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INCO LIMITED
ONE HUNDRED YEARS OF OPERATION - WHERE DO WE GO FROM HERE?

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ABSTRACT

Inco is celebrating a 100 years of operations. One of the environmental areas we have worked hard at is reclamation and rehabilitation. For example in 1916 Inco's predecessor company, Canadian Copper Company, established its Agricultural Department as a first attempt of reclaiming mining and roasting areas. In keeping with societal changes reclamation concepts, designs, objectives and expectations have changed with each passing decade. This paper highlights some of these milestones.

This paper provides a brief review of how the mining industry and, in particular, Inco has managed the evolutionary changes in mine rehabilitation. The paper describes how reclamation planning has become an integrated feature of a Project's economic feasibility study, how progressive reclamation has been incorporated at mining operations and how mine closure techniques are employed and advanced globally. This paper touches on some of the current issues facing a company's reclamation effort. Rationalizing a mine closure in the context of sustainable development is just one of a series of challenges currently being addressed by the mining community. A perspective is provided on other topics such as assessing closure finality i.e. is there ever a truly walk away situation; addressing future technological advances in the wake of current operating practices, and securing financial assurance. The importance of risk management is also discussed. Finally the paper speculates on how reclamation affect constituents can help chart a path forward as Inco enters its second century.

INTRODUCTION

Inco is celebrating its hundredth birthday. Much has changed since we sunk our first shaft and refined our first pound that is kilogram of nickel!

Reclamation and decommissioning was not a primary consideration for our first generation employees. The rehabilitation of active mine sites coincided with a number of environmental issues that was brought to the forefront some 30 years ago. Since the environmental revolution in the 1970s there has been focus on the environmental effects of mining including the reclamation of mine properties.

Mining is truly a temporary use of the land, since mine reserves at some point, although it is hard to say when, are depleted. The rehabilitation of mine properties is particularly important because the negative

effects resulting from operating, dormant or abandoned mine properties can create undesirable environmental effects and an adverse public view of mining. Public objections to mining activity often translate into increased regulatory burden and resistance to allowing new mining projects to proceed.

However, most companies recognize the importance of undertaking reclamation and rehabilitation activities and take pride in their reclamation work. The field of reclamation is a multi-stakeholder endeavour. The "mining reclamation network" includes researchers, government officials, consultants, other reclamation specialists, the aboriginal community and local residents. The fact that this conference is in its 26th year is evidence of the importance of this collaboration and how far we have progressed in our understanding of the topic.

THE EARLY YEARS

During our 100 years of operation, we have witnessed an evolutionary to revolutionary change in rehabilitation efforts. In 1916, Inco's predecessor company, the Canadian Copper Company established an agricultural department to reclaim mine and roasting areas and address landowner complaints. Within the next two decades the focus was to control dust from the ever-expanding tailings area. Dust measures such as fencing, straw mats and wind barriers provided a temporary solution to a long-term problem. Other activities including the creation of parks at the mine's town-sites and landscaping of property near the office buildings was undertaken annually. The aim of this initial work was to make the disturbed areas aesthetically pleasing and to provide a top dressing for the tailings surface. The most obvious choice of a tailings surface amendment is vegetation. Therefore, it is not surprising that Inco's first reclamation specialists were trained agriculturists.

By the end of the Second World War, there was a nursery built at the Sudbury operation. During the 1950s, efforts were taken to stabilize waste rock piles and slag storage areas, however, the primary focus was still to control tailings dust. After a series of tailings test plot studies in the 1950s Inco reclamation staff in the 1960s were able to take a sun baked nutrient-sterile tailings surface and grow cash crops of rye and hay. The recipe of neutralizing, fertilizing and planting crops became a successful means of transforming the tailings surface. The first step is the application of agricultural lime at 40 to 601/ha, then approximately 600 to 700 kg/ha of 6-12-24 fertilizer is applied and finally approximately 50 kg/ha of seed mixture is sown into the tailings surface. By the late 1960s approximately 10,000 bales of hay were obtained from the Inco tailings impoundment area. This hay was used primarily for dust control. By the

