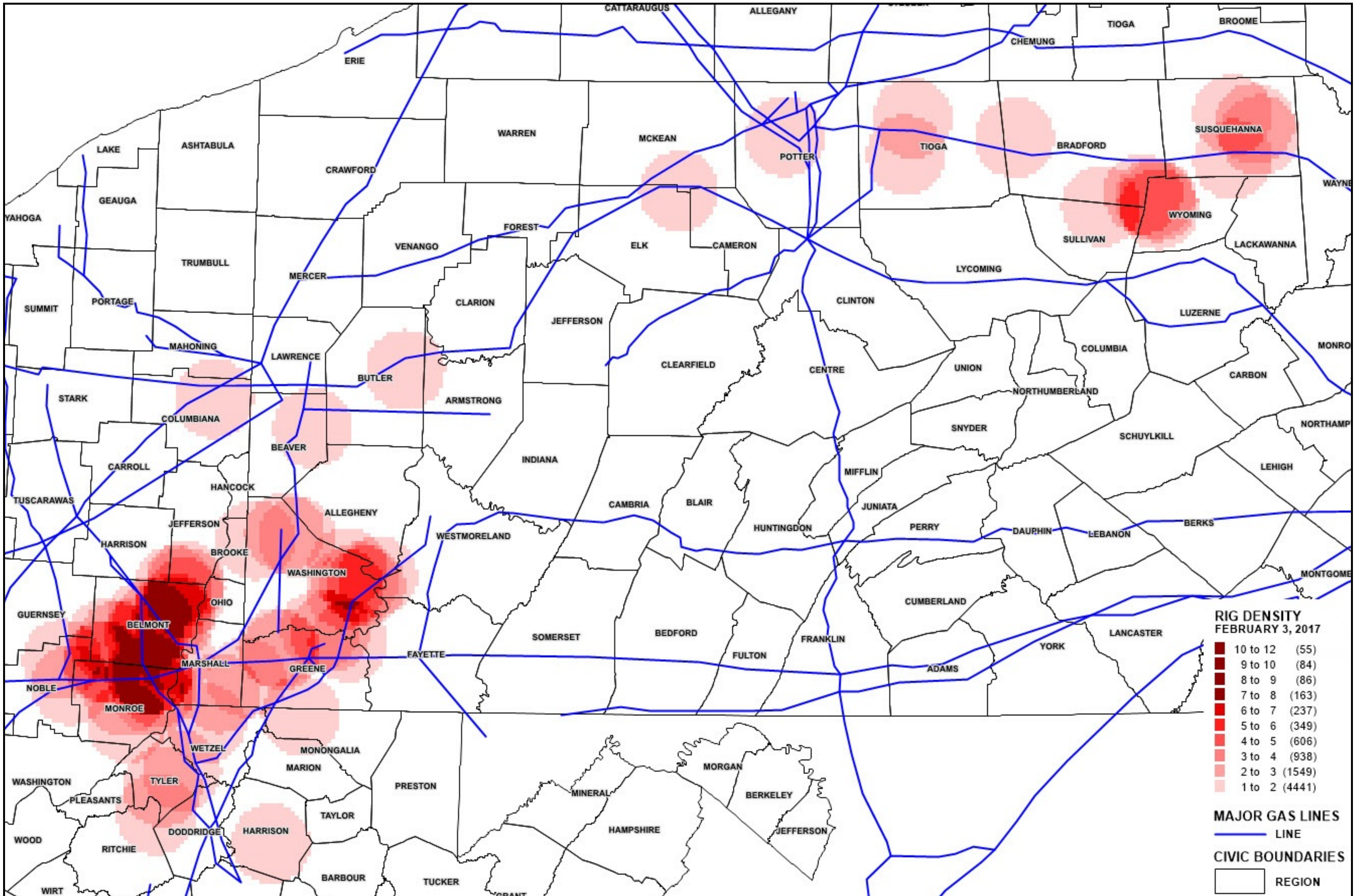


Exhibit 4.0-5 - Rig Density Map

Exhibit 4.0-6 is a well count density map representing all wells drilled in Pennsylvania from 2005 through January 2017. The map color codes well count densities within a 10-mile radius of the center of each one square mile grid. The brightest red grid represents a count of between 4,190 to 8,400 wells, while the dark blue grid represents a count of zero to 10 wells. Although the Marcellus has received a lot of attention in the past years, there are many other horizons that have also been developed, especially in northwestern Pennsylvania.

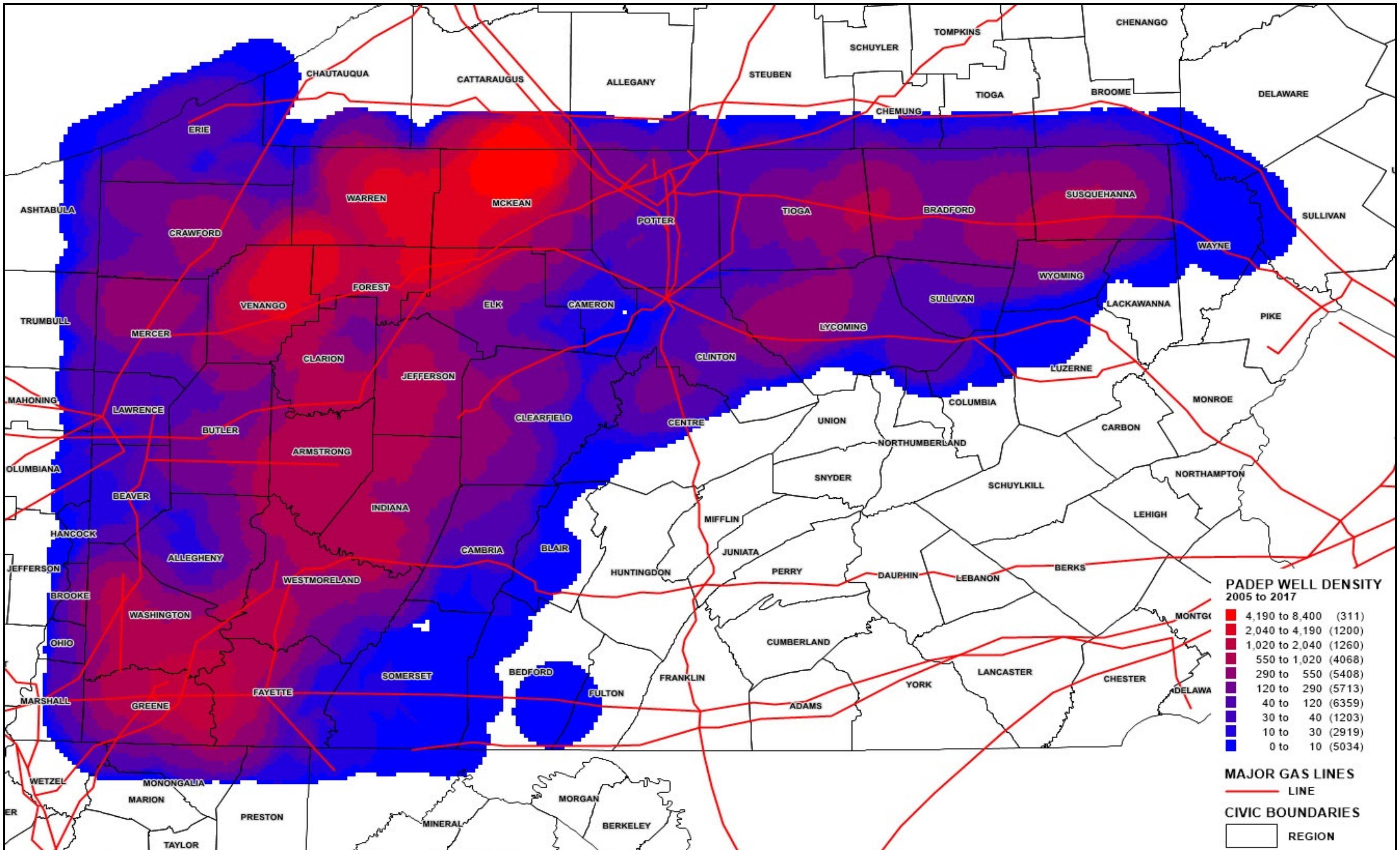


Exhibit 4.0-6 - 2005 to 2016 Well Density

Regional drilling activity as of February 3, 2017 is depicted on **Exhibit 4.0-7**[10]. Active gas drilling rigs are depicted as orange triangles.

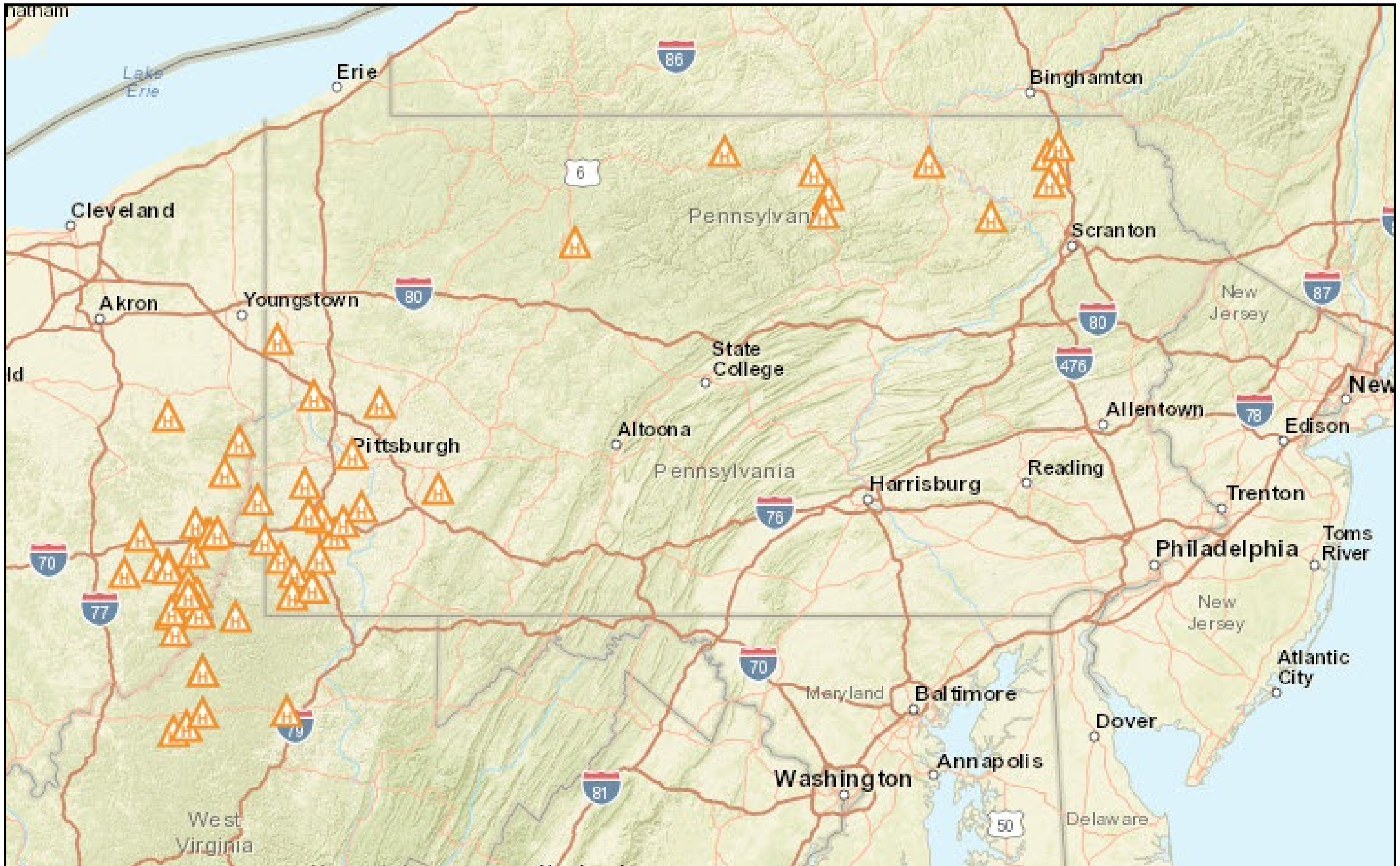


Exhibit 4.0-7

[10] http://gis.bakerhughesdirect.com/RigCounts/default2.aspx

New York has been under a drilling moratorium imposed by the state legislature in 2008. In 2015, the State banned high-volume hydraulic fracturing. However, the ban could one day be rescinded[11].

4.1 Area Data

Exhibit 4.1-1 is a map with the subject estate represented in red. The dashed circle represents a 5-mile radius around the subject estate. All historically known oil and gas wells are shown.

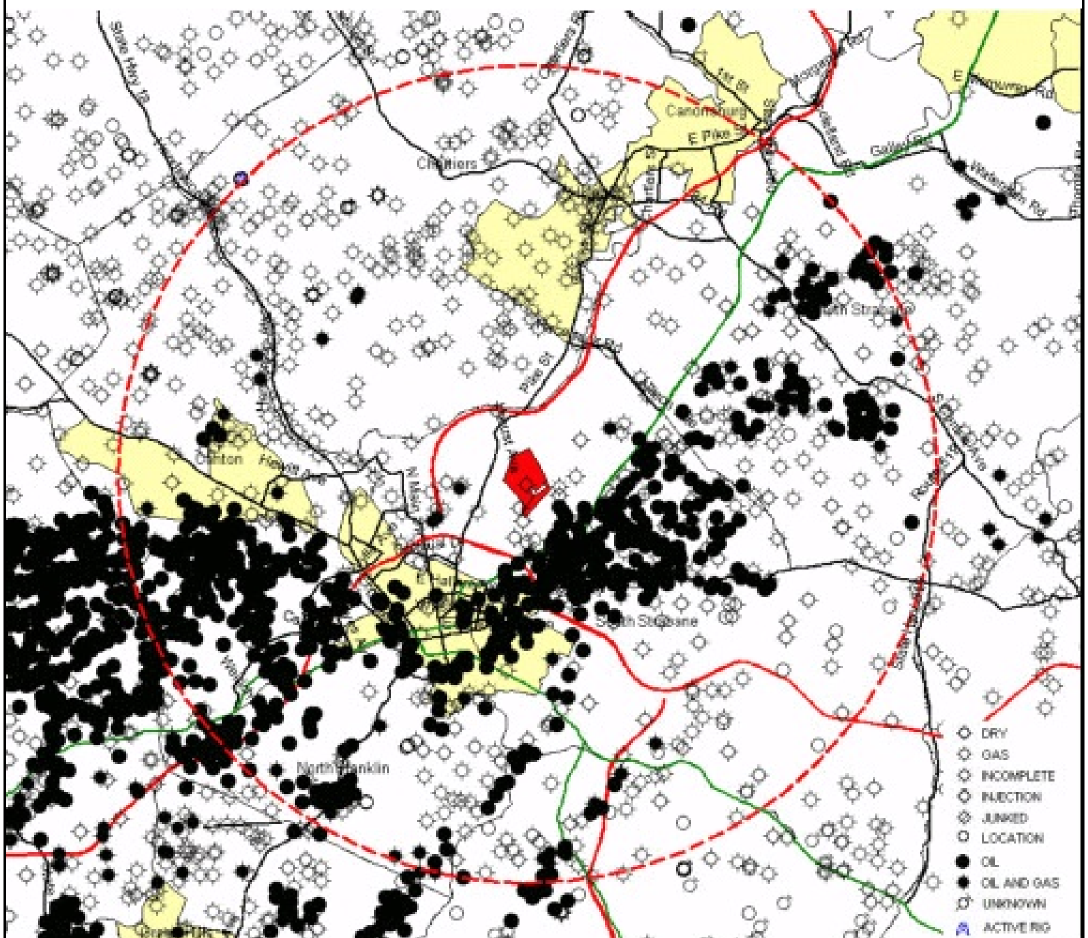


Exhibit 4.1-1

[11] http://www.syracuse.com/news/index.ssf/2015/06/new_york_officially_bans_hydrofracking.html

Exhibit 4.1-2 includes only wells drilled or permitted in 2006 or later. In addition to the larger 5-mile radius, this Exhibit also shows a 2-mile radius circle.

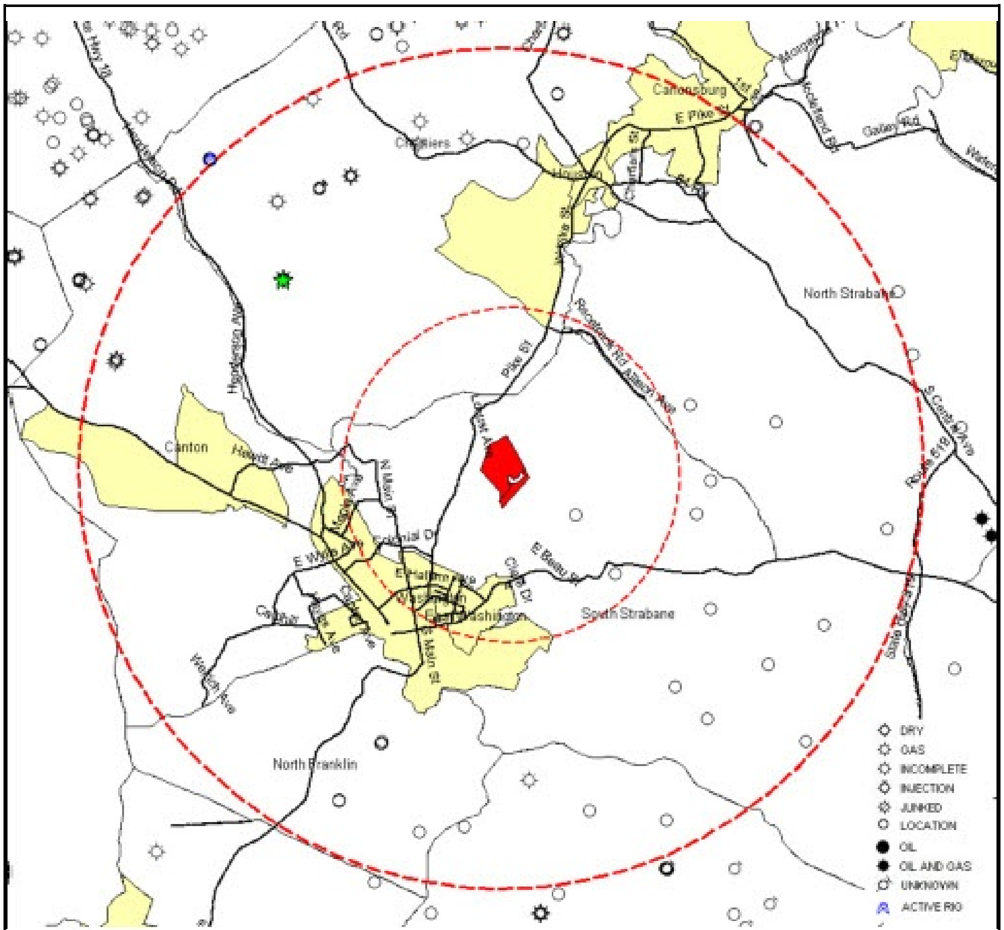


Exhibit 4.1-2

Within five miles of the property, there are:

- 5 rigs[12] actively drilling (as of February 3, 2017)
- 12 wells
- 75 new well locations permitted through the PADEP through January 2017

Within two miles of the property, there are:

- 2 rigs actively drilling (as of February 3, 2017)
- 5 wells
- 20 new well locations permitted through the PADEP through January 2017

Please note that, at the scale of the map, sites with multiple locations may overlap and appear as just one location. Most of this permitting activity is attributed to the Marcellus Shale Gas Play and have been permitted by Chesapeake Appalachia, LLC. Currently, there are no locations permitted through the Pennsylvania Department of Environmental Protection on the subject estate.

