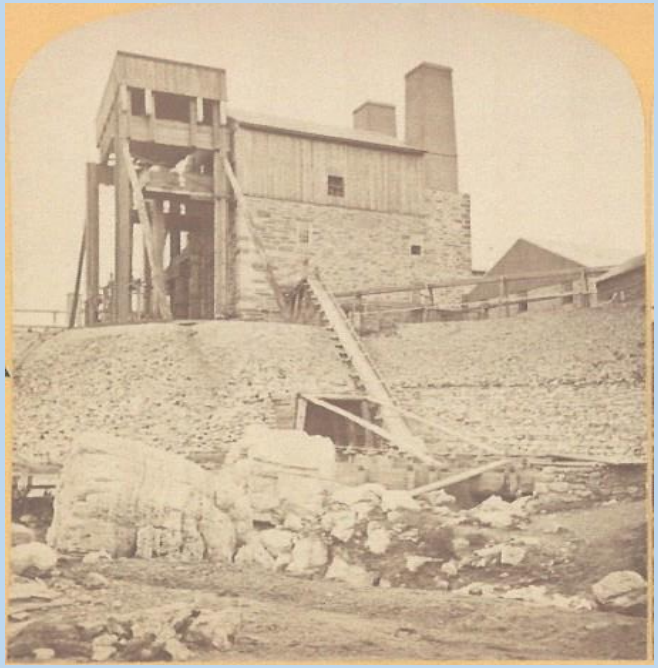
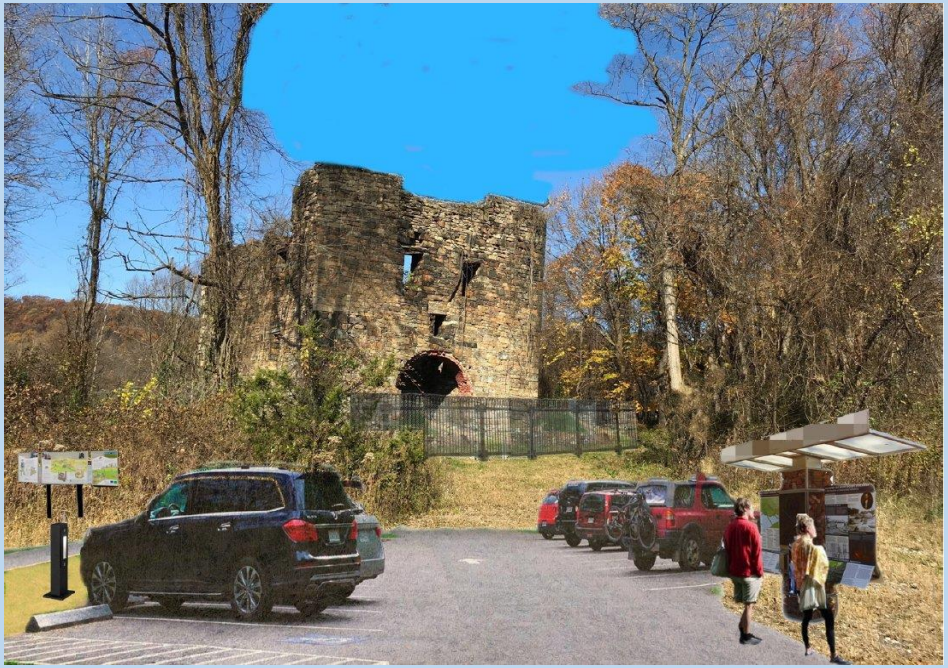
Impact of Green Fund for Student Technical Entrepreneurship (TE) Capstone Design Project to Create a Plan for a Pumping Engine House Heritage Park





