

# Christopher R. Vass, PhD, PE

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## EDUCATION

Doctor of Philosophy | Mining Engineering | West Virginia University | August 2019

Master of Science | Mining Engineering | West Virginia University | August 2016

Master of Business Administration | Business Administration | West Virginia University | August 2014

Bachelor of Science | Mining Engineering | West Virginia University | May 2001

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## PROFESSIONAL EXPERIENCE

**Owner/Partner** | South Fork Engineering | Jun 2021 – Present | Rainelle, WV

- Founding partner responsible for mining engineering and mineral processing.

**Principal Engineer** | Vass Engineering and Mineral Appraisals | Apr 2018 – Present | Rainelle, WV

- Reserve Estimation
- Process Optimization Studies
- Mine Design
- Geologic Modeling
- Flowsheet Development

**Facility Manager** | West Virginia Water Research Institute | Aug 2018 – Feb 2020 | Morgantown, WV

- Responsible for managing 2 DOE projects focusing on the recovery of rare earth elements from AMD
- Design and construction of mobile pilot plant resulting in fulfillment of project objectives
- Responsible for developing and protecting intellectual property relating to novel processing operations
- In charge of quarterly reporting for multiple DOE projects

**Research Engineer** | West Virginia Water Research Institute | Nov 2017 – Aug 2018 | Morgantown, WV

- Design, construction, and operation of bench scale solvent extraction system for \$3M project
- Collection of field samples across NAPP and CAPP to identify feedstocks for bench scale SX plant
- Design, construction, and operation of acid leaching system for project
- Development of experimental plans to test novel feedstocks in the solvent extraction system

**Graduate Research Assistant** | West Virginia University | Mining Engineering | Aug 2016 – Nov 2017 | Morgantown, WV

- Research Topic: A critical assessment on the resources and extraction of rare earths from AMD
- Design of bench-scale solvent extraction system for REE extraction from novel feedstocks
- Experimental design to evaluate effectiveness of mineral processing and metallurgical processes

**Graduate Research Assistant** | West Virginia University | Mining Engineering | Jan 2015 – Aug 2016 | Morgantown, WV

- Research Topic: A feasibility study for the automated monitoring and control of mine water discharges
- Construction of bench scale AMD treatment system for feasibility study
- Evaluation and modeling of multiple control schemes to treat AMD in bench scale system
- Research resulted in an advanced control scheme for implementation at AMD sites

**Chief Engineer** | Alpha Natural Resources | Brooks Run North | Sep 2011 - Jun 2014 | Sutton, WV

- Provide engineering services for underground, surface operations and preparation plants
- Oversee exploration and reserve analysis program for new and existing reserves
- Prepare engineering section of Business Plan for Budgets
- Oversee construction projects including new mines, ventilations systems and transportation systems
- Oversee reclamation and environmental compliance for active and closed mine sites
- Oversee permitting of new and existing mines for Brooks Run North
- Conduct meetings and tours of mining operations for international PCI coal customers
- Conduct all work activities in compliance with Federal, State and Company policies, procedures, and regulations

**Mine Engineer** | CONSOL Energy | Fola Operations | Nov 2008 - Sep 2011 | Bickmore, WV

- Constructed detailed short and long range plans for multiple excavator spreads with high-wall miners
- Developed budget to account for upcoming mine reclamation costs
- Worked extensively with exploration group to develop accurate cad based volumetric and quality models

- Designed mine face-ups for upcoming underground operations
- Coordinated deep mine and surface permitting via outside engineering consultants
- Responsible for royalty payment calculations for multiple surface and underground mines with several lessor's
- Implemented coal blending optimization program to maximize profitability and direct ship coal

**Quality Control Engineer** | Arch Coal Inc. | Coal-Mac | May 2007 - Oct 2008 | Holden, WV

- Facilitated coal blend optimization program to maximize high ash shipments for >3MM TPY operation
- Responsible for ensuring proper blending and loaded quality on every train at 2 separate loadouts
- Oversight of multiple contractor coal haulers and truck auger
- Worked with coal foreman on daily basis to facilitate the haulage of coal in pits to appropriate facility
- Conducted weekly meetings with engineers and mine management to forecast coal haulage for upcoming week

**Mine Planning Engineer** | North American Coal | Sabine Mine | Mar 2005 - Apr 2007 | Hallsville, TX

- Constructed detailed short and long-term mine plans for 4MM TPY operation utilizing draglines and truck/shovel
- Streamlined daily and monthly forecasting, inventory and production reporting
- Justification of mine AFE's exceeding \$5 MM
- Selected and developed specifications for mine equipment
- Conducted bi-weekly planning meetings with mine managers

