Solution:

1. Total Cycle Time = 3.41 + 0.25 = 3.66 min
   $$\text{Cycles/hour} = \frac{60 \text{ min/hr}}{3.66 \text{ min/cycle}} = 16.4$$
2. $$\text{Production per cycle} = \frac{300 \times 3 \times 2}{27} = 66.7$$
   BCY/cycle
3. Production = 66.7 BCY/cycle x 16.4 cycles/hr
   = 1094 BCY/hour
4. Remember results of this method are usually 10 to 20% high.
   Actual Production = 80% x 1094
   = 875 BCY/hr
   or 90% x 1094 = 984 BCY/hr
5. Owning and Operating Costs
   A D10N (ripping only) could have a $100.00/hr O & O cost including $15/hr operator
6. Loosening Costs
   $100.00/Hr ÷ 875 BCY/hr = $0.114/BCY
   $100.00/Hr ÷ 984 BCY/hr = $0.102/BCY
   The loosening cost should range from 10.2¢ to 11.4¢/BCY

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USE OF SEISMIC VELOCITY CHARTS

The charts of ripper performance estimated by seismic wave velocities have been developed from field tests conducted in a variety of materials. Considering the extreme variations among materials and even among rocks of a specific classification, the charts must be recognized as being at best only one indicator of rippability.

Accordingly, consider the following precautions when evaluating the feasibility of ripping a given formation:

— Tooth penetration is often the key to ripping success, regardless of seismic velocity. This is particularly true in homogeneous materials such as mudstones and claystones and the fine-grained caliches. It is also true in tightly cemented formations such as conglomerates, some glacial tills and caliches containing rock fragments.

— Low seismic velocities of sedimentaries can indicate probable rippability. However, if the fractures and bedding joints do not allow tooth penetration, the material may not be ripped effectively.

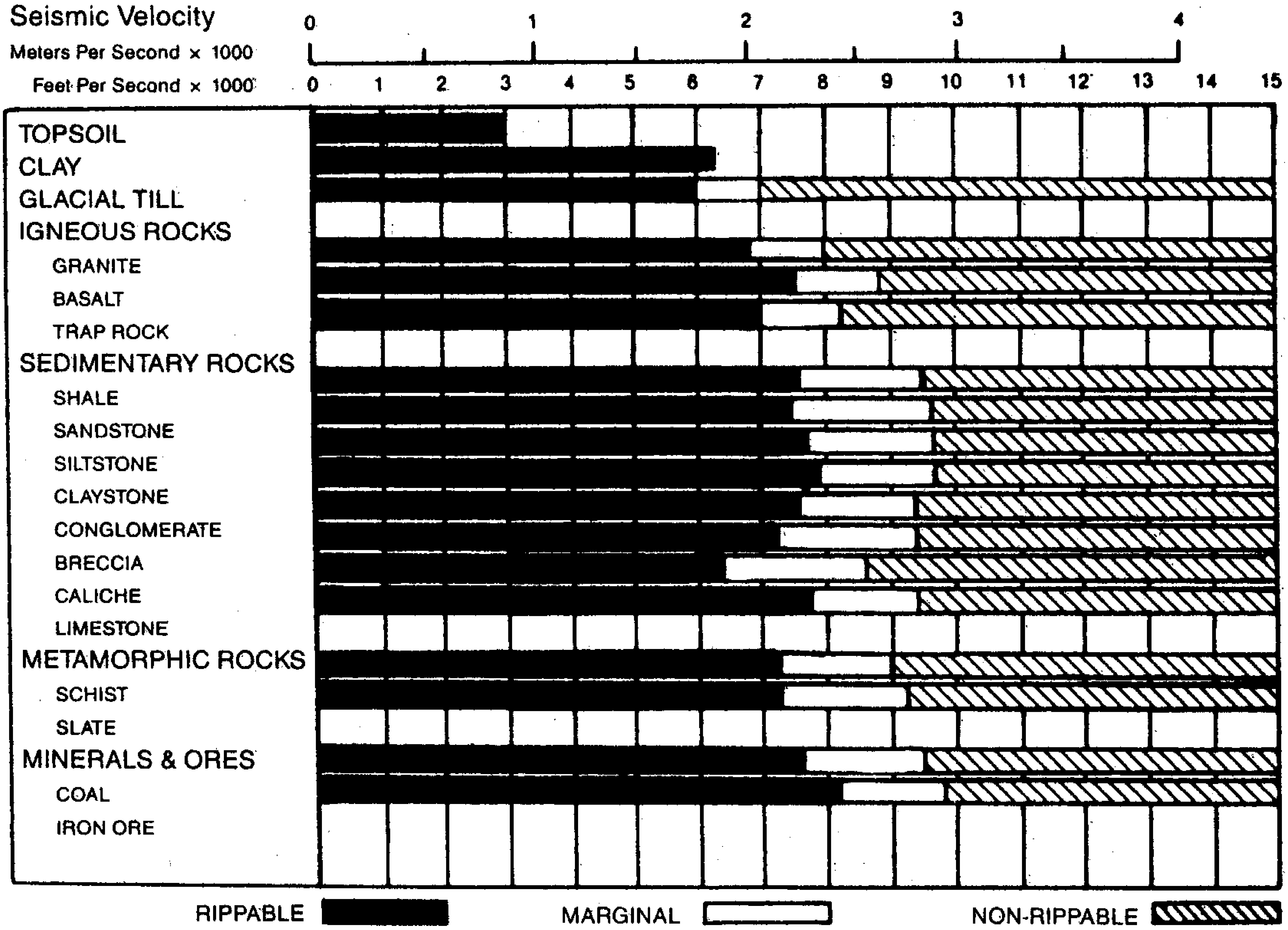
— Pre-blasting or "popping" may induce sufficient fracturing to permit tooth entry, particularly in the caliches, conglomerates and some other rocks; but the economics should be checked carefully when considering popping in the higher grades of sandstones, limestones and granites.