Dec 12, 2019 Presentation by Jerry Lennon & Mark W. Connar

Update to Lehigh Sustainability Council A ”Make Good” Analysis

Timetable

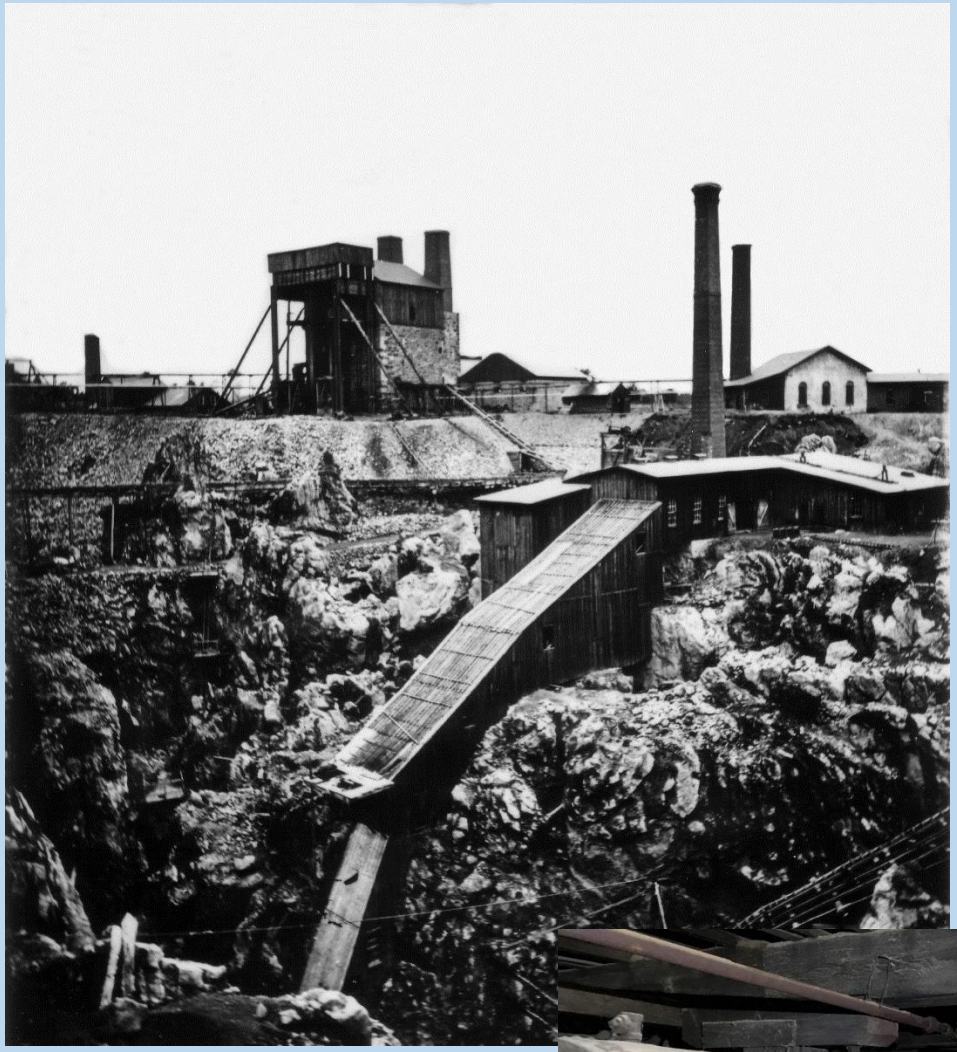
- **Jan 2018: Green Fund Proposal** ($2K of $5K TE Fee)
- **Students in Mechanical Engineering & Supply Chain Management carry out project in TE 211 Spring 2018, TE 212 Fall 2018**
- **~8 talks by Mark, Jerry or our colleagues that included slides on student project; more are planned**

Today’s Outline:

- **History & Importance of Site (this light blue background)**
- **Student Work (green background)**
- **Impact and Future Opportunities (red background)**
- **Backup Slides (yellow background)**

19th Century Mine Milestones

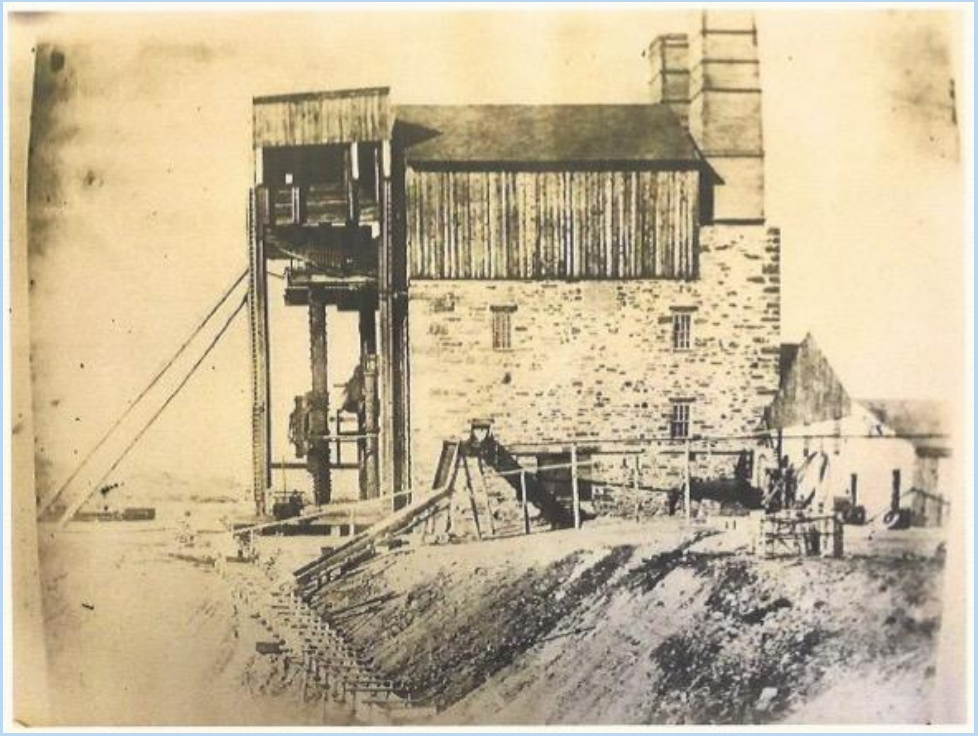
- Zinc mining began 1853
- Samuel Wetherill & Joseph Wharton build a modern industry, 1853-1863
- Water a huge problem – The President Pumping Engine built, 1868-1872
- Lehigh Zinc Closes Its Mines, 1876
- Bergen Point Zinc Owns All Mines, 1881
- All Mines Close (5 in district), 1893
- Engine Scrapped, 1900 (one boiler survives)
- New Jersey Zinc buys property, 1899



