Paper No. 12

Author(s): S.E. Yundt

Title of Paper: "A Case Study of Materials and Techniques Used in the Rehabilitation of a Pit and a Quarry in southern Ontario"

ABSTRACT

For many years Ontario residents have tolerated many ills related to the industries which provide them with their social well-being. The aggregate industry in particular provides us with our roads and our buildings. It is also an extensive land user particularly near urban areas where land is at a premium and residents are fighting to rid the landscape of unsightly conditions. The practice of extracting material from the ground and leaving the site in a subsequently derelict condition has been seriously questioned and criticized.

Many after-uses of land do exist: forestry, agriculture, recreation, nature reserves, housing and waste disposal sites. Attempts at reclaiming this land for alternate uses has been carried out by some pit and quarry operators' in Southern Ontario. Two sites will be discussed outlining practices and procedures towards rehabilitation of the extracted areas.

The first site operated by T.C.G. Materials Ltd. near Brantford, Ontario comprises nearly 400 acres with final rehabilitation plans in progress. A nearby farm is now harvesting corn on a rehabilitated 6 acre portion of the site and achieving a first year return of 65 bushels per acre. Winter wheat will be harvested from another portion later this year. Normal farming operations are expected to be achieved as the soil condition improves.

The second site operated by Nelson Crushed Stone near Burlington, Ontario consists of 500 acres of which approximately 50 acres have been rehabilitated into trout ponds and pasture land. The pond, stocked with healthy rainbow trout prove that the quarry is not a cause of water pollution. This has been a point of interest for visitors, but equally important, provides the company with much better relations between their neighbors and the municipality in which they operate.

While these examples only represent a portion of the unrehabilitated lands throughout Ontario, they do illustrate the capabilities of rehabilitation. The technology of rehabilitation has progressed so that virtually any type of land use can be achieved. There are, however, many areas of rehabilitation which require further study and documentation. Attempts are now being made to encourage operators to document their rehabilitation plans so that techniques which I am about to discuss can be compared and analysed.

# A CASE STUDY OF MATERIALS AND TECHNIQUES USED IN THE REHABILITATION OF A PIT AND A QUARRY IN SOUTHERN ONTARIO

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Canadian Land Reclamation Association
1977 Annual General Meeting
August 19, 1977
Edmonton, Alberta

## INTRODUCTION

For many years Ontario residents and the residents of all Provinces have tolerated many ills related to the industries which provide them with their social well-being. The mineral aggregate industry in particular provides us with our roads and our buildings. "As urbanization proceeds and population increases, more roads, sidewalks, bridges, sewers and buildings are required and an increasing tonnage of construction aggregates is consumed. However, the increasing consumption of aggregates has been out-pacing the population increase....." (Hewitt and Yundt, 1971, p. 2).

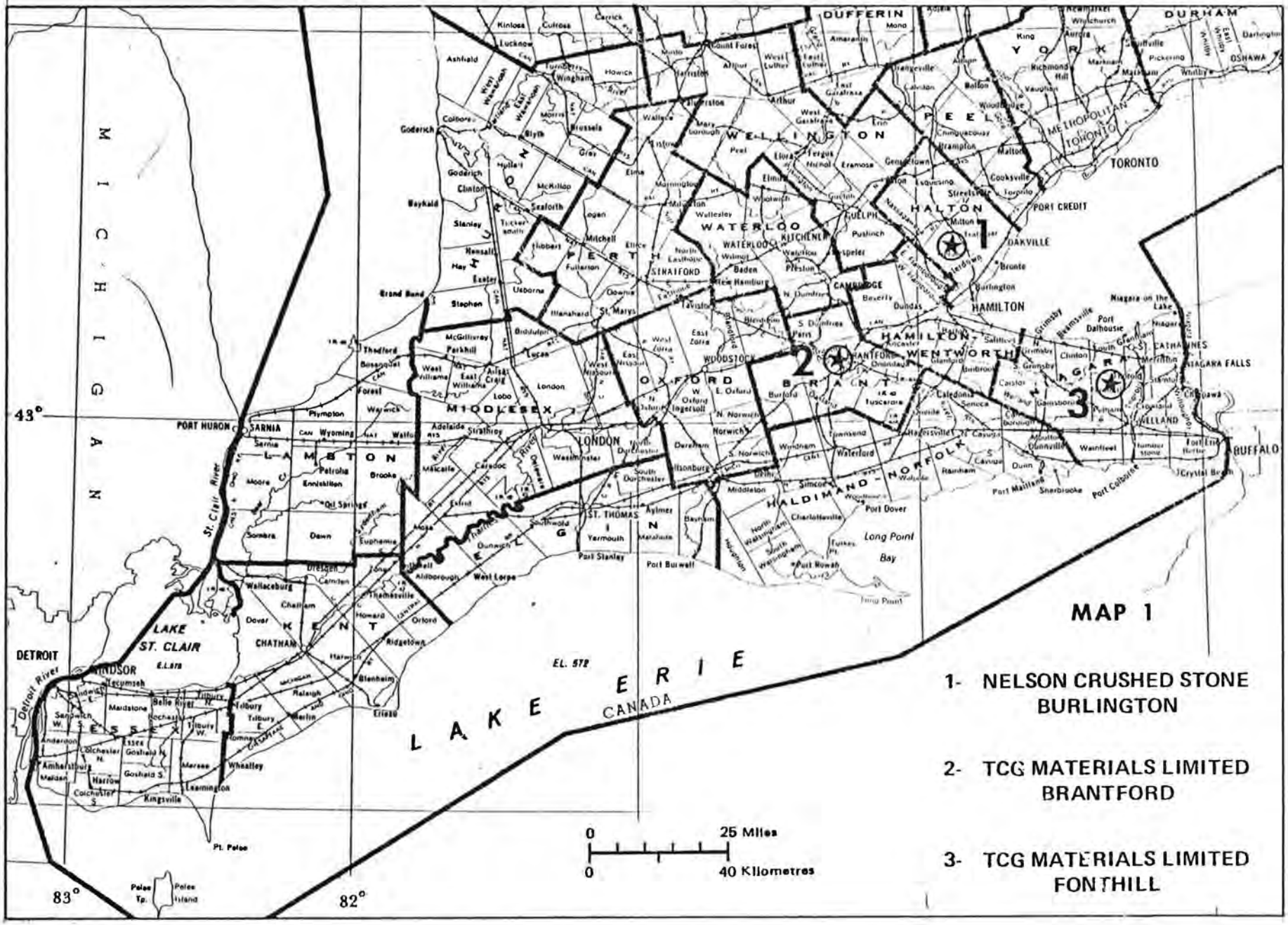
The mineral aggregate industry is thus an extensive land user particularly near urban areas where land is at a premium and residents are fighting to rid the landscape of unsightly conditions. The practice of extracting minerals and leaving the site derelict will no longer be tolerated by residents or any level of government.