— Impact ripping may be used in marginal situations where tooth penetration, shank advancement or material sizing may be a problem. Significant boosts in production relative to a conventional ripping tractor can be obtained by using an impact ripper mounted on a D10N or D11N.

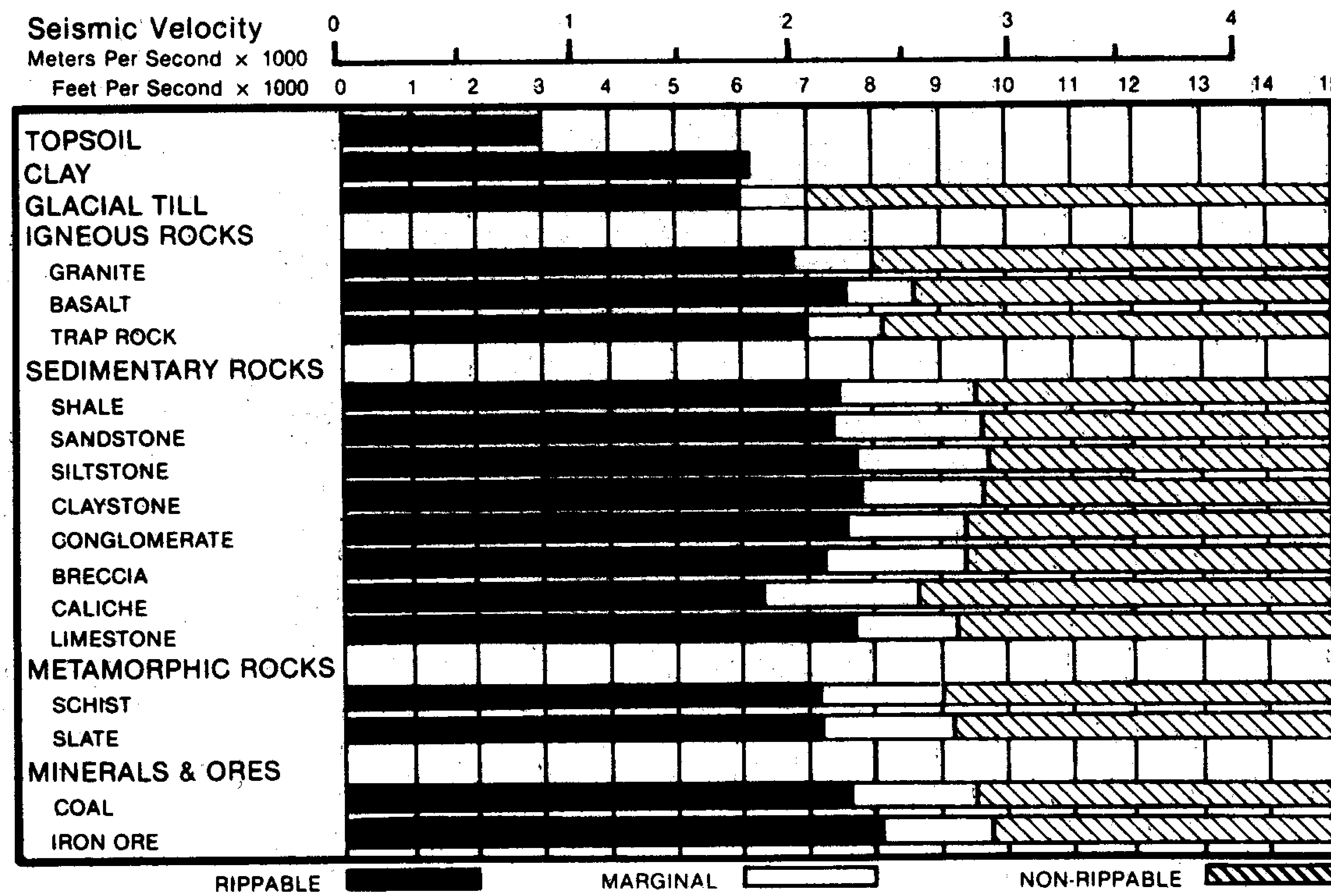
Ripping is still more art than science, and much will depend on the skill and experience of the tractor operator. Ripping for scraper loading may call for different techniques than if the same material is to be dozed away. If cross-ripping is called for, it, too, requires a change in approach. The number of shanks used, length and depth of shank and tooth angle, direction, throttle position — all must be adjusted according to field conditions encountered. Ripping success may well depend on the operator finding the proper combination for those conditions.

Note: Field Seismic Information shown in the following charts is the best single indication of rippability. However, Caterpillar does not rely on any single parameter to select the best machine for your particular operation and rock type. Field Seismic Information is just one aspect of a complete rippability analysis that can be obtained through your Caterpillar dealer. A Caterpillar rippability analysis includes a geological site survey, field seismic velocity measurements, laboratory analysis of rock properties and an equipment investment analysis. Contact your Caterpillar dealer for a complete rippability analysis.