(Miller, 1924, Plate II A)

Friedensville Mining– Engine House circa 1875

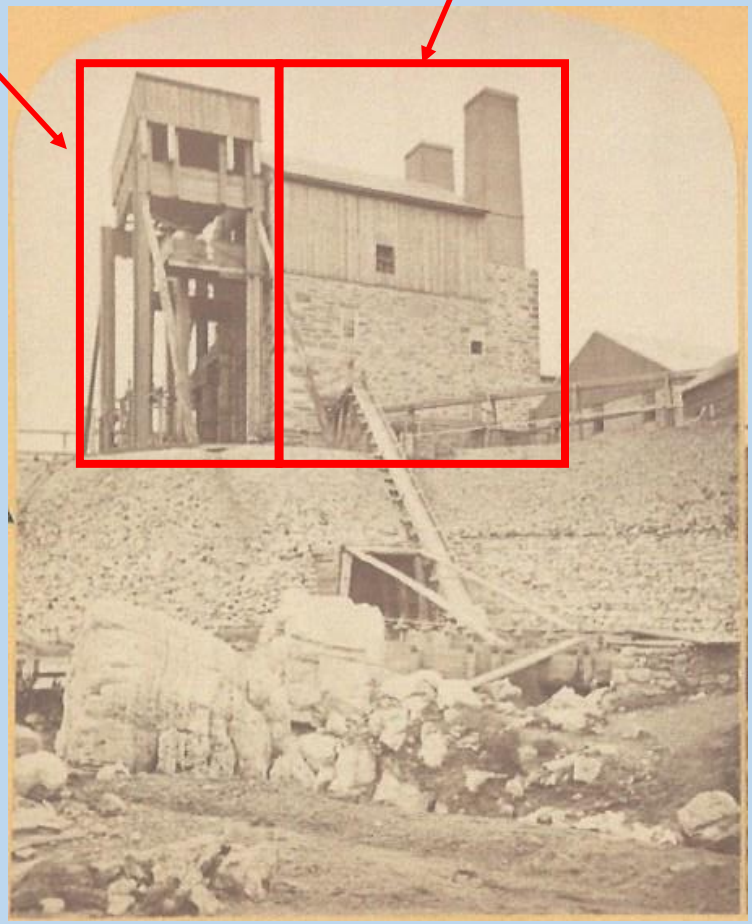
(Lehigh Special Collections & Library of Congress)



Engine House – Side View from South

Pump
(240’ deep)

