Building Transportation at over 10,000 feet: Narrow Gauge Railroads in the San Juan Mountains of Colorado

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1.011 Project
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Summary
• Need for transportation between mining towns of Ouray and Silverton
• Silverton Narrow Gauge Railroad operated between 1889 and 1922
• Transported over $2 billion in Silver ore out of San Juan County

Location of the Tracks

Colorado

Otto Mears
• “Pathfinder of the San Juans”
• Built toll roads between Silverton & Ouray in 1886
  Pack trains used to transport goods on toll roads
• Since RR more economical transport, began construction over the existing path of toll roads
• $80/ton on toll road vs. $8/ton on RR
• Used capital from previous toll roads to pay for projects

Issues Involved in Construction
• People in mining towns needed goods and materials to mine
• Challenge to build
• Unprecedented situation in Colorado and US
• Narrow Gauge vs. Regular Gauge
  • Can make sharper turns
  • Less material used to construct -> less expensive
• Track built to Maximum 7% Grade
• Natural environment extremely harsh

Risks/Uncertainties
• Heavily Dependant upon success of Silver Mines
• Remote location, construction uncertainty
• No large population to sustain growth
• Natural environment and weather constant risks
**Mears’ Evaluation**

Late 1800’s – Economic Evaluation Limited in Scope

Most likely Mears’ Considerations:
1. Revenues of the freight would be greater than the costs
2. People in mining towns along route needed supplies
3. Easier to use RR vs. pack trains to transport heavy ore
4. Terrain known through toll roads -> knew it was roughly possible to build

### Cost Breakdown

<table>
<thead>
<tr>
<th>Labor</th>
<th>Construction</th>
<th>Operation</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear trees</td>
<td>Run train</td>
<td>Rebuild track</td>
<td></td>
</tr>
<tr>
<td>Blast cliffs</td>
<td>Load ore</td>
<td>Clear track</td>
<td></td>
</tr>
<tr>
<td>Lay RR Ties and Track</td>
<td>Train:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engine</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Freight cars</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Passenger cars</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wood</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spikes</td>
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</tr>
</tbody>
</table>

### Historic Case

**Timeline:**
- 1887 – Construction begins
- 1889 – Construction ends
- 1893 – Silver Panic of 1893
- 1922 – Last train runs along Silverton line

<table>
<thead>
<tr>
<th>Costs</th>
<th>Materials</th>
<th>Labor</th>
</tr>
</thead>
</table>
| Construction| $165,000  | $3.50 / day-
|             | / mile    | man            |
| Maintenance & Operation | $1000 / day | $3.50 / day-
|             |           | man            |

<table>
<thead>
<tr>
<th>Revenue</th>
<th>2000 tons/year transported initially</th>
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<tbody>
<tr>
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<td>$8 per ton freight charge</td>
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### Two Scenarios

- **Silver Prices Increase**
  - NPW: Costs = $2.3M
  - Revenues = $11.6M
- **Silver Prices Decrease**
  - NPW: Costs = $1M
  - Revenues = $18,000

### What really happened?

- Railroad died out due to lack of need and use
- State Highway Department took over care of land and tracks in 1922
- Created US 550 over Mears’ toll road and railroad paths
- Cost $1.2 million to pave and make 2 road lanes over only 6 miles
- Million Dollar Highway

### Conclusions

- The risks involved in the Silverton Railroad were too great
- Silverton Railroad was highly successful financially even though it eventually went out of business
- A railroad in Southwestern Colorado is only viable if there is a strong economic climate

- The Silverton Railroad has been said to be “among the greatest wonders of railroad building in America”