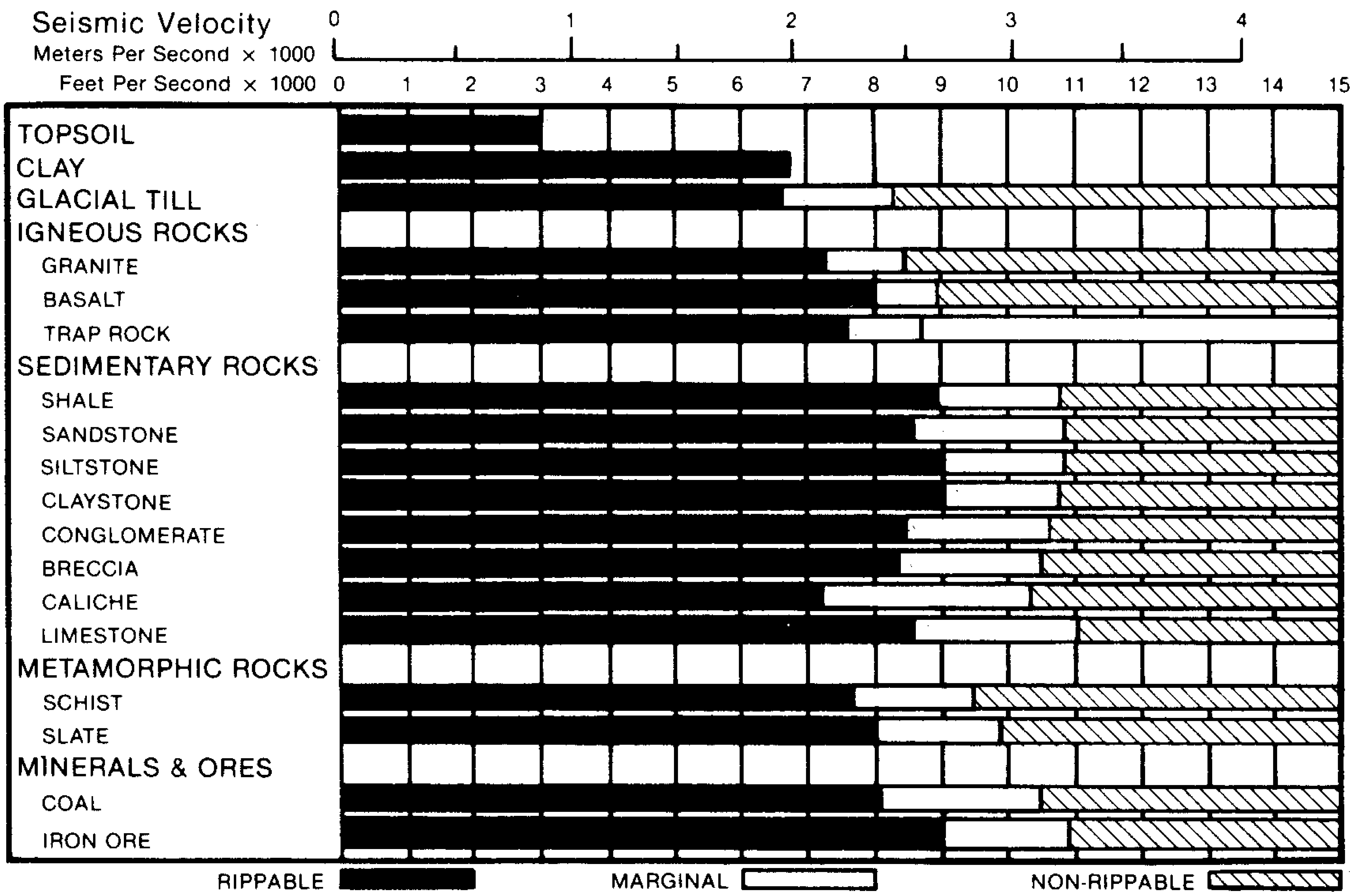
D8L Ripper Performance
- Multi or Single Shank No. 8 Ripper
- Estimated by Seismic Wave Velocities