Engine that runs
Pump is inside
this Pump House

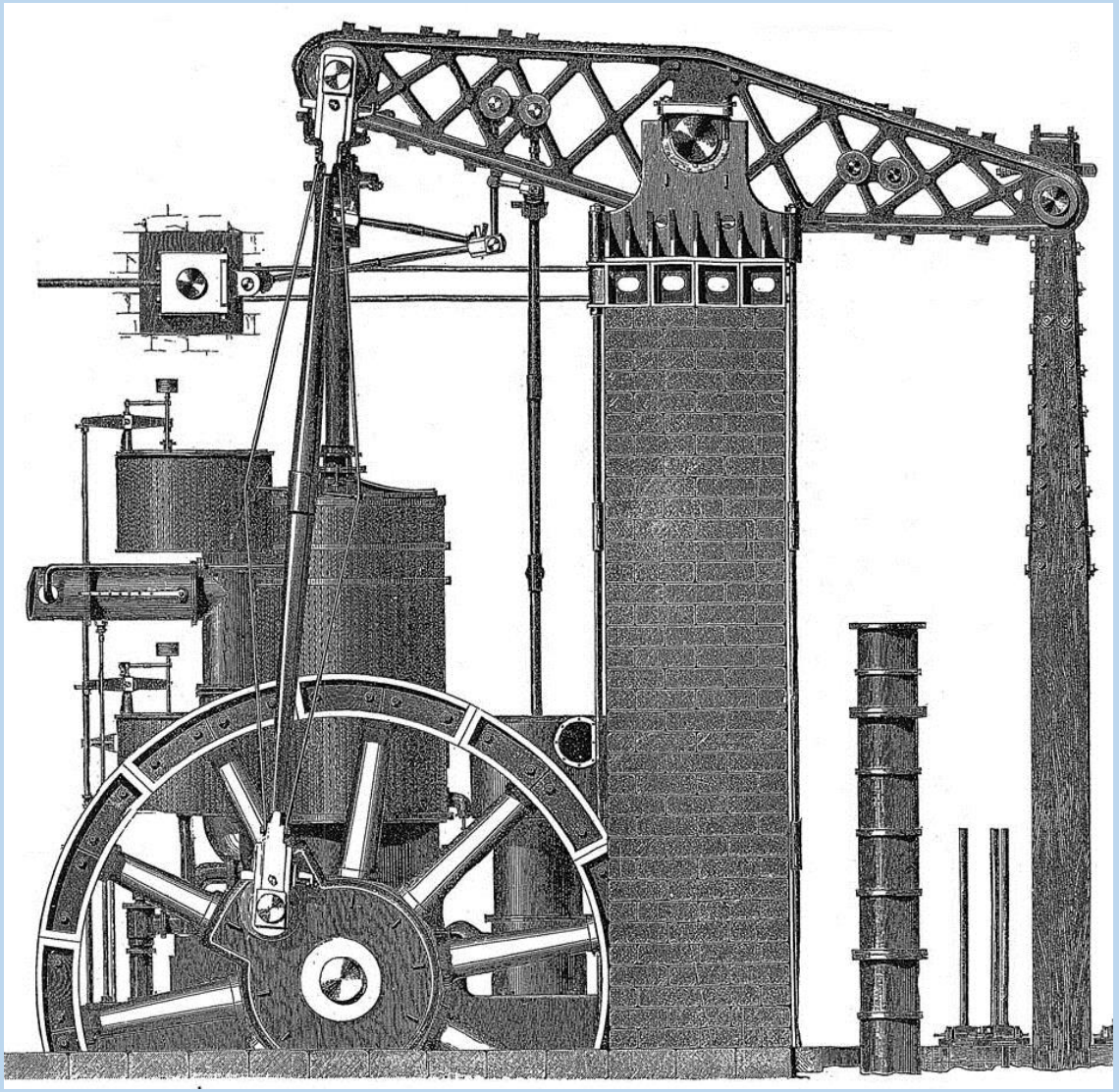


View of Engine House and Pump From Dewatered Pit

(Sluice Delivered Water to Nearby Stream)

The President

- Named for Ulysses S. Grant
- Weighed 675 tons
- 2 Latticework beams 36-ft. end to end
- 110-inch diameter cylinder
- Two 30-foot diameter flywheels
- 3,000 HP @ 60 PSI
- 2 stages of lift and plunger pumps in 240-foot deep shaft
- 20 operating steam boilers
- Built over 3 years
- John West – Cornish born engine and system designer
- Master builder and operators also from Cornwall
- Ran continuously from 1872 to late 1876 (shaft 240 feet deep)
- Ran intermittently from 1881 to 1892
- Capable of drawing 17,000 gallons of water per minute/24.5 million gallons per day



“ Why Saving Location Important…..”

- The existing President Engine House and the area surrounding the structure is a 19th century mining industry time capsule.
- Protection, preservation, interpretation and recognition of this engine house and its surroundings is of vital importance because:

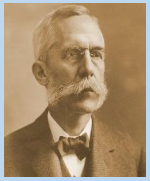
  - It is the only structure and physical setting remaining of one of the earliest industrial age enterprises in the Lehigh Valley;
  - The engine house is part of the largest single cylinder stationary steam engine ever built anywhere in the world;
  - The engine house is a unique structure which is the only surviving example in the United States and an international extension of a UNESCO World Heritage Landscape.

Lehigh University Connections

1840s –

Theodore Roepper identifies ore as zinc and later first LU Professor of Mineralogy and Geology

1870s -

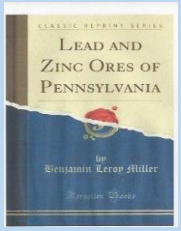


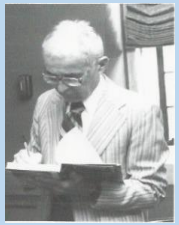
Founding graduates learn, work and comment on mines. One later becomes 5th President of Lehigh (Henry Drinker, Miles Rock, Francis Clerc)

1890s -

Professor Henry Chandler studies water quality as potential municipal water source

20th C –

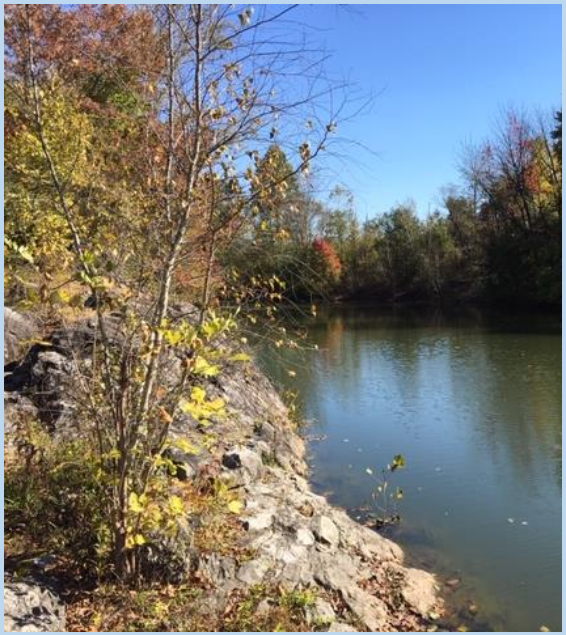




Benjamin Miller and Ross Yates study the mines from a geological and historical perspective

