Introduction

Mining is a necessary requirement of our civilization, and as the population and standard-of-living increase, the demand for non-renewable resources will also increase. Mining by private companies is also completely controlled by a simple financial criterion: the total cost to extract a commodity must be less than the revenue received for that commodity. “Total cost” can be calculated in a number of ways, but normally also includes the capital, start-up, working and closure costs. Revenue is typically based on the market price expected for that commodity, after extraction and during the lifetime of the project.

At the moment, the mining industry world-wide has moved from a period of low-demand and low-revenue into a cycle of increased demand, increased competition for scarce resources, and higher commodity prices. Declining commodity prices in the 1990s resulted in a lack of exploration and development, which combined with the industrial growth of China and India has led to rapidly increased build-up of mining activity. As revenues increase it then becomes possible to exploit previously uneconomic resources. Lead is a good example – long neglected in terms of exploration, there are currently no surplus lead stocks held in the US, and world-wide shortages are creating a demand for increased exploration and mining. In addition, there is currently a world-wide shortage in refinery and smelter capacity, further increasing commodity prices. Typically, a “boom-to-bust” commodity cycle will last around seven years; indications are that the current boom may continue considerably longer.

The worldwide mineral exploration budget for 2006 was USD7 billion, distributed as follows (Metals Economics Group, 2006):-

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1 This note was prepared as an informal summary of the author’s personal views.

2 “Mining” in this case refers to the extraction of non-renewable resources, including precious metals, base metals, industrial minerals, fossil fuels, etc. Petroleum is not specifically addressed.
Pacific/SE Asia: 4%
Latin America: 24%
Canada: 19%
Africa: 16%
Australia: 11%
United States: 8%
Rest of World: 18%

Of the 2006 exploration total, 18% was associated with existing operations, 39% with grassroots exploration, and 43% with late stage exploration. Current exploration activities are becoming more and more mature, with the majority of projects now reaching the pre-feasibility stage. A large number of projects are therefore set to become operating mines in the immediate future.

It is widely acknowledged within the mining and petroleum industries that there is limited potential for the discovery of new large-scale “world-class” high-grade deposits. Therefore the industry is moving towards the discovery and exploitation of marginal resources. “Marginal” resources include the following categories:

- High-grade small-scale deposits;
- Low-grade large-scale deposits;
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- Technically complex deposits;
- High risk operations.

High-grade small-scale deposits generally have a short lifetime, but may have high start-up costs. A priority target within the industry, there is increased financial pressure worldwide to locate and exploit this category of resource as quickly as possible, at minimal cost.
Low-grade large-scale deposits, are normally exploitable only by major companies and generally require extensive capital investment in order to exploit economies-of-scale.

Low grade small-scale deposits are typically exploited by smaller mining companies or artisanal (informal) miners. In order to remain profitable, exploitation of these deposits requires that costs be reduced to an absolute minimum – including associated environmental protection, mitigation and closure costs.

Technically complex deposits include those resources that require a higher investment in technology. Examples include marginal petroleum fields that can be exploited through the use of more invasive technology, or improved metallurgical technology that provides for a more efficient recovery of the commodity from the host rock, at a higher cost. Technically complex resources also includes those deposits that generate a higher environmental impact during exploitation; i.e. sulphide deposits with a high acid content, requiring the design, operation and maintenance of long-term tailings retention facilities.

High risk operations include those that were previously considered uneconomic due to remote location, political instability or lack of infrastructure. High commodity prices have to a large degree reduced the overall risk to the point where exploration and mining are no longer limited by these considerations.

Higher commodity prices and increased demand will therefore be offset by the need to exploit marginal resources. It can also be expected that there will be a concomitant trend in the mining industry towards minimizing associated costs and long-term social and environmental investments.

**Implications for policy, planning and decision-making**

The demand for mining products will continue to increase for the foreseeable future. High commodity demand will promote shorter commissioning times, implying that less time will be available for baseline ecological surveys and the assessment of the environmental and social impacts of mining projects. Financial and social pressures may
also encourage quick startups and reduced government oversight in order to maximize the short-term and medium-term economic benefits of mining activity.

**Implications for environmental impacts**

There is a reasonably good understanding of the nature, scope and significance of the environmental impacts of mining with the current technologies in general use. A large body of knowledge exists on assessment, mitigation, restoration, good practices etc. With the increased exploitation of marginal deposits however, one can expect new, alternate or previously uneconomic technologies to be applied more widely. These could have more severe impacts (i.e. more invasive, less amenable to restoration), more intractable waste products (i.e. increased use of cyanide leaching), or place a higher demand on limited resources (i.e. water). Because little information is currently available on the long-term impact of the newer technologies, there is little best-practice guidance available for their use.

**Areas for potential technical and scientific support for the wetlands sector**

The wetlands sector should continue to disseminate best practice guidance and share knowledge and capacity regarding current mining activities. At the same time, the wetlands sector should be anticipating new demands and pressures on wetlands due to increasing market demands, shorter timelines, the exploitation of previously marginal deposits, and the introduction of new or different technologies in the mining industry.

Two areas for possible attention in this regard are:

1. The timeous identification and assessment of likely mining regions in relation to specific wetlands and/or water resources, in order to prioritize the collection of baseline environmental information (such as wetland inventories) prior to the commencement of actual mining activities. This will better inform decision-making during the license application processes.
Currently many operations are fast-tracking economic studies to the point that site-construction may begin prior to the completion of a full environmental assessment. Where previously a large-scale operation might take several years from initial discovery to the start of actual production, in many places this timeline has been reduced to as little as eighteen months. Information on past, current and future exploration and mining activities carried out by public companies around the world is readily available (though not always free) within the professional mining sector. This could be used to identify and rank the likelihood of new mining activities (in various mining categories) in any area, such as a river basin.

2. Strategic assessment of newer mining technologies and likely emerging technologies, to identify potential environmental impacts and mitigation options associated with these technologies.

As commodity prices continue to rise, newer technologies will be utilized to extract previously marginal resources. Given the accelerated timeline discussed above, there will be limited time for site-specific assessments of the impacts of the newer technologies in any particular mining project. Strategic environmental assessments of newer technologies prior to their implementation would provide a knowledge base to improve the abilities of environmental regulators to assess the longer term impacts of a mining operation that utilizes these newer technologies.

Summary
The overall trend in the immediate future will therefore be to locate and exploit previously marginal or uneconomic resources, while keeping costs at a minimum in order to maximize the profit of the operation – and all within a much more compressed timescale. This will hold true regardless of whether the operator is a major international mining conglomerate, a local operator or a single artisanal miner.

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25 June 2007