# STABILIZATION OF STRESSED LANDS IN THE SUDBURY BASIN BY INCO LIMITED*

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It is my pleasure to speak to you today on the experiences of Inco Limited in the field of reclamation.

I will begin by briefly describing the operations of the company and some of the area's history. Inco Limited is the free world's largest producer of nickel and a major producer of copper and platinum group metals. We also produce significant quantities of silver, gold and selenium. The company's mines and major processing facilities are located in Ontario and Manitoba, Canada, Indonesia, the United States and in the United Kingdom. The Onatario division operations include 9 operating mines, 3 mills and a smelter, a copper refinery and a combined nickel refinery and sulphuric acid plant in Sudbury; a mine and mill at Shebandowan which is presently on standby and a nickel and cobalt refinery at Port Colborne.

1987 marks the 101'st year of Inco mining operations in the Sudbury area. Over these many years our technology has been in a state of constant change as we strive to address environmental concerns and improve production and processes to survive in a competitive world market.

In the early 1900's the two mainstays of Sudbury were lumbering and mining. As in many resource sectors of the economy, the clear cutting of the timber and the extraction and smelting of ore left an environmentally stressed landscape in the Sudbury area.

It is documented as early as 1915 that Inco personnel had become concerned with the effects of sulphur dioxide on the vegetation being produced by local farmers. In 1916 the agricultural department of Inco was formed to address these environmental concerns.

As time progressed, new improved mining, smelting and refinery methods were developed and the large smelting complex in Sudbury became a reality. The use of large smoke stacks to disperse exhaust gases were introduces and the damaging effects of smelter smoke were decreased.

*Presented at the 12th annual meeting of the Canadian Land Reclamation Association, Sudbury, Ontario on June 7 to 11 1987

Reclamation and revegetation of stressed areas and problem soils attributed to the impact of mining, milling and smelting practices has been a wide, varied and often puzzling task.

I would like to share with you today an overview of the projects we are presently working on.

SLIDE PRESENTATION COVERING

1) Tailings - dust control - revegetation
   wildlife and tree management
   equipment and methods

2) Garson sand flux and pit reclamation

3) Coniston slag reclamation

4) Levack tailings and seepage water research reclamation

5) Stressed land reclamation

After the mining stage the ore is shipped by rail cars to the mills for processing. It is at this stage that the ore is ground to a fine grain and the first step of metals recovery takes place. Through a flotation process the minerals are separated and concentrated and shipped to the smelter for further processing. The waste rock is separated at the milling stage and accounts for 97 to 98% of the ore shipped to the mills. This becomes the waste product tailings. The Copper Cliff tailings site encompasses an area of 5 500 acres and an average of 35 000 tons of tailings are being dumped per day. As a result of the large volume of sand-like material, severe dust storms may be experienced. We spray chemical sealants for approximately 7 months of the year in an attempt to minimize the chances of creating fugitive dust. We use hydroseeding equipment and other specialized equipment with boom type sprayers. In the early 70's we experimented with aerial spraying but due to the high costs it proved unfeasible. Another method we used for temporary dust control is the application of straw and crimping it into the tailings. This method reduces the effects of wind, stabilized the surfaces and the addition of the organic materials enhances our efforts when final reclamation and seeding is allowed.

Before proceeding with our ultimate dust control cover through grassing we move to our greenhouse where initial tests are carried out to see what liming and fertilizing rates are going to provide us with the most practical and economical methods for successful reclamation.

We then move into the field situation and using our agricultural equipment apply the materials and cultivation practices necessary. At present we use 25 to 30 tons of agricultural limestone, 600 lbs. of 6-24-24 fertilizer, 100 lbs. of grass seed and 80 lbs. of fall rye as a nursery crop per acre. After initial germination we then apply approximately 80 lbs. of slow release nitrogen to ensure good vigor and continued growth. Additional applications of fertilizer are applied when necessary.

The introduction of birdsfoot trefoil is carried out at a later date using a powertill seeder We try to avoid monoculture plantings in case of insect infestation destroying the whole crop.

In 1981 a large project commenced when the final grading of dams and establishment of grass on the P containmnent area began. Due to the severe slopes encountered and the already evident surface water erosion problems, we decided to clay the outer slopes to ensure encapsulation and immediate success. When feasible, we used our standard agricultural equipment but found in many areas that hydroseeding was the only safe and practical way of seeding. The project covered a four year period and has enjoyed lasting success. The one drawback of hauling materials and covering tailings is the cost. At $6 000 per acre capital disappears very quickly.