late 1970s native trees were beginning to invade the fields, therefore the growing of crops was replaced with the vision of creating on the tailings a wildlife management area. Evergreen test plots were established and now a significant portion of the 3,000 ha tailings area is typical of a northern Ontario transition forest. Reclamation efforts have taken us down to the 1,500 m level at Creighton Mine where over 50,000 seedlings are produced each year to supplement the 200,000 seedlings grown in the nursery. Inco has continued to investigate the application of other surface amendments to the tailings. Inco has been working with other regional industries to find synergies in the recycle and re-use of by-products. Today, the use of pulp and paper industry residues as a nutrient cover is being investigated.

In the early 1980s vegetation covers on tailings became the norm, however another environmental issue was identified that pre-occupies us to this day. The mining and milling of sulphidic bearing ores and associated deposition of waste rock and tailings can potentially cause the release of acid mine drainage. Through the cooperative approaches with government agencies, local constituents, researchers, consultants and the mining industry strategies to address the long-term consequences of acid drainage are being developed, implemented and currently verified. Throughout the years, acid rock drainage has gained prominence and has dominated the environmental and mine reclamation agenda to this day. The current focus of reclamation research for the Inco - Canadian operations is to control sulphidic oxidation. This research extends to the prevention of acid rock drainage processes. One project includes studying the feasibility of mixing tailings, waste rock and slag to form a surficial cap oxygen barrier.

Although this description has focused on the history of the reclamation efforts in Canada, at this conference, you will hear of our reclamation and rehabilitation efforts in New Caledonia as we continue to investigate and research the application of indigenous plants species for reclamation and the re-vegetation efforts at our mining works at Indonesia.

RECLAMATION PLANNING

Today, reclamation no longer is an afterthought once the decision is made to curtail mining operations. Reclamation considerations are now part of the exploration play. The purpose of collecting some of the environmental baseline data during the early stages of the environmental assessment process is to address reclamation issues. For example, the preferred site for waste rock storage areas and tailings facilities is predicated on the ease of reclamation and rehabilitation.

Reclamation is integrated in all phases of the mining project. For example, during the near term construction phase for the Goro Project, soils are being separated for later use in site remediation, and a chipper is used to ensure that non merchantable wood can play a role in the rehabilitation of disturbed areas. For the longer term, collaborative studies with the local university are underway to study the growth of indigenous species at the Goro nursery.

Inco, as with most other companies, require a preliminary closure plan included in the bankable feasibility study. Reclamation costs are included in the financial analysis for the Project and therefore are part of the decision-making process as to whether the Project should proceed. Inco has a corporate decommissioning guideline that is applied to all new and expansion projects.

Progressive reclamation is a key feature of our operations. Typically the Ontario operations spends approximately $15 to $20 million per year on progressive reclamation projects

MINE RECLAMATION AND SUSTAINABLE DEVELOPMENT

The sustainability of mining hinges on the sustainability of metal and mineral use. To some, the mining industry should be excluded from the sustainable development mantra because, ultimately, each ore body is finite and subject to depletion. While it is true that an orebody becomes depleted, metals and mineral use continues whether the metal is mined, re-used or recycled. For every mine property, there are a number of economic benefits: tie these economic benefits with prudent environmental management, addressing social considerations and adhering to good governance and the metals industry is as sustainable as most other human endeavours. Mine development can contribute to the quality of life of today's citizens and future generations. Government policy has an important influence on the economic sustainability of mineral resources. The economic rent accrued from developing mineral resources is large. For example, over the past 100 years Inco at the Manitoba and Ontario operations have employed over 100 000 workers, paid out billions of dollars in wages and spent over a billion dollars in taxes. Even today in Sudbury, Inco spends annually over a billion dollars in wages, contract services, goods and services, materials, supplies and taxes.