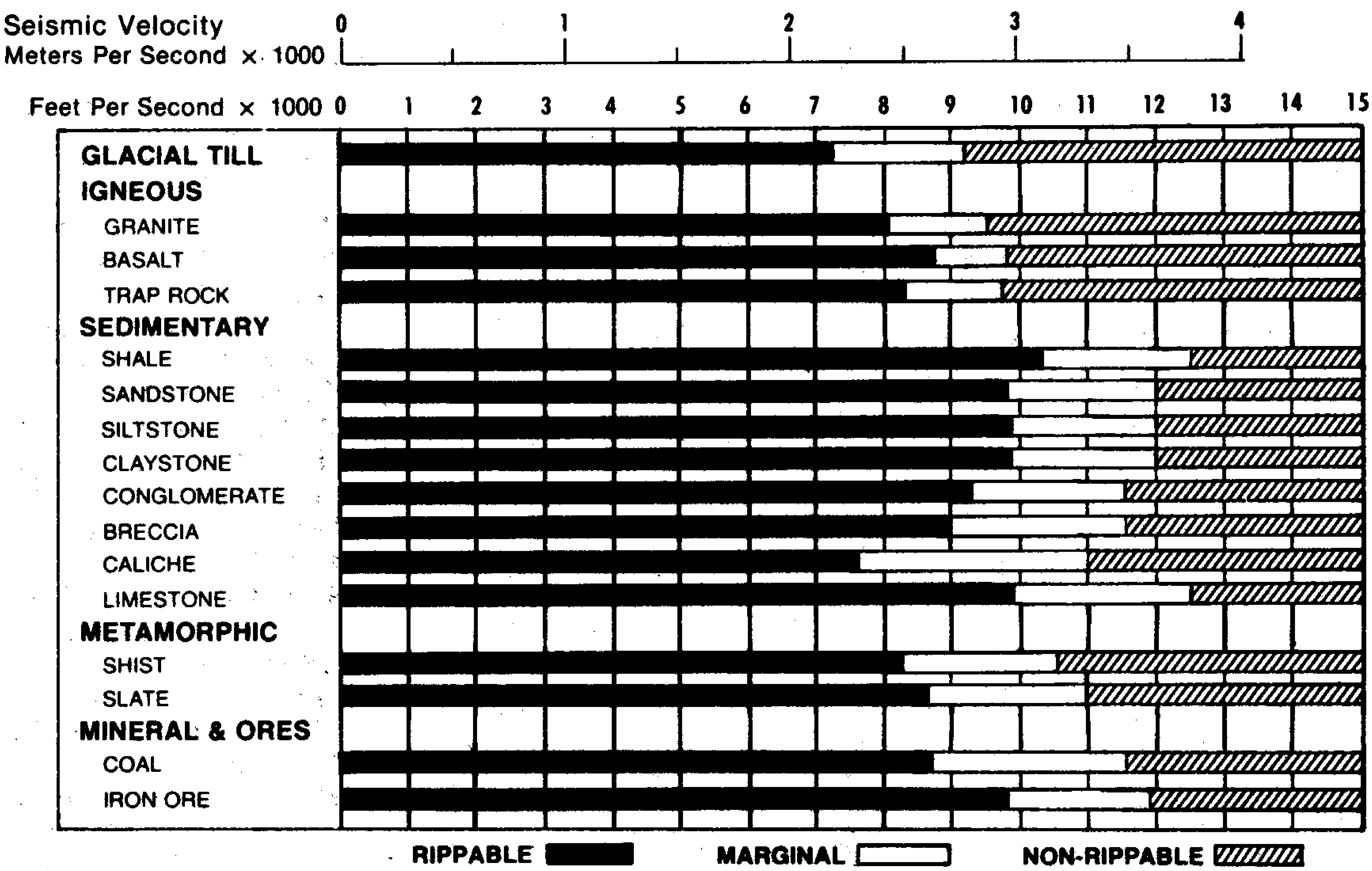
D9N Ripper Performance
- Multi or Single Shank No. 9 Ripper
- Estimated by Seismic Wave Velocities



D10N Ripper Performance
- Multi or Single Shank No. 10 Ripper
- Estimated by Seismic Wave Velocities

