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KERR ADDISON MINES LIMITED

ASSESSMENT WORK REPORT

ESPANOLA PROJECT - "0-25"

SHAKESPEARE, GOUGH, SALTER, VICTORIA, AND

SHEDDEN TOWNSHIPS, ONTARIO

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G. HINSE, J.R. FOSTER — NOVEMBER 1976

SHAKESPEARE, GOUCH, SALTER, VICTORIA AND

SHEDDEN TOWNSHIPS, ONTARIO

Corrected copy of report attached
see letter from Company
dated Jan. 24 1977

G. HINES, J. R. FOSTER — NOVEMBER 1976

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SUMMARY

Scintillometer and radon gas surveys combined with detailed geological mapping were used by Kerr Addison Mines Limited to outline anomalous radioactive zones in Huronian rocks with the Espanola Project. The project is located along the contact between granitic bedrock and Huronian sediments, from 46 to 70 miles west of Sudbury. Mapping indicated a nearly complete sequence of the sedimentary pile in Victoria Township, from the basal Matinenda Formation to the Gowganda Formation. Radioactive anomalies corresponded with the Matinenda, McKim, Mississagi and Espanola Formations. Further work over the most promising anomalies is recommended for 12 claims in Victoria Township, and 2 claims in Shedden Township.

ASSESSMENT WORK REPORT
ESPANOLA PROJECT - "0-25"

INTRODUCTION

Kerr Addison Mines Limited owns wholly a total of 119 claims in nine groups located in Shakespeare, Gough, Salter, Victoria and Shedden Townships.

With the exception of those groups or claims underlain by granites, all the claim groups were covered with line cutting, geology, scintillometer and radon gas surveys.

Several anomalous areas were outlined which will warrant further work.

PROPERTY

Location	Lot	Concession	Township	Claim No.
S ½	9	I	Shakespeare	438766, 438767
S ½	10	I	Shakespeare	433950, 439951
S ½	12	I	Shakespeare	438923, 438924
S ½	1	I	Gough	438919, 438920, 438921, 438922

The following claims are located in townships that are not subdivided into lots and concessions.

Location	Section	Township	Claim No.
NE ¼	14	Salter	438773, 438774, 438775, 438776
NE ¼	19	Salter	438772
SW ¼	13	Victoria	438217
SE ¼	14	Victoria	438213, 438214
SW ¼	14	Victoria	438209, 438210
SW ¼	15	Victoria	438204, 438207
SE ¼	15	Victoria	438415, 438416#
SE ¼	16	Victoria	438667, 438203
SW ¼	16	Victoria	438658, 438659, 438664, 438665
SW ¼	17	Victoria	438648,# 438649,# 438650,# 438651##
SE ¼	17	Victoria	438654, 438655, 438656, 438657

Location	Section	Township	Claim No.
SW ¼	18	Victoria	438633
SE ¼	18	Victoria	438640##, 438641##, 438642##, 438643##
NW ¼	19	Victoria	438634, 438635
NE ¼	19	Victoria	438638, 438639, 438644, 438645
SW ¼	19	Victoria	438636, 438637
NW ¼	20	Victoria	438646, 438647, 438652, 438653
NW ¼	21	Victoria	438660, 438661, 438662, 438663
NE ¼	21	Victoria	438668, 438669
NW ¼	23	Victoria	438413#, 438414#
NW ¼	24	Victoria	438399, 438400, 438401, 438402
NE ¼	24	Victoria	438407, 438408, 438409, 438410
NE ¼	23	Shedden	438301, 438302, 438307, 438308
SE ¼	23	Shedden	438303, 438304, 438305, 438306
NW ¼	24	Shedden	438293, 438294, 438299, 438300
NE ¼	24	Shedden	438289, 438290, 438291, 438292
SW ¼	24	Shedden	438295, 438296, 438297, 438298
NW ¼	19	Shedden	438712, 438717
SW ¼	19	Shedden	438713, 438714, 438715, 438716
SE ¼	19	Shedden	438707, 438708, 438709, 438710
NE ¼	19	Shedden	438706
NW ¼	20	Shedden	438701, 438705
NE ¼	20	Shedden	438317, 438700
SW ¼	20	Shedden	438702, 438703, 438704
SE ¼	20	Shedden	438698, 438699
NW ¼	21	Shedden	438313, 438716
NE ¼	21	Shedden	438309, 438312
SW ¼	21	Shedden	438314, 438315
SE ¼	21	Shedden	438310, 438311

\# These are water claims and will be covered at a later date with line cutting and a magnetometer survey.

\## Kerr Addison Mines Limited has applied for extensions of time in order to negotiate with the surface rights owners of these claims. Line cutting, geology, scintillometer, and radon gas surveys will be done on these claims at a later date.

LOCATION AND ACCESS

The most easterly claim group in the project area lies 46 miles west of Sudbury. The property extends for 25 miles to the west, more or less parallel to and at a distance varying from 1½ to 2½ miles north of

Highway 17, which runs between Sudbury and Sault Ste. Marie. Claim groups are in Shakespeare, Gough, Salter, Victoria and Shedden Townships.

Numerous secondary roads leading north from Highway 17 to agricultural, recreational and lumbering areas provide easy access to most of the project area.

PREVIOUS WORK

Sources of information for this section include Robertson (1965), Robertson (1976), Card and Palonen (1976), and the Resident Geologist's Files at Sudbury and Sault Ste. Marie.

Group C Glaciofluvial sands, gravels, and varved clays mask the bedrock in these two claims. No work has been recorded for either. However, to the southeast a large cliff of Matinenda Formation arkoses and quartzites outcrops. In 1957, Delcan Minerals Limited put down three diamond drill holes totalling 1297 feet in Lots 8 and 9, Concession 1, Shakespeare Township. In one hole, an assay of 1.27 lb./ton U_3O_8 was obtained over 1.5 feet of sheared quartzite. No oligomictic quartz pebble conglomerates were recorded in the core logs.

Group D A bed of radioactive oligomictic conglomerate has been pitted on the western boundary of Lot 12, Concession I, Shakespeare Township. In 1968 and 1969, Aggressive Mines Limited drilled several holes here, obtaining one assay of 6.0 lb./ton U_3O_8 over 0.7 feet. In 1969 also, Moncreiff Uranium Mines Limited did a geological survey, and drilled two holes totalling 1337 feet. Only trace uranium values are recorded in the core logs.

SUMMARY

Scintillometer and radon gas surveys combined with detailed geological mapping were used by Kerr Addison Mines Limited to outline anomalous radioactive zones in Huronian rocks with the Espanola Project. The projected is located along the contact between granitic bedrock and Huronian sediments, from 46 to 70 miles west of Sudbury. Mapping indicated a nearly complete sequence of the sedimentary pile in Victoria Township, from the basal Matinenda Formation to the Gowganda Formation, Radioactive anomalies corresponded with the Matinenda, McKim, Mississagi and Espanola formations. Further work over the most promising anomalies is recommended for 12 cliams in Victoria Township and 2 claims, in Shedden Township.

Note : The following report has been filmed previously in SAULT STE. MARIE under 2.2294 and can be found in SHEDDEN-0018-A1. The report is being filmed again as it refers to various areas within townships in Sudbury.

Group F The above showing in Group D extends into Lot 1, Concession I, Gough Township just north of Group F; previous work here is the same as for Group D.

Group H In 1956, three diamond drill holes were put down into Salmay Lake Formation metavolcanics for J. Gutcher. The core was assayed for copper; results were not recorded.

Group I No previous work is in the Resident Geologist's Files at Sudbury.

Group J Most of the work done in Group J occured shortly after the founding of the Blind River - Elliot Lake mining camp. In 1954, a geological survey and diamond drilling programme was carried out in the Sugar Lake vicinity in Victoria Township. Five holes totalling 2538.5 feet were drilled in the SE ¼ of the S ½ of Section 14, Victoria Township; no assays were recorded. Also in 1954, F.C. Knight did geological and geiger surveys near Denvic Lake (Section 19, Victoria Township). In 1954 and 1956, Peach Uranium and Metals Manufacturing Limited drilled seven holes within the Group J area in Shedden Township; four holes were in the unmetamorphosed Huronian sediments to the north of the Murray Fault, and three holes were in argillaceous schists to the south. No quartz pebble conglomerates or uranium values were recorded in the core logs. In 1955, airborne magnetometer and radioactivity surveys and a ground EM survey were conducted by Pronto Uranium Mines Limited over all of Shedden Township. No significant radioactivity was noted; also, the Em survey failed to locate any conductors. Minor radioactivity is associated with fractured quartzites of the Espanola Formation. In 1957, Victoria Algoma Mineral

Company Limited drilled and trenched these quartzites between Denvic and Sugar Lakes; full details are not available. Radioactivity is directly associated with the fractures.(Robertson, 1976). In 1968, Hugh Pam Porcupine Mines Limited drilled 4546 feet with three holes in Victoria Township. No radioactive zones were found. J.A. Robertson, who mapped Victoria and Salter Townships for the Ontario Division of Mines in 1966 and 1967, submitted an unknown number of samples for uranium assay. Only trace amounts (0.02-0.04 lb./ton U_3O_8) were found in rocks of the Elliot Lake and Hough Lake Groups (Robertson, 1976).