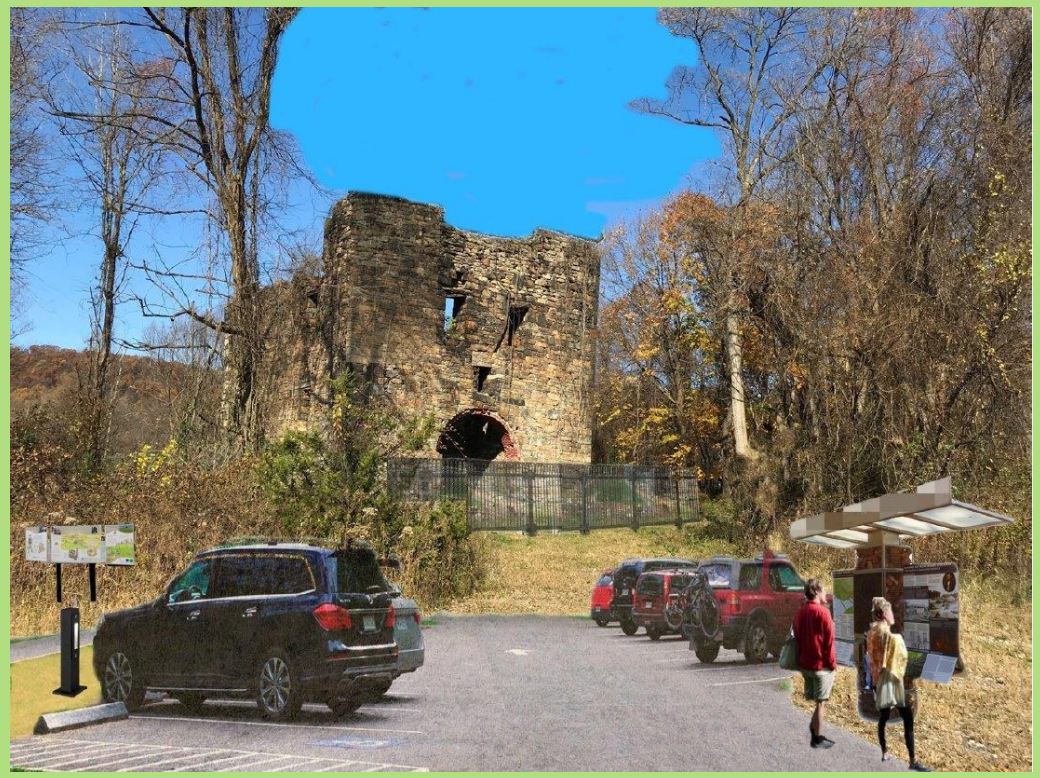
21st C -

Lehigh graduate Donald Stabler's estate grants property to Lehigh University



The Friedensville Mine Property Today (LU Parcel 12)

Friedensville Mining Heritage Park Opportunity



(Connar, 2019)

Student TE Capstone Park Design Project

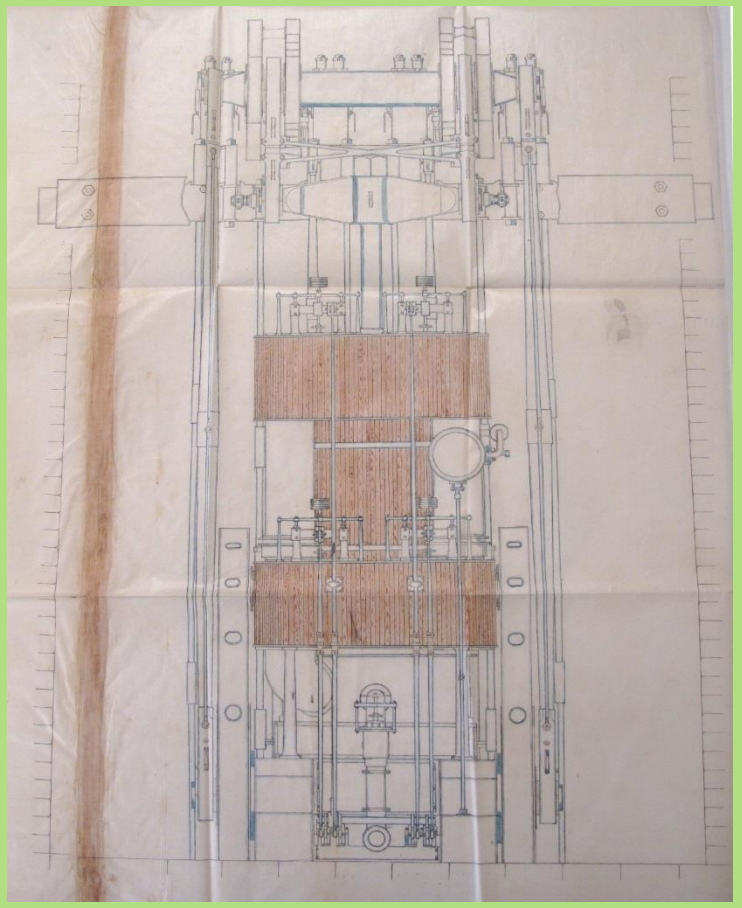
Mission Statement

"Our Mission is to incorporate the historical significance of the President Pump and engine house into a park design for the Ueberroth Mine."