Many after-uses of land do exist, such as, forestry, agriculture, recreation, nature reserves, housing and waste disposal sites. Attempts at reclaiming extracted land for alternate uses has been carried out by some pit and quarry operators in Southern Ontario. A good start has been made but there is a long rough road ahead for aggregate producers as they conform to more stringent standards.

Three specific sites have been chosen for the purposes of the present paper as follows: Nelson Crushed Stone, Burlington, TCG Materials Limited, Brantford and Fonthill (see Map 1). The Nelson Crushed Stone site was chosen because it is a limestone quarry that has been progressively rehabilitated for 20 years. It is one of the largest producing quarries in Southern Ontario and has been conscious about rapport with surrounding neighbours for years. Noise level readings have been taken at the site at each blast since the quarry started operations in 1954. The site also presents a multiple type of interim land use including, trout and waterfowl ponds, pastureland for cattle, and sloping, seeding and treeing. The rehabilitation plans for the site are not complex or detailed but the company has continually experimented with types of seed mixes, types of interim land uses and the development of both tree nurseries and fish nurseries. The final use of the site is a vast lake for recreation. The mere fact that the company has documented the bulk of its rehabilitation activities is also a valid reason for selecting this site.

The TCG Materials Limited sites were selected again because of the experimenting the company has done and because documentation was available. The Brantford site has been operated for over 60 years and is located in an area close to growing Brantford and may eventually be used for housing. The Fonthill site is critical because of the tender fruit land and although the rehabilitation is in its infancy it will be interesting to see how the cherry trees mature.

The emphasis is on documentation. The aggregate industry has been particularly negligent in documenting methods, techniques, fertilizers, seeds used and how rehabilitation is actually completed. Hopefully, this past omission will be corrected in the future.


MAP 1
1- NELSON CRUSHED STONE BURLINGTON
2- TCG MATERIALS LIMITED BRANTFORD
3- TCG MATERIALS LIMITED FONTHILL
0 25 Miles
0 40 Kilometres
LAKE ERIE
CANADA
LAKE ST. CLAIR
DETROIT
WINDSOR
SARNIA
PORT HURON
LONDON
TORONTO
HAMILTON
KITCHENER
WATERLOO
GUELPH
STRATFORD
ST. THOMAS
BUFFALO
43°
83°
82°

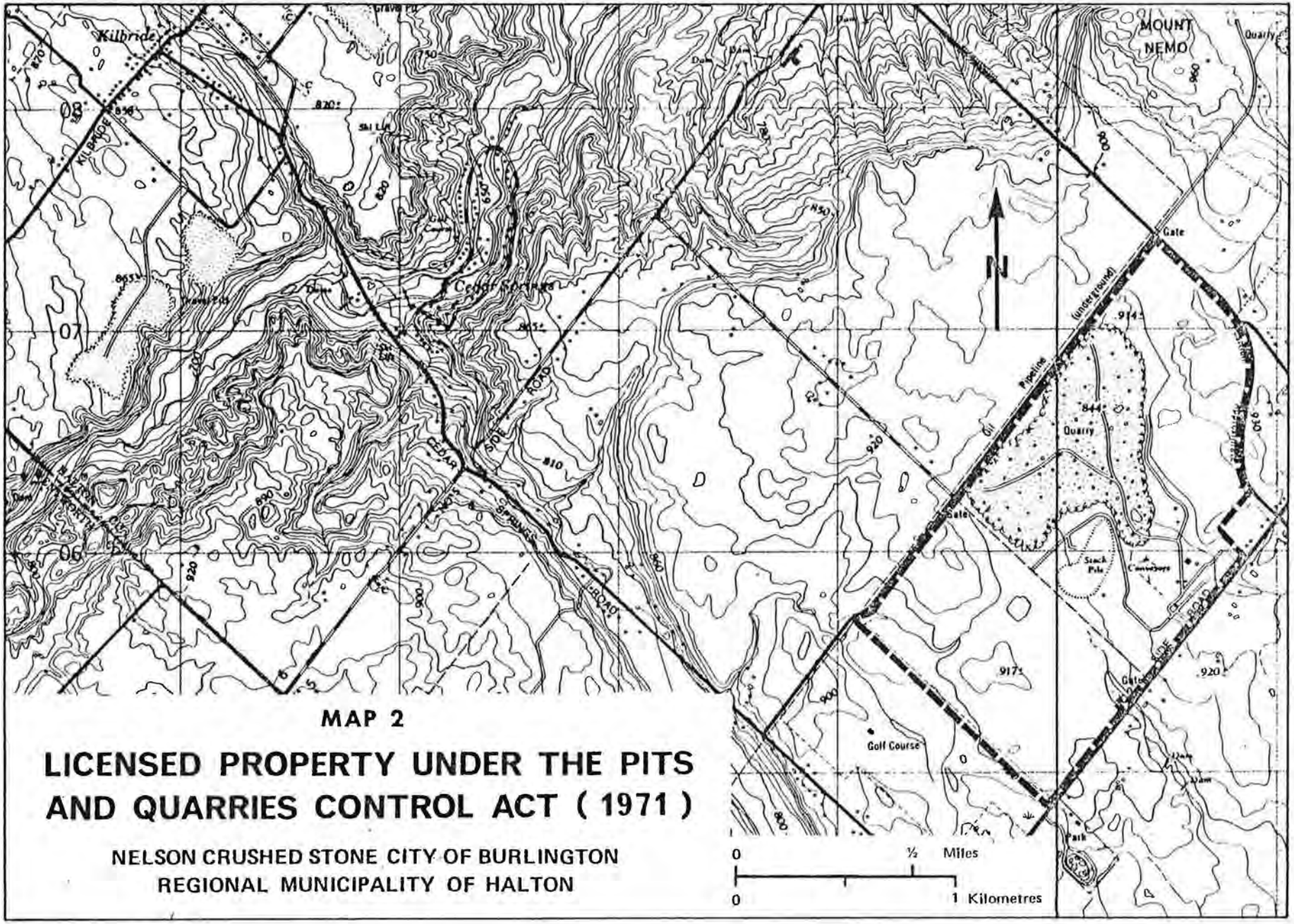
The majority of the papers presented at this meeting focus on various rehabilitation situations related to high acidity or alkalinity, low exchange capacity, high levels of carbonates and the presence of toxic compounds. The problems of rehabilitating the typical pit or quarry with virtually none of the above problems to overcome will make this paper seem simplistic. The major problem the Ontario Government faces is sufficiently stimulating aggregate producers to become serious about the progressive rehabilitation of their sites.

