A Review of the Many Cost Approach Methods for Minerals Valuation

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Cost Approach Historical Context in Minerals Appraisal

- Cost Approach Methods used extensively by Canadian and Australian practitioners
- For raw exploration land through early resource assessment stage
- In USA – almost exclusively only depreciated replacement cost method (DRC) for buildings, plant, and equipment
The Three Approaches to Value – Primary Economic Principles

• Sales Comparison Approach – The principle of *substitution* of value
• Income Approach – The principle of *anticipation* of value
• Cost Approach – The principle of *contribution* to value

(ASFMRA; CIMVal)
Theoretical Basis

• “The cost approach employs the technique of summing all the land and building components.”

• “The principle of contribution states that the value of a particular component is measured in terms of its contribution to the value of the whole property, ...”

_The Appraisal of Rural Property, Second Edition, ASFMRA and AI_
Appraising Mineral Property with Cost Approach

- DRC method is for buildings, plant, other surface improvements
- Other methods are for minerals estate, land surface, water rights
Standards and Regulatory Setting

• In the USA, Cost Approach use not significantly inhibited
  – Courts averse to reliance on only the DRC method or Depreciated *Reproduction* Cost

• Globally, national and international standards setters are inhibiting use of other than DRC
  – International Financial Reporting Standard IAS 16
  – International Valuation Standard GN 8

• But, TSX-V only allows a “modified *appraised value* method”
Appraisal Body of Knowledge Documents – Author’s Observation

• Usually closely held by major appraisal standards setting and education bodies
• Do not differentiate the three approaches to value on economic principles
• Cost approach factors pertaining directly to land, only pertain to use for site value
  – Nothing relevant to the mineral content of land
• Should modify to accommodate minerals and rural appraiser profession needs
Main Cost Approach Methods

- Depreciated Replacement Cost (DRC)
- Multiple of Exploration Expenditure (MEE)
- Appraised Value
- Geoscience Matrix
- Rural Cost (a.k.a. Land Mix)
Depreciated Replacement Cost (DRC) Method

Commonly applied to buildings and other surface structures, plant and equipment

Value = Replacement Cost – (Physical Depreciation + Functional Obsolescence + External Obsolescence)
Multiples of Exploration Expenditure (MEE) Method

• A Prospective Enhancement Multiplier (PEM), based upon a Valuer's assessment of the property's prospectivity to date, is applied to the relevant and effective past exploration expenditure on the property
  – Applicable for exploration properties without delineated resources

• Value = Effective Expenditure x PEM

M. Lawrence and P. Onley, 1994
Appraised Value Method

- Sum of warranted future expenditures and effective past exploration expenditures
- Warranted future expenditures:
  - comprised by a “reasonable exploration budget” to test the remaining exploration potential of the exploration property.
- Applicable to exploration and marginal development properties

Value = Effective Expenditure + Warranted Expenditure

W.E. Roscoe, 1986
Geoscience Matrix Method

- Originated by Woodcock 1985 as a rating system for the Securities Commission, BC, Canada
- To the cost of acquiring an unexplored mining claim, apply 4 prioritized adjustment factors from a matrix of 19. Adjusting for the subject property’s characteristics of:
  - location
  - known valuable mineralization
  - geophysical, geochemical, and geological targets
- The adjustment factors are multiplicative.
Geoscience Matrix method

Subject claim value = (unexplored claim cost) x (location factor) x (grade factor) x (geophys/geochem factor) x (geology factor)

Calculate for each claim in the tract, then sum.
Cautions for MEE, Appraised Value, and Geoscience Matrix Methods

- Only designed for exploration properties and marginal development properties.
- Generally applied without market transaction reference. To be a market-based method, need a means of market measurement to calibrate adjustment factors.
- Use in combination with another method, preferably from another approach.
- Best done by or with someone who has a good knowledge of the geology of the subject property and of deals involving similar exploration properties.
Rural Cost Method

- An adaptation of the land mix method taught by the American Society of Farm Managers and Rural Appraisers (ASFMRA).

- Generally requires plentiful transaction data, such as is available for gold properties.
  - More transactions than typically used in sales comparison approach.
Rural Cost Method

• First adjust transactions for time and commodity prices, location, financing
• Ratio analyses or simultaneous equations are used to calculate the unit value of the components of the subject property -- developed reserves, undeveloped reserves, resources, exploration land, water rights, and other assets.
• The quantitatively adjusted values of the components are then summed.
• Add DRC value of buildings, plant, etc.
Rural Cost Appraisal method

Value ≈ au + bv + cw + dx + ey + fz + land surface + DRC (buildings + P&E)

u = $/developed Reserve unit
v = $/P+P undeveloped Reserve unit
w = $/M+I Resource unit
x = $/Indicated Resource unit
y = $/acre exploration
z = $/ac-ft annual water rights
Rural Cost Method

To derive unit values:

- Find puritan transactions – e.g., having only M&I Resource, or exploration acreage, or water rights.
- Solve simultaneous equations constructed for transacted properties.

Suitable for application on complex properties, from exploration tracts to operating mining properties.
Conclusions

• The economic principle of contribution to value is predominant in the Cost Approach

• The Cost Approach has many methods available, not just DRC

• The major national and international valuation standards setting and education bodies should modify their *body of knowledge documents* to accommodate the needs of the minerals and rural appraiser professions

• For market valuations, most Cost Approach methods should be used in combination with another approach if possible

• The Rural Cost Appraisal method is a particularly powerful valuation method, available for exploration through operating properties