Plans to support the above Mission Statement:

- *Completion of an animated CAD Model of The President Engine*
- *Create a Working Model of The President Engine*
- *Conduct a Survey of Upper Saucon Township residents*
- *Benchmark similar open-air interpretative heritage walks/parks*
- *Create a thematic plan for the park*
- *Develop a Pitch Video to Promote Park*

The CAD Model of the President

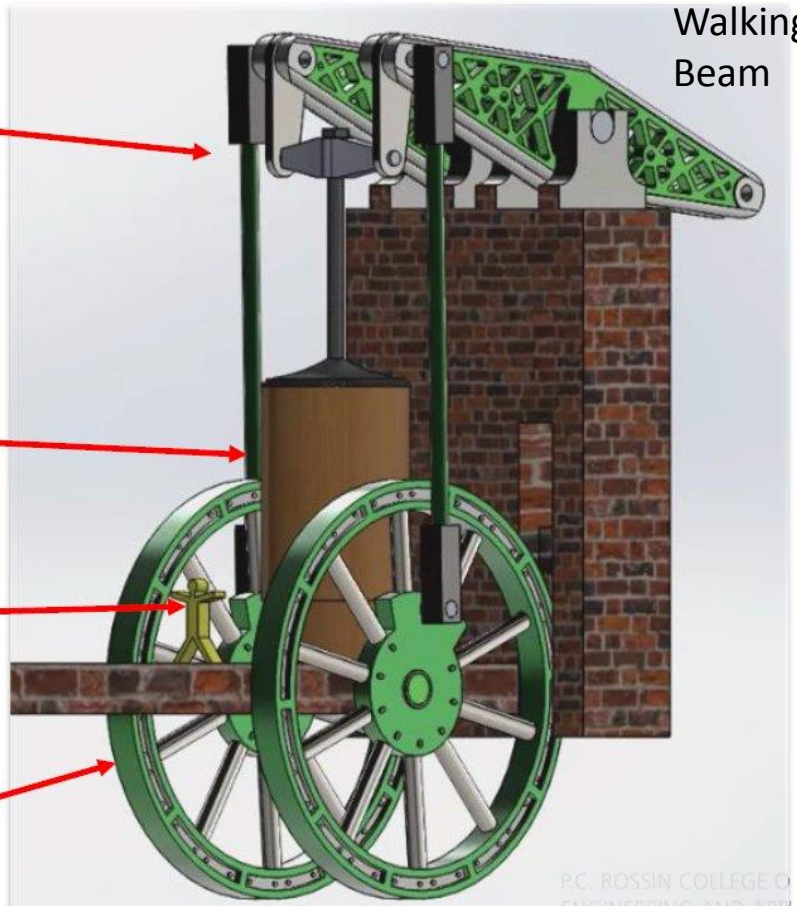


[CAD Model Video]

TE Capstone Lehigh Park Team in the Lafayette Archive Room, Winter 2018

Diagram – Riley Thesis, Lafayette Special Collections; quote from letter to Charles Pratt & Co. from F.L.Clerc, 1899 (Lehigh University Special Collections

How "The President" Operated



https://www.dropbox.com/s/zw3k109qj3aq8r3/TE_AnimatedPresidentPump.mov?dl=0

Physical Model Of The President
Lehigh Student TE Capstone Project Team (Fall 2018)

Other Team Accomplishments

- The Team Worked with Upper Saucon Township leadership to survey residents on interest in a heritage park including the proposed theme and use of VR/AR technology;

- Determined that a theme, ”a day in the life of a miner” would be an interesting way to tie signage in the park together. A representative sign example was created;

- Created a Pitch Video:

https://www.dropbox.com/s/q2tphy8hplimnb2/Lehigh%20Park%20Pitch%20Video.mov?dl=0

Results – Successful Grant Applications

At this early stage, Lehigh University support for a preservation plan as part of a park concept requires endorsement through matching grant funding:

- Prior to Capstone Team, application made to Pennsylvania Historical and Museum Commission (Keystone Preservation Grant) in March 2018 unsuccessful;
- Application made for Keystone Preservation Grant in March 2019 and application made for the Louis J. Appell Jr. Preservation Fund for Central PA (National Trust Fund). Both are highly competitive.
- In May and June 2019 LU was awarded both grant applications for a total of approximately $30,000 in matching funds

Results – TE Capstone Lehigh Park Team Impact

We improved our grant applications by using much of the material created by the Lehigh Park Team….

- The applications invited word limited essay responses with the addition of supporting materials.
- Materials included:
  - ✓ TE Capstone Program
  - ✓ Survey Results
  - ✓ CAD animated engine model (attachment)
  - ✓ Park “Day in the Life” Theme Concept
  - ✓ Pitch Video (attachment)

Beyond the grants, the Lehigh Park Team deliverables add depth, richness and interest to our on-going communication program.