[12] Rig counts in Section 4.1 from RigData, February 3, 2017

Resources-Appalachia, LLC and Atlas Resources, LLC are active in the area. The most active drilling company in the immediate area is Range Resources-Appalachia, LLC. The closest drilled Marcellus Shale well to the subject property, depicted with a green star in **Exhibit 4.1-2** and drilled by Range Resources-Appalachia, LLC., is located approximately 4 miles to the northeast of the subject property. According to PA*IRIS, this has been drilled, but is not yet producing.

4.2 Potential Production Target(s)

Based on the previous discussion in this Section, the most likely target of gas exploration and development in the area of the subject property is the Marcellus Shale. Although the Marcellus shale is the most likely target, this appraisal report values the entire oil and gas mineral property as of the date of the appraisal.

4.2.1 The Marcellus Shale

The Marcellus Shale Formation is an organic rich black shale deposited during the Devonian Period,[13] approximately 417-354 million years ago. It is slightly radioactive so it can be easily identified in geophysical logs. The formation covers more than 34,000,000 acres in Pennsylvania, West Virginia, New York, Ohio, Maryland and Virginia. (**Exhibit 4.2.1-1**)[14]. The Marcellus Shale is believed to be the source rock for a large portion of the oil and gas produced in the Appalachian Basin. A source rock is high in organic content and is the rock from which oil and/or gas has been or can be generated.

[13] http://naturalgas.extension.psu.edu/Devonian-Marcellus-Formation-Maps.htm.

[14] The American Oil & Gas Reporter, Engelder, Terry & Gary Lash, Marcellus Shale Play's Vast Resource Potential Causing Stir in Appalachia, May 2008.

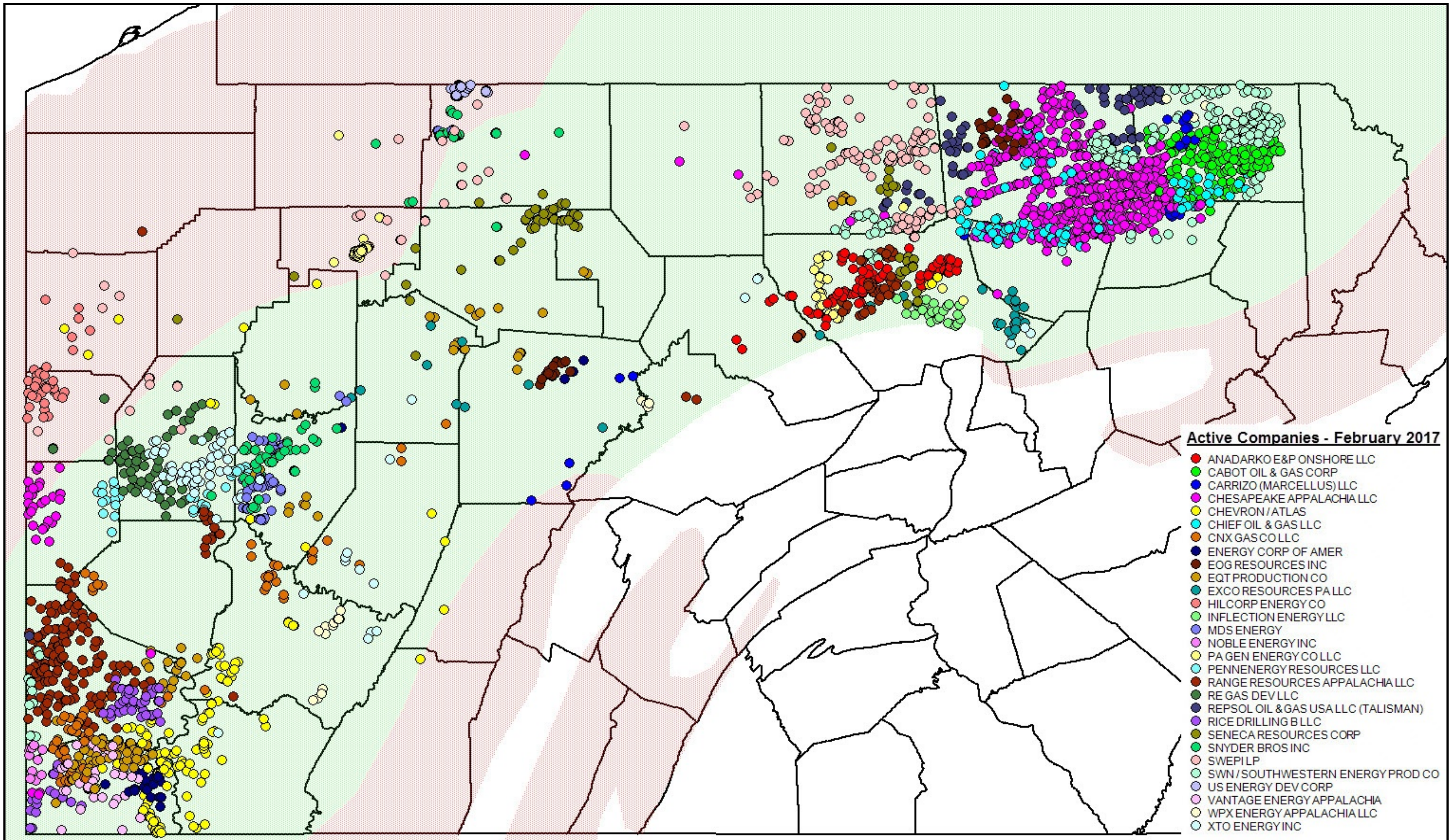


Exhibit 4.2.1-1

The Marcellus is an unconventional oil and gas reservoir. These reservoirs have different characteristics than traditional or conventional reservoirs; the Marcellus is a gas shale that has very low permeability. Unconventional reservoirs require different technology to develop and are more expensive to drill and complete than traditional wells. These wells typically start out with a vertical section then turn and go horizontal through the reservoir. **Exhibit 4.2.1-2** depicts a cross-section of a typical horizontal well. The entire well is encased in steel. Near the surface, to help protect the ground water, additional casing and cement are used. The vertical segment is typically drilled to a depth of a mile or more before extending horizontally. The horizontal section, usually between 2,000 to 9,000 feet in length, is where the well is stimulated by hydro-fracturing and the natural gas is produced. The orientation of the horizontal leg of the well is placed to take advantage of the natural fractures in the reservoir. It is a combination of the well placement, natural fractures and the hydro-fracturing that makes the unconventional plays economical.

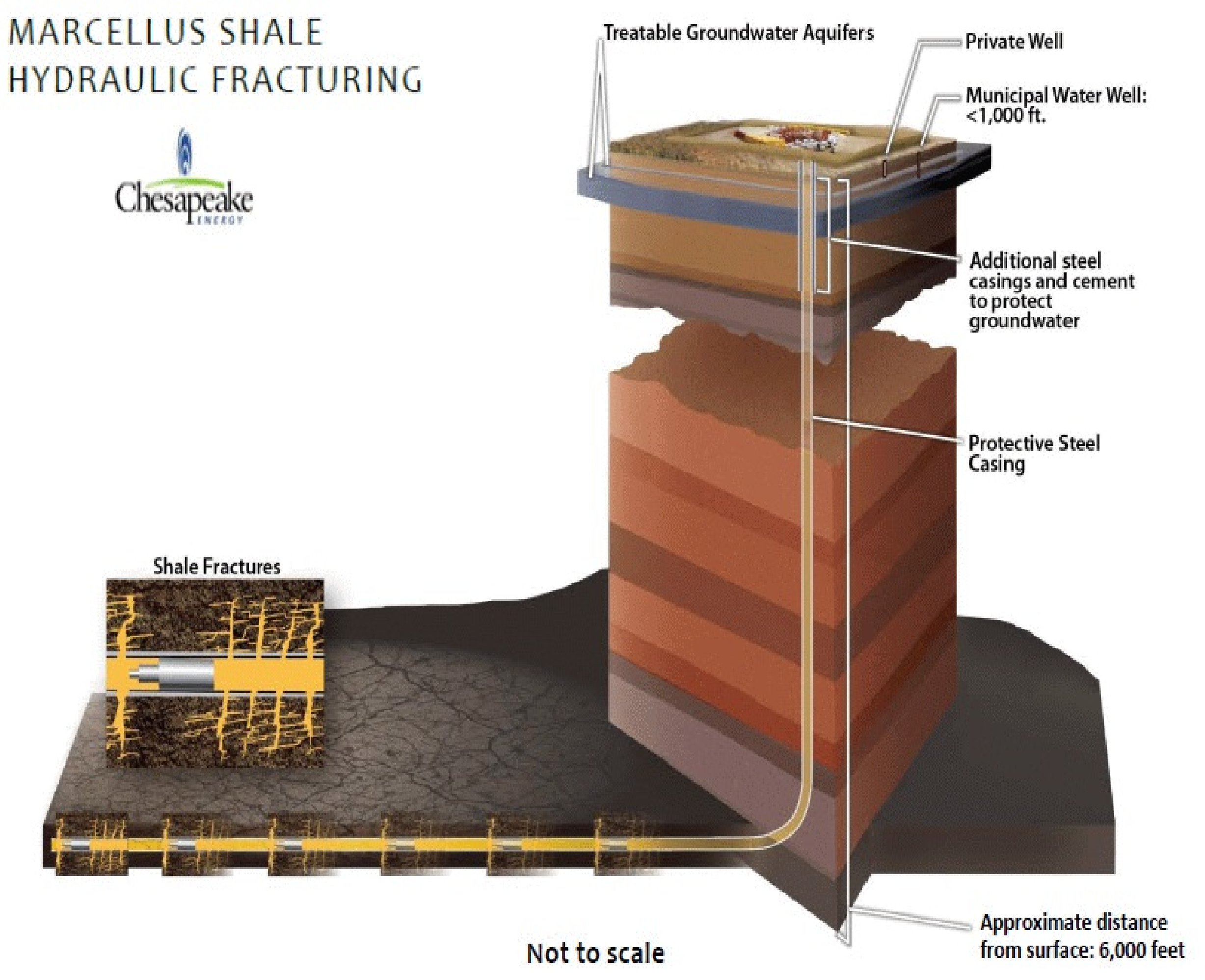


Exhibit 4.2.1-2: Horizontal Gas Well and Hydrofracing
(From Chesapeake Energy)

Hydro-fracturing is completed with large amounts of fluid and sand. The fluid is forced into the rock at very high pressures to create cracks in the shale; the sand keeps the cracks open, enhancing gas production. The act of hydro-fracturing the Marcellus creates an instantaneous gas reservoir for the tightly held gas still contained in the shale. The combination of horizontal drilling and fracing increase the flow of gas to the well and the total volume of gas that can be recovered.

In areas where the Marcellus is being fully developed, spacing between laterals can vary from 600 to 1,500 feet depending on the drilling company, area of the state, and leasehold interests. In some cases where companies are drilling to hold acreage, spacing between drilled and completed wells may be 5,000 feet or more. The number of frac stages in a well also varies with the company and length of lateral. **Exhibit 4.2.1-3** shows a generic declared unit and the drilled and proposed wells associated with it.

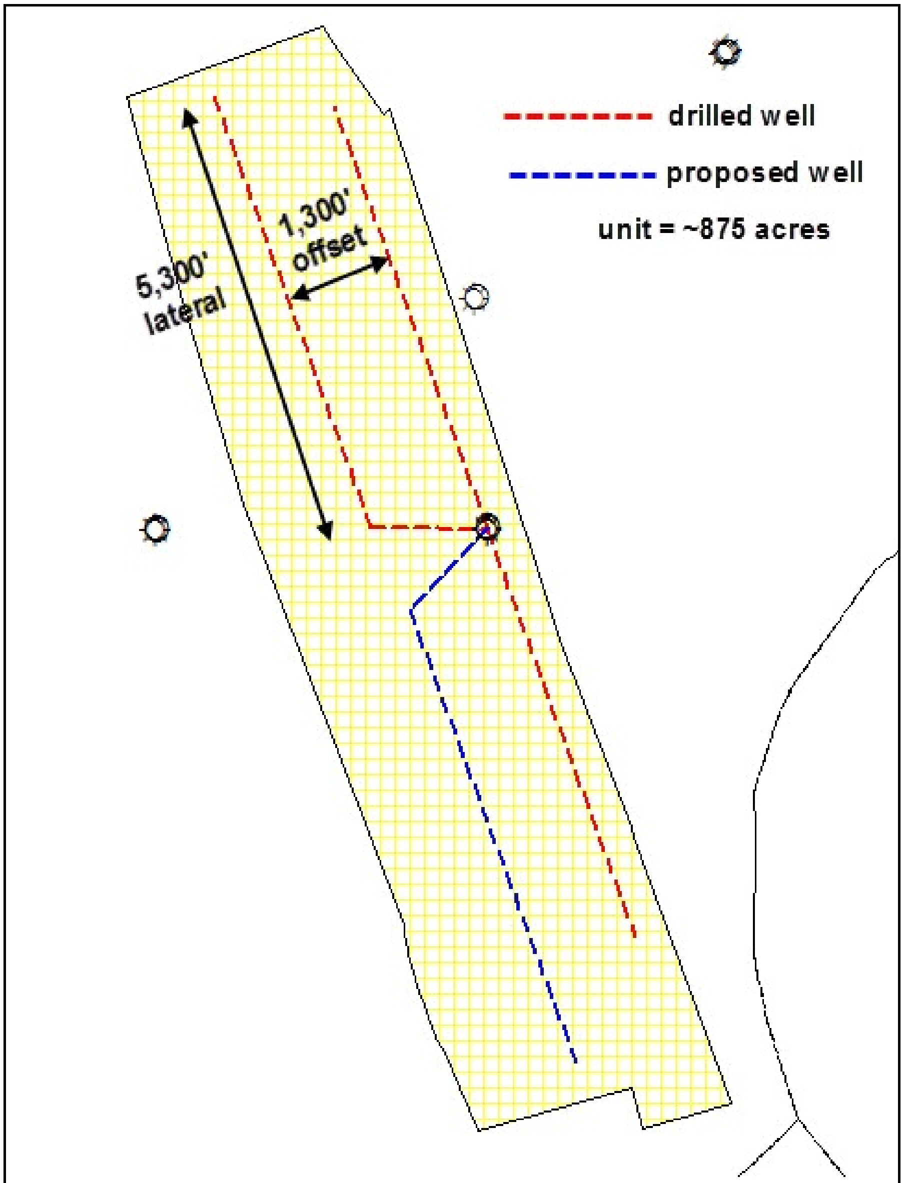


Exhibit 4.2.1-3

As shown below, the Marcellus was identified as a potential production horizon in 2004. The Marcellus Shale accumulated in a depositional system that extends south to Texas along what is called the North American Structural Suture (**Exhibit 4.2.1-4**)[15].

[15] http://www.truestar-petroleum.com/texas.html.

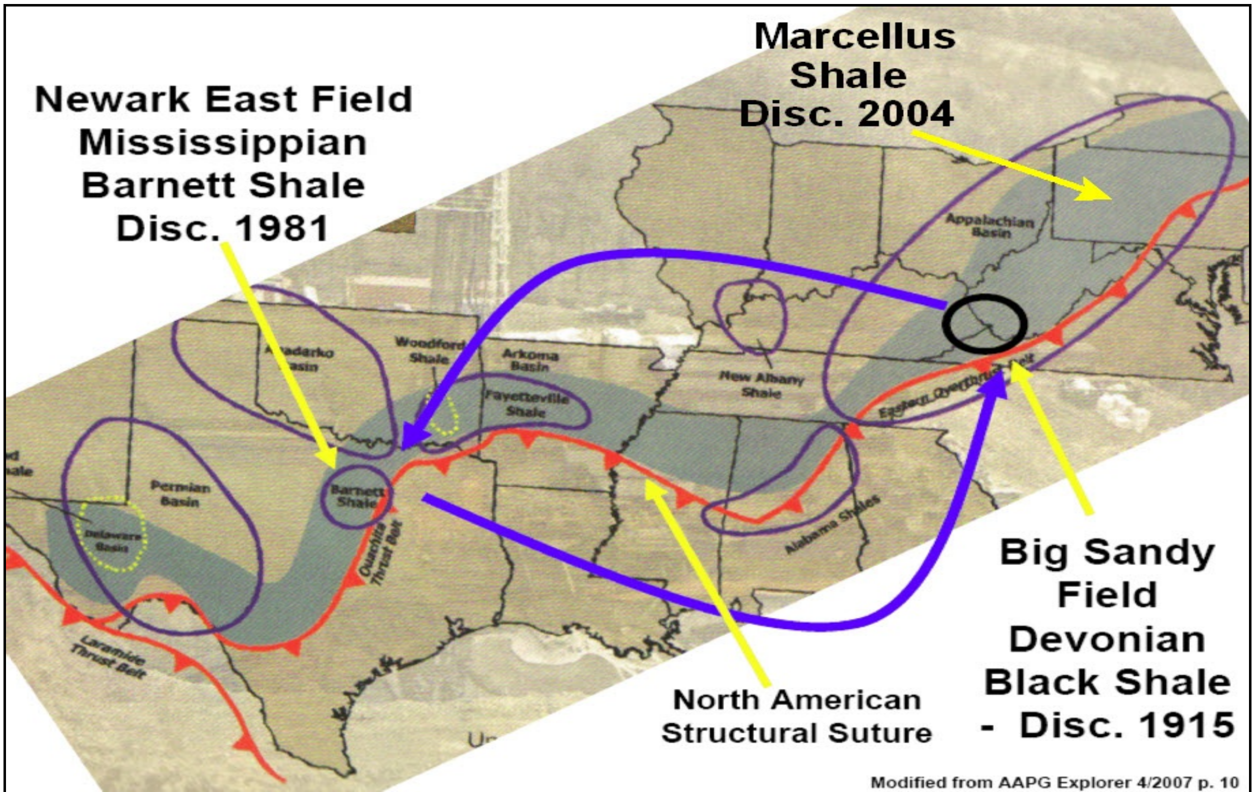


Exhibit 4.2.1-4: Devonian Shales from Texas to Pennsylvania

Within this system, several productive shales similar to the Marcellus were deposited. For example, the Big Sandy Field of West Virginia, Virginia, and Kentucky, discovered in 1915, produces gas from the Ohio Formation. Additionally, the Newark East Field of Texas, discovered in 1981, produces gas from the Barnett Shale. The most prominent shale similar to the Marcellus is the Barnett Shale.

4.2.2 The Marcellus Production Model

All oil or gas wells will experience a steep production decline during the first few years of production known as “flush production. This is accentuated in unconventional wells due to their reliance on natural fractures for gas production. Flush production is followed by a period of transition where production levels continue to decrease at a slower rate, to a settled production. During “settled production,” the rate of production continues to declines with each passing year. The rate of decline is related to the stratigraphic formation(s), natural fractures in the reservoir, quality of completion (hydro-fracture), and the age of the well. A well production rate is not simply governed by the “natural” decline rate of a well. Production rates can be greatly effected by the associated gas pipeline network and interactions from other wells tied into the same system as well as seasonal demand for natural gas.

RTC has well production data for Marcellus wells dating back to mid 2010 in some cases. Industry standards indicate a five year period with monthly production figures is the minimum production data needed to establish a proper decline curve for most reservoirs. General declines and extended models are used to gage the potential of a well when limited data is readily available, with early production peaks being a major indicator of overall well performance.

In areas where there is a lack of long-term production data (three to five or more years of production data) for producing wells in the Marcellus or Utica shales, data from other sources must be used to characterize the sites. Without adequate site-specific data, the appraiser, like a petroleum geologist or engineer, are trained to use comparable data. Data sources such as in house data obtained from RTC clients, as well as publically available data from state agencies where the reporting production data is mandated by statute are utilized to generate a model applicable to the subject property.