Resource revenue collected by government can be re-invested in long lasting infrastructure. In areas where government services are not universal mining companies have played a major role. For example, the community hospital, the Company, public schools and other services are sponsored by PT Inco. With

wise management and appropriate public policies, natural capital in the form of mineral deposits can be converted to long lasting forms of capital for the benefit of future generations. It is for this reason that many governments in the undeveloped countries and some non-government organizations are beginning to view mining a one tool that can be used to alleviate world poverty. During mining, the physical resource capital has been transformed to other useful forms of capital such as products, an educated work force, and public and private infrastructure. In this manner, mining has contributed to sustainability.

COMMUNITIES AND MINE CLOSURE

A mining company can be the raison d'être for a community, and therefore mine closure can be more dramatic for a single resource *(mining)* community. For communities primarily dependent on the mining operation, mine closure could lead to a significant shift in the social structure and economic profile of the community. Consequently closure and reclamation planning with community involvement is a pre-requisite for a successful transition. Mine infrastructure may have other uses once the mine ceases production. During the mine operation, the skill levels, education and employability of local people will be greater than when the project started. This is not to suggest that mine closure is easy to manage or without some significant drawbacks. For example, local authorities responsible for social services and infrastructure may find difficulty in managing their responsibilities after mine closure.

With prudent planning and the co-operation of all interested parties mine closure may eventually lead to the successful transition of a mining community to a post-mining economy. The success of the transition depends on many factors including the opportunity to build on the other features of the region and the willingness of governments to participate in the process.

FINANCIAL ASSURANCE

There are three principal issues relating to financial assurance. The first is the preparation of a reclamation plan based on project phase, generic guidelines and specific site requirements. The second is predicting as accurately as possible, the anticipated closure costs. The third is determining the amount and type of financial assurance necessary to address reclamation liability.

The reclamation plan is drafted and modified as the project develops. Reclamation and closure costs also change as more information becomes available. Hazards are identified and risk assessments are

undertaken to evaluate ideal remediation options. An ever-increasing number of jurisdictions require financial assurance for mining projects. The obligation of financial security requires a balance of ensuring financially protection if there is unforeseen closure and yet not to require companies to incur a needless expense with limited value.

Government authorities, mining companies and environmental associations are not the only ones interested in assuring a company has sufficient funds to carry out its reclamation and decommissioning liabilities. Assessing the cost of reclamation liability has captured the interest of the accounting community. A new United States accounting standard for environmental liabilities (FAS 133, *Accounting for Asset Retirement Obligations*) will be instituted during the first quarter of 2003, and will apply to the 2002 reporting year. Under FAS 133, closure and decommissioning costs will be recognized when incurred and recorded as a liability at fair value. This value will be capitalized as part of the assets' caring value and depreciated over the assets' useful life. The difference between the undiscounted value and the present value will be accredited to earnings over time. What this means is companies listed on United States stock exchanges will make this accounting change on their consolidated financial statements. A similar provision will be applied to the Canadian accounting practices for the 2003 reporting year. This new reporting requirement may provide some flexibility of financial security arrangements required for many jurisdictions since the company's reclamation risk will be itemized, reported and included on the balance sheet.

More and more mining companies are required to provide external financial assurance for their rehabilitation liabilities. The amount and type of security arrangements depends on the jurisdiction. Some argue that 100% of the predicted cost estimate for the anticipated project life is necessary and should be provided for by the company. When a company obtains any type of financial security, the amount influences the company's value and could affect the company's credit rating and ability to borrow additional money, say for a project modification or upgrade.

Financial assurance is desirable if there is a high probability of occurrence that a company would default on its reclamation obligations. Otherwise, these types of requirements for bonding mechanism may unnecessarily penalize the financial health of the company. Each year companies are required to fulfill regulatory obligations and provide some sort of form of financial assurance. For example, for the Ontario operation, Inco pays over $150,000 per year to maintain the premium for external financial assurance. The likelihood of the government, in the short term, to call in the financial security for some companies is

extremely low. In this circumstance, this financial burden could be used to address other, immediate reclamation issues. With more stringent reporting requirements as described above there may be opportunities to re-consider the need for full cost reclamation assurance and utilize existing funds in a more prudent fashion.