Group K The only previous work recorded for this group was by Pronto Uranium Mines Limited (see Group J above).

GEOLOGY

a) General Description

The rocks within the Espanola Project can be divided into five categories: 1) Keewatin (Archean) metasedimentary and metavolcanic rocks found as inclusions within granitic intrusions (These do not from a significant part of the Archean bedrock, and will not be discussed further); 2) Granitic rocks of Late Archean Age; 3) Clastic sediments and minor volcanics of the Huronian Supergroup; 4) Gabbro-diorite-anorthosite intrusions of uncertain age; and 5) Late Proterozoic (Keweenawan mafic dykes).

Granitic rocks (granites, granodiorites, aplites, related pegmatites) form the vast majority of the pre-Huronian bedrock. These are mainly coarse-grained, pink in colour, with high quartz content (20-30%) and little or no mafic minerals (generally less than 5%). The rest of the rock is feldspars; pink orthoclose and pink to white multiple twinned plagioclase. Where the contact with the Huronian sediments is not faulted, the granite grades upward into a dirty, sericitic, quartz-rich regolith, which contains fine greenish-black "veins" (probably tiny fractures filled with chloritic minerals). This regolith is difficult to distinguish from a dirty quartzite. At least one set of pre-Huronian mafic dykes cuts the granites, trending northwest.

Unmetamorphosed Huronian strata are in fault or unconformable contact with the Archean granites to the north. The Murray Fault forms their southern boundary, separating unmetamorphosed sediments from their metamorphic equivalents to the south.

An almost complete exposure of the Huronian sequence is exposed north of the Murray Fault in Group J. South of the fault within the group, only the McKim Formation is encountered. Beginning the Huronian sequence are either mafic volcanics or quartzo-feldspathic sediments of the Elliot Lake Group. The volcanics and intercalated arkoses, greywackes, and oligomictic quartz pebble conglomerates belong to the Salmay Lake Formation. These are locally extensive in Salter Township and the eastern extreme of Victoria Township; elsewhere in the Espanola Group they are not found. Quartzites, dirty arkoses and argillaceous sediments of the Matinenda Formation lie in unconformable contact with Archean basement in Shedden Township and the west half of Victoria Township on the north shore of Tube Lake. The quartzites exhibit good trough crossbedding, which was not noticed in quartzites of other formations. Current structures indicate provenance was to the northwest (Robertson, 1976). Interbedded with the quartzites are dirty arkoses and greywackes or argillites that sometimes have a rusty weathering surface. Only one occurrence of quartz pebble conglomerate similar to the Blind River - Elliot Lake uraniferous conglomerates was encountered in the entire project; this was on the extreme southern end of the boundary between Gough and Shakespeare Townships. McKim Formation argillites, greywackes and quartzites are next in the sequence. North of the Murray Fault, argillite dominates this formation. It is dark grey to black, fine-grained, often intensely dragfolded. Commonly, it is interbedded with a medium grained greywacke, which does not display the laminations and slaty cleavage found in the argillite. Sulphides (pyrite cubes and pyrrhotite) are usually present as minor disseminations (less than 1%). Some radioactivity is associated with McKim argillites, however, the distribution of this is very irregular and limited. South of the Murray Fault, the McKim Formation is composed of a massive to rhythmically bedded argillaceous schist, often with intensely drag-folded stringers of quartzite.

The Hough Lake Group included the Ramsay Lake, Pecors, and Mississagi Formations. The first is a polymictic microconglomerate with dark grey or smokey quartz granules and pebbles (3-10 mm.) set in a black to light grey weathering siliceous matrix. Most of the clasts are quartz (up to 90%), others are granitic and sometimes greenstone. The quartz granules are subrounded to rounded. This conglomerate is probably of glacial origin (Robertson, 1976). The Pecors Formation of argillites, argillaceous quartzites and quartzites is in conformable contact with the Ramsay Lake Formation. The Pecors Formation was not easily distinguished in the field from argillaceous sediments of the McKim Formation, as the intervening Ramsay Lake conglomerate was generally not observed in outcrop.

Last in the Hough Lake Group are arkoses, quartzites and feldspathic quartzites of the Mississagi Formation. These form a high barren ridge running through Group J and I. Sericitic arkose beds, 30-100 cm. thick, are commonly interbedded with the quartzites. The latter are generally light grey to white or pink, medium to coarse-grained, with well sorted, well rounded grains. Planar crossbedding is strongly developed throughout most of this formation. Tops are to the south. One persistent horizon near the fire tower at Tube Lake and within Group K in Shedden Township, is a pink feldspathic quartzite, cut by numerous quartz veins and segregations. These have entirely disrupted the bedding. The boundaries between this rock and other quartzites are very gradational, marked only by an increase in the number and size of quartz veins as this rock is approached. These veins may be related to a period of faulting. Another strongly developed horizon within the Mississagi Formation is an intraformational conglomeratic "breccia", found south of the large diabase sill near Denvic and Tube Lakes. Large angular pebbles and boulders (up to 3.6 metres, but usually up to 10-100 cm.) of sericitic arkose and quartzite occur in a highly chloritic and sericitized siltstone matrix. The matrix is smeared around the boulders. This appears to indicate transportation of partially consolidated quartzite as a turbidity or mud flow. The "breccia" lies between undisturbed Mississagi quartzites; it may be due to slumping or faulting during consolidation of these sediments.

An erosional unconformity appears to separate the Hough Lake Group from the Quirke Lake Group to the south. First in this group is another quartz granule microconglomerate, the Bruce Formation. It is very similar to the Ramsay Lake Formation, in that most of the clasts are small smokey quartz granules, subangular to subround, well spaced within a dark siliceous matrix. It is present only in Group J. Overlying this is the poorly exposed Espanola Formation. It consists of calcareous siltstones, siltstones and quartzites, generally well fractured by numerous faults. The Serpent Formation completes the Quirke Lake Group. It consists of more light grey quartzites. These only outcrop in Shedden Township within Group J. The beds are generally massive, up to 1 metre thick with no crossbedding observed.

Rounding out the Huronian sequence within the Espanola Project is the Gowganda Formation of the Cobalt Group. It is a polymictic para-conglomerate, quite dissimilar to the Ramsay Lake or Bruce conglomerates. Large granitic boulders, cobbles and pebbles (5 to 30 cm.) are distributed in a greywacke matrix. Interbeds of pink to red arkose are common in both Victoria and Shedden Townships.

Intrusives of uncertain age are found along the Archean-Huronian interface throughout much of Victoria and Salter Townships, in Groups H (in the northern half) and J (north of Tube and Sugar Lakes). These are coarse-grained diorites and gabbros.

The entire sequence is intruded by diabase dykes and sills (Nipissing diabase). These trend northwest-south-east across the Huronian rocks, or east-west as stratabound sills.

b) Structural Geology and Tectonic History

The area of the Espanola Project lies within the Southern Province of the Canadian Shield. Archean granites to the north were emplaced during the Kenoran Orogeny, the major mountain building period that ended 2500 m.y.

During the time following this and the interval of Huronian sedimentation (2450 m.y. to 2250.m.y.; Roscoe, 1973), the Archean paleosurface was eroded to the granitic basement. Downfaulting began the Huronian depositional basin. This was subject to repeated upwarping and downwarping of the crust, and probably further movement along old fault planes, giving rise to a distinctive sedimentation cycle (paraconglomerate, argillaceous sediments, quartzites) that characterizes the upper three groups of the Huronian Supergroup. The upwarps established periods of erosion responsible for local disconformities in the sedimentary pile. During sedimentation, faults were active in the basin, as shown by slump structures in argillite, quartz veining and brecciation of part of the Mississagi quartzites. The close of the Huronian is marked by intrusions of Nipissing diabase, and limited orogenic activity. The first major deformation of the sequence was the Hudsonian (penokean) Orogeny (1755 m.y.). At this time, stresses from the south produced steep northeast trending folds. Faults which had earlier defined the boundaries of the depositional basin were reactivated, with deeply buried metamorphosed sediments being thrust up onto the unmetamorphosed rocks. A later orogenic pulse (1170 m.y.) was responsible for intrusion of Keweenawan diabase dykes. Limited tectonic activity associated with the Grenville Orogeny (960 m.y.) had only a little effect on the Espanola Project area.

Huronian strata within the project are thrown into steep angled attitudes. In Shedden, Victoria and Salter Townships, the rocks form the south limb of the Chiblow Anticline (Robertson, 1976). In Gough and Shakespeare Townships, Groups C, D and F are found on a faulted limb of the Baldwin Anticlinorium.