4.3 Well Costs

Reported costs for the drilling and completion of Marcellus shale wells are published by most drilling and production companies in PA. Based on recent corporate reports and other publically available data, costs range from $4.5 million to $6.0 million to drill and complete a well. Depth of the Marcellus shale, length of lateral drilled, number of completions per lateral, and the nature of the production (dry verses http://www.depgis.state.pa.us/emappa/wet gas, versus oil & gas) are the driving force of the large rang in costs.

Range Resources has published a full breakdown of their average cost in 2011. The average depth of the Marcellus shale where Range Resources is developing the Marcellus is approximately 6,500 feet. Using percentages from their breakdown, RTC calculated a breakdown of cost for a $5.5 million well (see **Table 4.3-2**).

Table 4.3-2: Marcellus Shale Well Costs

Activity	Cost - 2016
Site Prep	$392,000
Drilling	$1,888,000
Tubulars	$480,000
Facilities	$363,000
Completion	$2,686,000
Total	$5,809,000

The average cost to drill and complete a Marcellus Shale gas well is estimated at $5.5 million for this report.

5.0 MARKET DATA

5.1 Gas Market

Since the mid-1990's, the consumption of natural gas has steadily increased. However, with the advent of successful shale gas production, the outlook for U.S. production and the anticipated need to import gas has radically changed and has actually reversed; major US export terminals are currently nearing completion. **Exhibit 5.1-1**[16] below shows production, consumption, and net imports of natural gas from 2012-2015. The spikes in consumption are related to seasonal changes in demand as natural gas is a major source for residential heat.

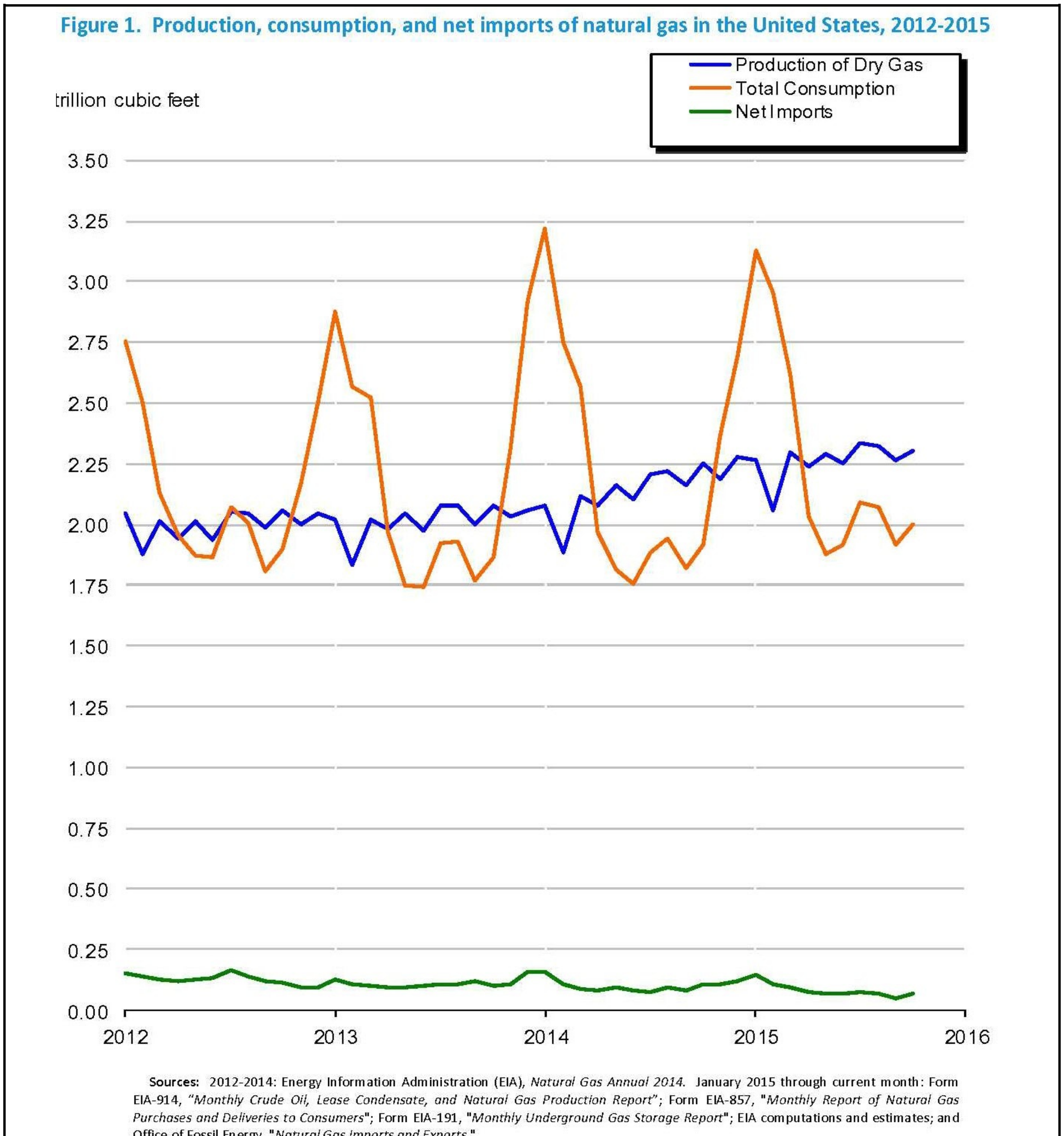


Exhibit 5.1-1

16 http://www.eia.gov/naturalgas/monthly/

Exhibit 5.1-2[17] shows the potential remaining reserves of hydrocarbon resources across North America. In the Appalachian basin, the vast majority of that resource in unconventional shale gas, like the Marcellus and Utica shales.

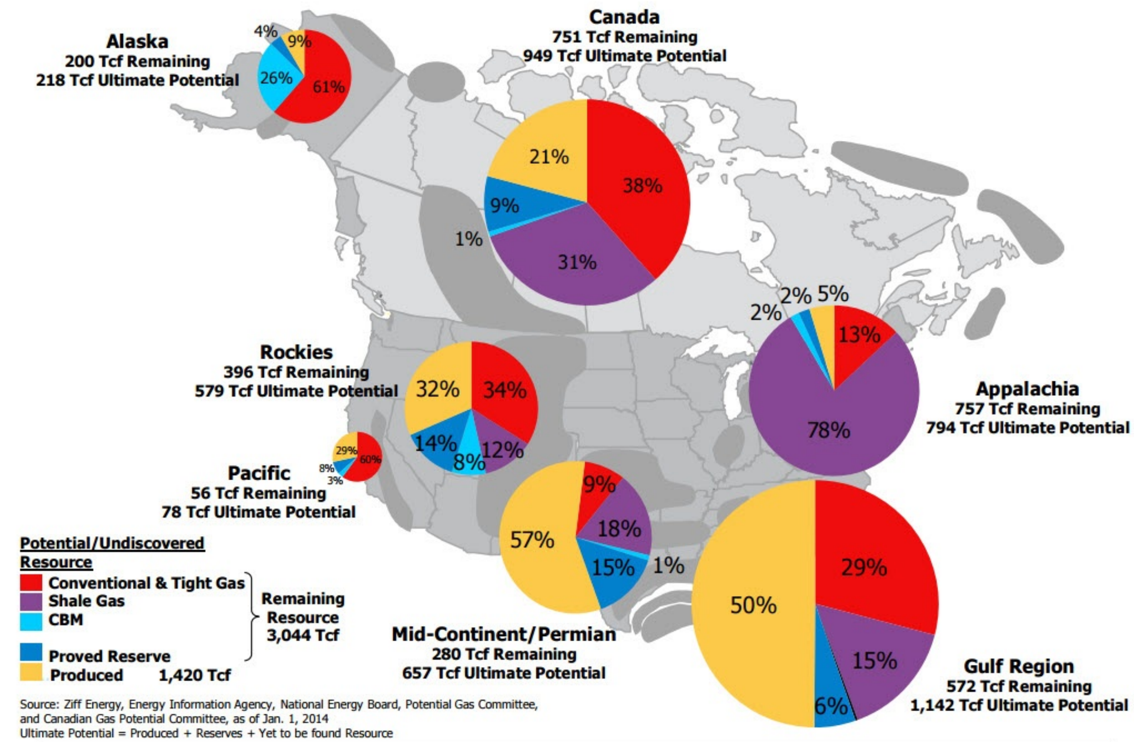


Figure 3. North American Natural Gas Resources

Exhibit 5.1-2: Ziff Energy's outlook on potential North American reserves

[17] http://energy.gov/sites/prod/files/2015/02/f20/Appendix%20D.pdf

Exhibit 5.1-3, also from Ziff Energy, projects a large growth in unconventional shale gas production. With more gas being available locally, less imports will be needed. This trend also drives down the price of gas. Without a major increase in demand (conversion from oil to natural gas for transportation or from coal to natural gas for electricity generation) and with the large production now becoming apparent from shales like the Marcellus, it is likely that gas prices will not climb faster than general inflation.

Ziff Energy forecasts total North American dry gas supply to grow to 139 Bcf/d (146 PJ/d) in 2050 from 81 Bcf/d (85 PJ/d) in 2013. Figure 22 (page 28) summarizes Ziff Energy's supply forecast by gas type.

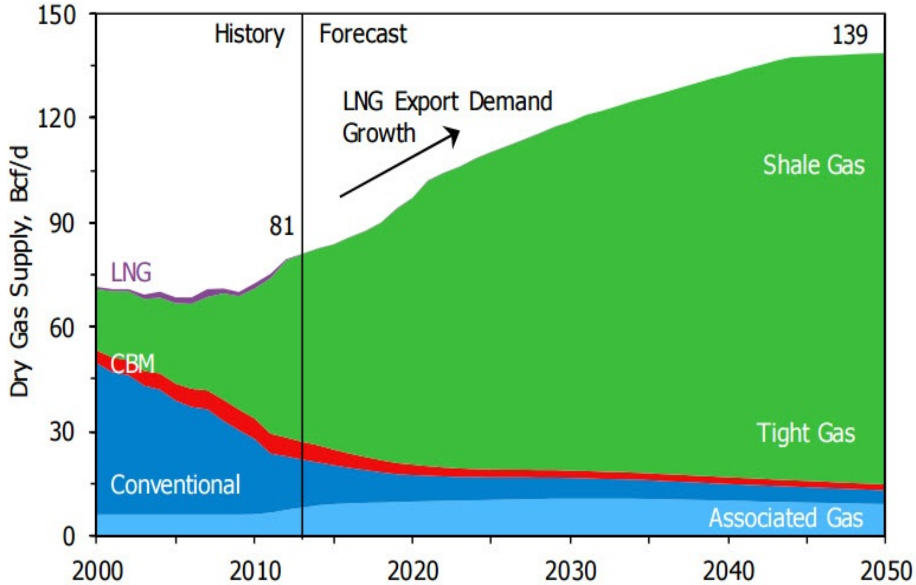


Figure 22. North American Gas Supply to 2050

Exhibit 5.1-3

5.2 Gas Prices

Gas prices were anticipated to increase steadily after 2003 (**Table 5.2-1**). However, after a spike in the middle of 2008, the price fell dramatically and has been fluctuating seasonally since, with no apparent overall trend (**Exhibit 5.2-2**). Gas prices may be on the lower end for the near future as so much gas is being produced.

The latest reported full month price is $3.35 for December 2012. January 2013 through January 2017 were estimated from daily spot prices used to calculate a previous 12 month average price of $2.60 for Henry Hub Wellhead Price (EIA reports Henry Hub spot prices). The appraisal is based on prices typical of historic markets and natural peak price corrections. From 2006 through 2015 average annual price of gas has changed at a CAGR of -9.4%.

Table 5.2-1: U.S. Natural Gas Wellhead Price ($/Mcf)

1998	$1.95
1999	$2.19
2000	$3.69
2001	$4.01
2002	$2.95
2003	$4.88
2004	$5.45
2005	$7.32
2006	$6.40
2007	$6.53
2008	$8.07
2009	$3.71
2010	$4.15
2011	$3.91
2012	$2.66
2013	$3.73
2014	$4.39
2015	$2.63
2016	$2.52
Source: US Energy Information Administration	

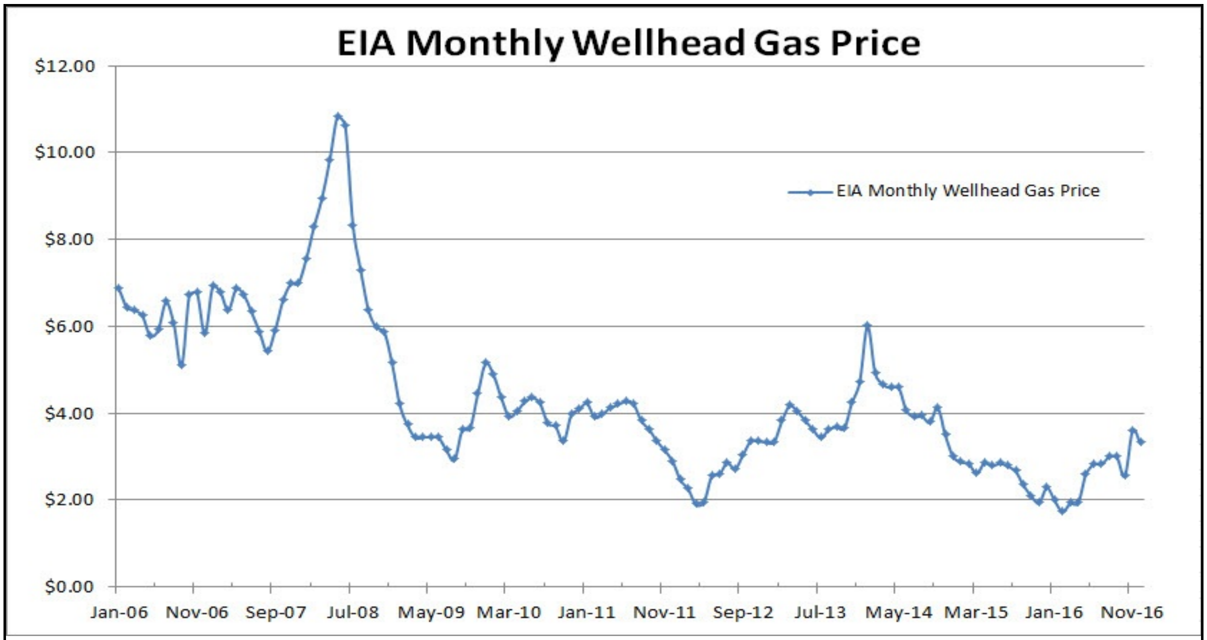


Exhibit 5.2-2

According to the Financial Forecast Center[18], the price for natural gas through July 2017 is expected to remain at or below $3.95/MMBTU. (See **Table 4.2-3**)

Table 5.2-3: U.S. Natural Gas Price Forecast Henry Hub Spot Price. USD/MMBTU Average of Month			
Month	**Date**	**Forecast Values**	**Error**
0	January 2017	$3.30	$0.00
1	February 2017	$3.22	$0.20
2	March 2017	$3.37	$0.27
3	April 2017	$3.49	$0.32
4	May 2017	$3.40	$0.36
5	June 2017	$3.50	$0.40
6	July 2017	$3.95	$0.43
Updated January 2017			

The use of Henry Hub spot pricing has become problematic with the development of significant production from regional gas plays such as the Marcellus Shale. This has created local spot pricing significantly different than that of Henry Hub (located in Louisiana). Traditionally a significant amount of the gas consumed in the northeastern part of the US was produced in Texas and Oklahoma and then a large portion passed through the Henry Hub (transported by pipeline to get to northern markets). The regional producers can take advantage of the reduced transportation cost in marketing their natural gas with lower prices. In northeastern Pennsylvania, spot prices for natural gas are significantly below Henry Hub national prices[19]. Due to these market conditions, a gas price of $2.30 per mcf of gas will be used in this appraisal. In keeping with SEC guidelines, the prices of gas and NGLs will not be inflated over time.

5.3 Local Oil and Gas Leases

As the subject is already under lease, the lease signing bonus value is not considered or developed in this appraisal. The lease signing bonus is the money, per acre of land leased, paid to a landowner by the leasing entity for signing the lease. Because this is money the landowner has already received, it is not included in the appraisal. The value of the potential, likely, or actual royalty stream, associated free gas (if any), and well site fees (if any) are the subject of the valuation. The net value of the lease from gas production as a whole, i.e., the working interest, is considered only in accounting for the economic viability of developing the oil and gas estate. That is to say, once a well's operating expenses are higher than its income, the well is no longer economically viable.

In consideration of the leased property, RTC reviewed the lease and evaluated the following factors, where applicable:

- Lease term and potential for renewal or extension
- Terms that would "hold" the lease
    - Delay rental, unitization/pooling, shut-in well, producing well
- Pugh Clause

[18] http://www.forecasts.org/natural-gas.htm

[19] http://www.eia.gov/todayinenergy/detail.cfm?id=18391

- All leased acreage is held if some part is included in a pooled unit (no Pugh)
- Only pooled leased acreage is held (Pugh)

6.0 HIGHEST AND BEST USE

According to The Appraisal of Real Estate Thirteenth Edition (page 305), Highest and Best Use means: **"the reasonably probable and legal use of vacant land or an improved property, which is physically possible, appropriately supported, financially feasible, and that results in the highest value."** The following criteria are considered in estimating the highest and best use of the subject:

- The use must be within the realm of probability; that is,
  - it must be likely
  - it must not be speculative or conjectural.
- The use must be legal.
- There must be a demand for such use.
- The use must be profitable.

6.1 Mineral Estate

Based on the geology of the site and the historical mineral exploitation in the area, the Highest and Best Use of the subject will not be mining. Economically viable coal is not present. The exploitation of the coal has historically not hindered the exploitation of the oil and gas reserves. The bedrock at the site is not generally used as aggregate in the area due to its poor quality. Even if aggregate was to be mined from the surface, it too would not hinder the exploitation of the oil and gas reserves.

6.2 Gas Estate

As discussed above, the area around the subject has not produced oil or gas in appreciable quantities using traditional drilling techniques in traditional oil and gas bearing formations. The subsurface value of the subject is based on potential proceeds that could be expected to be developed from drilling into the Marcellus Shale, the “new gas play”.

6.3 Highest and Best Use

• The use must be legal.	Oil and Gas development of the site is legal. The development and maintenance of wells are legal.
• There must be a demand for such use.	Based on a review of the market, the demand for oil and gas will be increasing in the foreseeable future.
• The use must be profitable	Currently, gas development is profitable in that it is more cost effective to drill a well that makes less money in order to maintain a lease and avoid paying additional lease bonuses. Production from a well is likely to be profitable for a predicable future. There is a continued and increasing demand for natural gas.

• The use must be within the realm of probability; that is, it must be likely and it must not be speculative or conjectural.	A future gas well is probable; there is great interest in drilling into the Marcellus Shale. The area is a known natural gas production region.

Gas drilling was highly profitable and will continue to be profitable. There are 12[20] active rigs as of February 3, 2017, and one new permit that has been issued so far in 2017 in northeastern PA. The Highest and Best Use of the subject is the development of Marcellus Shale as an economical gas play; as mentioned above, drilling for natural gas is legal, there is a demand for it, it is profitable to sell, and, based on previous successful wells, continued drilling for gas is likely.