THE MESSAGE OF THIS PAPER IS HOW SIMPLE AND INEXPENSIVE IT REALLY IS TO PROGRESSIVELY REHABILITATE PIT AND QUARRY SITES WHEN THEY ARE PROPERLY PLANNED.

## NELSON CRUSHED STONE QUARRY

This quarry was established in 1954 in the Niagara Escarpment 8 km (5 miles) north of the centre of Burlington on the Guelph Line in the Amabel and Reynales dolomite formations (Hewitt 1960, p. 115) (see Map 2). The quarry face averages 15 m (50 feet) and the yield per hectare is approximately 160 000 tonnes (180,000 tons). There is a total licensed area of 220 ha (540 acres) with 100 ha (250 acres) extracted and 120 ha (290 acres) remaining to be extracted. A total of 60 ha (150 acres) have been rehabilitated. The average annual production in recent years has been approximately 2.3 million tonnes (2.5 million tons) with a total of 38 million tonnes (42 million tons) of crushed stone produced since 1954 making this operation one of the largest in Ontario (Drury 1977).

There are three major features of the Nelson Crushed Stone Quarry that merit detailed consideration -- the trout pond and




**MAP 2**

# LICENSED PROPERTY UNDER THE PITS AND QUARRIES CONTROL ACT ( 1971 )

NELSON CRUSHED STONE CITY OF BURLINGTON
REGIONAL MUNICIPALITY OF HALTON

marsh areas, the pastureland and backsloping, seeding and treeing.

## TROUT POND

In constructing the pond, an area of approximately 0.2 ha (0.5 acre) was extracted below the quarry floor to a depth of 3 m (10 feet). The area was seeded and trees planted around the pond. The basic function of the pond is a pumping station to keep the quarry floor dry at all times for dry extraction methods and its use as a trout pond is secondary.

The pond is stocked with approximately 800 rainbow trout ranging in size. The company maintains a small fish nursery where the trout are raised to a size suitable for transference to the pond. The healthy fish are positive proof that the quarry is not a cause of water pollution (Nelson Crushed Stone Booklet, 1973).

The pond area and surrounding marshy areas full of bulrushes (cattails) are also a natural habitat for the Canada Goose (branta canadensis) and various species of ducks especially mallard, gadwall and pintail. Contrary to the belief that aggregate extraction areas ruin wildlife habitat areas -- once the wildlife understand the operation and that they will not be injured, they are not afraid as evidenced in deer, geese and ducks located in pits and quarries. Mother ducks and their broods frequently, merrily walk across paved roads in front of 50-ton Euclid trucks fully expecting the trucks to slow down and wait until the crossing is completed.

## PASTURELAND

In the spring of 1973, Nelson Crushed Stone started to develop pasturèland on the filled slopes of the quarried area. They

now have approximately 4.9 ha (12 acres) in pasture. The back slopes are part of a continuous program that follows along immediately behind the working face of the quarry.

The overburden being stripped from the top of the dolomite in situ, is transported to the quarry face and dumped. Then 5 to 8 cm (2 to 3 inches) of topsoil are placed over the overburden (this is the minimum to maintain grass) and fertilizer is applied. Topsoil is usually scarce and its use should be well-planned. Any topsoil that has been compacted in large piles for more than one year will lose much of its nutrient and micro-organisms, thereby reducing the quality (Ministry of Natural Resources, 1975, p. 9). This continual rehabilitation process practiced by Nelson Crushed Stone prohibits the topsoil from losing its nutrient and micro-organic properties. The fertilizer is 5-20-20 (5% nitrogen, 20% phosphorus and 20% potassium) at approximately 450 to 560 kg/ha (400 to 500 pounds per acre) per year. The slope is 3:1 and there is no subsidence. The back slopes are vegetated in grass using the following seed mix:

| | |
|---|---|
| Creeping Red Fescue (Festuca rubra L.) | 33% |
| Brome Grass (Bromus inermis Leyrs) | 29% |
| Annual Rye Grass | 17% |
| White Clover (Trifolium repens L.) | 4% |
| Companion Crop (ryegrass) | 17% |

On the back slopes nine beef cattle are grazed each year from April to November. In 1976 the company made a profit of $30.00 per head on the cattle (Drury, 1977).