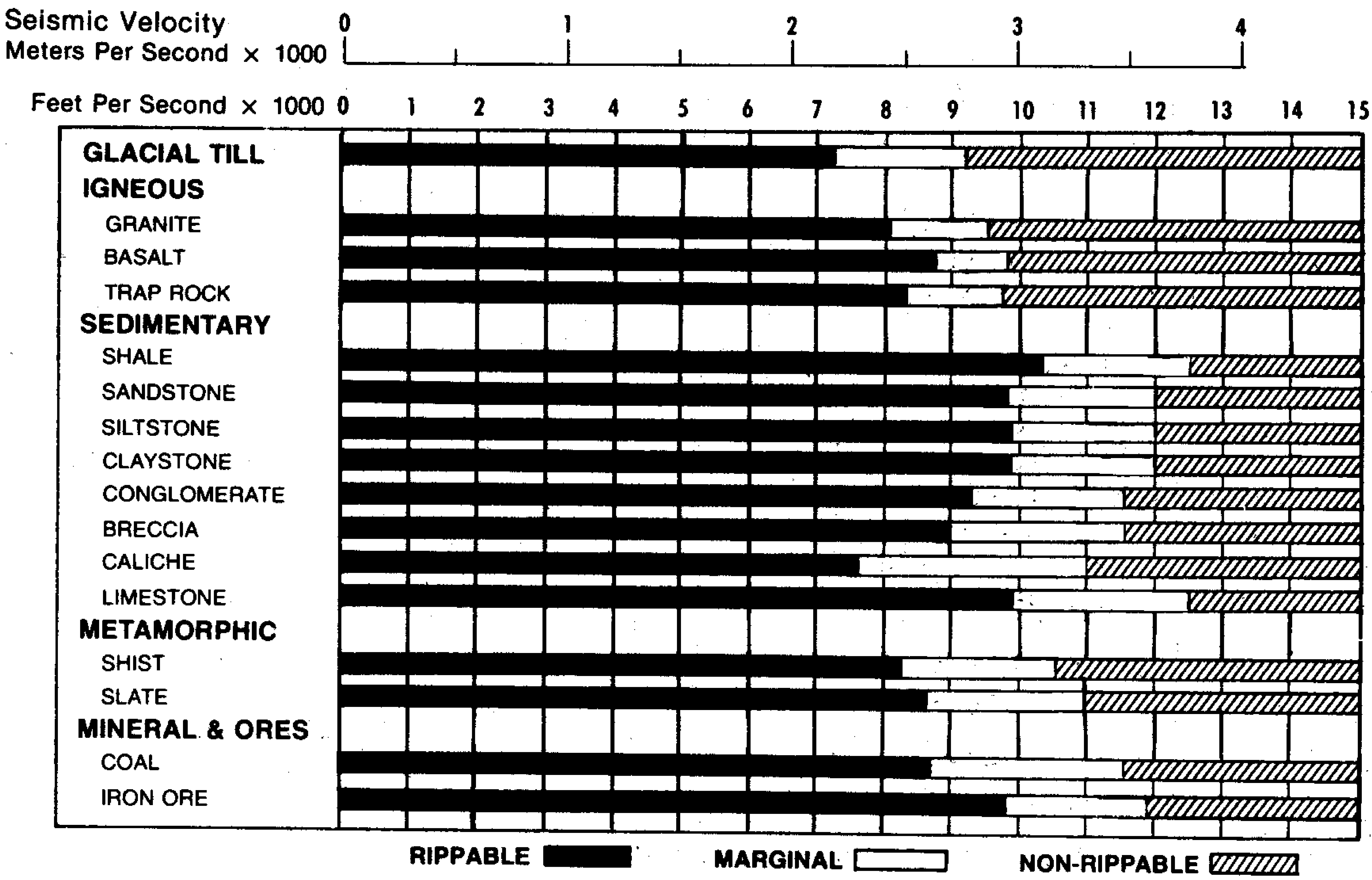


D10N Impact Ripper Performance
- Single Shank Impact Ripper
- Estimated by Seismic Wave Velocities



D11N Ripper Performance

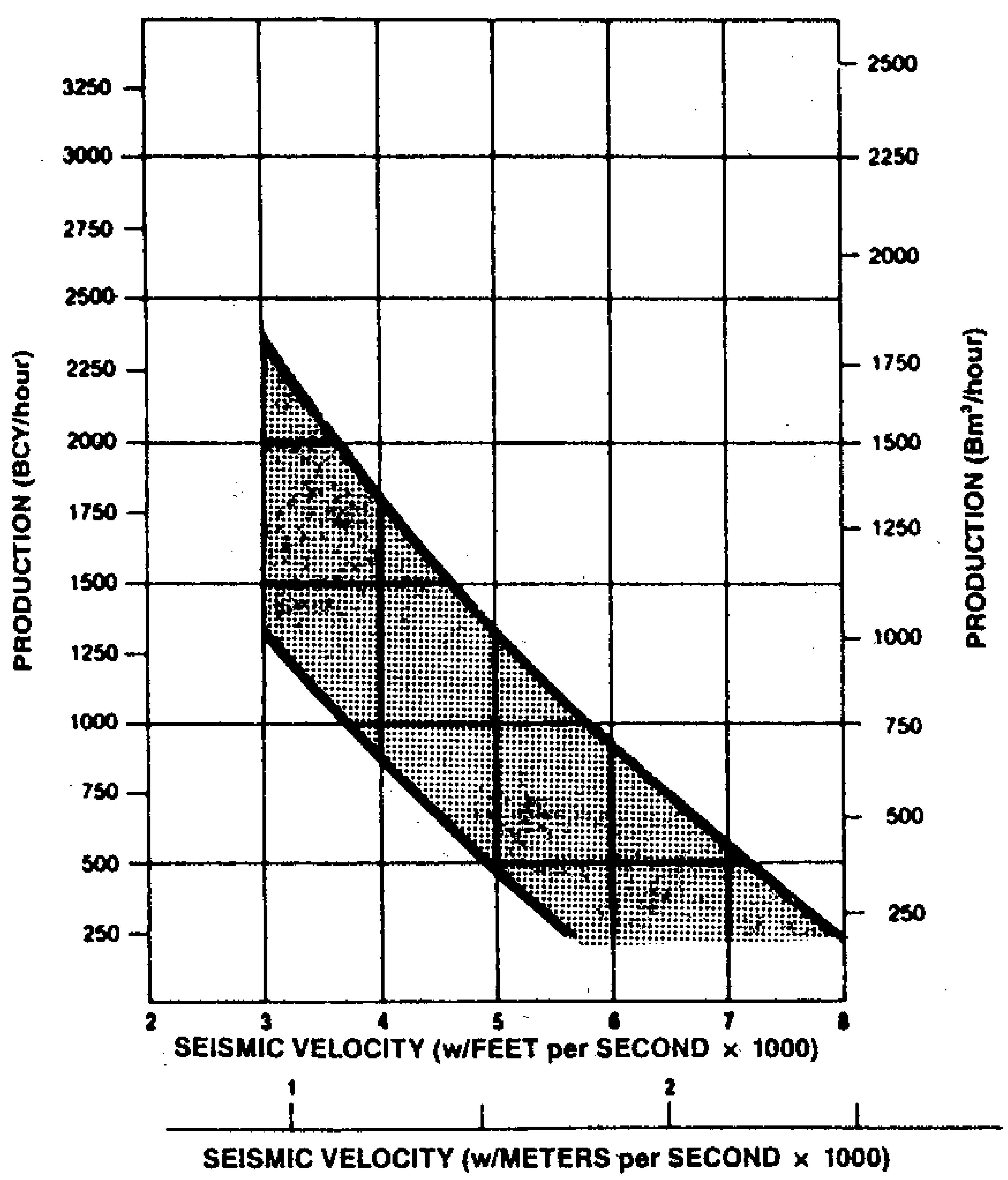
- Multi or Single Shank No. 11 Ripper
- Estimated by Seismic Wave Velocities