[20] RigData subscription

7.0 VALUATION

7.1 Valuation Assumptions

7.1.1 Marcellus Well Reserves

The property is currently not involved with any well or wells producing from the Marcellus Shale. This appraisal is concerned with the potential cash flow from well(s) that may be drilled directly on or in areas pooled/unitized with the subject estate. Since there is presently no production associated with the subject, assumed future production is based on a model well created by RTC. Using data production data from wells in the area of the subject property (acquired from Pennsylvania's Department of Environmental Protection[21]), RTC develops a dry gas model well for northeastern and some parts of southwestern Pennsylvania, as well as a typical wet gas well for some areas in southwestern Pennsylvania. The wet gas producing region of the Marcellus is still being defined but it appears to trend northeast over northern Washington County. The decline curve developed for the area of the subject property is shown in **Exhibit 7.1.1-1** and, for the most part, follows the trends reported by Range Resources.

"Wet gas" refers to natural gas liquids (NGLs) and light oils. Some examples of NGLs are propane, butane, and ethane. Production of these specific hydrocarbons from the Marcellus is typically limited to a few counties in southwestern Pennsylvania. The example well below would produce 5.0 BCFE (billion cubic feet equivalent), which works out to 3.75 BCF of gas with 0.066 barrels of NGLs and light oil for every Mcf of gas produced, over approximately 30 years. For properties where NGL production is unlikely, wells are modeled at 5 BCF. RTC examines known production data for wells surrounding each subject property and adjusts this base model accordingly.

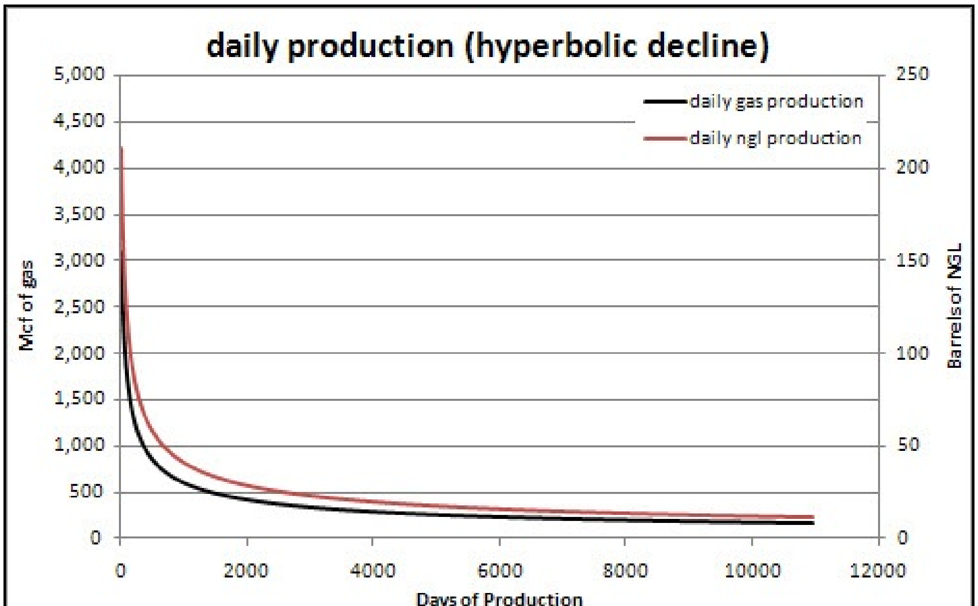


Exhibit 7.1.1-1: Marcellus Shale Well Decline Curve, Pennsylvania

[21] https://www.paoilandgasreporting.state.pa.us/publicreports/Modules/Production/ProductionHome.aspx

The basic equation for the decline of a well is given in **Table 7.1.1-2**. The parameters used to generate the decline curve are also given in **Table 7.3-1**.

Table 7.1.1-2: Marcellus Shale Decline Curve Parameters
Hyperbolic equation: q=q1*(1+b*D*t)^-(1/b)
Hyperbolic parameters:
q1 -initial flow
t - time
d - decline
D - decline fraction
b - hyperbolic exponent
q - production at time t
When a hyperbolic decline sets b = 1, it is said to be a Harmonic decline

Producers in the Appalachian basin initially established Marcellus Shale well EURs based on a harmonic decline curve; a hyperbolic decline where “b”, the hyperbolic exponent, is equal to 1. Some are currently abandoning the harmonic aspect of the equation and are utilizing a “b” value that ranges from 1.2 to 2.0. The “b” component characterizes the change in production decline over time, in general, the larger the “b” value, the greater the calculated EUR.

It should be noted that the harmonic decline analysis was initially utilized in the early development stage of the Barnett Shale, a shale considered analogous to the Marcellus. According to some experts, a close examination of long-term production data for the Barnett Shale indicates that the harmonic decline overestimated production potential of the Barnett Shale. Varying the “b” value from 0.5 to 1.5 does not produce a significant change in a well’s decline curve in the first months of production. Still other texts and experts in the field of decline analysis feel that a proper value for “b” should range from 0.3 to 0.8[22]. Due to the conflicting “b” values (from 0.3 to 2.0), RTC has used a harmonic decline with the “b” value of 1 for the appraisal.

Long-term modeling of the Marcellus Shale is difficult since we are still in the early stages of its development. Even though it is the most favorable gas-related shale play currently being developed, much more production data is needed to fully grasp the variables at play in the horizon. Among these variables: the location of the core areas, how to accurately estimate well EURs, and the most successful spacing, drilling, and completion techniques.

Based on the limitations of the data available and based on the performance of many of the Barnett wells, it is prudent to limit the estimate of the likely revenue stream generated by Marcellus wells to 15 years rather than extending the predicted life to 30 or more years. Using this conservative approach, the appraisal accounts for 85% of the gas that would be produced if the well were to last 30 years. Additionally, because of the present worth calculations, the appraisal accounts for greater than 92% of the present value of a well if it should produce for 30 years.

Market factors including access to transmission systems and a lack of demand for gas also affect the ability to estimate declines and EURs. Many drillers are developing more wells with more gas than can be sold or delivered. The pace of development is

[22] http://www.fekete.com/resources/papers/reservoir_engineering_geologists4_paper.pdf

related as much to "holding" leases as it is to satisfying market demand. Given this, many wells are being produced at less than maximum volumes – curtailed or shut in. Thus, in many cases, the reported production is related to market and transmission conditions rather than well performance.

7.1.2 Cost and Price Increases and General Inflation

Typically, the price per mcf used by RTC is derived from averaging the previous 12 months wellhead pricing data provided by the Energy Information Administration's (EIA) monthly and daily tracking of Wellhead Gas Pricing. However, in northeastern Pennsylvania, spot prices for natural gas are significantly below Henry Hub national prices[23]. Due to these market conditions, a gas price of $2.30 per mcf of gas will be used in this appraisal. In keeping with SEC guidelines, the prices of gas and NGLs will not be inflated over time.

As stated by the Federal Office of Management and Budget (OMB)[24]: "Future inflation is highly uncertain and analysts should avoid having to make an assumption about the general rate of inflation whenever possible." This statement is particularly applicable to today's economy where economists see an uncertain future. There is some wariness of inflation at some point in the future. However, because of continued recessionary pressure, global market displacement, and unstable monetary exchange rates, there is also fear of the development of a deflationary cycle. In this climate, it is nearly impossible to predict inflation or general economy based on cost or price increases or decreases.

The OMB states that:

1. "Real or Nominal Values. Economic analyses are often most readily accomplished using real or constant-dollar values, i.e., by measuring benefits and costs in units of stable purchasing power. (Such estimates may reflect expected future changes in relative prices, however, where there is a reasonable basis for estimating such changes.) Where future benefits and costs are given in nominal terms, i.e., in terms of the future purchasing power of the dollar, the analysis should use these values rather than convert them to constant dollars as, for example, in the case of lease-purchase analysis. Nominal and real values must not be combined in the same analysis. Logical consistency requires that analysis be conducted either in constant dollars or in terms of nominal values. This may require converting some nominal values to real values, or vice versa."

2. "Recommended Inflation Assumption. When a general inflation assumption is needed, the rate of increase in the Gross Domestic Product deflator from the Administration's economic assumptions for the period of the analysis is recommended. For projects or programs that extend beyond the six-year budget horizon, the inflation assumption can be extended by using the inflation rate for the sixth year of the budget forecast. The Administration's economic forecast is updated twice annually, at the time the budget is published in January or February and at the time of the Mid-Session Review of the Budget in July. Alternative inflation estimates, based on credible private sector forecasts, may be used for sensitivity analysis."

[23] http://www.eia.gov/todayinenergy/detail.cfm?id=18391

[24] Circular No. A-94 Revised, (Transmittal Memo No. 64), MEMORANDUM FOR HEADS OF EXECUTIVE DEPARTMENTS AND ESTABLISHMENTS, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs , October 29, 1992

The use of general cost and price trends (increasing) nearly always results in inflated values. Since the valuation is based on the difference between cost and gross income, with increasing cost and income scenarios, each succeeding year can show an ever-increasing NOI. History does not show any industry with an ever-expanding NOI – market adjustments take place to negate the artificial trend.

Where specific price or cost changes are known or are predictable, they should be addressed in the appraisal. The use of real or constant dollars is intended to eliminate a continuous trending NOI not to deny the effect of future market or technical events.

7.2 Valuation Modifying Factors

The modification factors that are developed in this section are intended to aid in the generation of a market value for the subject property, as if the subject estate were exposed to market – as-is. In other words, what would a group of investors in oil and gas properties likely pay for this gas estate (property) in its' entirety given its current status as leased but not yet developed?

Appraisals are based on the principle of substitution – that is "a buyer will pay no more for a property than the cost of an equally desirable alternative property." This appraisal is therefore based on a comparison alternative investment – properties and income streams that serve the same or similar in the same or similar market. While the income approach is the methodology used in the appraisal, it is still based on comparison of property characteristics, location factors, and alternative income streams.

This appraisal process involves first determining what the maximum productive potential is of the property – the most likely production from wells that would exploit the entire target horizon of the estate. The vast majority of current oil and gas activity in Pennsylvania is targeting the Marcellus shale. There are other potentially productive horizons (e.g., Upper Devonian shales, Utica shale), but these formations are presently attracting less attention and exploration dollars. Thus, the development of these horizons is not likely until further into the future. While they are included in this appraisal, they do not contribute any additional value to the oil and gas estate at this time. This maximum amount (ultimate recovery) and likely decline rate of well(s) to be located to access the subject site is based on the geology of the area and on the performance of similar and nearby wells. Since it is not always likely that an entire acreage will be produced, a proportion of the property judged likely to be produced is estimated from statistical inference from wells throughout the region. The primary comparative focus is then on likely timing of development – when is it likely that a well would be drilled and brought into service and when would the balance of the property be brought into service.

Based on this approach, several factors will affect the value of the subject property. These include but are not limited to:

- When the property was/will be leased and what the terms are/may be
- Drilling activity in the area
- Completion rates
- Timing to bring the gas into market (location of existing pipelines and scheduling of new pipelines or service facilities)
- The appropriate discount rate for the lessee and lessor
- Appropriate costs and prices

- Regional Estimated Ultimate Recovery (EUR)

7.2.1 Lease Signing Bonus and Royalty Value

The subject is already leased. If the subject was not leased, the mineral owner could expect to receive a lease signing bonus when the lease is signed. The lease signing bonus is analogous to an option payment, a payment that generally indicates a bonafide interest in the property, also sometimes used by the lessor (estate owner) to “spur” activity by the lessee (oil and gas company). Surveys and research by RTC show that signing bonuses vary between a low of $15 per acre and a high of $6,000 from 2007 to 2011, depending on the location of the property, the timing of the land agent’s efforts, the negotiating skill of the landowner, and the utility of a parcel to close or fill-in a developable area. In 2009, lease signing bonuses peaked and have declined since then. The bonus amount is associated with:

- Current interest of the local/regional market
- Desire, need, and ability to assemble adjacent large blocks
- Mineral owner negotiating skills.

As the property is already leased, no value for the Lease Signing Bonus or Royalty Rate was developed.

7.2.2 Well Location Bonus & Free Gas

Some leases stipulate additional items that must be awarded to the landowner if a well is drilled on their property. These are the well location bonus and/or free gas (also called house gas) payments. Well location bonuses require that the leasing company pay the landowner for damages to their land, a flat fee or a per acre fee. Typically, these well location bonuses (also called well location fees) range from $10,000 to $20,000 and can also be dependant upon the total depth of the well drilled on the property. Free gas is usually a certain amount of gas (or in lieu of the actual gas, a monetary payment) to be awarded to the landowner on a yearly basis. However, in some cases this gas, or payment, is offset against the royalty payments making the free gas a null value.

The estate is assumed to be unitized with a group of wells, all with individual well pools of 80 acres. As many as eight wells may be drilled and produced from one well pad, all of which may be put into a single production unit. RTC has reviewed and appraised estates with unitization documents that have included as little as 36 acres and as large as 1,100 acres, with an average of approximately 600 acres. Unitized well pools generally contained wells drilled from a single well pad. Acreage in individually unitized production pools is growing larger as the horizontal legs for individual Marcellus wells increase.

7.3 Maximum Potential Revenue

Table 7.3-1 shows the valuation assumptions used in this appraisal to achieve the maximum revenue for a well based on the likely production from a single well:

Table 7.3-1: Model Production Well Valuation Assumptions	
Valuation Year	2016
Year Property is Leased	N/A
Initial Production Year (estimated)	2017
Lease Signing Bonus Value	N/A
Royalty, per lease	12.50%
Producing Estate acreage	45.7
Type well pool acreage	80
Free gas volume (Mcf/year), per lease	0
Value for "free gas" as % of wellhead pricing	87.50%
Well Location Fee	$0.00
Initial Gas Production (Mcf/year) - for model	1,553,000
Initial NGL Production (Bbls/year) - if applicable	0
Harmonic Well Decline: q=q1*(1+b*D*t)^-(1/b) **(Table 7.1.1-2)**	
q - flow at time t	mcf / bbls
d - decline	0.7112
D - decline fraction (1/d)	1.40607
t - unit of time	Years
b - hyperbolic exponent	1
Initial Cost (Section 3.7)	$5,500,000
Operating Cost (annual, Section 3.7)	$10,000
Price Per MCF Wellhead (Section 7.1.2)	$2.30
Gas Price Inflation Rate (Section 7.1.2)	0.0%
Price Per Bbls Wellhead (Section 7.1.2)	$0.00
Natural Gas Liquids Price Inflation Rate (Section 7.1.2)	0.0%

Based on the factors given in **Table 7.3-1**, the revenue stream of a single 80 acre well is calculated as shown in **Table 7.3-2**.

Table 7.3-2: Single Well Cash Flow							
Year	NGL Production (Bbls)	Gas Production (Mcf)	Gross	Royalty Revenue Stream	Free Gas Revenue Stream	Annual Cost	Working Interest
2016			$0	$0	$0	$3,695,000	($3,695,000)
2017	0	1,553,000	$3,571,900	$446,487	$0	$1,825,000	$1,300,412
2018	0	645,450	$1,484,534	$185,567	$0	$10,000	$1,288,968
2019	0	407,382	$936,978	$117,122	$0	$10,000	$809,856
2020	0	297,611	$684,505	$85,563	$0	$10,000	$588,942
2021	0	234,440	$539,212	$67,401	$0	$10,000	$461,810
2022	0	193,391	$444,799	$55,600	$0	$10,000	$379,199
2023	0	164,575	$378,522	$47,315	$0	$10,000	$321,207
2024	0	143,232	$329,434	$41,179	$0	$10,000	$278,255
2025	0	126,790	$291,617	$36,452	$0	$10,000	$245,165
2026	0	113,734	$261,588	$32,699	$0	$10,000	$218,890
2027	0	103,116	$237,166	$29,646	$0	$10,000	$197,520
2028	0	94,311	$216,915	$27,114	$0	$10,000	$179,801
2029	0	86,891	$199,850	$24,981	$0	$10,000	$164,869
2030	0	80,554	$185,274	$23,159	$0	$10,000	$152,115
2031	0	75,078	$172,680	$21,585	$0	$10,000	$141,095
2032	0	70,300	$161,689	$20,211	$0	$10,000	$131,478
2033	0	66,093	$152,014	$19,002	$0	$10,000	$123,012
2034	0	62,361	$143,431	$17,929	$0	$10,000	$115,502
2035	0	59,028	$135,765	$16,971	$0	$10,000	$108,795
2036	0	56,034	$128,878	$16,110	$0	$10,000	$102,768
2037	0	53,328	$122,655	$15,332	$0	$10,000	$97,323
2038	0	50,872	$117,006	$14,626	$0	$10,000	$92,380
2039	0	48,632	$111,854	$13,982	$0	$10,000	$87,872
2040	0	46,581	$107,137	$13,392	$0	$10,000	$83,744
2041	0	44,696	$102,801	$12,850	$0	$10,000	$79,951
2042	0	42,958	$98,803	$12,350	$0	$10,000	$76,452
2043	0	41,349	$95,104	$11,888	$0	$10,000	$73,216
2044	0	39,857	$91,672	$11,459	$0	$10,000	$70,213
2045	0	38,469	$88,479	$11,060	$0	$10,000	$67,419
2046	0	37,174	$85,501	$10,688	$0	$10,000	$64,813
1st 15 Years	**0**	**4,319,555**	**$9,934,976**	**$1,241,872**	**$0**	**$5,660,000**	**$3,033,104**
30 Year Total	**0**	**5,077,289**	**$11,677,764**	**$1,459,721**	**$0**	**$5,810,000**	**$4,408,044**

As shown in **Table 7.3-2** above, a Royalty Revenue Income Stream is estimated to be $1,241,872 and a Working Interests Income Stream is estimated to be $3,033,104. This is based on the assumption that there is a 100% potential for a single well at 80 acre spacing drilled and put into production at the date of the appraisal. A royalty revenue per acre is then calculated by dividing the revenue streams by 80 acres. The royalty revenue for a 15 year period is $15,523 per acre.

As more wells are drilled, confidence in using past performance to predict future performance will increase. Additionally, since the value of the gas well is based on estimating the present value of the likely future income stream, future income is discounted to present value. The present value of income that may be produced more than 15 years from today is relatively small. Therefore, given the confidence level of the predictability of long-term Marcellus production and the affect of discounting future income to a reasonable present value, the possible production and income after 15 years is negligible.

Table 7.3-3 shows the potential revenue of the oil & gas estate (lease signing bonus (if applicable), royalty, and free gas) of a **single well**, from **Table 7.3-1**, maximized to the subject estate. The estate is assumed to be put into a well pool, or series of well pools, maximizing the gas production potential of the entire estate.

Table 7.3-3 Maximum Potential Lease Revenue						
Year	Estate Acreage	Potential Royalty Revenue per Acre	Total Potential Royalty Gas Production Revenue	Free Gas Lease & Well Location Revenue (single well)	Value of the Lease Signing Bonus	Total Maximum Potential Revenue
2016	45.70	$15,523	$709,419	$0	$0	$709,000

As shown in the table above, the total potential (maximum) royalty revenue stream generated by the subject as per the lease terms is $709,000.

7.3.1 Reserve Property Adjustment

The Income Approach to valuation is the basis for determining the value of the subject property. As such, a realistic schedule for its development must be estimated. The factors needed to estimate this schedule are the timing for the development of the property and the economic viability of the Marcellus Shale.

Leasing and drilling activity in the immediate area of the subject property will be used to form the basis of the potential time frame for the development of the subject property. For the purposes of this appraisal, the economic viability of the Marcellus Shale is assumed to be a given.

The location of existing completed Marcellus Shale wells and the relative time frame for the development of the property will frame the value of the subject property through the development of a Reserve Property Adjustment. This analysis is detailed in the following sections.