Preserving the Engine House

Lehigh University funding a study of the ruins with match funding provided by:

Keystone Historic Preservation Grant (State of PA)

Louis J Appell, Jr. Preservation Fund for Central PA (National Trust)

Contractors/Consultants:

Vegetation Removal - *Keystone Siteworks*
PM, 3D Scan, Pump Shaft Evaluation
– *Borton Lawson*
Architectural Assessment
– *Whitman, Requardt & Assoc.*
Engine House Structural Analysis
– *Keast & Hood*

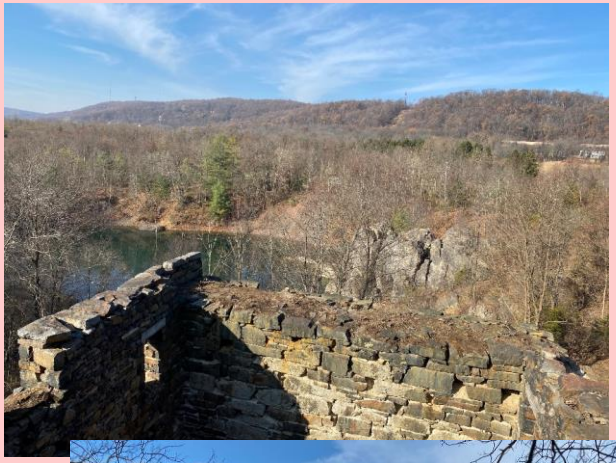
The only surviving example of a Cornish style Engine House in the United States

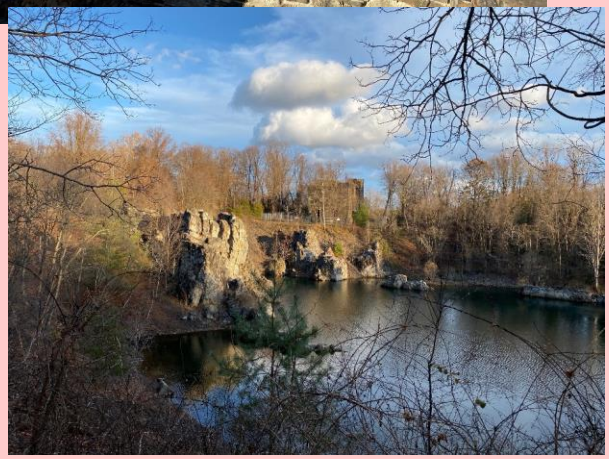
Preservation Steps Have Started !

Why Green Funding Was and Is Important

- A preserved President Engine House ruin will enhance quality of life and instill pride and sense of place for Upper Saucon Township, Lehigh University and entire LV region;
- Reinforces region and University as home to centuries of ingenuity and advancement;
- Beyond recreation, a heritage park will be learning place to motivate future generations toward success;
- Creates societal value (physical and economic) for an underutilized property;
- Lehigh University “story” is deeply intertwined with the location.

Future Opportunities





Learning Area where support from the Sustainability Council can be beneficial….

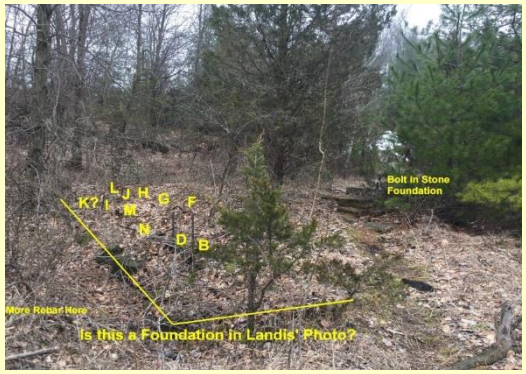
- GIS/3D Mapping using locational markers, historical maps and photographs to bring the past to life;
- Archeological study opportunities to bring richness to the story of a “day in the life of a miner”;
- Virtual Reconstructions of The President Engine and The Engine House
- Exploiting practical applications of drone technology for architectural renderings and property management