The major fault running through the entire project area is the Murray Fault. This has been traced from Sault Ste. Marie to Sudbury. Later faults have offset it sinistrally (ie. The Webbwood Fault at Group D). The claim groups of the Espanola Project lie just to the north or straddle the Murray Fault. Other lesser faults parallel this major fault, or, like the Webbwood Fault, trend northwest across the map area.

c) Economic Geology

In the Blind River - Elliot Lake region, quartz pebble conglomerates of the Matinenda Formation are hosts for uranium minerals. The distribution of these conglomerates is controlled by depressions in the Archean pale-surface, where initial deposition of quartz gravels took place. As such, the Matinenda Formation has been a focus of uranium prospecting. Only one outcrop of uraniferous quartz pebble conglomerate was observed in the Espanola Project area. This occurs on the boundary between Gough and Shakespeare Townships (claim no. 438923). The outcrop has been pitted, exposing a 2 metre wide lens of sulphide bearing radioactive conglomerate. Clasts are about 10 to 30 mm. in diameter, and make up 50% of the rock. These are well rounded, with little or no accompanying deformation. The sulphides are well weathered to an unknown depth; no estimate of their percentage was made. No samples were taken, as the surface exposure has been thoroughly leached of radioactive minerals. The conglomerate lies at the contact between a white, fine to medium grained quartzite to the north, and a highly contorted siltstone to the south. This contact is further exposed to the west, but no more conglomerate is present, as it pinches out rapidly to the east and west. In Shakespeare Township, the contact is obscured by thick overburden. The rapid pinching out of the bed is due to the high degree of deformation here, shown also by the remobilization of the quartzite, intrusion and folding of quartz stringers in the siltstone, and strong dragfolding along the contact. This showing has been prospected by at least two companies (see Previous Work). One other trench in arkose and greywacke of the Matinenda Formation was visited on the north shore of Tube Lake (claim no. 438665). No conglomerate was present, although some rusty zones were noted.

In Grid H, Salmay Lake volcanics have been trenched and drilled for copper sulphides (claim no. 438775). Several shallow pits were observed during mapping; distribution of sulphides was poor.

Barnes and Lalonde (1973) have correlated the uranium bearing conglomerates at Agnew Lake Mine with the McKim Formation, based on local stratigraphy at the mine. Although some radioactive anomalies are associated with the McKim argillites on the north shore of Sugar Lake (claim no. 438209), these have not been trenched.

Several pits in the Mississagi quartzite exposed radioactive anomalies, although none are within the Espanola Project. The intraformational breccia in the Mississagi Formation is slightly radioactive. It has been trenched (claim no. 438646). Radioactivity was 5 to 10 times background.

Other radioactive showings occur in sheared and fractured quartzites and greywackes of the Espanola Formation. This has been trenched and drilled (see Previous Work). It appears that radioactive mineralization is restricted to the shears; this proved to be the case when the greywackes were checked with a scintillometer.

The Massey Mine in Salter Township was visited briefly. Mineralized zones containing chalcopyrite, bornite and chalcocite are found in argillites and quartzites of the Pecors Formation. This mineralization extends to the west, but not into Victoria Township (for a more complete description of the Massey Mine, see Robertson, 1976; p.p. 111-116).

WORK DONE

a) Line cutting and chaining:
b) Geology:
c) Scintillometer survey:
d) Radon gas survey:

a) Line Cutting and Chaining

Base lines were established in an east-west direction along existing concession or section lines where possible. Survey lines were cut at 90° to the base lines at 400 foot intervals. All lines were made by compassing and chaining. Stations along survey lines were chained at 100 foot intervals, and the station number recorded on orange flagging tape.

b) Geology

Outcrops were mapped by tying into survey lines, and extrapolation of outcrop contours between them. Approximately 80% of outcrop in the Espanola Project was visited. Rock types were distinguished in the field, according to a simple classification scheme (see legend of geological maps). Mapping was done at 1" = 200', and transferred to base maps of similar scale.

c) Scintillometer Survey

A scintillometer measures gamma-rays associated with the decay of Uranium, Thorium and Potassium isotopes, and transforms this radiation into a visual readout of radioactive intensity. The signal is displayed as counts per second. Emission energy (expressed as millions of electron volts, Mev.) for unstable elements of interest to a radiometric survey are:

Potassium 40 (daughter product of Potassium 40) 1.46 Mev.
Bismuth 214 (daughter product of Uranium 238) 0.608-2.44 Mev.
Thalium 232 (daughter product of Thorium 232) 0.277-2.62 Mev.

Energy response of the Exploranium GRS-101 portable gamma-ray scintillometer used in this survey is to total counts (all energies above 0.05 Mev.). The crystal detector is 1.25" diameter by 1".

The scintillometer survey was done at the same time as the radon survey. The instrument was held at waist height for each reading, and kept on continually during each day's work.

Advantages of a scintillometer survey are speed and ease of operation. Also, it is ideal for use in areas of very thin overburden or bare rock or in wet soils where a radon survey cannot be done. The GRS-101 scintillometer is not useful in areas of thick overburden, as this masks gamma-ray radiation from radioactive sources. Also, it does not differentiate between the sources it detects (Potassium 40, Bismuth 214, Thalium 232).

Most of the scintillometer readings in the Espanola Project were low, only 2 or 3 times the background of 20 counts per second. The survey was not done over areas underlain by granitic basement, as granites along the north shore of Lake Huron have proved to be poor targets for uranium exploration.

A number of distinct types of scintillometer anomalies were encountered (results were considered to be anomalous if over 2 times background).

The following table shows the association of each anomaly.

TABLE I

SCINTILLOMETER ANOMALIES

Type	Association
1	Granitic rocks
2	Thick overburden
3	Faults and shears
4	Argillite and greywacke
5	Arkose and quartzite
6	Oligomictic conglomerates

TABLE II

RADON GAS ANOMALIES

Type	Association
1	Granitic rocks
2	Sand and gravel
3	Wet ground
4	Clay Soils
5	Argillite
6	Arkose and quartzite
7	Oligomictic conglomerates

1) Anomalies in granitic rocks. Certain granites in the Blind River to Espanola area are slightly radioactive, similar to those found at Theano Point on Lake Superior (Robertson, 1976). This was verified during mapping when granitic rocks north of Tube Lake in Victoria Township were discovered to have radioactivity 4 to 6 times background;

2) Anomalies in thick overburden. These are low ($1\frac{1}{2}$ to 2 times background) and may be due to leached uranium minerals from Huronian sediment sources being redeposited under reducing conditions in sands and gravels;

3) Anomalies associated with faults and shears. Radioactive minerals redeposited along shear or fault planes are responsible for this type. This situation may mean that more extensive concentrations of uranium are present at depth;

4) Anomalies in argillite and greywacke. The reason for these anomalies is not clear. They are not considered to be significant.

5) Anomalies in arkose and quartzite. Concentrations of radioactive minerals in these rocks (not in shears) cause scintillometer highs. In general, these were limited in a real extent;

6) Anomalies in intraformational breccias. Again, these are considered insignificant. The source may be the argillaceous matrix;

7) Anomalies in oligomictic conglomerates. These are due to radioactive minerals in the matrix of the conglomerate. As such, they are the best target for further work.

A very distinct low in the scintillometer readings is found over the large diabase sill in Victoria and Shedden Townships.

d) Radon Gas Survey

The radon gas method detects and measures alpha radiation associated with Radon in soil gas. Radiation is measured by use of a Portable Radon Detector, Model RD200, manufactured by EDA Electronics Limited of Ottawa, Ontario. The technique has had long usage in Europe, and was introduced into Canada in 1968 by the Geological Survey of Canada. The present system (EDA - RD200) was based on an original design of the Atomic Energy of Canada Limited, in co-operation with the GSC.

Radon gas consists mainly of two isotopes: Radon 222 and Radon 220. The former is the sixth member of the disintegration series of Uranium 238. With a half life of 3.82 days, it decays by alpha emission to Polonium 218. Radon 220 is the fifth member of the disintegration series of Thorium 232, which decays with a half life of 54.5 seconds by alpha emission to Polonium 216.

The RD200 is a scintillometer that detects and counts alpha particles over a pre-set period (in this survey, one minute) so that it is possible to detect radiation sources obscurred by overburden. The operation of the RD200 is rapid and easy, requiring that overburden be present to trap soil gas below or at the humus cover. The method involves augering a hole into the soil, inserting a hollow probe, and by means of a bulb pump, circulating the gas back into an alpha-sensitive zinc sulphate cell. This cell is coupled with the scintillometer that counts the alpha particles over a pre-set one minute sequence.

Radon gas readings were spaced 100 feet apart along survey lines. Where a reading exceeded 100 counts per minute over background, a second reading was taken at a 50 foot interval. For anomalies greater than

250 cpm over background, three consecutive one minute readings were taken, and the rate of decay of the radioactive source noted. In this manner, a Uranium source can be differentiated from a Thorium source, on the basis of their respective longer and shorter half lives.