The seed mixture given above used by Nelson Crushed Stone is a slight variation of the Ontario Ministry of Transportation and Communications standard seed mixture used extensively across

Ontario, as follows sown at 90 kg/ha (80 pounds per acre);

| | | |
|---|---|---|
| Creeping Red Fescue (Festuca rubra L.) | 55% | permanent grass |
| Kentucky Blue Grass (Poa pratensis L.) | 25% | permanent grass |
| Red Top (Agrostic alba L.) | 5% | short lived interim grass germinates quickly, will re-seed itself |
| Companion Crop* | 12% | may be increased if hydro-seeded |
| White Dutch Clover (Trifolium repens L.) | 3% | may be increased for heavier soils |

*For fall seeding the mixture is supplemented by the addition of 67 kg/ha of wheat (1 bushel per acre) or 63 kg/ha of fall rye (1 bushel per acre). For spring seeding 57 kg/ha of oats (1.5 bushel per acre) is added (Ministry of Natural Resources , 1975, p. 17).

## BACKSLOPING, SEEDING AND TREEING

The principle purposes for vegetating a quarry face are landscaping, the encouragement of wildlife and the control of erosion. There is some erosion on the new slopes each year after the first winter. This is a result of the seed spread in September not being able to stabilize the soil over the first winter. As will be seen from the slides there is a large amount of 5 to 10 cm (2 to 4 inch) stones remaining in the overburden and topsoil and this no doubt aids the erosion. The company feels this is not a major problem and hand broadcasts the eroded areas. After the second winter the erosion is no longer evident.

Nelson Crushed Stone estimates the cost of filling, seeding, treeing, to be in the order of $36,300 per ha ($14,700 per acre) including maintenance costs. This figure appears to be high because it is the cost for the backsloping, not including the total area of 60 ha (150 acres) considered rehabilitated but which is quarry floor needing no attention. Nelson is really building a shoreline in the backsloping process because the area will eventually be an artificial lake covering the entire quarry. The depth of the lake will be approximately 6 m (20 feet) and Nelson have purposely varied the backsloping area so it will eventually form an attractive irregular shoreline. The cost of rehabilitating including the area needing no attention is approximately $5,000 per ha ($2,000 per acre) (Drury, 1977). There may be some problems when the vegetated, treed area is flooded (stabilized to natural water table level) because as this rots the decayed vegetation floats to the surface. The company would be well advised to seek opinions on the problems that may result if the vegetation is not removed before flooding because the costs of maintenance crews to clean the decayed vegetation from the surface of the lake could be far more costly than removal before flooding.

Nelson Crushed Stone are also testing a seed mix for shaded areas of slopes or berms as follows:

75% Poa Trivialis
25% Creeping Red Fescue

The result of this test will not be known until it has gone through one full winter season. The company maintain full time nursery staff and have several tree-nursery plots - for eventual transplanting on the slopes. Originally the company planted many lombardy poplars and willows which are particularly suited to the soil conditions associated with pits and quarries. The nursery has now expanded including many tree species notably spruce and cedars.

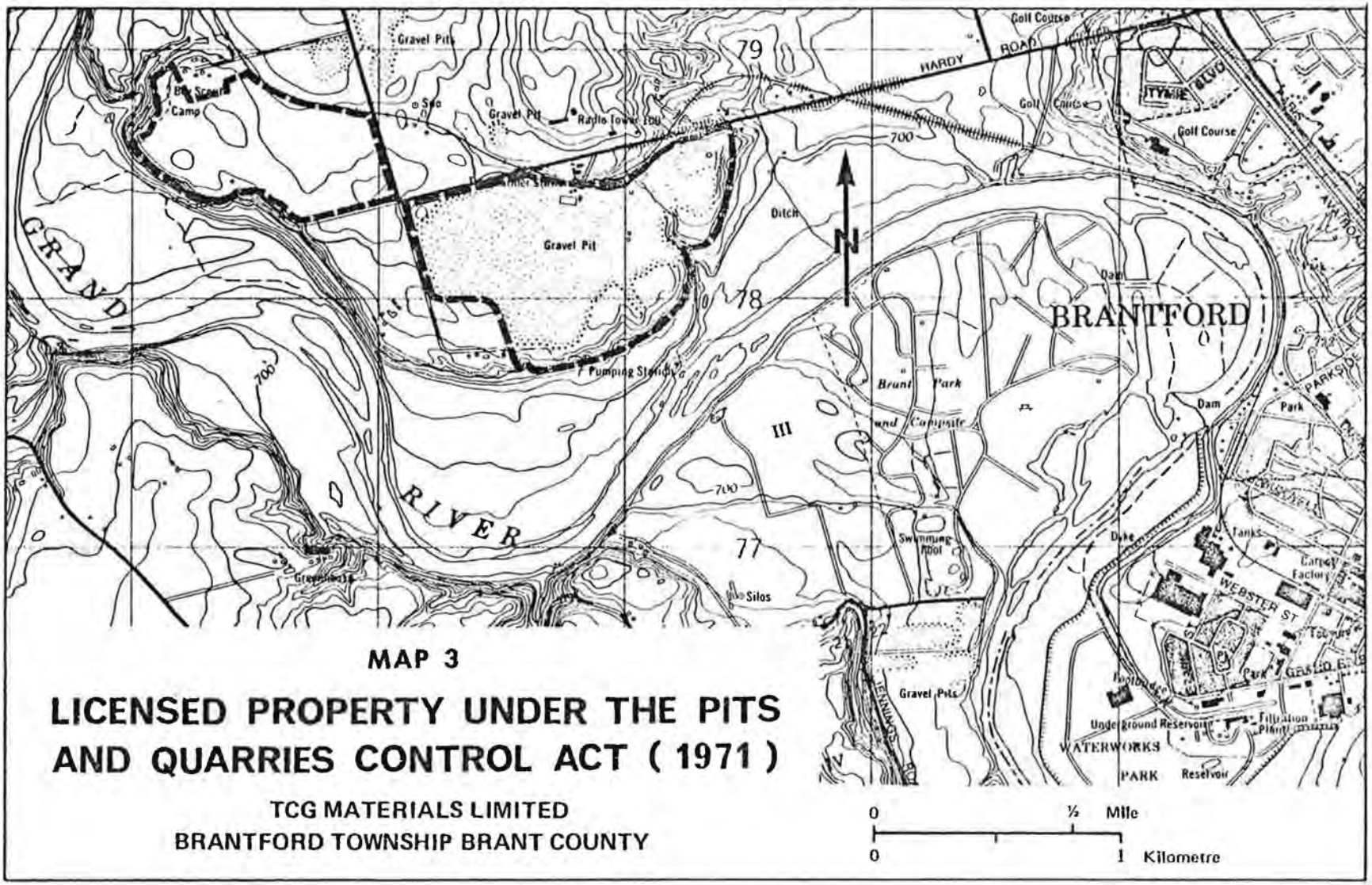
When the quarry first started, the initial overburden was stock-piled in one huge hill. This mound was seeded and later made into a ski hill complete with rope tow (Drury, 1977).