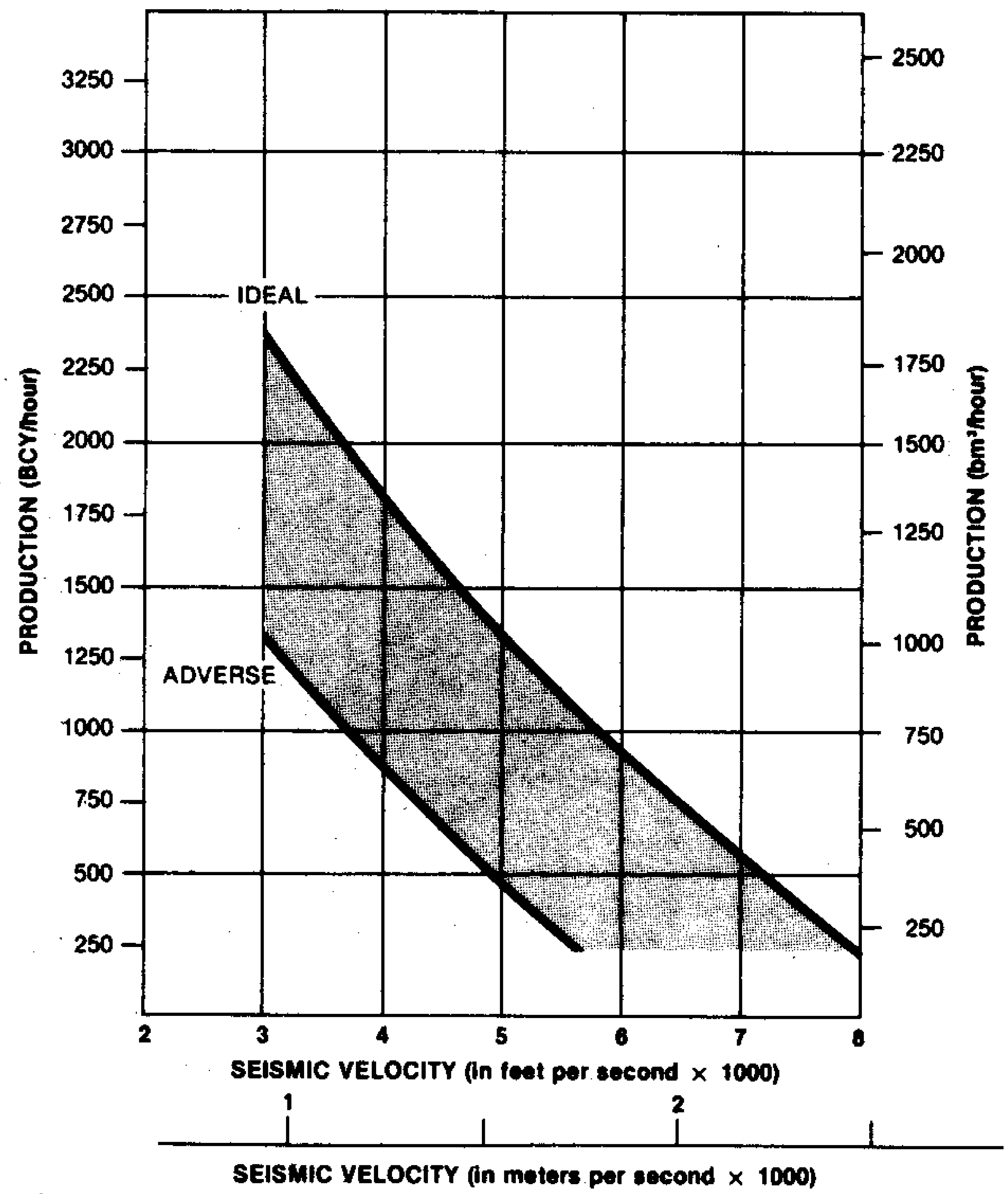
CONSIDERATIONS FOR USING PRODUCTION ESTIMATED GRAPHS:

- Machine rips full-time — no dozing.
- Power shift tractors with single shank rippers.
- 100% efficiency (60 min hour).
- Charts are for all classes of material.
- In igneous rock with seismic velocity of 8000 fps or higher for the D11N, and 6000 fps or higher for the D10N and D9N, the production figures shown should be reduced by 25%.
- Upper limit of charts reflect ripping under ideal conditions only. If conditions such as thick lamination, vertical lamination or any factor which would adversely affect production are present, the lower limit should be used.