The advantage of this technique over previously and better known gamma-ray geiger and scintillometer surveys is that gamma-rays associated with the decay of Uranium, Thorium and Potassium isotopes are easily masked by overburden, and therefore, only effective to bedrock exposures. There are a number of disadvantages to the radon gas method. Readings cannot be taken where soil is thin (less than six inches) or when the auger cannot penetrate into the ground (for example, boulder-rich tills, talus slopes). Also, if the soil is wet, a reading cannot be taken. In such a case, the wet earth likely indicates a high water table, which establishes a reducing environment. Uranium, which is water soluble under oxidizing conditions, is then able to precipitate very close to the surface. A sample taken in this situation would give an anomalous high reading, which would not at all reflect bedrock concentrations of radioactive minerals. The type and thickness of soil can also influence the strength of the radon gas anomaly. Impermeable clay layers will tend to mask bedrock effects, as the radon gas cannot escape into higher levels in the soil. Readings here would be low. Another possibility exists whereby a sample hole is augered through a clay layer where radon gas has collected, causing a high reading which may not be truly representative of the underlying bedrock.

As with the scintillometer survey, a number of types of radon gas anomalies were encountered. These are shown in Table II. Radon gas readings were not taken in areas underlain by granites.

1) Associated with granites. Again, these are caused by radioactivity inherent in red granites to the north of the Huronian sequence;

2) Associated with sand and gravel. Radon gas is adsorbed to the surface of sand grains, thus accounting for the high readings;

3) Associated with wet ground. Uranium may be present in soil where reducing conditions are established (where the water table nears the surface in topographic depressions). Uranium in groundwater will precipitate out in such an environment, which is the likely cause of such anomalies;

4) Associated with clay soils. In this case, clay layers act as an impermeable barrier to the surface migration of radon gas. Such layers (hardpan) are common in podzolic soils, which are found throughout Northern Ontario. If a sample hole is augered through clay into a zone where radon gas has accumulated, a high reading not necessarily indicative of bedrock conditions will be recorded;

5) Associated with argillite. Presumably, radioactive quartzites may be interbedded with argillite and not appear in outcrop. Again, these are not considered to be suitable for further work;

6) Associated with arkose and quartzite. These are good exploration targets;

7) Associated with oligomictic conglomerates. These are also suitable for additional work.

Table III shows the location and association of radon gas anomalies in the Espanola Project, and the correlation of these with scintillometer anomaly types.

TABLE III

CORRELATION OF RADON GAS AND SCINTILLOMETER ANOMALIES

Group	Location	Map Number	Radon Anomaly	Scint. Anomaly	Comments
C	entire group	0-25-20 & 21	2,3	2	Possibly also related to Murray Fault
D	L4W:2N	as above	1	1	
	L20W:5N	as above	2,3	—	
	L32W:12N	as above	—	—	Note the lack of a scint. or radon gas anomaly east of the U showing. This may be due to thick overburden or extreme pinching out of the radioactive source
H	L24E:0-7N	0-25-24	2	2	Very high readings in gravel pit - may coincide with arkosic beds of Salmay Lake Formation
	L12E:5N,8N	as above	2	—	
	L4E:1N,2N	as above	2	—	
I	L8E:2N	as above	6	weak	Weak anomaly in each survey
J	L152E:12S	0-25-25 & 26	6 (2)	—	No scint. anomaly in area of outcrop and thin sand overburden
	L144E:2S	as above	2	—	Occurs in area of Salmay Lake volcanics, which do have some radioactivity-note high scint. reading on L148E:3S of 110 cps in volcanics
	L136E:9S	as above	6,2	—	No scint. anomaly in area of thin overburden and outcrop
	L136E:14S	as above	2	—	Sand anomaly
	L124E-L116E, 12S-14S	as above	2,3(6)	—	Low scint. readings-anomaly may be due to slightly radioactive arkose beds in feldspathic quartzite
	L120E:0	as above	3		Swamp
	L112E:5S	0-25-25 & 26	2 (6)	—	Weak scint. readings, sand overburden
	L88E:11N	as above	2,1	1	Granite outcrop, sandy overburden

TABLE III

CORRELATION OF RADON GAS AND SCINTILLOMETER ANOMALIES

Group	Location	Map Number	Radon Anomaly	Scint. Anomaly	Comments
J	L60E:11N	0-25-27 & 28	3,(1)	weak	Wet ground-note high scint. (5XBG.) in near by quartzites and arkoses near granite contact
	L4E:6N	as above	3,(6)	6	High reading on feldspathic quartzite ( ) outcrop at 7N
	L20W:19S	0-25-29 & 30	6	5,3	Associated with shears in Espanola quartzite
	L28W:5N	as above	2,(5)	—	Possibly caused by slightly radioactive argillite
	L32W:17N,18N	as above	5,6	weak	Caused by slight radioactivity in Matinenda arkose and argillites
	L32W:5S	as above	6	—	Possibly due to radioactive arkose interbeds in quartzites
	L40W:18S,21S	as above	5,6	3,4,5 weak	Follows trend of Espanola quartzites
	L44W:3S	as above	6	—	Due to arkosic interbeds in quartzite, ties in with anomaly on L32W:5S
	L44W:7S-18S	as above	6	5	Fairly strong scint. anomaly 5XBG., indicates radioactive minerals in arkose
	L52W&L72W, 2N-12N	as above	2,5	—	Large radon anomaly in valley over argillites - may be interbedded arkoses at depth
	L88W-104W, 6S-2N	0-25-31 & 32	2,5,6		Large radon anomaly associated mainly with greywackes and arkoses (McKim Formation)
	L88W:10S	025-31 & 32	2	—	Sand overburden, also possibly related to arkoses at depth
	L88W:18S, L92W:14S, L100W:12S	as above	2,4,6	weak	Anomaly appears to be related mainly to types of overburden and possibly arkoses at depth
	L100W:22S	as above	2,6	5,(3)	Anomaly is related to arkoses at depth, and to fractured greywackes and quartzites of the Espanola Formation - note high scint. readings in breccia zone just north of radon anomaly

TABLE III

CORRELATION OF RADON GAS AND SCINTILLOMETER ANOMALIES

Group	Location	Map Number	Radon Anomaly	Scint. Anomaly	Comments
J	L104W-L132W, 6S-10S	025-31 & 32	3,6	5 (ltd.)	Long anomaly occuring over quartzites intruded by diabase - may be due to remobilisation of uranium minerals during intrusion, and concentration of these near contacts - wet ground readings also possible in some areas
	L116W:16S,18S	as above	6	—	As above
	L116W:26S	as above	6,(7)	5 (ltd.)	Associated with breccia zone in Mississagi quartzite-follows zone along strike to anomaly at 100W:22S
	L116W:2S, L120W:2S	as above	2,5	—	Caused by argillites, also related to sandy overburden
	L132W:14S	as above	6	weak	Due to radioactive minerals in quartzite, possibly concentrated by diabase intrusion
	L132W:22S	as above	2,6	—	Related to arkose, sand overburden
	L144W:42S	as above	3,6	—	May be due to radioactive minerals leached from arkose to north and redeposited in soil down in topographic low-also wet soil
		0-25-33,34			Group J in Shedden Twp. is characterized by numerous small, rather weak radon anomalies. Only a few are discussed here
	L176W:3S	as above	2	—	Sand anomaly
	L188W:37S	as above	2,3,5	—	May be due to faulting, likely an effect of overburden or possibly slightly radioactive argillites

TABLE III

CORRELATION OF RADON GAS AND SCINTILLOMETER ANOMALIES

Group	Location	Map Number	Radon Anomaly	Scint. Anomaly	Comments
J	L200W:3S	0-25-33,34	4,(6)	—	Clay soil, may be due to radioactive arkose at depth
K	L84E:4N,8N	0-25-37 & 38	2	—	May be related to faulting
	L80E:15N,17N	as above	5,3	—	Does not appear to be significant
	L72E:1N,9N	as above	2,6	—	May be fault related
	L44E:7N-10N	as above	3	—	Wet ground
	L44E: 14N	as above	1	1	Granite
	L40E:2N	as above	6	—	Not significant
	L28E:4N	as above	6	—	No scint. anomaly over area of thin overburden - anomaly cuts across bedding, maybe related to faulting
	L20E:5N	as above	6	—	Fault related
	L8W:12N	0-25-39 & 40	5	5	Long anomaly from 12W to 8E, centered on 8W - coincides with argillite
	L8W:6N	as above	6	weak	Not significant
	L8W:1S	as above	6,4	—	May extend to 4E
	L8W:4S	as above	4	—	Clay overburden
	L12W:9N	as above	2	—	Sand overburden
	L12W:2N	as above	2,3	—	Sand overburden, wet ground
	L24W:4S	as above	2	—	Sand overburden
	L28W:9N	as above	5	4	Slight radioactivity
	L32W:4N,6N	as above	2,4	—	Samples taken through clay layer giving high readings
	L32W:0	as above	2,4	—	As above
	L32W:2S	as above	2	—	Sand overburden
	L44W:9S-11S	as above	2,3,4	—	Wet clays, sand
	L48W:5S	as above	2	—	Sand overburden
	L52W:19N	as above	3,6	5	Some correlation between radon and scint.
	L52W:6S	as above	2	—	Sand
	L52W:12S	as above	2	—	Sand
	L56W:9S	as above	3	—	Sand

CONCLUSIONS

A synthesis of geological, scintillometer, and radon gas surveys was successful in outlining numerous radioactive anomalies within the Espanola Project. Of these five were considered significant enough to warrant further detailed work. This work will cover Claim no. 438660, 438661, 438662, 438663 and 438669 along the Espanola Formation (Group J, Victoria Township, Centre J Group)(map 0-25-29); 438654, 438657 and 438659 over argillites and arkoses (also Centre J Group Map); 438638, 438645, 438646, and 438653 (West Centre J Group Map 0-25-31, Victoria Township) and 438698 and 438699 (Centre K Group map, 0-25-37, Shedden Township).