7.3.1.1 Development & Production Schedule

When attempting to predict when a certain property will be developed, RTC considers an aspect of the appraisal process that is a big uncertainty: absorption rate. This is the property lease, sale, and development rate in a certain area. Multiple factors come into play when determining the absorption rate, including the demand for the asset, the location of the property, and the amount of other similar properties available for the same use (i.e., lease, sale, development).

In the ten counties that make up northeastern Pennsylvania, there are about 4.7 million acres of Marcellus Shale. Assuming that an average well will drain about 80 of those acres and that each acre is equally accessible, mathematically about 46,400 wells are possible. Further, assuming one rig can drill twenty wells each year and that 29 rigs are available in the region to do so, the total acreage wouldn't be absorbed for over 100 years. This simple analysis does not take into account the other organic rich shales that have also been developed in the same region, namely the Utica (below the Marcellus) and the Burkett (above the Marcellus).

For the purpose of RTC's development and production model, current drilling rates and well spacing patterns in Pennsylvania are assumed to continue. The local/regional area is analyzed by the appraiser to establish a base absorption rate. The examination must include a delineation of the shales present and the dominant target of drilling activity, recent drilling activity and production rates for wells, current drilling activity (number of rigs actively drilling) and the productivity of a rig (wells drilled per month). **Table 7.3.1-1** summarizes RTC's analysis.

Table 7.3.1.1-1 Generic Drilling Time Table

COUNTY NAME	AREA SQUARE MILE	MARCELLUS COVERAGE	SQUARE MILES OF MARCELLUS	ACRES OF MARCELLUS	# OF WELLS @ 80 ACRE SPACING	NUMBER OF RIGS USED IN ANALYSIS	# OF WELLS COMPLETED PER YEAR	ACRES DRILLED PER YEAR	% OF COUNTY DRILLED ANNUALLY	YEARS TO DRILL COUNTY
BRADFORD	1,161	100%	1,161	743,258	9,291	4	80	6,400	0.86%	116.1
CENTRE	1,115	40%	446	285,379	3,567	1	20	1,600	0.56%	178.4
CLINTON	894	60%	536	343,103	4,289	1	20	1,600	0.47%	214.4
LYCOMING	1,244	70%	871	557,437	6,968	7	140	11,200	2.01%	49.8
POTTER	1,082	100%	1,082	692,659	8,658	1	20	1,600	0.23%	432.9
SULLIVAN	452	100%	452	289,441	3,618	1	20	1,600	0.55%	180.9
SUSQUEHANNA	833	100%	833	532,837	6,660	8	160	12,800	2.40%	41.6
TIOGA	1,137	100%	1,137	727,840	9,098	2	40	3,200	0.44%	227.5
WAYNE	751	60%	451	288,318	3,604	1	20	1,600	0.55%	180.2
WYOMING	405	100%	405	259,270	3,241	3	60	4,800	1.85%	54.0
				4,719,541		29		Average	0.99%	

Ultimately this approach is too simplistic to be utilized directly in the appraisal of a specific property. However, it does demonstrate the amount of time it will take to fully explore and develop the Marcellus (one of three potential target horizons) in a given county. Even in the most active regions, it will take a significant number of years to develop the Marcellus Shale; for example, based on the assumption, Bradford County could take 116 years to fully explore and develop generating an initial annual estate absorption rate of 0.86%. This rate will increase as drilling continues; assuming that drilling in earnest was initiated in 2008, then a calculated absorption rate of 0.92% is appropriate for 2015.

Based on this analysis, the average 80 acre site in Pennsylvania has no more than a 1% chance of being drilled in any given year (randomly). This is because there are literally millions of acres of land underlaid with Marcellus Shale throughout Pennsylvania, and drilling companies can only drill so many wells in a year. Only a small portion of those wells will be completed, even less will start producing, and some will ultimately be plugged and abandoned. As more is learned about the Marcellus, the areas of the play that are better and worse than average will be discovered.

Most important is the fact than many wells and many well drilling efforts are based as much on holding acreage already leased than in maximizing production from one site or one pad or one lease. There are far too many leases and far too many acres to be developed for an operator to concentrate on maximizing production from individual leases. Instead, the operator's goal is to optimize the investment in multiple leases over large geographic areas.

RTC normalized this base absorption rate of 1% to 1, which is then adjusted based on the activity in the area surrounding the subject estate. Is the property closer to activity (i.e., closer to oil and gas drilling, leasing, pipeline building), or farther away than an average property? Using the SEC reserve definitions from Section 3.0, a property that is one offset (5,000 feet) from a known Marellus well, could be classified as Proven Reserves; thus, the reserves of that property are adjusted to between 50% and 90% of its potential.

Based on the drilling company and their activity in the surrounding region, a specific adjustment is selected. For example, if the landowner was leased with a company that is more aggressive with drilling and producing multiple wells in a unit, 90% would be appropriate. Conversely, a leasing company that is notorious for drilling a vertical well simply to hold acreage would warrant an adjustment to 50%. If the property is 35,000 feet or greater from a known Marcellus well, then the base reserve factor is adjusted between 5% and 0%. **Table 7.3.1.1-2** shows the breakdown used by RTC for the assignment of a base reserve factor, "P" factor in the report.

Table 7.3.1.1-2: Base Reserve Factor

Distance Bracket (distance from drilled well in feet)	Base Reserve Factor ("P" factor)	
	MAX	MIN
0 to 5,000	90%	50%
5,001 to 15,000	50%	25%
15,001 to 25,000	25%	10%
25,001 to 35,000	10%	5%
Greater than 35,000	5%	0%

The establishment of a "P" value from the range given in the table above is based on the drilling habits of the leasing company. Some companies are developing leased property by drilling one or two laterals to hold a 700+ acre unit, a unit that will ultimately hold six laterals. Without full development of a production unit, its value diminishes due to delays in full development, i.e., delays in the overall income stream from the production unit. Once a well is drilled and a unit is established, generally the entire unit and all leased properties are owned by the leasing company which has no need to drill additional wells until the current well becomes uneconomical. This style of drilling and development is typical for new field development. It is a way to tie up a significant amount of acreage with a limited number of drilling rigs without flooding the market with an extreme oversupply of natural gas.

For valuation purposes, it is assumed that the gas production companies will continue as an on-going concern; that is to say they will remain a viable business entity. However, this appraisal must recognize the likely risks associated with the realization of the future income from the exploitation of the gas estate. The Marcellus Shale lies beneath the subject. Based on publically available data where the Marcellus Shale is currently productive, it is a Proven economic reservoir, meaning that:

- A significant number of wells are being drilled in the area by multiple companies.
- Pipeline systems are currently being built and expanded to accommodate increased production.
- New Natural Gas Liquid plants are being constructed to separate the NGLs.

- As companies move out of the current known reservoir area for the Barnett Shale (Marcellus Shale Model), they are predicting only a 50% chance of success[25].
- The Marcellus Shale is less understood than the Barnett Shale and has no substantiated long-term gas production. Keep in mind that the Marcellus is considered a statistical play; that is to say, a significant number of wells need to be drilled in a large region to understand the best way to develop the resource.

7.3.1.2 Development of the Reserve Property Adjustment

The preceding discussion was geared towards regional activity. It provides the reader an overview of the scale and the potential time frame it will take to fully develop the Marcellus Shale in the region. Next the statistics for the area within a 5-mile radius will be utilize to characterize the subject property. This more limited view, and by default, reduced scale is localized to the area surrounding the subject property. This set of statistics defines the basis for the value analysis (the basis of which were presented in Section 4.1). In summary, the activity statistics for the area within the 5-mile radius of the property are as follows:

- 5 rigs[26] actively drilling (as of February 3, 2017)
- 12 wells drilled
- 75 new well locations permitted through the PADEP through January 2017

RTC will use this data to construct a working model that will characterize the activity in the local area within the 5-mile region of the property and establish a potential pattern of development. This data was developed from RTC's extensive geographically-based (GIS) data sets[27]. If the property was leased, RTC also compiles a set of statistics regarding the lease for the property.

Lease data for the subject property:

- leased acreage
- the lease date and term
- is there an extension clause?
- is there a continuous development clause?
- the termination date of the lease if not perfected (without activity)
- the latest possible date for production of oil and gas (assumed to be a two year delay after the lease would theoretically terminate).

---

[25] The Barnett Shale: Visitors Guide to the Hottest Gas Play in the U.S. (2005) Hayden, Jeff & Pursell, Dave; Pickering Energy Partners, Inc, pg:40.

[26] Rig counts in Section 4.1 from RigData, February 3, 2017

[27] RTC maintains a large multi-state geographic database of lease, well locations, well completion data, and well production information. RTC completes periodic statistical analysis of these results to ascertain patterns by time-frame year, by region, and by company.

The statistics used to characterize the area surrounding the subject property are presented below in **Table 7.3.1.2-1**.

Table 7.3.1.2-1: 5-mile Area Activity Characteristics

#1 "P" Factor - developed as follows:
Based on distance from a drilled Marcellus Well and the leasing company

#2 acreage within the 5-mile radius - calculated as follows:
(5 x 5,280) ^ 2 x 3.14159 ÷ 43,560 = total acres

#3 the number of wells drilled (horizontal laterals) within the 5-mile radius

#4. the potential acres developed with a single lateral - area specific:
80 acres for the northeastern Pennsylvania

#5 the acres developed within the 5-mile radius - calculated as follows:
#3 x #4 = acres

#6 the percent of the 5-mile radius developed to date - calculated as follows:
#5 ÷ #2 = %

#7 the number of rigs active within the 5-mile radius:
based on publically available data

#8 the potential number of horizontal laterals a each rig is responsible for being completed annually
based on publically available data

#9 the potential acres developed annually - calculated as follows:
#4 x #7 x #8 = potential acres developed annually

#10 the remaining acres undeveloped within the 5-mile radius - calculated as follows:
#2 ÷ #9 = acres undeveloped

#11 the percent of the undeveloped acreage that could be developed annually based on the current active rig count - calculated as follows:
#9 ÷ #10 = percent undeveloped

#12 the maximum delay for development (not to be greater than 32 years; based on it taking a single rig 32 years of continuous drilling activity to fully develop the 5-mile radius) - calculated as follows:
1 ÷ #10 or #10 ÷ #9 = years.

A 5-mile radius circle contains 50,266 acres. Hypothetically, it would take three drill rigs 11 years to develop all of the 50,266 acres. This assumes each rig is considered responsible for twenty wells being drilled and completed per year.

RTC further refines the model by accounting for past activity. RTC calculated the currently developed acreage within the 5-mile radius and subtracted that from the total acreage, 50,266 acres. Then, by identifying the number of active rigs in the 5-mile radius, we can calculate a theoretical time for full development of the remaining undeveloped acreage.

After these are developed, a series of property value discounts are calculated, the basis of which are the above assembled statistics. These discounts provide for an adjustment to the property's value by accounting for unknowns such as timing of the development of the subject property, the pace of development of the entire subject property, and the utilization of the available acreage. These factors and the method for calculation are presented in **Table 7.3.1.2-2** below.

Table 7.3.1.2-2: Reserve Property Adjustment

#13 The average delay for development of a given property within the 5-mile radius - calculated as follows:

#12 ÷ 2 = maximum delay

#14 The anticipated delay for the subject property based on the lease (one year after activity is started)

#15 Development Time factor- calculated as follows:

1 - (#13 ÷ 100) = Time factor

#16 Property Utilization factor - based on leasing company and local area drilling patterns (80% based on local drilling activity)

#17 Owner Control factor - 50%, assigned by RTC

#18 Reserve Property Adjustment (RPA) - calculated as follows:

#1 x #15 #16 x #17 = RPA.

Ultimately, the adjustments discussed above are RTC's method of taking into account the following unknowns:

- Will the property be developed for oil and gas production?
- What is the development schedule for the property?
- Is the property being drilled to simply hold the lease?
- Will 100% of the property be utilized for gas production?

The statistics used to characterize the area within the 5-mile radius of the subject property is presented below in **Table 7.3.1.2-3**.

Table 7.3.1.2-3: 5-mile Area Activity Characteristics

For Reference	Statistic	Basis	Subject Property Statistics
	Distance to closest drilled Marcellus well	As measured from the center of subject properties	21,120
#1	Property base reserve "P" Factor	RTC's designation based on distance from proven production with consideration given for production company	15%
	Property acreage		46
	The date the subject property was leased		2012
	The subject property primary lease term (years)		5
	The date the lease terminates without drilling activity (end of primary term)		2017
	The date of the appraisal		2016
	Time remaining for activity to start - rounded (one year after the end of the primary term)		2018
#2	Acreage within the 5-mile radius	(5 x 5,280) ^ 2 x 3.14159 / 43,560	50,266
#3	The number of wells drilled within the 5-mile radius - base data presented earlier in **Section 4.1**	RTC's GIS based analysis of drilling activity: Data obtained from the Pennsylvania Department of Environmental Protection	12
#4	The potential acres developed with a single lateral: 3,500 lateral x 1,000 "radial drainage area ÷ 43,560 square feet per acre = 80 acres	RTC's GIS based analysis of regional drilling patterns: Data obtained from the Pennsylvania Department of Environmental Protection	80
#5	The acres developed within the 5-mile radius	#3 x #4	960
#6	The percent of the 5-mile radius developed to date	#5 ÷ #2	1.9%
#7	The number of active rigs within the 5-mile radius	RTC's GIS based analysis of data purchased from RigData	5
#8	The potential number of horizontal laterals each rig is responsible for being completed annually	RTC's GIS based analysis of regional completion patterns: Data obtained from the Pennsylvania Department of Environmental Protection and purchased RigData	20
#9	The potential acres developed annually, based on the active rig count	#4 x #7 x #8	8,000
#10	The remaining acres undeveloped within the 5-mile radius	#2 - #9	42,266
#11	The percent of the undeveloped acreage that could be developed annually with the current active rig count	#9 ÷ #10	18.9%
#12	The maximum delay for development (not to be greater than 32 years - a single rig)	1 ÷ #11	5
#13	The average delay for development of a given property within the 5-mile radius	#12 ÷ 2	3
#14	The anticipated delay for production based on lease (two years after the end of the primary term)	based on lease	2019

The statistics above characterize the area of the 5-mile radius surrounding the subject property. Taking the statistics from **Table 7.3.1.2-3** a series of calculations are made to develop a Reserve Property Adjustment for the subject property. They are presented in **Table 7.3.1.2-4**.

Table 7.3.1.2-4: Reserve Property Adjustment			
#15	Development Time Factor (“T” Factor)	1 - (#13 ÷ 100)	97%
#16	The Property Utilization Factor (“U” Factor)	RTC’s GIS based analysis of developed properties	80%
#17	The subject property “Owner” Control factor (“C” Factor)	50%	50%
#18	The subject Reserve Property Adjustment (RPA)	#1 x #15 x #16 x #17	6%

Key points of **Table 7.3.1.2-4** are:

The calculation of the “T” Factor, or the Development Time Factor, is directly related to the number of active rigs, the number of undeveloped acres, and the time it would take to fully develop the undeveloped acreage within the modeled 5-mile radius. The lower the activity and or developed acreage in the given 5-mile radius the higher the “T” Factor, and thus the greater the reduction of the Reserve Property Adjustment.

The “U” Factor, or Property Utilization Factor, is based on RTC’s GIS database of mapped production units and drilled horizontal laterals. The mapped information typically shows that only approximately 80% of any given unit is actually hydraulically fractured, or stimulated, for gas production. The loss typically comes from the gas well bore making the transition from vertical to horizontal. This curve takes up a considerable amount of acreage. Additional losses can be generated by the lease-hold positions of adjoining competitive producers.

The “C” Factor, or Owner Control Factor, accounts for the lack of control. Despite attempts by landowners to guarantee a reasonable development process for their property with a well-constructed lease agreement, delays in development typically occur. Additionally, the leasing company still maintains total control with respect to whether any activity at all is initiating.

The RPA, or Reserves Property Adjustment, is simply the product of all the factors developed: “P” Factor, “T” factor, “U” factor, and “C” factor.

From the table above, the Reserve Property Adjustment is estimated to be 6%. That is not to say that there is only a 6% probability of success in a well at this location or that the property will be developed - rather, when viewed as a value of income from the subject properties, a reasonable estimate of value would be 6% of the total value of the estates maximum production potential. This is all based on statistics for the surrounding area, key statistics being the lack of activity, unproven nature of the Marcellus Shale in the area, and the lack of control the landowner has in any development schedule.

Additional unquantifiable factors must also be considered. These include:

- Leasing activity
- Delays in permitting
- Potential delays related to environmental concerns and frac-water disposal

- Restrictions of production related to access to transmission.

Larger parcels are less likely to be fully developed for gas production upon initial drilling. It may take multiple wells to fully develop a large lease. It is not uncommon for a company to plan its drilling program maximizing one well that effectively ties up a large lease, or multiple leases, with minimal capital investment. Some wells are currently being drilled for the sole purpose of holding a lease. Keep in mind that some of these wells are being permitted with laterals that reach in excess of 5,000 feet.

Multiple leases can be held by a single well by pooling leased acreage. Under pooling arrangements, production is assumed to be proportionately divided among multiple oil & gas estate owners. The proportional value is generally based upon the number of acres within the zone of influence of a well. This zone of influence (the area from which gas is produced from) is called a well pool. Pooling just a small portion of a large estate can effectively tie up the estate.

As gas plays are developed and further understood, it is also common for well spacing to be adjusted. The Marcellus Shale regions in northeastern Pennsylvania are currently planned with well spacing as low as 40 acres and as high as 150. The Barnett Shale, a production horizon similar to the Marcellus Shale, has been in continuous development for over the last 14 years. Over time, the development of the Barnett Shale play has trended toward decreasing the well spacing. The initial Barnett well spacing has declined from 140 acres to as close as 40 acres for both vertical and horizontal wells. The model used in this appraisal assumes an average well spacing of 80 acres.

Further adjustments to the calculated Reserve Property Value are considered by RTC. These adjustments are based on certain factors generally not tracked in a format easily accessed by the general public. These are mainly local leasing activity, leasing companies property development patterns, and, if leased, the nature of the lease terms.

7.3.2 Discount Rate

The value of the well is calculated as a discounted cash flow. The rates used to calculate the present value of the future cash flow are discussed below. One rate is used to calculate the present value of the operating interest and one rate is used to calculate the present value of the royalty interest.

The discount rate for the royalty portion of the asset is estimated at 12.1% and the operating portion at 9.75%. RTC generated these values based on research along with Ibbotson (Morningstar) Cost of Capital Center. As defined by Pratt and Grabowski, the:

> "Cost of Capital is the expected rate of return that the market participants require in order to attract funds to a particular investment. In economic terms, the cost of capital for a particular investment is an 'opportunity cost' – the cost of forgoing the next best alternative investment. In this sense, it relates to the economic principle of substitution – that is, an investor will not invest in a particular asset if there is a more attractive substitute."[28]

Kaufman in the Budgeting Handbook goes on to show that:

[28] Pratt, Shannon and Grabowski, Roger, Cost of Capital, 3rd Edition, Wiley and Sons, New York, 2008, page 3.