D8L WITH SINGLE SHANK

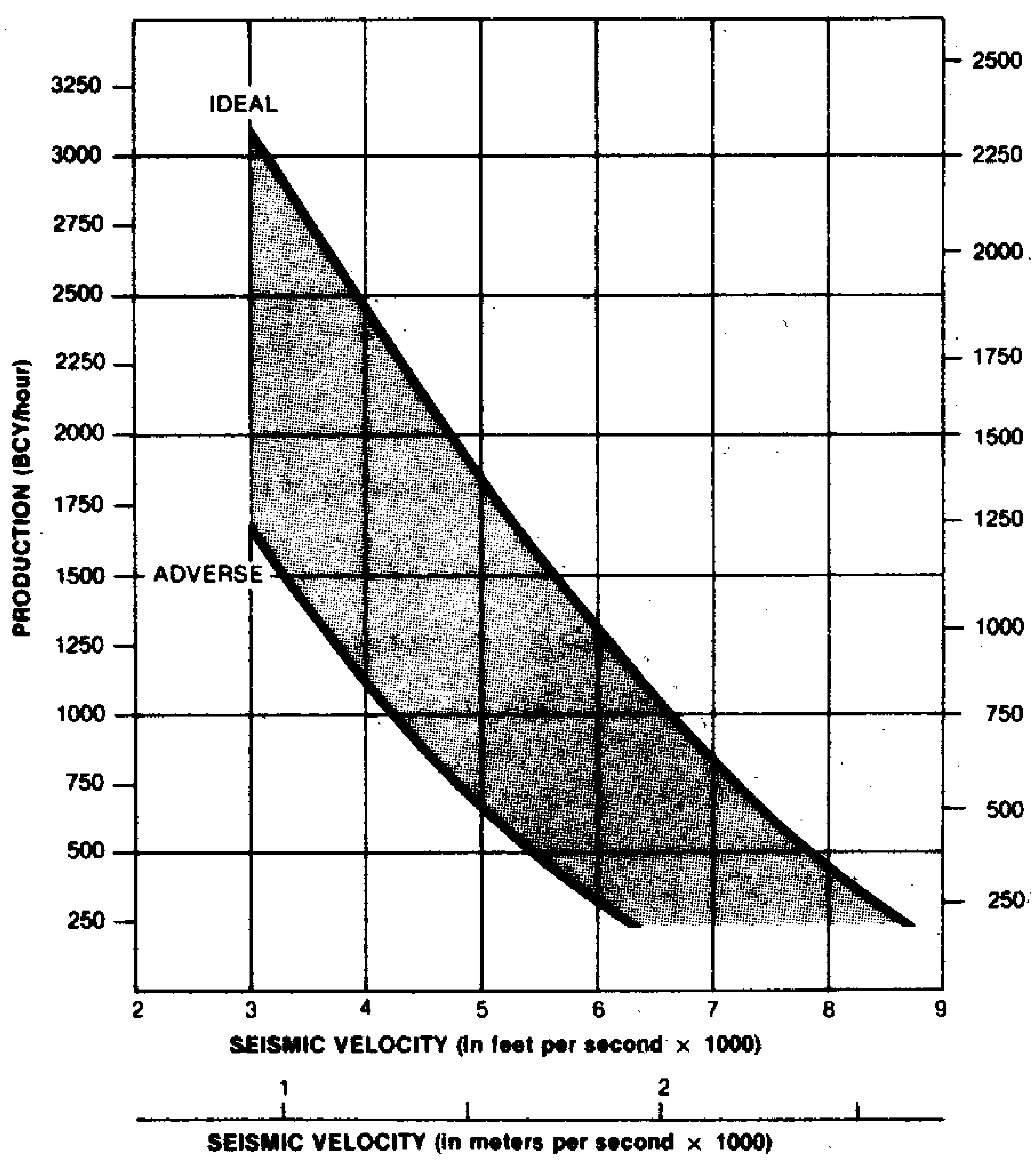


D9N WITH SINGLE SHANK

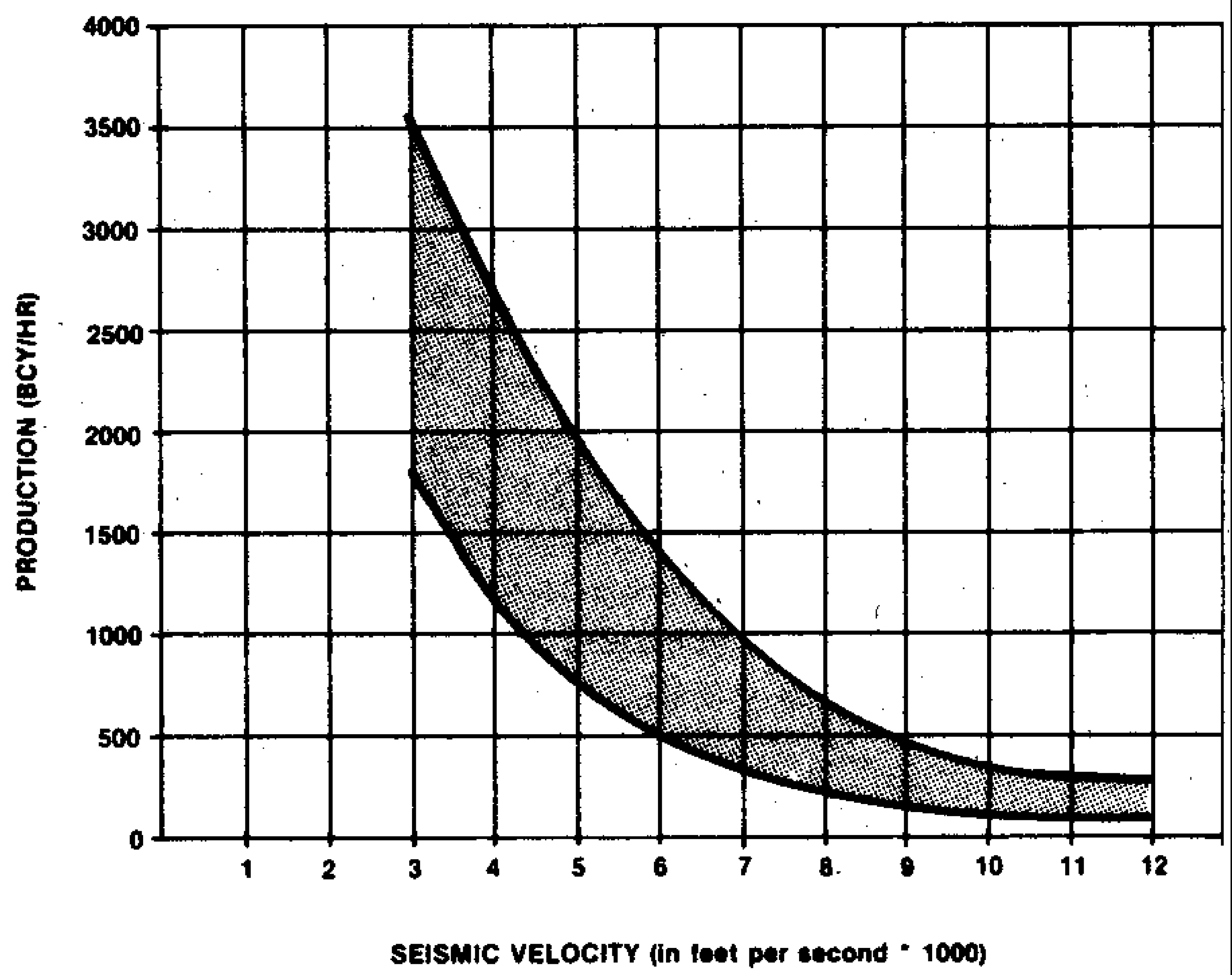


NOTE: Top line — Ideal conditions
Bottom line — Adverse conditions