Respectfully submitted,

J R Foster (Qualifications: NOT ON RECORD)

Qualifications: Not on record

J. R. Foster

G. Hinse

G. Hinse, P.Eng.

REGISTERED PROFESSIONAL ENGINEER
G. J. HINSE
PROVINCE OF ONTARIO

Qualifications:
2.1402
(2.1402) ←
(QUALIFICATIONS)

LIST OF REFERENCES

Barnes, F.Q., and Lalonde, E.J.

1973: Lower Huronian Stratigraphy, Hyman and Drury Township, Sudbury District; in Huronian Stratigraphy and Sedimentation, G.M. Young ed. Geol. Assoc. Canada Special Paper No. 12, 271 p.

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1976: Geology of the Dunlop - Shakespeare Area, District of Sudbury; Ontario Div. Mines, GR139, 52 p. Accompanied by Map No. 2313.

Robertson, J.A.

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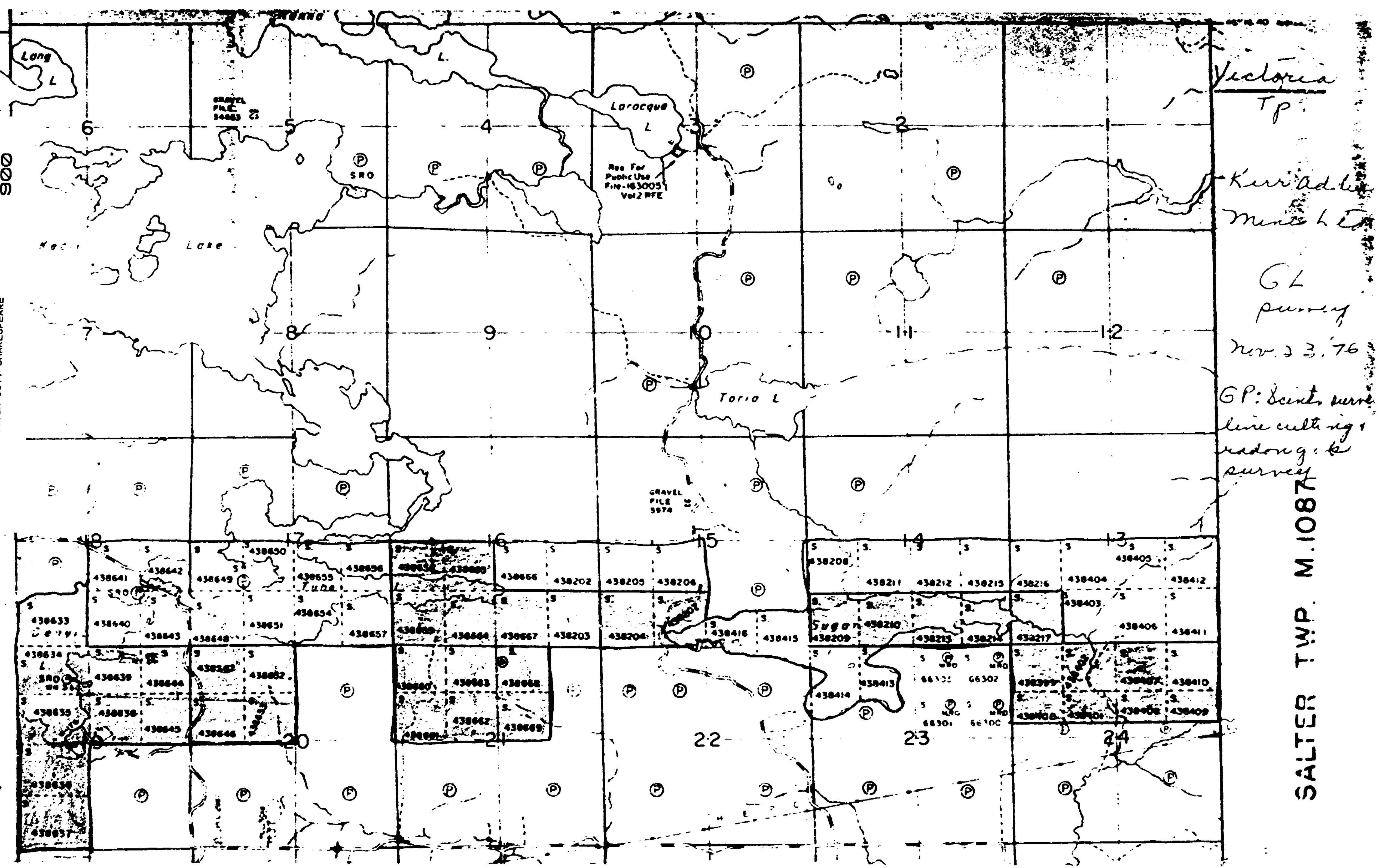
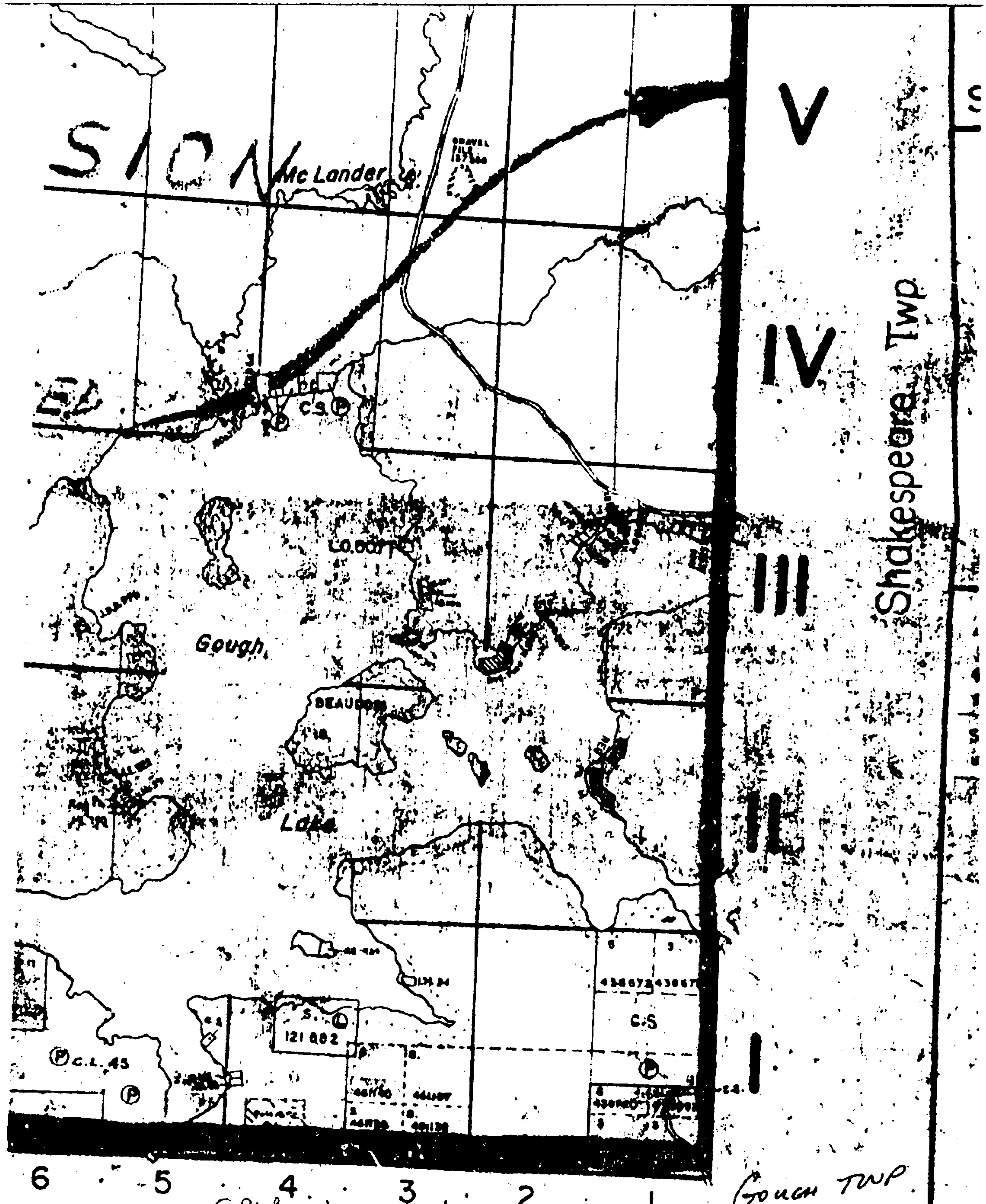
Roscoe, S.M.

