Swartz Mine Holding Company
Wabash Mine

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Senior Design Project
MinE 484
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Selected Slides from the Oral Report
Introduction

- Underground Room and Pillar Coal Mine.
- Springfield #5 Coal Seam, Illinois Coal Basin.
- Southeastern Illinois near Keensburg, IL
- Annual Production of approximately 1 Million Clean Tons.
- Sold to Coal Fired Steam Power Plants.
- Project Life of 19 years with 14 years of mining
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- Keensburg, Wabash County, IL
- 45 miles Northwest of Evansville, IN
- Approximately 150 miles from St. Louis, MO and Louisville, KY.
- Norfolk Southern has an abandoned railroad spur adjacent to the property.
- The Wabash River which overlies the property is not navigable in this area.
Geology

- Springfield #5 Coal Seam
  - Averages 6.9 ft thick
- Roof: 80 ft of Dykersbug Gray Shale
- Floor: 3 in of Fireclay
- Horizontal Stress between N84E and N87E.
- Overburden Averages 745 ft.
- New Harmony Fault dissects property N-S.
  - Fault is a sub-parallel, high angle normal fault with a vertical displacement of ~100 ft.
Reserves

- Classified according to USGS system of Measured, Indicated, and Inferred.
  - Measured = 41,347,576 tons
  - Indicated = 4,583,121 tons
  - Inferred = 0 tons

- Drilling program defines the project area well but additional drilling must take place to confirm anomalies.
46 Million Tons of in-place reserves.

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<thead>
<tr>
<th></th>
<th>As Received</th>
<th>Dry</th>
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<tr>
<td>Moisture %</td>
<td>13.8</td>
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<tr>
<td>Ash %</td>
<td>5.9</td>
<td>6.8</td>
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<tr>
<td>Sulfur %</td>
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<td>1.8</td>
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<tr>
<td>BTU</td>
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</table>
Ash 5.9%: In Place, Dry Basis, No Dilution
Sulfur 1.5%: In Place, Dry Basis, No Dilution
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Mine Plan

- Topsoil is designated Prime Farmland.
- Mine designed to allow zero subsidence.
- Conservative mine plan.
- Two CM sections, with the ability to expand production by using dual split ventilation and supersections.
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Mine Plan

- The New Harmony Fault Line provided the basis of the mine Layout.
- The mains were driven SW, parallel to the fault line.
- A buffer of 200 ft was left between the fault and western-most entry in the mains.
- A buffer of 200 ft was also left within the project boundary to protect the mine from potential flooding from abandoned adjacent mines.
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Mine Plan

- Recovery = 39 %
- 10-Entry Mains
- 8-Entry Submains
- 3 shifts/day, 5 day/wk, 245 day/yr
- Entry width 18 ft
- Max Production 200 ft linear advance per operating shift
Pillar Design Based on:
- Bienawski formula
- Tributary Load Theory

In-situ strength assumed 900 psi

Safety Factor of 2, with Max Overburden of 900’ (typically weak roof conditions and compression-type roof failures)

Pillars sized on 100 ft x 80 ft centers (Mains and the SubMains)
Ground Control

- Barrier Pillars were designed using King and Whittakers formula.
- Maximum Overburden used (900’)
- 132’ (150’ centers) were sized between the Mains and the development sections.
- 62’ (80’ centers) were sized between the developed panels

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- Entry width 18’
- Sq. Bolt Pattern 3.6’ x 3.6’
- Fully Grouted Resin Bolts grade 75 psi.
- Anchorage in Dykersburg Shale.
- Load /Bolt = 11,551 lbs
- Strength/Bolt = 33,134 lbs
- Safety Factor = 2.58
Ventilation

- Complies strictly to CFR 30
- Jefferey (DBT) 8HU108-58 Aerodyne Fan with 9’ Diameter
- Dual Split Ventilation Design
- Ability to Expand to Dual-Split Supersections.
- Undivided, Common, Neutral Air on the Belt/Track.
Haulage

Shuttle Cars and Belt Conveyor System.