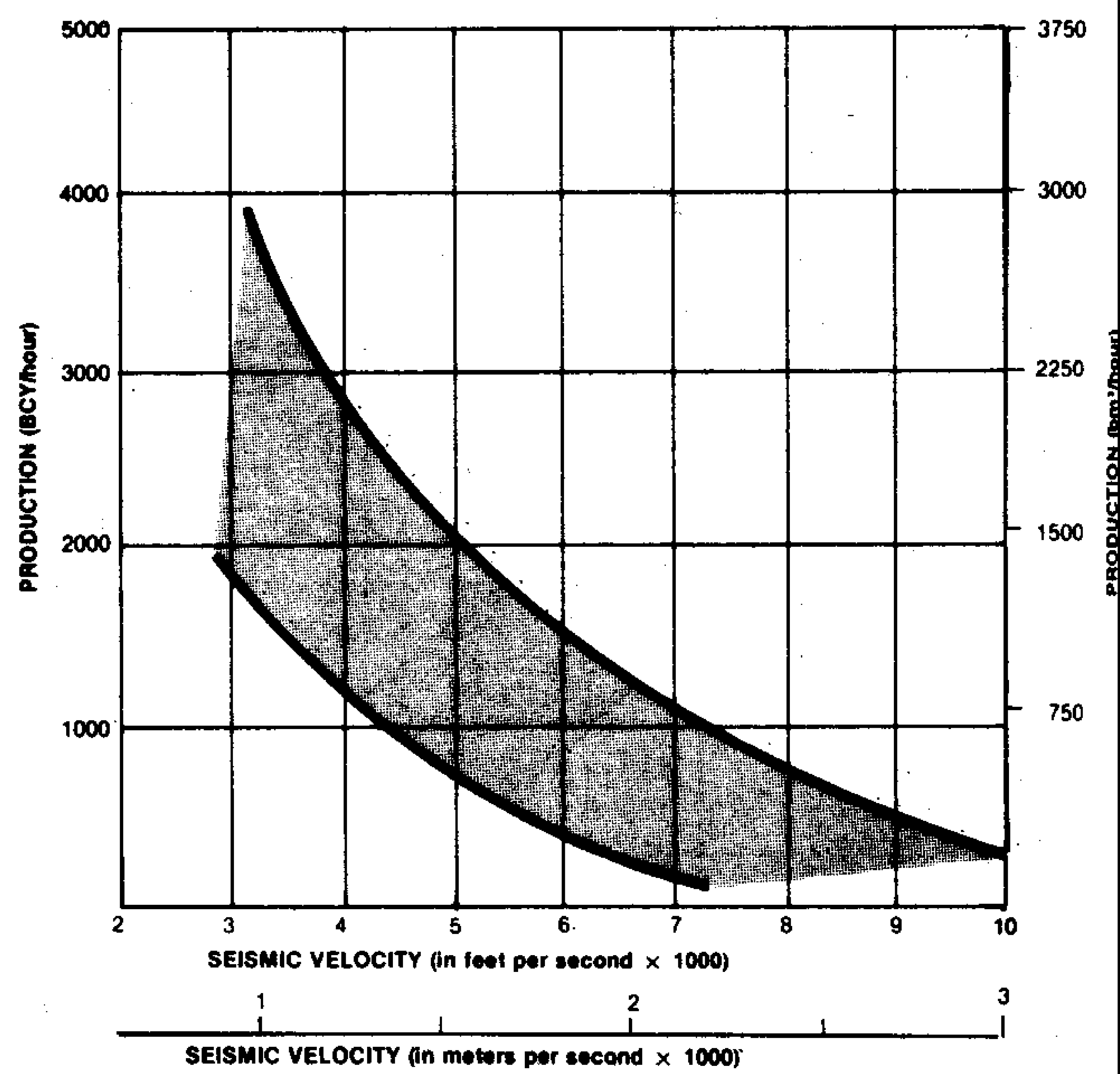
D10N WITH SINGLE SHANK



D10N WITH IMPACT RIPPER



D11N WITH SINGLE SHANK



Note: Top line — Ideal conditions
Bottom line — Adverse conditions