1973: The Huronian Supergroup, a Paleoaphebian Succession showing Evidence of Atmospheric Evolution; in Huronian Stratigraphy and Sedimentation, G.M. Young ed., Geol Assoc. Canada Special Paper No. 12, 271 p.

	Claim No.		Claim No.	Claim No.	
Victoria	S 438637	Victoria	S 438658	S 438767	Shakespear
"	S 438638	"	S 438659	S 438772	Salter
"	S 438639	"	S 438660	S 438773	Salter
"	S 438644	"	S 438661	S 438774	Salter
"	S 438645	"	S 438662	S 438775	Salter
"	S 438646	"	S 438663	S 438776	Salter
"	S 438647	"	S 438664	S 438919	Hough
"	S 438652	"	S 438665	S 438920	Hough
"	S 438653	"	S 438667	S 438921	Hough
"	S 438654	"	S 438668	S 438922	Hough
"	S 438655	"	S [illegible]8669	S 438923	Shakespear
"	S 438656	Shakespeare	S 438766	S 438924	"
"	S 438657				



Long L
Larocque L
Toria L
Res For Public Use File-163005 Vol2 RFE
GRAVEL FILE 3974
SRO
Victoria Tp.
GL survey
Nov. 23. '76
SALTER TWP. M.1087

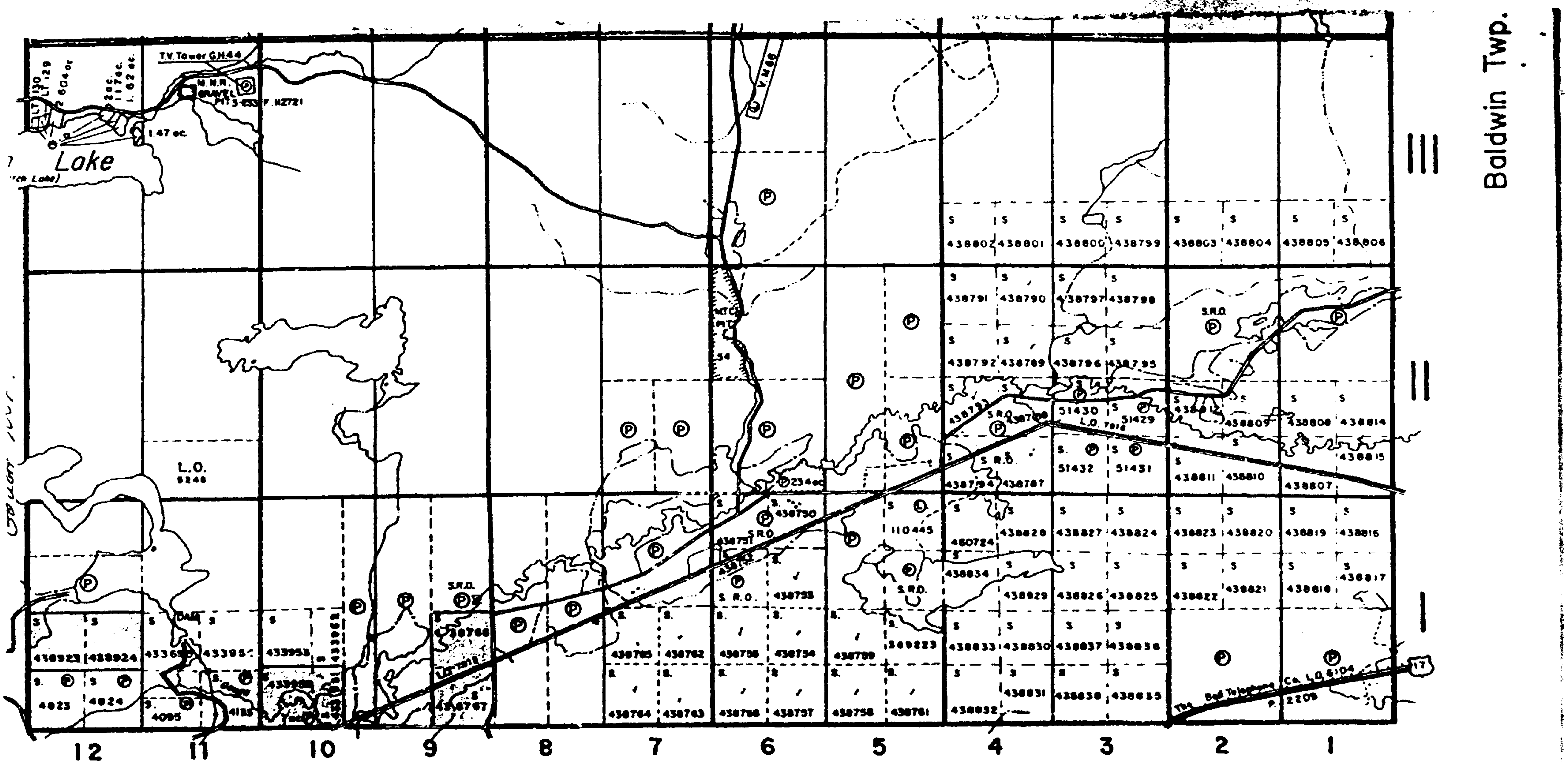


Gough TWP

6P: Scint. survey; line cutting, radon gas survey.

Kerr Addison Mines GL survey Mar 22/76

Twp. Gough Tp



Shakespeare Tp.

Hallam Twp. (M.909)

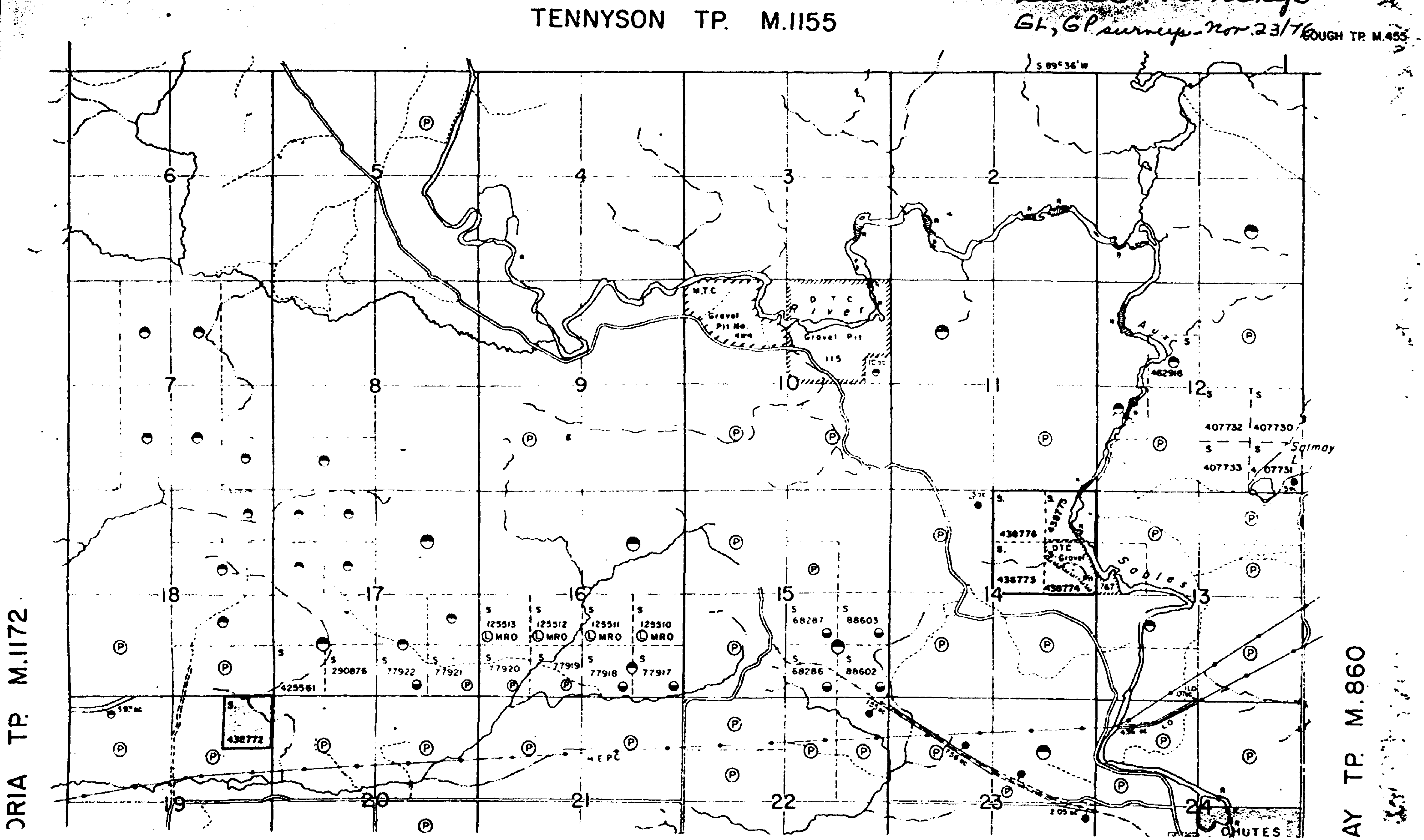
Kerr Addison Mines Ltd.