> "Since the cost of anything can be defined as the price one must pay to get it, the cost of capital is the return a company must promise in order to get capital from the market, either debt or equity. A company does not set its own cost of capital, it must go into the market to discover it. Yet meeting this cost is the financial market's one basic yardstick for determining whether a company's performance is adequate."[29]

The cost of capital is always an expected or forward-looking return. It is the competitive return available in the market on a comparable investment, with risk being the most important component in comparability. "The opportunity cost of capital is equal to the return that could have been earned on an alternative investment at a specific level of risk."[30] The term is applied differently to the various perspectives of a firm's assets:

- "On the asset side of a firm's balance sheet, it is the rate that should be used to discount to a present value the future expected cash flow.
- On the liability side, it is the economic cost to the firm of attracting and retaining capital in a competitive environment, in which investors (capital providers) carefully analyze and compare all return-generating opportunities.
- On the investor's side, it is the return one expects and requires from an investment in a firm's debt or equity.
- While each of these perspectives might view the cost of capital differently, they are all dealing with the same number."[31]

It is important to note that the cost of capital "comes from the investment not the investor."[32] In other words, it is derived from the market-place where the market-place is the universe of investors who are actively pricing the risk associated with a particular class of assets. The rate represents investors expectations of future performance. There are two elements of these expectations:

The Risk-free rate (or 'time-value' of money) includes:

- The 'real' rate of return – the amount (excluding inflation) investors expect to obtain in exchange for letting someone else use their money on a risk free basis.
- Expected inflation – the expected depreciation in purchasing power while money is in use.
- Risk rate which includes:

---

29 Kaufmann, Mike, "Profitability and the Cost of Capital," Hand book on Budgeting, 4th Edition, Rachlin, Robert, Wiley and Sons, New York, 1999, page 8.

30 Ibbotson, Roger, Ibbotson Associates, Chicago, Ill, Cost of Capital Workshop, 1999.

31 Stocks, Bonds, Bills, and Inflation, Valuation Edition, 2008 Yearbook, Ibbotson, Morningstar, Chicago, Il, 2008, page 23.

32 Ibbotson, Roger, Ibbotson Associates, Chicago, Ill, Cost of Capital Workshop, 1999.

- ○ The uncertainty as to when and how much cash flow or other economic income will be received.
- ○ The loss of opportunity related to the loss of liquidity – the loss of options in moving money to alternative investments.

Two discount rates are calculated:

- The first rate is related to the royalty income stream. This rate includes equity information related to oil and gas distribution, and oil, gas, and mineral royalty traders. This rate is applied to the presumed royalty income stream. It represents more risk than that related to royalty traders or the producer. The landowner has no control over when or to what extent his or her property will be developed. Royalty traders who have large portfolios of assets across the country can still make money if one area or one commodity is doing poorly. A large production company can curtail production or shut in a whole field entirely until more favorable market conditions return. The landowner is completely at the mercy of the market, with very little control.

- The second rate is used for the assumed producer's income stream. This income stream requires the investment of significant capital and operating expenditures prior to receiving income. The company is also more likely to be affected by management, taxes, economic, and political risk.

The discount rate applied to the pre-tax net operating income estimate is 9.75%. The calculations are shown in **Table 7.3.2-1**.

Table 7.3.2-1

Calculation of Financial Basis

Q1 2016					
Inflation Rate					
10-year Inflation Indexed Rate		0.67		10yIIR	http://www.federalreserve.gov/releases/h15/data.htm
30-year Inflation Indexed Rate		1.26		30yIIR	http://www.federalreserve.gov/releases/h15/data.htm
10-year no index		2.09		10yr	http://www.federalreserve.gov/releases/h15/data.htm
30-year no index		2.86		30yr	http://www.federalreserve.gov/releases/h15/data.htm
Annual Market Expected Inflation			1.51	AMEI	
Historic Inflation		3.20		HI	10 year average
Assumed Inflation			2.36	AI	= (AMEI + HI) / 2
Calculation of Discount Rate (no Inflation)					
Equity Risk Rate					
Risk Free Rate			2.48	RFR	Twenty Year = (10 yr + 30yr) / 2
Equity Risk (Premium over risk Free)		5.00		ER	Ibbotson 2013
Industry Specific Premium Adjustment					
Crude Petroleum and Natural Gas	25%	0.60			Duff & Phelps (SIC Code 131)
Oil and Gas Extraction	25%	0.80			Duff & Phelps (SIC Code 13)
Gas Production and Distribution	50%	-0.80			Duff & Phelps (SIC Code 492)
Weighted Industry Premium			-0.23	WIPA	= $ISPA_n$ * proportion
Size Premium		5.78		SP	10th decile (Mrkt cap $1.2 -- $235 million)
Overall Industry Equity Risk Rate			13.02	OERR	= RFR + ER + WIPA + SP
Company/Site/Control Adjustment		0.00		CSA	Based on site as well as corporate and market conditions
Inflation Adjusted	Yes		2.36		AI
Equity Cost			10.67	EC	= OERR + CSA - AI
Tax Structure					
Industry Specific Effective Rates					
Oil and Gas Extraction	25%	14.56			Industry Effective Federal Tax Rate (Stated = 35%) (Damodaran)
Crude Petroleum & Natural Gas	25%	7.04			Industry Effective Federal Tax Rate (Stated = 35%) (Damodaran)
Gas Production and Distribution	50%	4.68			Industry Effective Federal Tax Rate (Stated = 35%) (Damodaran)
Federal Tax Rate			7.74	EFTR	Proportional Effective Federal Tax Rate
Local/State	6.00			STR	Stated Tax Rate
Overall Tax Rate			7.80	OTR	= ((1 - (EFTR / 100)) * STR / 100) + EFTR
Debt					
Interest Rate (Moddy's Seasoned BAA)		5.45		I	http://www.federalreserve.gov/releases/h15/data.htm
Tax Adjusted Debt Rate			5.03	TADR	= I * (1 - (OTR / 100))
Weighted Average Cost of Capital					
After Tax (free cash flow)					Ibottson/Morning Star-basis
Capital Structure					
Debt	30%		1.51	ATD	= TADR * CSRatio
Equity	70%		7.47	ATE	= EC * CSRatio
Weight Cost of Capital After Tax			8.98	WACC	= ADT + ATE
Pre Tax					Adjust Ibottson for Valuation of EBITDA
Capital Structure					
Debt	30%		1.64	PTD	= I * CSRatio
Equity	70%		8.12	PTE	= ATE / (1 - ((OTR / 100) / (1 - (AI / 100))))
Weighted Cost of Capital Pre Tax			**9.75**	**WACC**	= PTD + PTE
Sources					
Duff and Phelps, Valuation Handbook, May 2014					
Federal Reserve Data Sets					
Damodaran On-Line Financial Data Sets: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/home.htm					

The discount rate for the royalty interests is based on the discount rate developed for the operator, adjusted for uncertainty in production. The uncertainty relates to how the well will be produced by the operator, its interactions with the other wells, and the pipeline gathering system. In a developing gas field, stronger wells will tend to dominate gathering systems, temporarily depressing the natural gas produced by weaker, older wells. Additionally, when natural gas prices are low, operators will maximize income by producing fewer stronger wells while shutting-in or curtailing production from other wells. Seasonal demands also play a role in production variation. The effects of the shut-ins, curtailments, and seasonal variations are mitigated for the company, but can have a drastic effect on an individual landowner who receives the royalty payment, as he/she has no control over the operator.

Based on published data, 28% of the unconventional wells drilled and completed in Pennsylvania were not produced in 2015. No explanation for the lack of production was provided in the database. RTC is making an adjustment to the discount rate developed for the operator, based on the percent of wells shut in for the previous year. The discount rate for the royalty owner is 0.121. This is calculated by increasing the operator's discount rate by 28%, as follows: 0.0975 x (1+.0.28) = 0.121.

Based on the discount factors detailed in **Section 7.3.2**, **Table 7.3-2** is reformulated and presented in **Table 7.3.2-3**. This table applies several of the discounts developed in this section. The initial discount applied is the time delay for the drilling and completing the well, the year RTC anticipates the well will be put into full production. Further discounts for the time value of money are applied as follows: The Production Company Discount Rate is applied to the Working Interest Revenue Stream, and the Royalty Discount Rate is applied to both the Royalty Revenue Stream and the Free Gas Revenue Stream, if applicable. Although not utilized by most of our clients, the Working Interest Revenue Stream is developed to demonstrate the economic viability of drilling the gas well. This must be completed as part of USPAP standards for determining Highest and Best Use. The discounted values are shown in the last three columns of **Table 7.3.2-3**.

Table 7.3.2-2 shows the valuation assumptions used in this appraisal - based on the likely production from a single well. It differs from **Table 7.3-1** in that all of the discount rates are included, allowing for a Net Present Value for the property to be achieved.

Table 7.3.2-2 Model Production Well Valuation Assumptions	
Valuation Year	2016
Year Property is Leased	N/A
Initial Production Year (estimated)	2019
Lease Signing Bonus Value	$0
Royalty, per lease	12.50%
Producing Estate acreage	45.7
Type well pool acreage	80
Free gas volume (Mcf/year), per lease	0
Value for "free gas" as % of wellhead pricing	87.50%
Well Location Fee	$0.00
Initial Gas Production (Mcf/year) - for model	1,553,000
Initial NGL Production (Bbls/year) - if applicable	0
Reserve Property Adjustment (Section 7.3.1)	6%
Harmonic Well Decline: q=q1*(1+b*D*t)^-(1/b) **(Table 7.1.1-2)**	
q - flow at time t	mcf / bbls
d - decline	0.7112
D - decline fraction (1/d)	1.40607
t - unit of time	Years
b - hyperbolic exponent	1
Initial Cost (Section 3.7)	$5,500,000
Operating Cost (annual, Section 3.7)	$10,000
Price Per MCF Wellhead (Section 7.1.2)	$2.30
Gas Price Inflation Rate (Section 7.1.2)	0.0%
Price Per Bbls Wellhead (Section 7.1.2)	$0.00
Natural Gas Liquids Price Inflation Rate (Section 7.1.2)	0.0%
Production Company Discount Rate (Section 7.3.2) - rounded	9.8%
Estate Royalty Discount Rate (Section 7.3.2) - rounded	12.1%
Salvage/Plugging	$0

The maximized value of a single well (i.e. the value if it were maximally produced today) is developed and modified by several factors, as discussed below.

- Currently there are no locations permitted through the PA DEP for drilling on the subject property. There are two drill rigs operating within two miles of the subject estate, and five rigs operating within five miles of the subject estate, as of February 3, 2017. A three year delay for the production of the well was estimated for this appraisal. The time delay is based on the absorption rate (**Table 7.3.1-1**), and is influenced by distance from established Marcellus production.

- Decline Rate: Hyperbolic decline curve developed from published well performance data discussed in **Section 7.1.1**.

- Yearly costs are estimated at $10,000 for ongoing capital requirements, anticipated expenses, and/or contingency maintenance, working capital, clean-outs, brine removal, and equipment changes are subtracted from the anticipated monthly income.

- The cost of plugging and the value of salvageable equipment are assumed to be equal. Therefore, the cash flow shows no plugging expense or sinking fund and no value to equipment upon plugging.

- If applicable, the free gas or residual gas is valued. If the property is small and likely to be included in a well pool with a larger adjoining property, the free gas clause is assumed to not be applicable. Typically, only the landowner upon which the well lies receives free or residential gas.

- Well life can be calculated as the duration of production less royalty and contingency to the economic limit – point at which production will no longer support expenses (operating, maintenance, plugging costs). For this appraisal, a well life of 15 years was used, due to the uncertainty of long-term production. [33] [34]

[33] 2008 Tarrant County Barnett Shale Well Revenue Estimates for Neighborhoods, Powell, Gene, Powell Barnett Shale Newsletter. Pg, 6.

[34] The Barnett Shale: Visitors Guide to the Hottest Gas Play in the US (2005) Hayden, Jeff & Pursell, Dave; Pickering Energy Partners, Inc, pg:25.

Table 7.3.2-3: Discounted Cash Flow per Well										
Year	NGL Production (Bbls)	Gas Production (Mcf)	Gross	Royalty Revenue Stream	Free Gas Revenue Stream	Annual Cost	Working Interest	PV Royalty Interests	PV Free Gas	PV Working
2018						$3,695,000	($3,695,000)	$0	$0	($2,928,216)
2019	0	1,553,000	$3,571,900	$446,487	$0	$1,825,000	$1,300,412	$299,357	$0	$938,999
2020	0	645,450	$1,484,534	$185,567	$0	$10,000	$1,288,968	$110,988	$0	$848,050
2021	0	407,382	$936,978	$117,122	$0	$10,000	$809,856	$62,490	$0	$485,493
2022	0	297,611	$684,505	$85,563	$0	$10,000	$588,942	$40,724	$0	$321,694
2023	0	234,440	$539,212	$67,401	$0	$10,000	$461,810	$28,617	$0	$229,842
2024	0	193,391	$444,799	$55,600	$0	$10,000	$379,199	$21,058	$0	$171,960
2025	0	164,575	$378,522	$47,315	$0	$10,000	$321,207	$15,986	$0	$132,722
2026	0	143,232	$329,434	$41,179	$0	$10,000	$278,255	$12,411	$0	$104,760
2027	0	126,790	$291,617	$36,452	$0	$10,000	$245,165	$9,801	$0	$84,102
2028	0	113,734	$261,588	$32,699	$0	$10,000	$218,890	$7,843	$0	$68,418
2029	0	103,116	$237,166	$29,646	$0	$10,000	$197,520	$6,343	$0	$56,254
2030	0	94,311	$216,915	$27,114	$0	$10,000	$179,801	$5,175	$0	$46,658
2031	0	86,891	$199,850	$24,981	$0	$10,000	$164,869	$4,253	$0	$38,982
2032	0	80,554	$185,274	$23,159	$0	$10,000	$152,115	$3,517	$0	$32,772
2033	0	75,078	$172,680	$21,585	$0	$10,000	$141,095	$2,925	$0	$27,697
2034	0	70,300	$161,689	$20,211	$0	$10,000	$131,478	$2,443	$0	$23,516
2035	0	66,093	$152,014	$19,002	$0	$10,000	$123,012	$2,049	$0	$20,047
2036	0	62,361	$143,431	$17,929	$0	$10,000	$115,502	$1,724	$0	$17,151
2037	0	59,028	$135,765	$16,971	$0	$10,000	$108,795	$1,456	$0	$14,720
2038	0	56,034	$128,878	$16,110	$0	$10,000	$102,768	$1,233	$0	$12,669
2039	0	53,328	$122,655	$15,332	$0	$10,000	$97,323	$1,047	$0	$10,932
2040	0	50,872	$117,006	$14,626	$0	$10,000	$92,380	$891	$0	$9,455
2041	0	48,632	$111,854	$13,982	$0	$10,000	$87,872	$760	$0	$8,195
2042	0	46,581	$107,137	$13,392	$0	$10,000	$83,744	$649	$0	$7,116
2043	0	44,696	$102,801	$12,850	$0	$10,000	$79,951	$556	$0	$6,190
2044	0	42,958	$98,803	$12,350	$0	$10,000	$76,452	$476	$0	$5,393
2045	0	41,349	$95,104	$11,888	$0	$10,000	$73,216	$409	$0	$4,706
2046	0	39,857	$91,672	$11,459	$0	$10,000	$70,213	$352	$0	$4,112
2047	0	38,469	$88,479	$11,060	$0	$10,000	$67,419	$303	$0	$3,598
2048	0	37,174	$85,501	$10,688	$0	$10,000	$64,813	$261	$0	$3,151
1st 15 Years	**0**	**4,319,555**	**$9,934,976**	**$1,241,872**	**$0**	**$5,660,000**	**$3,033,104**	**$631,489**	**$0**	**$660,187**
30 Year Total	**0**	**5,077,289**	**$11,677,764**	**$1,459,721**	**$0**	**$5,810,000**	**$4,408,044**	**$646,096**	**$0**	**$811,141**

As shown in **Table 7.3.2-3**, above, the discounted Royalty Income Stream is $631,489 and the Working Interest Income Stream is $660,187. This assumes a 100% potential for a single well at 80 acre spacing drilled and put into production at the date of the appraisal. A royalty revenue per acre is then calculated by dividing the revenue streams by 80 acres. The royalty revenue per acre is $7,894.

Table 7.3.2-4 shows the present value of the oil & gas estate (lease signing bonus, royalty, and free gas) with discounted **single well** potential, from **Table 7.3.2-4**, maximized to the subject estate.

Table 7.3.2-4 Maximum Potential Lease Value					
Year	Estate Acreage	Royalty Value per Acre	Total Potential Royalty Production Value	Well Location Value (single well pad)	Present Value of the Lease Signing Bonus
2019	45.70	$7,894	$360,738	$0	$0

The royalty value from the property if it were to be drilled and put into production at RTC's projected date, and maximized for its gas and natural gas liquids production potential, would be $360,738.

7.4 Appraised Value of the Oil and Gas Estate

The value of the subject is the Net Present Value of the lease signing bonus value and the lease interest revenue stream discounted by the Reserve Property Adjustment. The long-term reserve potential of the Marcellus Shale is still unproven. From a calculated maximum value of $360,738 for the oil & gas production from the subject estate, the Reserve Property Adjustment requires a further adjustment to 6% of the calculated production value of the royalty stream.

The net present value of the reserve acreage associated with the subject oil and gas estate for the subject property is $22,000. **Table 7.4-1** shows the net present value of the oil and gas estate.