ABANDONED MINES

Mine closures of yesterday have not been reclaimed to the standards expected today. Indeed many of these properties were left idle. Part of the reason why these properties were left in a non-reclaimed state is because of the operating practices and expectations of the day. Historically governments, mining companies, investors as well as local communities encourage companies to retain infrastructure once mining had ceased. The premise was that a mine is never exhausted; it is just waiting for the right economic conditions to be revived. This means many sites that should have been properly decommissioned and reclaimed were left in standby mode. Consequently, if the owners relinquished land title or sold their mining leases to other companies; these governments and purchasers inherited properties with little or no reclamation work undertaken and escalating reclamation liability.

There has been the suggestion that current operating companies should pool their limited resources and assume accountability for the abandoned mine sites. While mining companies have joined collaborative efforts such the National Multi-stakeholder Advisory Committee for Orphaned and Abandoned Mines, with the Mining Association of Canada, the Prospector and Developers Association of Canada, Federal and Provincial governments, First Nations and the Canadian Environmental Network, most believe that the risk of orphaned mines should be shared amongst other stakeholders.

Not all abandoned mine properties are orphaned properties. In the portfolio of most major mining companies there are likely a number of properties that have not benefited from reclamation. These properties, residual of another area, may have been mined for a period of time and left dormant in the hopes of a miraculous metal upturn that will reactivate the site. Sometimes with consolidation of companies, one partner may have obtained a few more properties that were periphery to the deal, but emerged as a reclamation challenge. Also exploration departments, in the hopes of finding a second major find at a past operation obtained properties without consideration of their potential environmental liabilities. How many of us have reclaimed mine sites that our company never operated but yet these properties become an integral and expensive part of our reclamation portfolio? The Inco - Ontario

operations have a variety of dormant facilities: some 44 in all. Our first priority is to ensure the safety of the community and therefore all of the properties have been properly secured. Our reclamation effort is ongoing. For the past decade we have reclaimed over half of these properties and with the plan to continue reclaiming the rest.

WHAT IS IN STORE FOR THE NEXT 100 YEARS?

Currently, Inco is developing two new mining projects: one in Newfoundland and Labrador and the other in New Caledonia. Other presenters at this conference from Inco will describe how reclamation activity is prevalent at new developments as well as at our existing operations. Reclamation, rehabilitation has emerged as its own discipline, gleaning information from a variety of fields including agriculture, forestry, civil and geotechnical engineering, the social sciences, biology and even accounting. Encouraged by the exchange of ideas, reclamation is truly a multi-disciplinarily field that brings together the bio-physical and social sciences. As we continue to explore for new mines; we continue to explore for new reclamation measures that are cost effective and ecological resilient and integrated into the regional landscape.

For example currently we are investigating the field of phytomining. Phytomining, the use of metal specific hyper-accumulative plants will provide a vegetation cover as well as removing nickel from the soil. As metal such as nickel accumulate in the plant species it is possible that the ash from the plants could be processed, providing an economic opportunity for local residents and removing metals from the surficial soils.

Since we started mining one hundred years ago, times have certainly changed: society has advanced at a phenomenal pace. Mining practices have also changed, now miners are equipped with the knowledge of how to fix a remote controlled computer, as well as how to fix a jack leg. Our products are found in stainless steel, in homes, in hospitals and in the new generation of battery-driven automobiles.

But what really has changed is our desire to do things right. We all are aware of our past mining ills, we have the present to undertake action and to plan for our future.

Dr. T. Peters, Agriculturist for the Ontario Division and credited for advancing the field of mine reclamation stated in 1978 at the eightieth annual general meeting of the Canadian Institute of Mining and Metallurgy.

" *While standard landscaping methods have been the basic procedures in grounds improvements around buildings, the field of reclamation and revegetation of distressed areas and problem soils, attributable to the impact of mining and smelting practices, has been a variable and fascinating, but often a puzzling, task."*

Our challenge for our second century of operating is to continue our work in solving the puzzle.