- Mains Belt system = 48” belt @ 500fpm
- SubMains = 42” belt @ 400 fpm
- Belt Drives: 250hp (48”) & 150hp (42”)
- Max Production Rate = 700 TPH
- Max Flite Length = 5000’
Drainage and Pumping

- Potable water for bathhouse, warehouse and plant at 25 psi @ 3,000 gpm.
- Non-potable water supply from 100,000 gallon water tank.
- Freshwater Pump: 300 gpm @ 100 psi, 50 hp
- Wastewater Pump: 500 gpm, 200 hp
Electric Power

- Surface power provided by utility at 62.9 kV
- Underground primary distribution voltage at 12470 V, 3 phase.
- Electric Power is fed underground by insulated cables down a power borehole.
Surface Facilities

Portal Area: Portal Building, Management Offices, Engineering Offices, Bathouse, Elevator, Water Tank, Dust Storage.

Coal Holding: 2 Clean Coal Silos, Raw and Clean Coal Stockpiles with Reclaims, Truck and Railroad Scales.


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Coal Preparation

- Plant Efficiency 98%
- Out of Seam Dilution 0.25'
- Lab Yield = 92 %
- Weighted Average of Coal, Near Gravity Material, and Out of Seam Dilution Produced an actual recovery of 84% for this plant.
Coal Preparation

- Plant operates 2 shifts/day @ 350 RTPH
- 294 TPH Clean in 3 circuits
  - **Coarse:** Dense Media vessel, rinse and drain screens, centrifuges, Heavy Media Reclaim, Recirculation, Recovery and Sumps.
  - **Intermediate:** Sieve Bends, Heavy Media Cylcones.
  - **Fines:** Spirals
  - **Ultra Fine Coal** is sent to the refuse thickener and belt press and combined with course and fine refuse in the disposal area.
Refuse Disposal

- Refuse Area is about 267,000 yd^2
- Combined Refuse Area.
- Average 150-180 k tons of Refuse/yr
- 2.3 M tons over the life of the mine
- Will compact course refuse dams around the combined refuse disposal cells.
Permitting

- Projected 2 years to receive all 7 permits.
- SMCRA/OSM – Illinois DNR
- Exploration Drilling
- Water/NPDES
- Air/SSOA
- Construction in a Floodway
- MSHA Impoundments/Slope Sinking Plan
- Road Entrance/Closure/Crossing
Marketing

- Majority of the coal (+80%) will be sold to Gibson Plant in Owensville, IN.
- Gibson has burned over 10 M tons each of the last two years meaning a contract could be reached.
- Wabash coal complies with the Indiana State Air Quality Measures.
- The Gibson Plant is the only one on NS Railway between St Louis and Louisville.
- Realization projected as $29/ton fob mine.

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Development Schedule - Critical Path

- Acquire Surface Property (12 months)
- Layout Preliminary Mine Plan (3 mo)
- Permit Approvals (24 mo)
- Slope Driving/Belt Installation (32 mo)
- Shaft (18 mo)
- Set Up Skip/Drop CM 1 (2 mo)
- Full Production occurs 7 years after the project begins.

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Hiring done in stages up to full production.

Year 1 of mining 82 (24 salary + 58 hourly)
$3,180,000

Year 2 of mining 132 (32 salary + 102 hourly)
$6,637,500/yr

Ratio of 3.187 : 1 of hourly/salary employees

Overtime assumed to be 25% ($)

Absenteeism built in at 7%
Operating Costs

- Direct Mining Costs in the first year
  $19.92/ton

- Direct Mining Costs after full production is reached
  $ 16.57/ton
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**Capital Expenditures**

- Capital Life of Mine: $96,264,400
- Capital to Full Production: $79,009,600
- Capital After Full Production: $17,254,800
- Capital to Full Production / Annual Ton: $72
- Total Tons Mined: 11,723,857
- Tons to Full Production: 1,696,200
- Tons after Full Production: 10,027,657
- Ongoing Capital after full Production: $1.72 $ / Ton
Economic Summary

- IRR = 5%
- NPV = $-7.95 Million
- Discount Rate = 7%
- Break even point came in the next to last year of the project.
Recommendations

- The project is not deemed feasible with the specified hurdle rate of 20%.
- The mine plan is conservative, allowing for oversized pillars to account for safety concerns. It also only utilizes two CM Sections but was designed to handle up to four units.
- It is therefore recommended that market prices be monitored and a more aggressive mining plan be analyzed for potential use of the property.

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