Table 7.4-1: Net Present Value of the Oil and Gas Estate					
Total Potential Royalty Gas Production Value	Free Gas Lease & Well Location Value (single well)	Reserve Property Adjustment	Appraised Royalty Production Value	Appraised Present Value of Lease Signing Bonus	Total Oil and Gas Estate Net Present Value
$360,738	$0	6%	$21,644	$0	$22,000

8.0 APPENDIX

8.1 Qualifications

Jeffrey R. Kern, MRP, ASA
State Certified, General Appraiser

EDUCATION

Degrees

Masters of Regional Planning: The Pennsylvania State University. Resource Economics. Emphasis on land use planning and resource management (1980)

Bachelor of Arts: Dickinson College. Political Science, minor in Geology. Emphasis on land use planning and resource management (1973)

Graduate Work in Public Administration: The Pennsylvania State University. Focus on public finance and land use management (1977 - 1981)

Appraisal and Real Estate Courses

Reviewer's Checklist, McKissock, 2016
Pennsylvania State Mandated Law, McKissock, 2016
National USPAP Update Equivalent (2016-2017), McKissock, 2016
Delaware Laws and Regulations for Appraisers, McKissock, 2015
Complex Litigation Appraisal Case Studies, Appraisal Institute, 2015
Land and Site Valuation, McKissock, 2015
Appraisal of Land Subject to Ground Leases, McKissock, 2015
Mortgage Fraud-Protect Yourself!, McKissock, 2014
National USPAP Update Equivalent (2014-2015), McKissock, 2014
Pennsylvania State Mandated Law, McKissock, 2014
Complex Appraisal Review, McKissock, 2013
Residential Appraisal Review, McKissock, 2013
Mortgage Fraud-Protect Yourself!, McKissock, 2012
National USPAP Update Equivalent (2012-2013), McKissock, 2012
Pennsylvania State Mandated Law, McKissock, 2012
Deriving and Supporting Adjustments, McKissock, 2011
Even Odder: More Oddball Appraisals, McKissock, 2011
National USPAP Update Equivalent (2011-2012), McKissock, 2011
Foundations in Sustainability: "Greening" the Real Estate & Appraisal Industries, McKissock, 2010
National USPAP Update Equivalent (2010-2011), McKissock, 2010
Income Capitalization, McKissock, 2009
Forecasting Revenue, Appraisal Institute, 2009
Office Building Valuation: A Contemporary Perspective, Appraisal Institute, 2008
Condemnation Appraising, Appraisal Institute, 2008
USPAP Update, McKissock, 2008
Real Estate Finance, Statistics, & Valuation Modeling, Appraisal Institute, 2006
Partial Interest Valuation - Divided, Appraisal Institute, 2005
USPAP Update, McKissock, 2005
Limited Appraisals and the Scope of Work Decision, McKissock, 2005
USPAP, McKissock, 2004
Valuation of Regional Malls & Golf Courses, IAAO, 2004
Complex Industrial Property, IAAO, 2004
Minerals & Golf Courses, IAAO, 2004
Electric Asset Valuation, CBI, 2003
Business Valuation - Selected Advanced Topics, ASA, 2002
Electric Asset Valuation, CBI, 2002

Minneapolis Assessor's Info. & CAMA System Migration, IAAO, 2001
Alternative Valuation Methods for Downtown Office Properties, IAAO, 2001
PariTop: A Decision Support System for Mass Appraisal, IAAO, 2001
First Application of Modern Location Adjustments to Cost Approach, IAAO, 2001
Improving Location Analysis by Integrating GIS & CAMA Methods, IAAO, 2001
Regional Models for Valuation & Ratio Studies, IAAO, 2001
Analyzing Sales Using GIS & Technology, IAAO, 2001
The Appraisal of Health Care Facilities and Retirement Housing, IAAO, 2001
USPAP, McKissock, 2001
Managing Your Mineral and Real Estate Assets, SME, 2000
USPAP, ASA, 2000
Market Approach to Valuing Businesses, ASA, 1999
Geostatistical Simulation for Mineral Deposit Modeling & Mining Application, Colorado School of Mines (CSM), 1999
APCOM '99 Computer Applications in the Minerals Industries, CSM, 1999
Marshall & Swift Residential Costing, AAP, 1999
Valuation of Pennsylvania Minerals, AAP, 1999
Mining In a Volatile World, MEMS, 1999
Due Diligence Review and Valuation of Industrial Mineral Acquisitions, SME, 1999
USPAP, McKissock, 1998
Economic Globalization of the Mining Industry, MEMS, 1998
Economic Evaluation and Investment Decision Methods, CSM, 1997
USPAP, McKissock, 1997
Income Capitalization, McKissock, 1997
Coal Taxation, Virginia Polytechnic Institute State University, 1997
Evaluating, Buying, & Selling Coal Properties, Coal Outlook, 1997
Coal Taxation, Virginia Technical Institute, 1996
USPAP, ASA, 1996
Regression Analysis as an Appraisal Tool, McKissock, 1995
USPAP, ASA, 1994
Real Property Appraisal, Income Producing Properties III, ASA, 1992
Fundamentals of Real Estate, Polley School, 1991 (State Certification Requirement)
Real Estate Practice, Polley School, 1991 (State Certification Requirement)
Appraisal Ethics and Practice, Polley School, 1991
Real Property Appraisal II, ASA, 1990
Real Property Appraisal, Income Producing Properties I, ASA, 1990
Value-Tape Series, ASA (self-study materials for certification examinations)

CERTIFICATIONS AND ACTIVITIES

Certifications

Certified General Appraiser:

Pennsylvania, GA 000447-L	Delaware, X1-0000593
New Jersey, 42RG00083000	West Virginia, 226
New York, 46000021412	Virginia, 4001 016594
Georgia, 343350	Ohio, 2013002843
Indiana, CG41100044	Maryland, 31956
Arkansas, CG 3341	Kentucky, 5027

Certified Evaluator:
Pennsylvania, AV 000790-L

Member of:

American Society of Appraisers (Senior Member #213)
International Institute of Mineral Appraisers (Certified Member)
National Association of Independent Fee Appraisers (Member #20704)
International Association of Assessing Officers (Member #16911)
Society for Mining, Metallurgy, and Exploration (Member #4106174)

GUEST SPEAKER/ LECTURER

Mineral Valuation for Condemnation, Pennsylvania Department of Transportation, 2016
Estate Planning Concerning Oil and Gas Leases, Pennsylvania Bar Institute, 2015
Appraisal Statistics, Assessors Association of Pennsylvania, 2015
Mineral Valuation, Assessors Association of Pennsylvania, 2014
Appraisal of Mineral Properties, Virginia Association of Assessing Officers, 2014
Land and Property Valuations With Shale Development, PSU Extension Education, 2014
Land and Property Valuations With Shale Development, PA Association of Realtors, 2014
Oil and Gas Reserve Valuation, Pennsylvania Institute of CPA's, 2013
Specialized Oil and Gas Valuation Update, Appraisal Institute, 2013
Oil and Gas Reserve Valuation, Ohio Bar Association/Ohio Appraisal Institute, 2013
Specialized Oil and Gas Valuation, Appraisal Institute, 2012
Oil and Gas Reserve Valuation, Pennsylvania Institute of CPA's, 2012
Oil and Gas Valuation, Pennsylvania Institute of CPA's, 2011
Specialized Oil and Gas Valuation, Appraisal Institute, 2011
Mineral Valuation, Assessors Association of Pennsylvania, 2011
Forest Resource Appraisal, Assessors Association of Pennsylvania, 2011
Oil and Gas Valuation, Pennsylvania Institute of CPA's, 2010
Oil and Gas Valuation, Penn State Extension Education, 2010
Oil and Gas Valuation, Appraisal Institute, 2010
Valuation of Pennsylvania Minerals, AAP, 2010
GIS for Assessment, AAP, 2009
Taxation of Pennsylvania Minerals, PA Aggregate and Concrete Associations, 2008
Geographic Information Systems and Assessment, AAP, 2008
Valuation of Pennsylvania Minerals, AAP, 2008
Valuation of Timberlands, AAP, 2008
Statistics to Support and Analyze Assessment, Highmark Institute, 2007
Using GIS in the Appraisal Process, Highmark Institute, 2007
Soil Characteristics and Influence on Valuation, AAP, 2006
Appraisal of Mineral Property, IAAO, Indianapolis, 2004
Appraisal of Mineral Property, IAAO, Boston, 2004
GIS for Assessment, AAP, 2004
Advanced GIS and Property Assessment, AAP, 2003
Advanced Tax Mapping, AAP, 2003
Auditing the Reassessment, AAP, 2002
Assessment of Forest Lands/Timber Resources, AAP, 2002
Valuation of Pennsylvania Minerals, AAP, 2001
Valuation of Pennsylvania Minerals, AAP, 2000
USPAP, ASA, 2000
Mineral Valuation, SME, 2000
GIS, Tax Assessment, and Local Government, AAP, 2000
GIS and Real Estate Tax Assessment, AAP, 2000
Reserve Coal Appraisal Methodology, Virginia Tech, 1999
Valuation of Pennsylvania Minerals, AAP, 1999
GIS and Property Tax Appraisals, AAP, 1999
Business Management, Rehabilitation Services, PSU, 1993

Business Management, Rehabilitation Services, PSU, 1992
Business Management, Rehabilitation Services, PSU, 1991
Business Management, Employee Assistance Plan Opportunities, PSU, 1990
Business Management, Rehabilitation Hospital Locations, PSU, 1990
Hospital Location, Development, and Administration in the For-Profit Sector, PSU, 1989
Rehabilitation Environment, Council on Disabilities, 1988
Remote Sensing Workshop, PSU, 1982
Careers in Geography Workshop, PSU, 1982
Remote Sensing Workshop, PSU, 1981

EXPERIENCE

President, Senior Appraiser of Resource Technologies Corporation (1980 - Present)

Commercial, Industrial, and Mineral Appraisal Projects Include:

- Natural resources such as coal, oil, gas, sand, gravel, clay, limestone, and other minerals
- Energy production facilities
- Environmentally-sensitive properties
- Technical and business properties including associated equipment
- Mass appraisal technology

Many of these efforts have involved condemnation and/or taxation and many have required court presentation with values up to $2,500,000,000
Annual appraisals exceed $5 billion in market value.

Expert Testimony

Expert Testimony has been Accepted in Numerous Courts:

- United States District Court, Northern District of West Virginia
- United States District Court, Middle District Court of Pennsylvania
- United States District Court, Western District of Pennsylvania
- United States District Court, Eastern District of Kentucky
- United States Bankruptcy Court, Wilkes-Barre, Pennsylvania
- Various State and Local Courts

APPRAISAL CLIENTS

Federal Clients

U.S. Department of Defense, Army Corps of Engineers
U.S. Department of Interior, Office of Surface Mining
U.S. Department of Treasury, Internal Revenue Service
U.S. Department of Justice, various divisions

State, Local, and Private Clients

21st Century Appraisals
Adams County, Pennsylvania
AMFIRE Mining Company
Amoco Oil Company
Appraisal & Marketing, Inc.
Arthur Andersen, LLP
Artisans' Bank
AT&T Capital
Atlantic County NJ Utilities Authority
B.S. Quarries, Inc.
Bank of America
Banyan Street Partners
Barclays Business Credit
Bedford County, Pennsylvania
Beltrami Enterprises, Inc.
Berg, Klein, Salomon, LLP

Blair County, Pennsylvania
Blaschak Coal
Blue Coal Corporation
BNYH Real Estate Management
Borough of Gibbsboro, New Jersey
Brann, Williams, Caldwell & Sheetz
Buchanan County, Virginia
Cambria County, Pennsylvania
Campbell County, Virginia
Carter Lake Enterprises, Inc.
CBIZ MHM, LLC
Central New York Oil and Gas Company
Centre County, Pennsylvania
Centre Lime & Stone
Chernau, Chaffin & Burnsed, PLLC
Chicago Title Insurance Company
CIB Bank
Citizens & Northern Bank
Citizens Bank
City of Concord, North Carolina
City of Springfield, Ohio
Clarion County, Pennsylvania
Clean Streams Foundation
Clinton County, Pennsylvania
CLT - Tyler Technologies
Coast Business Credit
Common Cause of West Virginia
CONSOL
Coram Materials
Corestates Bank
County Bank
Crossroads Financial
Curry Lumber
Cyprus Emerald Resources
Davis, Davis & Kaar
Desisti & Keeffe
Diversified Energy Ventures, Inc.
Dominion Transmission
DoveBid Valuation Services, Inc.
Dragon Products
E.R. Linde Construction Corporation
Eastern Industries, Inc.
Elliot & Company Appraisers
Equitable Transportation
Erie County, Pennsylvania
Ernst & Young, LLP
Essroc Materials, Inc.
Fayette County, Pennsylvania
FDIC-NE Service Center
Fidelity National Title Insurance
Fifth Third Bank
First Indiana Bank
First National Bank
First National Bank of Wyoming
First Niagara Financial Group
First National Bank
First Union Bank
Firstrust Bank
Fisher & Bendeck, P.A.
Fleet Bank
Fleet Capital Corporation
Fifth Third Bank
Florida Community Bank
Forecon, Inc.
Fosbel, Inc.
Fulton Financial Corporation
Glenn O. Hawbaker, Inc.
Grafton Coal
Greenberg Traurig
Greene County, Pennsylvania
Griffin, Dawsey, DePaola & Jones
Hampton and Hampton
Harper & Marti
Harris, Harris, Bauerle & Sharma
Heritage Global Valuations
Hilco Appraisal Services
Hinman, Howard & Kattell
Holland Energy, LLC
Hook and Hook, PC
Hopper Blackwell
HRI, Inc.
Huntingdon County, Pennsylvania
International Appraisal Company
Interstate Acquisition Services
Jacobs Government Services Company
J.C. Hill Tree Farms, Inc.
Jehl and Fabian
Jerrold F. Janata, Attorney at Law
Jireh Corporation
Karl D. Kammer, Attorney at Law
Katz, Cohen & Price
Kentucky Revenue Cabinet
Key Bank
KMG Minerals, Inc.
Knobloch Group
Knox McLaughlin Gornall & Sennett
L. Robert Kimball & Associates, Inc.
LaFarge Canada, Inc.
Lavery, Faherty, Young & Patterson, P.C.
Law Offices of Richard Cooper
Lehigh Cement Company
Levene, Gouldin & Thompson
Lower Milford Township
Lycoming County, Pennsylvania
M&I Bank
M&T Bank
MacDonald, Illig, Jones & Britton LLP
Marshall & Stevens, Inc.
Marshall, Parker & Associates
Masso Group
McElroy Coal Company
McGuffey School District
MD Associates
Melcroft Coal Company
Mendenhall Law Offices
Mesa Verde Enterprises
Mid-State Bank and Trust Company
Midland International Tileworks
Miller Brothers Sand & Gravel
Myers, Brier & Kelly
National Bank of the Commonwealth
National Penn Bank

Natural Lands Trust
NBT Bank
NJ Department of Transportation
NJ Department of Environmental Resources
Ody & Wilson
Ohio Attorney General's Office
Oklahoma Flint Rock Products
Omega Bank
Old Castle Materials
Old Republic National Title Insurance Company
Ogle Bay Norton
Orrick, Herrington & Sutcliffe, LP
PA Department of Environmental Protection
PA Department of Transportation
Pennsy Supply
PA Game Commission
PA General Energy Corporation
PA Power & Light
Peacock Keller & Ecker, LLP
Penn National Gaming, Inc.
Pennsylvania State University
Peoples National Bank
Peoples Security Bank & Trust
Pepper, Hamilton & Sheetz
PFM, Inc.
Perry Pines, LLC
Philpott & Prosser, LLP
Pierce & Petersen
PNC Bank
Porter, Wright, Morris & Arthur, LLP
Portnoff Law Associates, LTD
Radnor Township
RCC Consulting, Inc.
Redevelopment Authority of the County of Washington
Regions Bank
Reliance Bank
Reliant Energy Wholesale Generation
Resco Products
Rhoads & Sinon, LLP
Rosenn Jenkins & Greenwald
RWH Design
Ryan Co
S&B Industrial Minerals
S.R. Law, LLC
Sally Steele Law Office
Schuylkill County, Pennsylvania
Shade Central-City School District
Sherrard, German & Kelly, PC
Shively & Associates
Snell & Wilmer, LLC
Somerset County, Pennsylvania
Somerset Trust Company
Speakman, Riethmuller & Allison
State of Ohio
State of West Virginia
Stavola Construction Materials
Steptoe & Johnson
Stone Consulting and Design, Inc.
Sullivan County, Pennsylvania
Sun National Bank
SunTrust Bank
Susquehanna Bank
Sweat law Offices
Szaferman, Lakind, Blumstein & Blader, PC
Tarasi, Tarasi & Fishman, PC
Tarrant, Gillies, Merriman & Richardson
TD Bank
The First
The Foundation of Monongalia General Hospital
Thomas, Thomas, Armstrong & Niesen
Town of Adams, Massachusetts
Tri-County Habitat for Humanity
Triumph Savings Bank SSB
United Miners' Workers
Univest National Bank and Trust Company
Venango County, Pennsylvania
Verde Funding
Victor Oolitic Stone Company
Wachovia Corporation
Waldschmidt & Werner
Wampler-Eanes Appraisal Group
Warren County, Pennsylvania
Washington Financial
Watson, Mundorff & Brooks
Weinheimer Schadel & Haber
Wells Fargo
West Virginia Department of Tax and Revenue
West Virginia Education Association
West Virginia University
Western Pennsylvania Conservancy
White & Williams
Wieck DeLuca & Gemma, Inc.
Wilmington Trust Company
Wolf, Block, Schorr & Solis-Cohen
Wolf Popper
Wyoming Department of Tax and Revenue

RECENT APPRAISAL PROJECTS

Appraisal of Various Oil and Gas Properties Throughout New York, Ohio, Pennsylvania, and West Virginia, Clients: Private and Various Law Firms

Assessment of all Minerals for Tax Purposes, Clients: Pennsylvania Counties of Cambria, Centre, Fayette, Greene, Indiana, Schuylkill, and Washington
Appraisal of Operating Quarries and Asphalts Plants throughout Pennsylvania, Client: Univest Bank and Trust
Appraisal of 5 Operating Quarries and 5 Asphalt Plants throughout Pennsylvania, Client: M&T Bank
Appraisal of an Operating Quarry and Asphalt Plant, Colchester, Vermont, Client: TD Bank
Appraisal of Sand and Gravel Quarry, La Luz, New Mexico, Client: Private
Appraisal of a Mining Operation, Port Norris, New Jersey, Client: Wells Fargo
Appraisals of 12 Quarries and 2 Asphalt Plants throughout Pennsylvania, Maryland, and New Jersey, Prepared for First Niagara Bank
Appraisal of a Mining Operation, Birdsboro, Pennsylvania, Client: Fulton Financial
Appraisal of a Lime Rock Quarry, Fort Myers, Florida, Client: Florida Community Bank
Appraisals of 11 Quarries throughout Virginia, Maryland, and Pennsylvania, Client: SunTrust Robinson Humphrey
Appraisal of Bluestone Mineral Reserves in Pennsylvania, Client: Peoples Security Bank
Appraisal of a Sand Mine Operation in South Carolina, Client: Triumph Savings Bank
Appraisal of a Proposed Sand and Gravel Surface Mine in Colorado, Client: Private
Appraisal of an Operating Quarry and Concrete Plant in Connecticut, Client: Wells Fargo Bank
Appraisal of Oil, Gas, Coal, Limestone, and Surface Rights CDC NIOS site, Client: Center for Disease Control
Appraisal of Brick Plant and Quarry in North Carolina, Client: Wells Fargo
Appraisal of Oil and Gas Properties in New York, Client: Bank of America
Appraisal of a World Famous Quarry Operation, Client: Private
Continuing Consulting of a reserve coal and oil and gas assessment system and procedures for West Virginia, Client: State of West Virginia
Appraisal of Construction Materials Operations in Pennsylvania, Client: Wells Fargo
Appraisal of Sand and Gravel Operation in Florida, Client: Fifth Third Bank
Appraisal of Sand and Gravel Operation in Florida, Client: Brooklyn New York Private Equity
Appraisal of Coal Waste Recovery Operation, Client: M&T Bank
Appraisal of Gas-Fired Power Generation Facility, Client: County of Fayette, PA
Appraisal of Coal Mining and Power Generation Operation, Client: M&T Bank
Appraisal of Met Coal Operation, Client: Private
Appraisal of Oil and Gas Interests, Client: Private
Appraisal of Coal in Mine Area in West Virginia, Client: CONSOL
Appraisal of Sand and Gravel Operation in Delaware, Client: Wilmington Trust
Appraisal of Limestone Quarries, Client: OldCastle
Appraisal of Various Mineral Parcels, Client: Dominion Natural Gas
Consulting on Sale of Anthracite Operation
Mining and Mineral Processing Business in Pennsylvania, Client: NBT Bank
Mineral Rights in Pennsylvania, Client: Western Pennsylvania Conservancy
Mineral Rights in Arkansas, Client: Chicago Title Insurance Company
Mineral Rights in Pennsylvania, Client: Private
Mineral Rights in Mississippi, Client: S&B Industrial Minerals
Mining and Mineral Processing Business in Pennsylvania, Client: M&T Bank
Mining and Mineral Processing Business in Pennsylvania, Client: First National Bank
Mining and Mineral Processing Business in Pennsylvania, Client: Private
Mining and Mineral Processing Business in Indiana, Client: M&I Bank
Current Vacant Land Appraised as a Sand and Gravel Quarry In New Jersey, Client: Borough of Gibbsboro, New Jersey
Mining and Mineral Processing Business in Pennsylvania, Client: Somerset Trust Company
Mining and Mineral Processing Business in New Jersey, Client: Wachovia Corporation
Shale Pit Before-and-After-Taking in Pennsylvania, Client: Interstate Acquisition Services
Current Vacant Land Appraised as a Limestone/Limerock Quarry in Florida, Client: Banyan Street Partners
Mine Refuse Site in Pennsylvania, Client: The Clean Streams Foundation