The quarry has occasionally been blamed for lowering the water table in the surrounding area. Nelson Crushed Stone continually test the water levels around the perimeter of the property with test holes and weekly readings which proves the surrounding water wells have not been lowered or interfered with. The Ministry of the Environment as well as the Ministry of Health also test the water (Nelson Crushed Stone Booklet, 1973).

The company feels there is nothing particularly sophisticated about their procedure of progressive rehabilitation and they constantly try new ideas and techniques. Nelson Crushed Stone is clearly interested in the practical side of rehabilitation.

TCG MATERIALS LIMITED

This sand and gravel pit was first operated in 1915 with materials shipped to Fort Erie. It was operated intermittently until 1956 when TCG Materials Limited took it over and it has operated coninuously since that time. The site is 3 km (2 miles) northwest of the City of Brantford in Brantford Township (see Map 3). The gravel reserves form part of an outwash spillway terrace of the Grand River system. The 0 to 2.4 m (8 feet) thick overburden is composed of stratified sand and silt overlying approximately 12 m (40 feet) of gravel on average (Hewitt and Cowan, 1969, p. 42). The yield per hectare (acre)is approximately 73 000 tonnes (80,000 tons). The average annual production from the site is approximately 635 000 tonnes (700,000 tons).




**MAP 3**

# LICENSED PROPERTY UNDER THE PITS AND QUARRIES CONTROL ACT ( 1971 )

**TCG MATERIALS LIMITED**
**BRANTFORD TOWNSHIP BRANT COUNTY**

TCG Materials Limited have a total of 80 ha (196 acres) licensed at this site. For the sake of simplicity this paper deals specifically with two small sections of the licensed site, that is, the 2.4 ha (6 acres) of corn land and the 2.8 ha (7 acres) of wheat land.

## CORN FIELD

In 1975, TCG Materials Limited decided to experiment and try to grow corn on the floor of their Brantford pit. Between 15 to 30 cm (6 to 12 inches) of topsoil/subsoil undifferentiated was added. The 2.4 ha (6 acres) were ploughed, disked, planted, seeded and sprayed by Oakwald Farms Ltd. for TCG Materials. The starter fertilizer was 7-37-10 at 160 kg/ha (140 pounds per acre) applied with corn seed. 3.4 ka (7.5 pounds) of atrazene, 6.8 ℓ (12 pints) of lasso and 545 kg (1200 pounds) of urea were used over the 2.4 ha (6 acres). Corn was selected as a matter of expediency because it is highly visible and easy to grow (Telfer, 1977).

The yield in 1975 was 3000 kg/ha (47 bushels per acre) with surrounding yields on adjacent non-extracted sites producing an average 5000 kg/ha (80 bushels per acre).

In 1976, the corn stalks were ploughed under and fertilizer 30-0-30 was used at 340 ka/ha (300 pounds per acre). The corn was planted with fertilizer starter 18-46-0 at 150 kg/ha (135 pounds per acre). The entire 2.4 ha (6 acres) was sprayed and 3.6 kg (8 pounds) of atrazene and 10.2 ℓ (18 pints) of lasso were used. The corn yield in 1976 was 2100 kg/ha (34 bushels per acre) compared to 3800 kg/ha (60 bushels per acre) on surrounding farms that year. There was generally a lower corn yield in 1976.

In 1977, a subsoil/topsoil mixture was applied to the corn field (20.6 tonnes/ha, 9.2 tons per acre). The cost of this was $8.30 per tonne ($7.50 per ton). The entire 2.4 ha (6 acres) was manured in 1977 in an attempt to improve the yields. The fertilizer was 30-0-20 at 340 kg/ha (300 pounds per acre). The starter fertilizer applied with the corn seed was 12.5-50-0 at 120 hg/ha (110 pounds per acre). The entire 2.4 ha (6 acres) was sprayed with 3.6 kg (8 pounds) atrazene and 4.1 kg (9 pounds) bladex. The corn crop this year is looking the best yet and could produce up to 3800 kg/ha (60 bushels per acre) (Telfer, 1977).

TCG Materials Limited are considering switching the corn field over to alfalfa because it is a melioration plant with deep roots and after ploughing in it leaves a considerable amount of organic substance and nitrogen in the ground. There may however be a problem with the atrazene sprayed on the corn. The area was carefully lightly sprayed and kill of an alfalfa crop would probably only occur in the areas of overlapped spraying.

The land was virtually flat and has been graded and levelled five years before any crops were even considered. Stones are a problem as they continue to come to the surface each year and the ploughing must be done very carefully. Unfortunately, originally the topsoil and subsoil were not stripped off the gravel deposit separately and this had caused some difficulty. The only solution would be to add extra topsoil (Broeckel and Sterrett, 1977). Aggregate producers must now be very careful to separate the topsoil and subsoil so previous problems are overcome.