GL survey Nov. 23/76

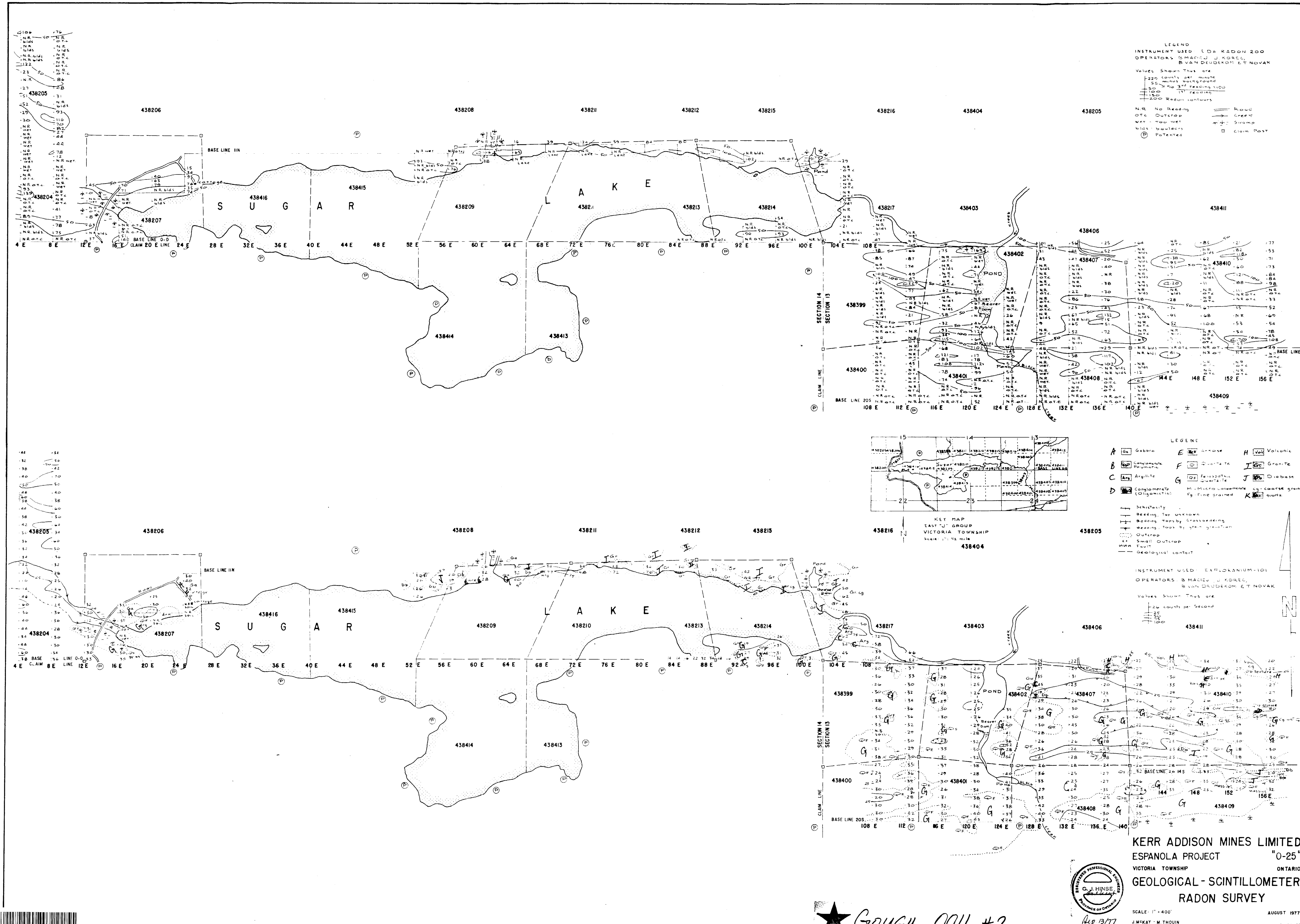
GP: Scint. survey; line cutting + radon gas survey

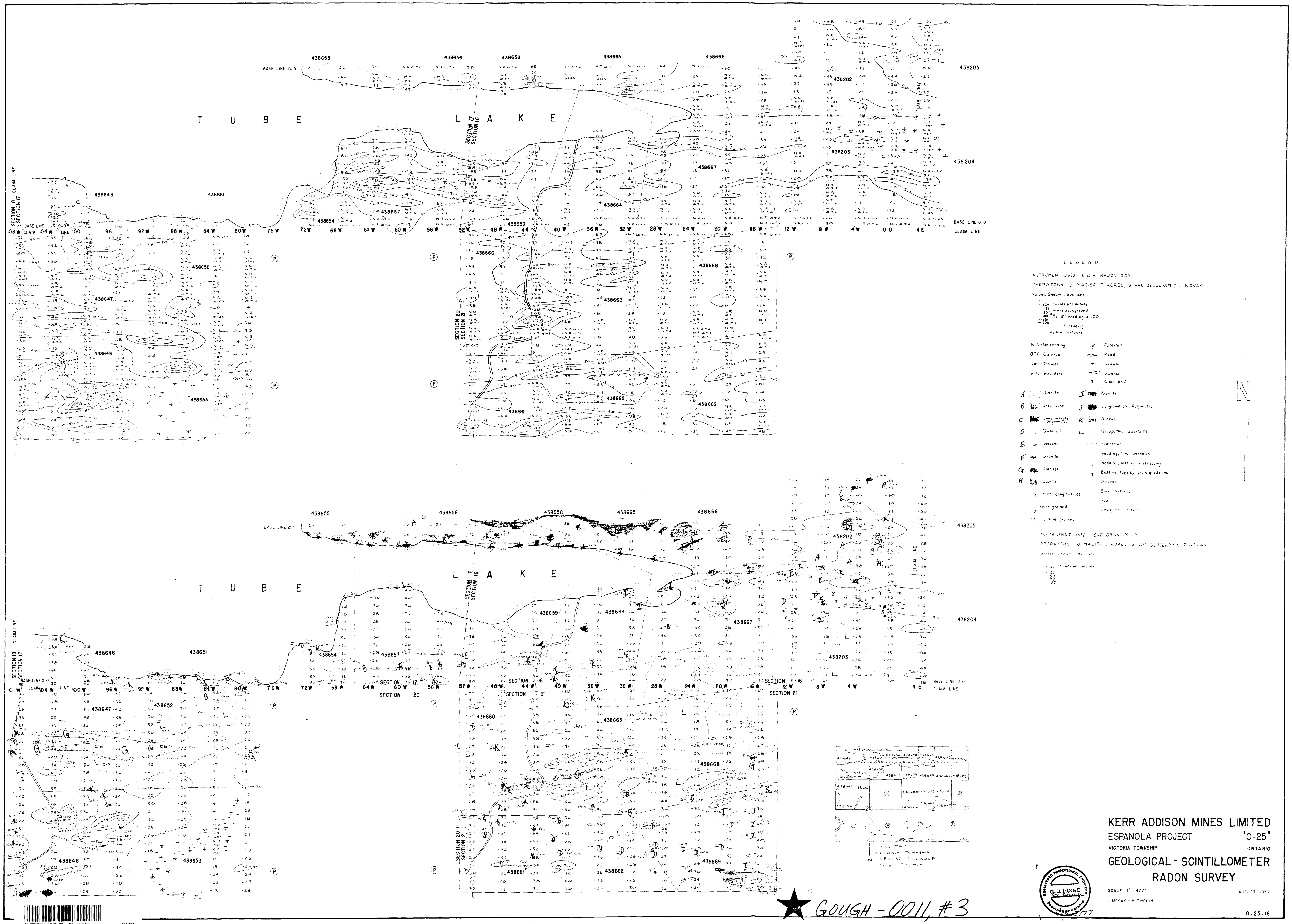
Kerr Addison Mines Ltd.