**Plant Foreman** | Florida Rock Industries | Havre de Grace Quarry | May 2003 - Mar 2005 | Havre de Grace, MD

- Daily supervision of 4MTPY aggregate plant and personnel
- Served as company representative for MSHA and environmental inspections
- Accountable for maintaining consumable and critical parts inventory for plant
- Established plant downtime tracking to identify maintenance deficiencies within the plant
- Implemented manganese wear study to optimize plant crushing resulting in increased plant production

**Pit Foreman** | Florida Rock Industries | Havre de Grace Quarry | Jun 2001 - May 2003 | Havre de Grace, MD

- Daily supervision of multiple truck/loader spreads at union operation
- Oversight of contract stripping drilling and blasting operations
- Experimented with emulsion blends to optimize fragmentation to achieve a lower cost per ton
- Changed haulage patterns based on cycle time study to increase flow of raw material to the plant

## CERTIFICATIONS

- Registered Professional Engineer | West Virginia | No. 018481
- Underground Miner | West Virginia | No. 4-14639
- Surface Miner | West Virginia | No. 3-13555

## PUBLICATIONS AND SCHOLARLY WORK

### Articles, Proceedings, Presentations, and Reports

1. **Christopher Vass**, Aaron Noble, and Paul Ziemkiewicz (2019), "The Occurrence and Concentration of Rare Earth Elements in Acid Mine Drainage and Treatment By-products: Part 2- Regional survey of Northern and Central Appalachian coal basins," Mining, Metallurgy and Exploration, DOI: 10.1007/s42461-019-00112-9
2. **Christopher Vass**, Aaron Noble, and Paul Ziemkiewicz (2019), "The Occurrence and Concentration of Rare Earth Elements in Acid Mine Drainage and Treatment By-products: Part 1 - Initial Survey of the Northern Appalachian Coal Basin," Mining, Metallurgy and Exploration, DOI: 10.1007/s42461-019-0097-z
3. Seyed Hassan Amini, **Christopher Vass**, Mehrdad Shahabi & Aaron Noble (2019) Optimization of coal blending operations under uncertainty - robust optimization approach, International Journal of Coal Preparation and Utilization, DOI: 10.1080/19392699.2019.1574262
4. Noble, Aaron, Paul Ziemkiewicz, **Christopher Vass**, Xingbo Liu, Panpan Ren. (2018). "Design and evaluation of an acid leaching-solvent extraction process to extract rare earth elements from acid mine drainage precipitates." 2018 SME Annual Meeting & Exhibit. Minneapolis, MN. February 26, 2018.
5. **Vass, Christopher** and Aaron Noble, "A Feasibility Study for the Automated Monitoring and Control of Mine Water Discharges." 2017 Annual Meeting of the American Society of Mining and Reclamation. April 11, 2017. Presentation Only.
6. **Vass, Christopher** and Aaron Noble, "Characterization Study to Determine REE Distributions and Content in

Coal and Acid Mine Drainage Precipitates.” 2017 SME Annual Meeting and Exhibit. Denver, CO. Poster Presentation

7. **Vass, Christopher** and Aaron Noble. “Assessing the Feasibility of Automated Data Monitoring and Control Strategies for Chemical Treatment of NPDES Outlets: Bench-Scale Studies.” 2016 SME Annual Meeting and Exhibit. Phoenix, AZ. Preprint and Presentation.
8. Noble, Aaron and **Christopher Vass**. "Automated Monitoring and Control of NPDES Outlets: Laboratory Studies." Environmental Considerations in Energy Production Conference. Pittsburgh, PA. September 23, 2015. Presentation only.
9. **Vass, Christopher** and Aaron Noble. “A Feasibility Study for the Automated Monitoring of Mine Water Discharges.” Coal and Energy Research Bureau. Morgantown, WV. July 2015. 1-16. Final Project Report.
10. Zhang, Peter, Scott Peterson, Joe Pugh, Patrick Bucks and **Christopher Vass**. “Multi-Seam Mining Over Old Workings with Small Pillars – A Case Study.” 33<sup>rd</sup> International Conference on Ground Control in Mining. Morgantown, WV. 2014. Jul 29 - 31. 1-8. Refereed Conference Proceeding.

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## PATENTS

1. Ziemkiewicz, Noble & **Vass**. 2021. Systems and Processes for Recovery of High-Grade Rare Earth Concentrate from Acid Mine Drainage. Patent No. US 10,954,589 B2. filed February 19, 2020, and issued March 23, 2021.