TCG Materials Limited feels quite strongly that the yields per hectare (acre) of the corn land could reach close to those of surrounding undisturbed areas if the company made the decision to put more capital into the project, for example, additional

topsoil, fertilizer, etc. The company is hopeful that the land will be used for residential purposes in future and accordingly the agricultural use of the land is only an interim use so the land does not sit idle.

In 1975, the 2.4 ha (6 acres) of corn grossed $665.05 with a net profit of $78.80. In 1976, the gross was $411.93 with a net loss of $174.57 (Telfer, 1977). The company views the use of the land in crops as the value not whether or not it is profitable.

WHEAT FIELD

In 1976, 2.8 ha (7 acres) at the TCG Materials Limited Brantford pit was planted with winter wheat at 170 kg/ha (2.5 bushels per acre). This crop was chosen because the filling operation taking place on the area was not complete until early August. Then the subsoil and topsoil to cover the fill started and was completed in late August. Winter wheat was the only practical crop to plant that late in the season. The area was fertilized with 9-23-30 at 220 kg/ha (200 pounds per acre).

The land is sloped at 10 - 15% and 0.6 to 0.9 m (2 to 3 feet) of subsoil and 0.3 m (1 foot) of topsoil were used as soil cover. The site had been filled with construction site waste and only one small pocket of subsidence occurred. The land was shaped carefully to give the proper slope or contour for natural drainage.

The costs of filling, sloping, topsoiling including equipment were approximately $4450.00 per hectare ($1800.00 per acre) excluding the costs from Oakwald Farms Ltd. (Broeckel and Sterrett, 1977).

In the spring of 1977, urea was added at 185 kg/ha (165 pounds per acre). The site was not sprayed but was cultivated and packed twice. The total farming cost for the project was $193 per ha ($78 per acre). The yield in 1977 was 2300 kg/ha (34 bushels per acre) compared to 3400 kg/ha (50 bushels per acre) on surrounding unextracted natural areas (Telfer, 1977). The full cost of filling, sloping, topsoiling, seeding and cultivation was $4780 per ha ($1935 per acre).

## CHERRY TREES

One other site operated by TCG Materials Limited warrants mentioning. The site is west of Fonthill, Ontario in Pelham Township. The land prior to extraction was tender fruit land for sour cherry trees. In 1977, the company decided to plant 0.8 ha (2 acres) with sour cherry trees (100) in a flat portion of the extracted pit area. The area was filled with silt and fine materials unuseable for aggregate purposes and then 0.9 m (3 feet) of topsoil (sand) was applied (Cook, 1977). As the silt ponds continue to fill and solidify the cherry orchard area will be expanded.

The soil was analysed by the Ontario Soil Testing Laboratory at the University of Guelph and found to be lacking in potash. Accordingly 1.4 kg (3 pounds) of fertilizer 0-0-60 was placed around each tree in a 1.5 m (5 foot) circle. It will take these trees five years to reach crop level and leaf analysis will be done by the University of Guelph to see if there are any other deficiencies (Ontario Soil Testing Laboratory, 1977).

There are very low maintenance costs for young trees. The costs are in the order of:

$50 per year fertilizer
$30 per year spraying
$300 for 100 1.4 cm (9/16 inch) stock sour cherry trees (Cook, 1977).

The real costs are incurred when the trees reach maturity because of the costs of picking the cherries and marketing the produce. This example is used strictly to show that there is some interesting experimenting going on in Ontario in fully extracted areas of pits. All of these activities must be encouraged, documented and expanded with the assistance of trained professional experts in the various fields.

## CONCLUSIONS

Before extraction is started from any site a detailed soil survey and environmental study should be completed with full documentation including soil depth, texture, structure, stoniness, drainage, land form, land quality and agricultural production.

The topsoil and subsoil must be religiously separated when stripping takes place and these valuable materials must not be stockpiled for long periods of time because of the nutrient and micro-organic loss to the soil.

Aggregate producers should make much better use of the Ontario Soil Testing Laboratory at the University of Guelph which will analyze any soil samples and recommend fertilizers and seed mixtures. Aggregate producers should become more familiar with seeding methods as follows to produce better

results:

1. seed drill or brillion seeder which place the seed in the ground and covers it with soil and no additional mulch is required.
2. broadcast seeding where the seed and fertilizer are applied to the soil surface - a mulch is necessary to protect the seed and prevent drifting during germination - in some cases a binder is needed to keep the mulch from blowing.
3. hydroseeder is the most expensive method of seeding where the seed and fertilizer are applied to the soil surface in one operation - a mulch blower then applies straw and asphalt emulsion in a second operation. The hydroseed method is recommended for dry sites with little or no topsoil, steep slopes and other difficult sites (Ministry of Natural Resources, 1975, p. 11).

For more details on grass mixtures, trees, shrubs and fertilizers for wet, fresh and dry mineral aggregate sites refer to "Vegetation for the Rehabilitation of Pits and Quarries", Ministry of Natural Resources, 1975.

Aggregate producers must make effective use of the technical expertise available in Canada, the United States, Germany and the United Kingdom on rehabilitation. Much experimentation is necessary in rehabilitating but equally the provincial governments must provide strong leadership in developing rehabilitation documentation, techniques and methods. The Provinces are responsible under The British North America Act for resources. Are they doing enough?

The filling of pits and quarries with inert wastes should be encouraged because the agricultural productivity is likely to be closer to normal in areas brought back to the same elevation as the surrounding land. The retention of moisture is the most

critical factor and this is difficult if the agricultural site is in the bottom of a pit.

The progressive rehabilitation of pits and quarries is not difficult when compared to coal, salt, uranium or other mineral rehabilitation. The most difficult task is getting the aggregate producers sufficiently interested either through a rehabilitation security deposit (Ontario Mineral Aggregate Working Party Report, 1977, p. 65.), licence fees and strict legislation. All the needed technology exists -- and rehabilitation will occur either through a concerted effort by the industry or through legislative force by the Ontario Government.