In 1976 a five year experiment on water fowl was developed. 30 ducks were brought in from Southern Ontario. The birds were pinioned and fenced in to live in the pond of the reclaimed C.D. area. Blood samples were extracted from the birds in the spring and fall and analyzed by our process technology laboratory. After the five year period it was determined by Tom Peters that there were no significant elevated metal levels in these birds. It is at this time we began investigating the possiblility of introducting more water fowl to the area. In 1985 in cooperation with the Ministry of Natural Resources and the Copper Cliff Rod and Gun Club the first group of 50 giant Canada Geese Goslings was introduced to the tailings site. They were taken from the Toronto Island area where their numbers have grown to the point they are somewhat of a nuisance. The Gun Club and Ministry rounded them up before the flight feather stage and the Ministry flew them to Sudbury. They were then transported and released in the C-D area of the tailings. The same program was carried out in 1986 and will be carried out again in the third week of June this year. Giant Canadas were not common in the Sudbury area but numerous sitings in all parts of the city are now common places.

In 1978 a joint project with Laurentian University commences to study the feasibility of growing vegetables in an underground mine to explore practicability and energy efficiency using the natural geo-thermal heat generated underground. The program experienced many successes with the different vegetable crops tested.

We have now turned our energies to growing trees underground and the second crop of 35 000 were brought up in early may for planting on our tailings and other reclaimed areas.

In 1983 the department took on a project which in general goes against our principles. This was the clear cutting of 200 acres of trees to make way for the new R area for pyrotite disposal. The project was completed in the fall of 1985 and is presently an active disposal area.

Other areas of concern in our operations are the sand pit and flux pit, providing sand for mine backfill and flux sand for our smelter operation. We report to the Ministries Pits and Quarries Personnel. We have carried out an annual program in these areas and are responsible for final grading and revegetation to ensure safety for the public and avoid fugitive dust complaints. Trees are introduces at these sites when appropriate.

In the late 60's a liming program began at the company's old Coniston smelter site to alleviate pH fluctuations in spring runoff water from the now abandoned slag piles. This program has been carried out with the spreading of 100 tons of agricultural lime both spring and fall. In 1985 I observed a natural growth of small trembling aspen and attributed it to our liming program. In 1985 a test plot of 10 acres was seeded on the slag. The successful growth validated the concept and we continue to seed 15 to 25 acres per year. We hope the vegetation will help with the water runoff and allow tree establishment in the future and enhance the aesthetics of the area.

In 1984 the reclamation of the Levack mine tailings site began with our department doing initial greenhouse and in-field tests. We were also approached by the mines' personnel to come up with a close out and decommissioning plan for the site. As a result of this we became involved in a water quality assessment. The concept of close out, leaving a natural secure landscape and water runoff quality acceptable to the Ministry of the Environment's standards, without long-term treatment, has lead us in a new direction. The concept of biological polishing ponds was introduced by Margret Kalin of Goojum Research. In cooperation with the National Research Council we have jointly investigated this possiblitiy. The results to date have showed great promise and we are still pursuing this very practical method of dealing with a long-term problem of all mining companies.

The overall close out proposal is still under design but through our initial research is becoming a near future reality.

In 1981 we began our own Stressed Land Reclamation Program on company property to complement the work being carried out by the joint efforts of municipal, regional, provincial and federal governments. We

employed 25 students for the summer and manually spread lime and fertilizer on surrounding rocky-till outcrops. The program was very successful.

We have since moved on to a mechanized operation using 4 wheel all-terrain vehicles with electric spreaders mounted on the rear of the machines. We spread pelletized lime, fertilizer and seed. The equipment has allowed us to progress with the program at an accelerated rate.

In conclusion I would like to say we at Inco are dedicated to complying with all environmental legislation and continue to take all practical measure in minimizing any adverse effects that our operations might have on the environment. We are developing new technology to reach these goals and improve the environment we all share.

ISSN 0705-5927

CANADIAN LAND RECLAMATION ASSOCIATION

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Laurentian University / Université Laurentienne
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Canadian Land Reclamation Association / Association Canadienne de Réhabilitation des Sites Dégradés, 1987

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