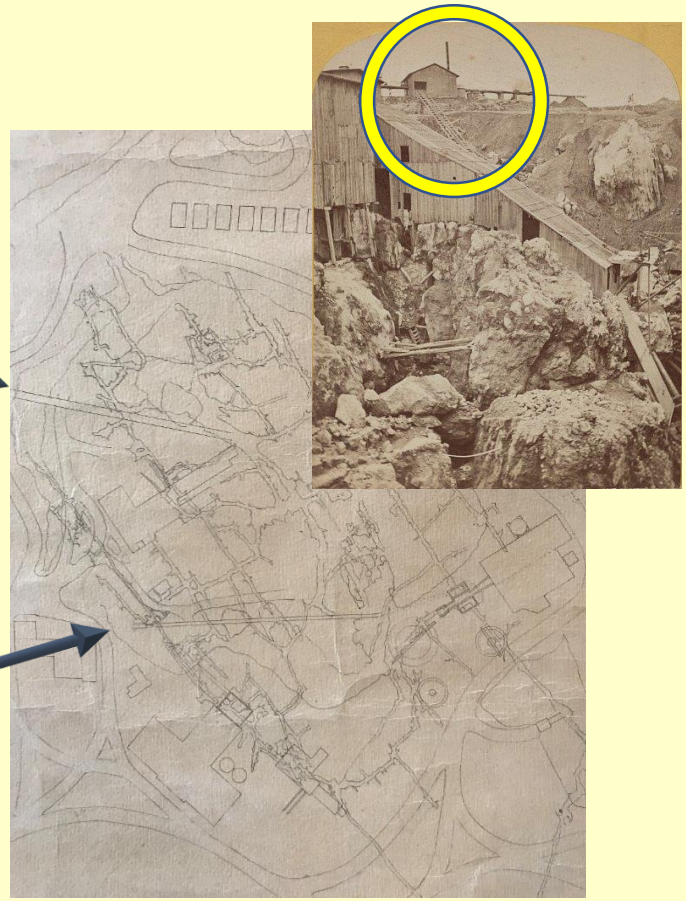
Backup Slides

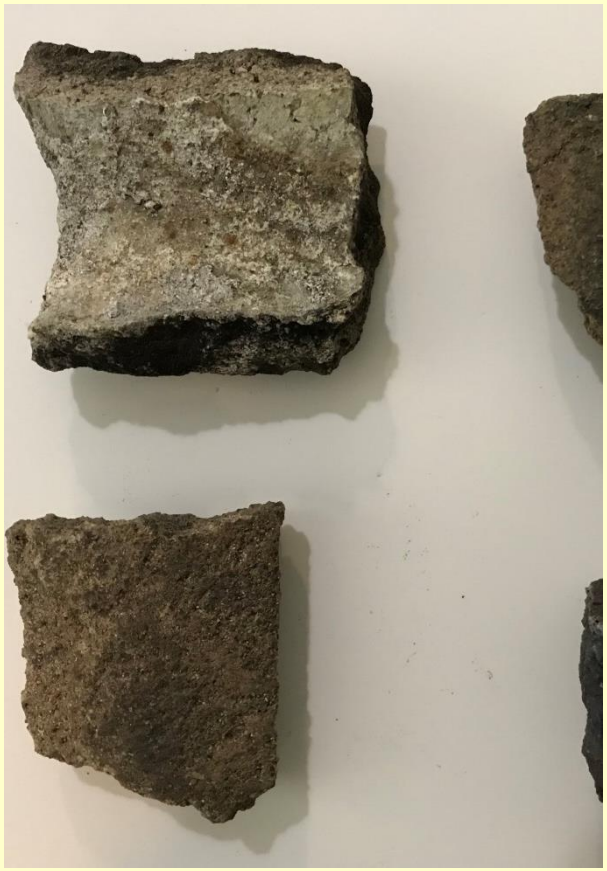
WHAT IS ZINC (Zn) ?

- 4th Most Common Metal – 13 million tons per year produced (after iron, aluminum, copper) – 2017 statistics
- Sphalerite is most common zinc ore
- Uses (Traditional)
  - Medical/Cosmetics
  - Brass Alloy
  - Paint Additive
  - Anti Corrosion Plating
- Newer Uses
  - Aerospace
  - Lithium Batteries
  - Alkaline Batteries
  - Cathodic Protection

GEOGRAPHIC INFORMATION SYSTEMS/3D MAPPING – ONGOING STUDIES







ARCHAEOLOGICAL SURVEY OPPORTUNITIES

VIRTUAL RECONSTRUCTIONS

DRONE STUDIES

- Still shot from Borton Lawson Drone Flyover of the Engine House (2018)
- LU extensive property assets – how can drone technology be used to provide appropriate oversight and “legs free” management?
- Use drone technology to record building in concert with CAD 3D Modeling and to support virtual reconstructions

ACKNOWLEGEMENTS

L. Michael Kaas, Arlington, VA
Dr. R. Damian Nance, Stratford, CT
Dr. Gerard Lennon, Bethlehem, PA
Erin Kintzer, Lehigh University
Upper Saucon Township
Borton-Lawson, Bethlehem, PA
National Museum of Industrial History
Lehigh University, Special Collections
Lafayette College, Special
Moravian Church Archives
Robert Lanning, Saint Louis, Mo
Lehigh University Student TE “Lehigh Park” Project Team

Justin Caspar
Christy Conley
Andrew Dintino
Erin Hank
Stephanie Kong
Owen Loughlin
Robert Tischbein

“Tell Me More” CONTACTS:

Dr. Gerard (Jerry) P. Lennon
Department of Civil and Environmental Engineering
STEPS Building, Room 334
Bethlehem, PA 18015
610-758-3558
jerry.lennon@lehigh.edu

Mark W. Connar LU ‘84 MBA
1480 Saucon Meadow Court
Bethlehem, PA 18015
610-248-6653
mwconnar@aol.com