The Ontario Government appointed the Ontario Mineral Aggregate Working Party in 1975 to produce a policy for mineral aggregates and to make recommendations concerning the new legislation to replace The Pits and Quarries Control Act (1971). The Report of the Working Party is now being considered by the Ontario Government and will go forward with new legislation in the near future (Ontario Mineral Aggregate Working Party, 1977).

The horizons appear to be widening as far as research, experimentation and interest in the rehabilitation of pits and quarries are concerned. However, there is not enough communication between the various groups concerned including: seed mills, nurseries, technical experts, professionals, consultants, planners, government, aggregate producers, etc. I hope that the Canadian Land Reclamation Association can be instrumental in bringing about this communication.

SOURCES

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2. Cook, G. W., Questionnaire Response, June 22, 1977.

3. Drury, E. V., Personal Interviews, Nelson Crushed Stone, Burlington, June 13 and July 8, 1977.

4. Hewitt, D. F., The Limestone Industries of Ontario, Toronto; Department of Mines, Industrial Mineral Report 5, 1960.

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7. Ministry of Natural Resources, Vegetation for the Rehabilitation of Pits and Quarries, Toronto: Division of Forests, 1975.

8. Nelson Crushed Stone Quarry, Booklet, 1973.

9. Ontario Soil Testing Laboratory, University of Guelph, 1977.

10. Ontario Mineral Aggregate Working Party, A Policy for Mineral Aggregate Resource Management in Ontario, 1977.

11. Telfer, William, Personal Interview (Oakwald Farms Limited), Paris, July 18, and July 25, 1977.

# PROCEEDINGS

OF

THE SECOND ANNUAL GENERAL MEETING

OF THE

# CANADIAN LAND RECLAMATION ASSOCIATION

August 17, 18, 19 & 20 — 1977 Edmonton, Alberta

( Sponsored by the Faculty of Extension, University of Alberta )

P R O G R A M

Canadian Land Reclamation Association

Second Annual General Meeting

August 17, 18, 19, 20, 1977

Edmonton, Alberta

Wednesday, August 17 (Optional Field Trips)

Field Trip No. 1 (Athabasca Tar Sands)

Leader: Philip Lulman (Syncrude Canada Ltd.)

Fee: $100.00 (covers bus and air transportation, lunch, and field trip information pamphlets)

Schedule: 7:30 a.m.- delegates board bus at Parking Lot T, located immediately south of the Lister Hall Student Residence complex. Air transportation from Edmonton Industrial Airport to Fort McMurray and return. Guided bus tour of surface mining and reclamation operations on Syncrude Canada Ltd. and Great Canadian Oil Sands Ltd. leases.
6:30 p.m.- delegates arrive back at Parking Lot T, University of Alberta campus.

Field Trip No. 2 (Aspen Parkland; Forestburg Coal Mine Reclamation)

Leader: George Robbins (Luscar Ltd.)

Fee: $25.00 (covers bus transportation, lunch, and field trip information pamphlets)

Schedule: 8:00 a.m. - delegates board bus at Parking Lot T, located immediately south of the Lister Hall student residence complex. Guided bus tour southeast of Edmonton, stopping at various points of interest (oil spill reclamation field plots; Black Nugget Park [abandoned minesite]; trench plots on Dodds-Roundhill Coal Field; solonetzic soil deep ploughing site) on the way to the Luscar Ltd. Coal Mine at Forestburg.
6:30 p.m. - delegates arrive back at Parking Lot T, University of Alberta campus.

## Thursday, August 18

| | |
|---|---|
| Events: | Opening of Formal Meeting; Presentation of Papers |
| Location: | Multi-Media Room, located on second floor of Education Building, University of Alberta. |
| 8:00 a.m. | Authors of papers being presented on August 18 meet with paper presentation chairmen and audio-visual co-ordinator (Douglas Patching) |
| 9:00 a.m. | Meeting Opened by Dr. Jack Winch (President of the C.L.R.A.; Head of the Department of Crop Science, University of Guelph). Comments by Dr. Winch. |
| 9:15 a.m. | Welcome to delegates on behalf of the Government of Alberta by the Hon. Mr. Dallas Schmidt, (Associate Minister Responsible for Lands, Alberta Department of Energy and Natural Resources) |
| 9:25 a.m. | Commencement of Paper Presentations. Morning session chaired by Mr. Henry Thiessen (Chairman of the Land Surface Conservation and Reclamation Council and Assistant Deputy Minister, Alberta Department of Environment). |
| 9:30 a.m. | Paper 1. Combined Overburden Revegetation and Wastewater Disposal in the Southern Alberta Foothills by H.F. Thimm, G.J. Clark and G. Baker (presented by Harald Thimm of Chemex Reclamation and Sump Disposal Services Ltd., Calgary, Alberta). |
| 10:00 a.m. | Paper 2. Brine Spillage in the Oil Industry; The Natural Recovery of an Area Affected by a Salt Water Spill near Swan Hills, Alberta by M.J. Rowell and J.M. Crepin (presented by Michael Rowell of Norwest Soils Research Ltd., Edmonton, Alberta) |
| 10:30 a.m. | Coffee Recess |
| 11:00 a.m. | Paper 3. The Interaction of Groundwater and Surface Materials in Mine Reclamation by Philip L. Hall of Groundwater Consultants Group Ltd., Edmonton, Alberta. |
| 11:30 a.m. | Paper 4. Subsurface Water Chemistry in Mined Land Reclamation; Key to Development of a Productive Post-Mining Landscape by S.R. Moran and J.A. Cherry (presented by Stephen Moran of the Research Council of Alberta, Edmonton, Alberta). |
| 12:00 noon | Lunch Recess |

1:25 p.m. Continuation of Paper Presentations. Afternoon session chaired by Mr. Philip Lulman (member of C.L.R.A. executive; reclamation research ecologist with Syncrude Canada Ltd.).