Glenn O. Hawbaker Properties: Big Flats, Brokenstraw, Canoe Valley, Canton, Clarion, Cove Forge, Erwin, Hagermans Run, Hostetler Bonson, Lawrenceville, Mammoth Latimore, Pleasant Gap, Sandy Ridge, Shinglehouse, Shrader, Waterstreet, Youngs Farm, Client: M&T Bank
Sand and Gravel Operation in Ohio, Client: Private
Mineral Appraisal in Ohio, Client: Private
Limerock Operation in Florida, Client: Bank of America
Limerock Operation in Florida, Client: BNYH Real Estate Management
Sandstone Quarry in Colorado, Client: Carter Lake Enterprises
Sand and Gravel Operation in Massachusetts, Client: Bank of America
Sand and Gravel Operation in New Jersey, Client: Sun National Bank
Appraisal Review of Vulcan Materials Property and Concord Regional Airport, Client: City of Concord, North Carolina
Sand and Gravel Operation in Delaware, Client: Wilmington Trust Company
Allegheny Energy Power Plant in Pennsylvania, Client: Greene County, Pennsylvania
Coal Fines Recovery Facilities, Lands, and Operations in West Virginia, Client: Ernst and Young, LLP
Hard Rock Quarry Operation in Colorado, Client: Fleet Bank
Aggregate Operation in British Columbia, Client: Arthur Anderson
Federal Acquisitions including Coal, Oil, Gas, Other Minerals and Rural Lands in Various States for Federal Prison Construction, Client: U.S. Bureau of Prisons
Clay Mine and Manufacturing Facility, Midwest United States, Client: Coast Business Credit
Sodium Sulfate Deposit and Processing Operation in Texas, Client: Fleet Bank
Limestone and Aggregate Mine in British Columbia, Canada, Client: Arthur Andersen, LLP
Slate Mine and Processing Operation in Pennsylvania, Client: Confidential
Bus Station and Garage in Pennsylvania, Client: Confidential
Paper Production Plant, Client: West Virginia Department of Tax and Revenue
Limestone and Aggregate Mine and Cement Production Facility in Pennsylvania, Client: Essroc Materials, Inc.
Limestone and Aggregate Mine and Cement Production Facility in Missouri, Client: RESCO
Limestone and Aggregate Mine and Cement Production Facility in British Columbia, Client: LaFarge Canada, Inc.
Coal Reserves in Western Pennsylvania, Client: Greene County, Pennsylvania
Gas Storage Field in Western and Central Pennsylvania, Client: Confidential
KMG Minerals, Inc., Client: Confidential
All Reserve Mineral Properties in West Virginia, Client: West Virginia Department of Tax and Revenue
All Reserve Mineral Properties in Fayette County, Pennsylvania, Client: West Virginia Department of Tax and Revenue
Dimension Stone Reserves in South Dakota, Minnesota, and Texas, Client: Confidential
Sand, Gravel, and Dolomite Operation in Florida, Client: Barclays Business Credit
Oil and Gas and Other Minerals in Centre, Greene, and Clinton Counties, Pennsylvania, Client: Various County Real Estate Tax Departments
Damages Caused by Undermining of Cemetery, Client: Hook and Hook, PC
Review of Coal Reserve Assessment System in West Virginia, Client: Common Cause, Federation of Teachers, et. al.
Wood Product Reprocessing Business, Client: Keystone Financial Services
Scenic Easement and Rights-of-Way, Youghogeny River, Client: Curry Lumber Company
Selection of Potential Mineral Sites, Client: Glenn O. Hawbaker, Inc.
Nursing Home, Greene County, Pennsylvania, Client: Greene County Commissioners
Coal and Oil and Gas Reserves and Rural Lands in four Pennsylvania Counties, Client: United Properties Group
Condominium and Vacation Complex in Pennsylvania, Client: GE Capital Credit
Coal Refuse Processing Operation in Pennsylvania, Client: Comerica Bank
Four Operating Deep Mines in Pennsylvania, Client: Fleet Financial Services

Coal Refuse Resources in Pennsylvania, Client: Rhoads & Sinon, LLP
Nursing Home in Jefferson County, Pennsylvania, Client: Nursing Home Corporation
Large Bankrupt Coal and Land Estate, Client: Beltrami Enterprises, Inc.
Lands and Resources Associated with a 20-Mine Holding Company, Client: Schuylkill County, Pennsylvania
Coal Reserve Values, Client: Wheeling Creek Water Shed
Granite Mining Operations, Minnesota and Texas, Client: Barclays Business Credit
Coal Processing Plant, Coal Tipple, Rail and River Load-out, Client: Confidential
Sand, Gravel, and Dolomite Operation in Florida, Client: Barclays Business Credit
Sand and Gravel Operation in Pennsylvania, Client: First Bank
Sand and Gravel Operation in New Jersey, Client: Atlantic Counties Utilities Authority
Silverbrook Anthracite, Coal, Culm, and Land Resources, Client: Bank of Seoul, Korea
Consolidation Coal Co., Greene County Coal Properties, Client: Greene County, Pennsylvania
Consolidated Coal/Monongahela Railway Rail Spur, Client: Tarasi and Johnson, PC
Uranium Mine Tailings Depository, Client: U.S. Corps of Engineers
Coal Reprocessing Facility, Client: Pressed Steel, Inc.
Coal Processing and Shipping Facility, Client: Hook and Hook, PC
Coal and Oil and Gas Reserves and Operations, Stonewall Jackson Lake, West Virginia, Client: U.S. Army Corps of Engineers

ADDITIONAL EXPERIENCE

Peer Reviewer, SME

Pennsylvania Oil and Gas Task Force, County of Centre, Pennsylvania

Technical Advisor, Participant: National Conference on U.S. Coal Reserves, U.S. Department of Energy. Provide input concerning criteria to determine U.S. coal reserves, volumes, and value.

Technical Advisor, Senior Economics Analyst: "Defining the Anthracite Resources" for the U.S. Department of Energy. Economic analysis focused on the national and world coal market to the year 2010 as well as the local economic, regulatory, labor, and transportation situation.

Principal Investigator: "Concepts for the Protection Against Catastrophic Events" for the U.S. Department of the Interior. Project involved extensive interviews, literature searches, and analyses concerning various legal, financial, and other instruments potentially available to avoid, mitigate, or abate problems that are associated with the long-term effects of mining. Instruments evaluated included bonding, local planning options, insurance programs, surety arrangements, regulatory programs, legal restrictions and covenants, and disaster assistance programs. Both a policy and economic analysis were included in the report.

Principal Investigator: Development and publication of a self-instructional aerial photographic and inspection handbook for federal, state, local, and private environmental personnel. The 150+ page textbook includes numerous "hands-on" learning exercises and case studies.

SELECTED PUBLICATIONS AND REPORTS

2014, **Appraisal of Carolina Aggregates' Gaston Sand Mine, Gaston, South Carolina**, Prepared for Triumph Savings Bank SSB

2014, **Appraisal of TT Land Development, Seymour, Connecticut**, Prepared for Wells Fargo Bank

2014, **Appraisal of J&J Stone Products, Hop Bottom, Pennsylvania**, Prepared for Peoples Security Bank

2014, **Appraisal of Lafarge Mid-Atlantic, LLC Quarries, Virginia, Maryland, and Pennsylvania**, Prepared for SunTrust Robinson Humphrey

2014, **Appraisal of Vulcan Construction Materials, Adams County, Pennsylvania**, Prepared for Ryan

2014, **Appraisal of Youngquist Brothers Quarry, Fort Myers, Florida**, Prepared for Florida Community Bank

2014, **Appraisal of Dyer Quarry, Birdsboro, Pennsylvania**, Prepared for Fulton Financial

2013, **Appraisal of H&K (12 Quarries and 2 Asphalt Plants) throughout New Jersey, Maryland, and Pennsylvania**, Prepared for First Niagara Bank

2013, **Appraisal of Ricci Brothers Sand Company, Port Norris, New Jersey**, Prepared for Wells Fargo

2013, **Appraisal of F.W. Whitcomb Quarry, Colchester, Vermont**, Prepared for TD Bank

2013, **Appraisal of Highway Materials throughout Pennsylvania**, Prepared for M&T Bank

2013, **Appraisal of Reading Materials throughout Pennsylvania**, Prepared for Univest Bank and Trust

2012, **Appraisal of JML Quarries, New York**, Prepared for M&T Bank

2012, **Appraisal of M&M Telford Mine (East), Telford, Pennsylvania**, Prepared for Univest National Bank and Trust Co.

2012, **Appraisal of Pine Ridge Energy's Oil and Gas Well Lease, Warren, Pennsylvania**, Prepared for Steptoe & Johnson

2012, **Appraisal of Sunset Towns, Chambersburg, Pennsylvania**, Prepared for Regions Bank

2011, **Appraisal of Norlite Expanded Shale Mine and Processing, New York**, Prepared for Charter One Bank

2011, **Appraisal of Miller Brothers Masonry Sand & Gravel, Harrington, Delaware**, Prepared for Wilmington Trust

2011, **Appraisal of PPL Substation Acquisition, Summit Hill Borough, Pennsylvania**, Prepared for PPL Services Corporation

2011, **Appraisal of Harleysville Quarry, Harleysville, Pennsylvania**, Prepared for Univest National Bank and Trust Company

2011, **Appraisal of Phoenix Business Park**, Prepared for Redevelopment Authority of the County of Washington

2011, **Appraisal of Millville Asphalt Unit and Appraisal of Rosano Asphalt Unit, New Jersey**, Prepared for Stavola Construction Materials Company

2011, **Appraisal of North Church Sand and Gravel, Franklin, New Jersey**, Prepared for Mizzone & Associates

2010, **Appraisal of Buckeye Industrial Mining, Ohio**, Prepared for Evergreen Energy, Inc.

2010, **Appraisal of Haines & Kibblehouse, Cornwall & Chalfont, Pennsylvania and Belvidere, New Jersey**, Prepared for Bank of America

2010, **Appraisal of Cedar Rock Materials Corporation Stone & Gravel Pit, Berwick, Pennsylvania**, Prepared for Appraisal & Marketing Associates, Inc.

2010, **Appraisal of Horsey Family, Sussex County, Delaware**, Prepared for Wilmington Trust

2010, **Appraisal of Lake Point Holdings, Canal Point, Florida**, Prepared for Bank of America

2010, **Appraisal of Coral Rock, Punta Gorda, Florida**, Prepared for Fifth Third Bank

2010, **Appraisal of Colver Limestone Grinding Facility, Colver, Pennsylvania**, Prepared for Wells Fargo

2008, **Appraisal of Garrett Limestone Company, Inc., Somerset County, Pennsylvania**, Prepared for Somerset Trust Company

2008, **Appraisal of Belle Mead Quarry, Belle Mead and Hillsborough, New Jersey**, Prepared for Wachovia Corporation

2008, **Appraisal of Perry Pines Project, Taylor County, Florida**, Prepared for Banyan Street Partners

2008, **Appraisal of LTV Russellton Mine Site, Allegheny County**, **Pennsylvania**, Prepared for The Clean Streams Foundation

2007, **Mineral Appraisal of North Church Gravel, Inc., Franklin, New Jersey**, Prepared for Sun National Bank

2007, **Mineral Appraisal of Youngquist Limerock Quarries, Lee County, Florida**, Prepared for Bank of America

2007, (and Falkenstern, DM) **Mineral Appraisal of Colletti Sand Pit, Nantucket, Massachusetts**, Prepared for Bank of America

2007, (and Stingelin, RW) **Mineral Appraisal of Lucky Sand & Gravel, Inc., Mantua, Ohio**, Prepared for Karl D. Kammer, Esquire

2007, (and Stingelin, RW) **Mineral Appraisal of Como Stone, Wayne, Susquehanna, and Pike Counties, Pennsylvania,** Prepared for B.S. Quarries, Inc.

2006, (and Stingelin, RW) **Appraisal of Miller Brothers Masonry Sand & Gravel Operation, Kent County, Delaware**, Prepared for Wilmington Trust Company

2006, (and Falkenstern, DM) **Appraisal of Cole Water Company, LLC, Peru, Indiana (Aquifer Only),** Prepared for MD Associates

2006, (and Stingelin, RW) **Mineral Appraisal of B.S. Quarries Damascus 535 Bluestone Quarry, Broome County, New York**, Prepared for Peoples National Bank

2005, **Methods for Determining Discount Rates**, Newsletter of the Mineral Economics and Management Society (MEMS)

2005, **Mineral Appraisal of Donald and Evelyn Stein Placer Claims, Gilmore, Tom and Pat Creeks, Alaska**, Prepared for U.S. Army Corps of Engineers, Alaska District

2005, (and Falkenstern, DM) **Limited Appraisal of Penn-Ohio Coal Company and Kimble Sanitary Mining Operations, Tuscarawas County, Ohio**, Prepared for Keith Kimble, Penn-Ohio Coal Company

2005, (and Stingelin, RW) **Appraisal of the Fee Estate, Surface and Minerals (Coal, Oil, and Gas) in Approximately 378.9 Acres, McDowell County, West Virginia**, Prepared for U.S. Federal Bureau of Prisons

2005, (and Stingelin, RW, Falkenstern, DM) **Appraisal Review Report, PG Hemlock Property, Wayne County, Pennsylvania**, Prepared for NexxusSoft Corporation

2005, **Appraisal of J.D. Materials Co. Quarry, Gibbsboro, New Jersey**, Prepared for Borough of Gibbsboro

2004, **Tax Assessment of Mineral Property**, Proceedings of IAAO Conference, Boston, MA, Valuation Sessions, International Association of Assessing Officers

2004, Contributing Author, **Property Taxation, 3rd Edition**, Institute for Professionals in Taxation. *This textbook serves as a manual or desk reference for the business property tax practitioner/professional. It provides an in-depth analysis compiled and edited by experienced property tax practitioners.*

2004, (and Stingelin, RW) **Appraisal of Shore Sand & Gravel, LLC Mining Operations, Ocean County, New Jersey**, Prepared for Sun National Bank

2004, (and Stingelin, RW, Falkenstern, DM) **Appraisal of Mineral Parcels Located Within U.S. Route 22 Section 491, Indiana County, Pennsylvania**, Prepared for The Pennsylvania Department of Transportation, District 10

2004, (and Stingelin, RW) **Appraisal of Barrick Limestone Quarry, Woodsboro, Maryland**, Prepared for SunTrust Bank

2004, (and Stingelin, RW) **Appraisal of the Walter Quarries, Bradford County, Pennsylvania**, Prepared for PNC Bank

2004, (and Stingelin, RW, Falkenstern, DM) **Appraisal of R.T.G., Inc. Mineral Estates, Guernsey County, Ohio**, Prepared for The State of Ohio

2003, (and Stingelin, RW) **Appraisal of Dragon Products' Thomaston Cement Plant & Quarry, Knox County, Maine**, Prepared for Fleet Bank

2002, (and Stingelin, RW) **Appraisal of Victor Oolitic Stone Company, Monroe & Lawrence Counties, Indiana**, Prepared for CIB Bank

2002, (and Stingelin, RW) **Appraisal of Leeward Quarry, Pike County, Pennsylvania**, Prepared for Leeward Construction Inc.

2002, (and Stingelin, RW, Falkenstern, DM) **Effects of Longwall Mining on Real Property Value and the Tax Base of Greene and Washington Counties, Pennsylvania**, Prepared for the Pennsylvania Department of Environmental Protection, Bureau of Mining and Reclamation

1999, (and Torries, TF) **Use of Geographic Information Systems Technology to Value for Ad Valorem Tax Purposes Coal Reserves Deposit**, Prepared for Society of Mining Engineers, Denver, CO

1998, (and Torries, TF) **Use of Geographic Information Systems Technology to Evaluate Large Mineral Deposit**, Prepared for Minerals Economics and Management Society, Calgary, Canada

1989, (and Stingelin, RW) **Analysis of Coal Tipple And Loadout Needs Along the Monongahela River From Milepost 60 Below the Maxwell Lock And Dam to Milepost 100 Above Lock And Dam Number 8**, Prepared for U.S. Army Corps of Engineers, Huntington District, Huntington, WV

1984, (and Stingelin, RW, McGrory, BJ) **Defining the Anthracite Resources of Northeastern Pennsylvania**, Prepared for U.S. Bureau of Mines, Pittsburgh Mining Research Center

1983, (and Evans, BM, Stingelin, RW) **Low Altitude Photointerpretation Manual for Surface Coal Mining Operations**, Prepared for U.S. Geological Survey, U.S. Office of Surface Mining

1981, **Concepts for Protection Against Catastrophic Events Resulting from Coal Mining**, Prepared for Office of Surface Mining, U.S. Dept. of the Interior, Washington, DC

1981, **Semi-Automated Land Cover Change Detection from Sequential Aerial Imagery as a Resource Planning Tool**, MRP Dissertation, The Pennsylvania State University

1980, **SWMIS - Solid Waste Management Information System - Specifications**, Prepared for The Pennsylvania Department of Environmental Resources, U.S. Environmental Protection Agency

1979, (and Stingelin, RW) **Premining Identification of Hazards Associated with Coal Mine Roof Measures**, Prepared for U.S. Bureau of Mines, Pittsburgh, PA

1979, (and Armstrong, RM) "**SUMIS - Surface and Underground Mine Management Information System - Specifications**", Prepared for The Pennsylvania Department of Environmental Resources, U.S. Office of Surface Mining

1979, (and HRB Singer, Inc.) "**Digital Mapping for Waterways Monitoring and Surveillance**", Prepared for U.S. Army Corps of Engineers, Cincinnati, OH

1978, "**Evaluation of Color Infrared Aerial Photography Data for Regional Wildlife and Land Use Inventory and Analysis**", Prepared for U.S. Fish and Wildlife Service, Fort Collins, CO

1978, (and Stingelin, RW) "**Impact of Coal Gasification and Mine Degasification on Appalachian Coal Production**", Prepared for Battelle Columbus Laboratories

1977, (and Stingelin, RW) "**A Bibliography of Appalachian Coal Resources and Reserves**", Prepared for Battelle Columbus Laboratories

1976, (and Stingelin, RW) "**The Impact of Overmining and Undermining on the Eastern Underground Coal Reserve Base**", Prepared for U.S. Bureau of Mines, Pittsburgh, PA

STATE OF ARKANSAS

APPRAISER LICENSING & CERTIFICATION BOARD

Attests that

Jeffrey R Kern

On this date was certified as a

STATE CERTIFIED GENERAL APPRAISER

The Arkansas Appraiser Licensing and Certification Board hereby affirms that this Certification is issued in accordance with all the requirements of Arkansas Code Annotated, Section 17-14-101 et seq., and subsequently adopted "Rules and Regulations" and shall remain in force when properly supported by a current pocket identification card.

August 10, 2016
Date Issued

CG 3341
Certification Number

Peter W. Pritzman
Chairman, AALCB

RESOURCE TECHNOLOGIES CORPORATION
248 E Calder Way, Suite 305, State College, PA 16801 814-237-4009 f: 237-1769
PO Box 242, State College, PA 16804 www.resourcetec.com

Resource Technologies Corporation
Equal Employment Opportunity Policy

Resource Technologies Corporation (RTC) is committed to providing a non-discriminatory employment environment for its employees.

The policy of RTC is to fully comply with applicable federal, state, and local laws, rules, and regulations in the area of non-discrimination in employment. Discrimination against employees and applicants due to race, color, religion, sex (including sexual harassment), national origin, disability, age, military, and veteran status is prohibited. Violations of this policy will be subject to discipline, up to and including termination.

Equal employment opportunity and non-discriminatory commitments include, but are not limited to, the areas of hiring, promotion, demotion, recruitment, discipline, layoff or termination, rate of compensation, and company-sponsored training.

All employees are expected to comply with this Equal Employment Opportunity (EEO) Policy. Managers and supervisors who are responsible for meeting business objectives are expected to cooperate fully in meeting RTC's equal employment opportunity objectives.

Any employee who believes he or she has been discriminated against must immediately report any incident to the company's designated EEO Officer.

The company will not tolerate retaliation against any employee who reports acts of discrimination or provides information in connection with any such complaint.

If you have any questions regarding this policy, please see April Saldaña, EEO Officer.