1:30 p.m. Paper 5. Coal Mine Spoils and Their Revegetation Patterns in Central Alberta by A.E.A. Schumacher, R. Hermesh and A.L. Bedwany (presented by Alex Schumacher of Montreal Engineering Company Ltd., Calgary, Alberta).

2:00 p.m. Paper 6. Surface Reclamation Situations and Practices on Coal Exploration and Surface Mine Sites at Sparwood, B.C. by R.J. Berdusco and A.W. Milligan (presented by Roger Berdusco of Kaiser Resources Ltd., Sparwood, B.C.).

2:30 p.m. Paper 7. Agronomic Properties and Reclamation Possibilities for Surface Materials on Syncrude Lease #17 by H.M. Etter and G.L. Lesko (presented by Harold Etter of Thurber Consultants Ltd., Victoria, B.C.).

3:00 p.m. Paper 8. The Use of Peat, Fertilizers and Mine Overburden to Stabilize Steep Tailings Sand Slopes by Michael J. Rowell of Norwest Soils Research Ltd., Edmonton, Alberta.

3:30 p.m. Coffee Recess

4:00 p.m. Paper 9. Oil Sands Tailings; Integrated Planning to Provide Long-Term Stabilization by David W. Devenny of E.B.A. Engineering Consultants Ltd., Edmonton, Alberta.

4:30 p.m. Paper 10. Bioengineering. The Use of Plant Biomass to Stabilize and Reclaim Highly Disturbed Sites by H. Schiechtel and K. (Nick) Horstmann (presented by Margit Kuttler).

5:00 p.m. End of August 18 Sessions.

## Friday, August 19

Events: Presentation of Papers; C.L.R.A. Annual General Business Meeting; C.L.R.A. Annual Dinner.

Locations: Paper presentations and C.L.R.A. Annual General Business Meeting in Multi-Media Room, located on second floor of Education Building, University of Alberta.
- Annual Dinner held in Banquet Room located on second floor of Lister Hall.

8:00 a.m. Authors of Papers being presented on August 19 meet with paper presentation chairmen and audio-visual co-ordinator (Douglas Patching).

8:30 a.m. Showing of Film Rye on the Rocks. This film depicts reclamation situations at Copper Cliff, Ontario and is being shown for the purpose of introducing delegates to the site of the 1978 C.L.R.A. meeting (Sudbury, Ontario).

8:55 a.m. Continuation of Paper Presentations. Morning session chaired by Dr. J.V. Thirgood (Vice-President of C.L.R.A.; member of Forestry Faculty, University of British Columbia).

9:00 a.m. Paper 11. Reclamation of Coal Refuse Material on an Abandoned Mine Site at Staunton, Illinois by M.L. Wilkey and S.D. Zellmer (presented by Michael Wilkey of the Argonne National Laboratory, Argonne, Illinois).

9:30 a.m. Paper 12. A Case Study of Materials and Techniques Used in the Rehabilitation of a Pit and a Quarry in Southern Ontario by Sherry E. Yundt of the Ontario Ministry of Natural Resources, Toronto, Ontario).

10:00 a.m. Coffee Recess.

10:30 a.m. Paper 13. Amelioration and Revegetation of Smelter-Contaminated Soils in the Coeur D'Alene Mining District of Northern Idaho by D.B. Carter, H. Loewenstein and F.H. Pitkin (presented by Daniel Carter of Technicolor Graphic Services Inc., Sioux Falls, South Dakota).

11:00 a.m. Paper 14. The Influence of Uranium Mine Tailings on Tree Growth at Elliot Lake, Ontario by David R. Murray of the Elliot Lake Laboratory, Elliot Lake, Ontario.

11:30 a.m. Paper 15. Weathering Coal Mine Waste. Assessing Potential Side Effects at Luscar, Alberta by D.W. Devenny and D.E. Ryder (presented by David Devenny of E.B.A. Engineering Consultants Ltd., Edmonton, Alberta).

12:00 noon Lunch Recess.

1:25 p.m. Continuation of Paper Presentations. Afternoon session chaired by Dr. John Railton, (Manager, Environmental Planning, Calgary Power Ltd., Calgary, Alberta).

1:30 p.m. Paper 16. The Distribution of Nutrients and Organic Matter in Native Mountain Grasslands and Reclaimed Coalmined Areas in Southeastern B.C. by Paul F. Ziemkiewicz of the Faculty of Forestry, University of B.C., Vancouver, British Columbia.

2:00 p.m. Paper 17. Systems Inventory of Surficial Disturbance, Peace River Coal Block, B.C. by D.M. (Murray) Galbraith of the British Columbia Ministry of Mines and Petroleum Resources, Victoria, British Columbia.

2:30 p.m. Paper 18. The Selection and Utilization of Native Grasses for Reclamation in the Rocky Mountains of Alberta by D. Walker, R.S. Sadasivaiah and J. Weijer (presented by David Walker of the Department of Genetics, University of Alberta, Edmonton, Alberta).

3:00 p.m. Coffee Recess; Distribution of Proceedings.

3:30 p.m. Commencement of 1977 General Business Meeting of the Canadian Land Reclamation Association. Meeting chaired by Dr. J.V. Winch, C.L.R.A. President.

7:30 p.m. Commencement of C.L.R.A. Annual Dinner in Banquet Room, second floor of Lister Hall.

Guest Speaker: William T. Plass, Principal Plant Ecologist, U.S.D.A. Forest Service, Northeastern Forest Experiment Station, Princeton, West Virginia.

Topic of Speech: Challenges in Co-operative Reclamation Research.

Note: Following the Annual Dinner and Mr. Plass's speech, delegates may retire to the adjacent Gold Room. A bartender will be on service until midnight.