Salter Township
GL, GP surveys - Nov. 23/76




RADON GAS SURVEY
GROUP-D
CON. I
GEOLOGICAL-SCINTILLOMETER SURVEY
GROUP-D
CON. I
RADON GAS SURVEY
GROUP-F
CON. I
LOT-1
GEOLOGICAL-SCINTILLOMETER SURVEY
GROUP-F
CON I
LOT-1
RADON GAS SURVEY
GROUP-C
CON. I
LOT-9
GEOLOGICAL-SCINTILLOMETER SURVEY
GROUP-C
CON. I
LOT-9
GROUP-H
SECTION-14
GEOLOGICAL SCINTILLOMETER SURVEY
GROUP-H
SECTION-14
RADON GAS SURVEY
KEY MAP
GROUP-C-D-F
GOUGH-SHAKESPEARE TWP.
SCALE 1" = ½ MILE
KEY MAP
SALTER TWP
GROUP-H
SECTION-14
SCALE 1" = ½ MILE
KEY MAP
SALTER TWP
GROUP - I
SECTION - 19
SCALE 1" = ½ MILE
GROUP-I
SECTION-14
GEOLOGICAL-SCINTILLOMETER SURVEY
GROUP-I
SECTION 14
RADON GAS SURVEY
LEGEND
INSTRUMENT USED: E.D.A. RADON-200
OPERATORS: B. MACIEJ, J. KOREC, B. VAN DEUDEKOM & T. NOVAK
Values Shown Thus are:
229 counts per minute
55 minus background
% 3rd reading X100 / 1st reading
Radon contours
N.R. - No Reading
wet - Too wet
P - Patented
Creek
Claim post
O.T.C. - Outcrop
blds. - Boulders
Road
Swamp
Power Line
A Ga Gabbro
C Argillite
E Arkose
G Q Quartzite
B Volc. Volcanic
D Granite
F Diabase
H Di Diorite
M - Micro conglomerate
Fg - Fine grained
cg - coarse grained
Schistosity
Bedding, tops unknown
Bedding, tops by crossbedding
Bedding, tops by grain gradation
Outcrop
Small outcrop
Fault
Geological contact
INSTRUMENT USED: EXPLORANIUM-101
OPERATORS: B. MACIEJ, J. KOREC, B. VAN DEUDEKOM & T. NOVAK
Values Shown Thus are:
29 counts per second
KERR ADDISON MINES LIMITED
ESPANOLA PROJECT "0-25"
SHAKESPEARE - GOUGH - SALTER TOWNSHIP ONTARIO
GEOLOGICAL - SCINTILLOMETER
RADON SURVEY
SCALE: 1" = 400'
AUGUST 1977
J. McKAY - M. THOUIN
0-25-14
REGISTERED PROFESSIONAL ENGINEER
G. J. HINSE
PROVINCE OF ONTARIO
GOUGH-0011, #1


LEGEND
INSTRUMENT USED EDA RADON 200
N.R. No Reading
O.T.C. Outcrop
bldrs boulders
Patented
Road
Creek
Swamp
Claim Post
S U G A R
L A K E
POND
BASE LINE 11N
BASE LINE 20S
BASE LINE 14S
BASE LINE 0-0
CLAIM LINE
SECTION 14
SECTION 13
KEY MAP
EAST "J" GROUP
VICTORIA TOWNSHIP
LEGEND
Gabbro
Argillite
Arkose
Volcanic
Granite
Diabase
Fg - Fine grained
Geological contact
INSTRUMENT USED: EXPLORANIUM-101
Values Shown Thus are
counts per second
KERR ADDISON MINES LIMITED
ESPANOLA PROJECT
"0-25"
VICTORIA TOWNSHIP
ONTARIO
GEOLOGICAL - SCINTILLOMETER
RADON SURVEY
SCALE: 1" = 400'
AUGUST 1977
J. McKAY · M. THOUIN
0-25-16
G. J. HINSE
GOUGH - 0011, #2
210


TUBE LAKE
BASE LINE 20 N
BASE LINE 0-0
CLAIM LINE
SECTION 16
SECTION 17
SECTION 18
SECTION 20
SECTION 21
438655
438656
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438665
438666
438205
438204
438202
438203
438667
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438651
438654
438657
438659
438664
438652
438647
438646
438653
438660
438663
438668
438661
438662
438669
LEGEND
INSTRUMENT USED E D A RADON 200
OPERATORS B MACIEJ, J. KOREC, B VAN DEUJEKOM & T NOVAK
Values Shown Thus are
229 counts per minute
55 minus background
% 3rd reading x 100
1st reading
Radon contours
N.R.-No reading
O.T.C.-Outcrop
wet - Too wet
blds - Boulders
Patented
Road
Creek
Swamp
Claim post
A Diorite
B Greywacke
C Conglomerate Oligomictic
D Quartzite
E Volcanic
F Granite
G Diabase
H Quartz
I Argillite
J Conglomerate Polymictic
K Arkose
L Feldspathic quartzite
Schistosity
Bedding, tops unknown
Bedding, tops by crossbedding
Bedding, tops by grain gradation
Outcrop
Small outcrop
Fault
Geological contact
M - Micro conglomerate
Fg - Fine grained
Cg - Coarse grained
INSTRUMENT USED EXPLORANIUM
OPERATORS B MACIEJ, J KOREC, B VAN DEUJEKOM & T NOVAK
Values shown thus are
counts per second
KEY MAP
VICTORIA TOWNSHIP
CENTRE J. GROUP
KERR ADDISON MINES LIMITED
ESPANOLA PROJECT "0-25"
VICTORIA TOWNSHIP ONTARIO
GEOLOGICAL - SCINTILLOMETER
RADON SURVEY
SCALE: 1" = 400'
AUGUST 1977
J McKAY - M. THOUIN
0-25-16
REGISTERED PROFESSIONAL ENGINEER
G. J. HINSE
PROVINCE OF ONTARIO
GOUGH - 0011, #3
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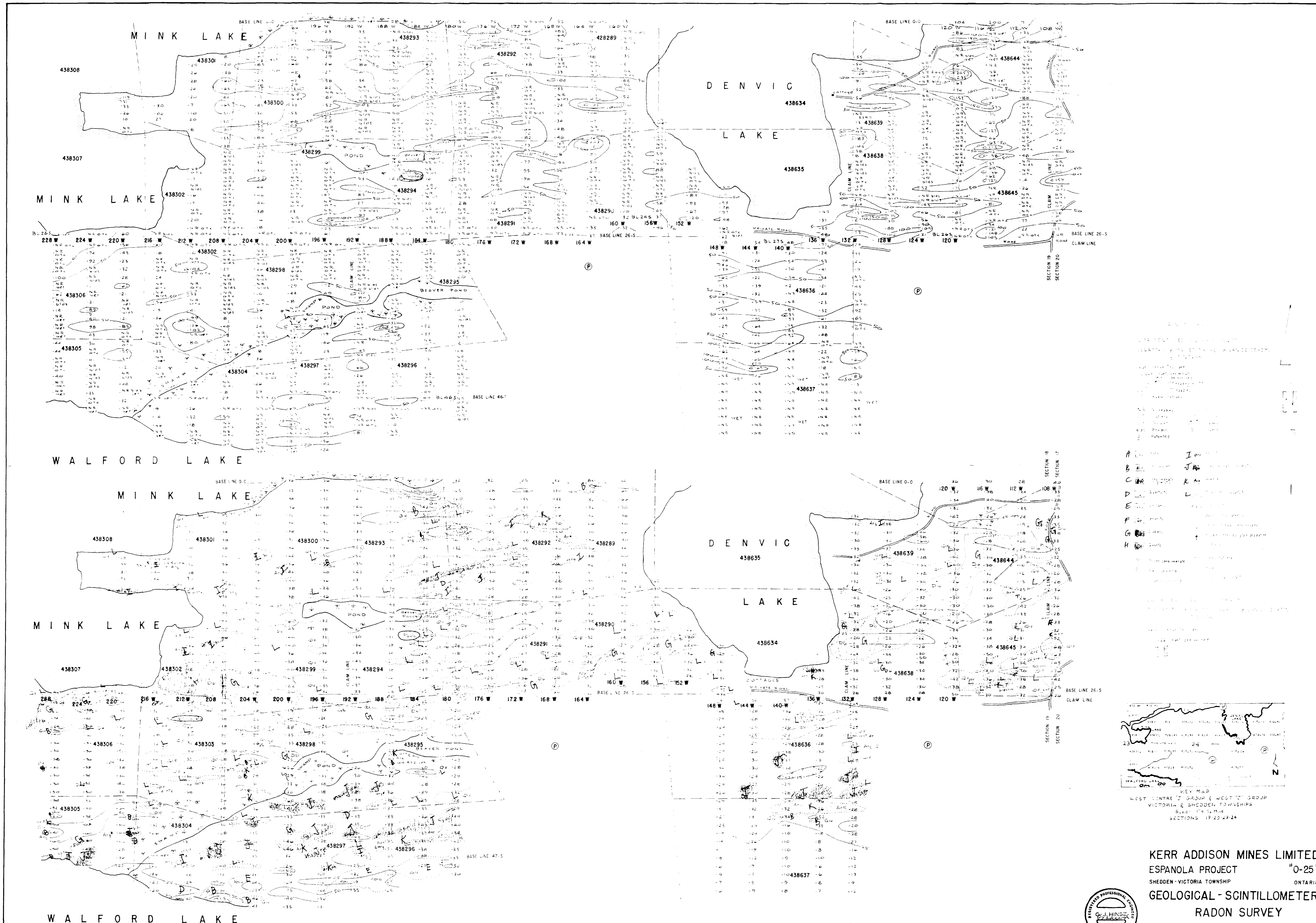

KERR ADDISON MINES LIMITED

ESPANOLA PROJECT "0-25"

SHEDDEN - VICTORIA TOWNSHIP ONTARIO

GEOLOGICAL - SCINTILLOMETER

RADON SURVEY

SCALE 1" = 400' AUGUST 1977

J. McKAY - M. THOUIN

0-25-17

REGISTERED PROFESSIONAL ENGINEER G. J. HINSE PROVINCE OF ONTARIO

Sep 13/77

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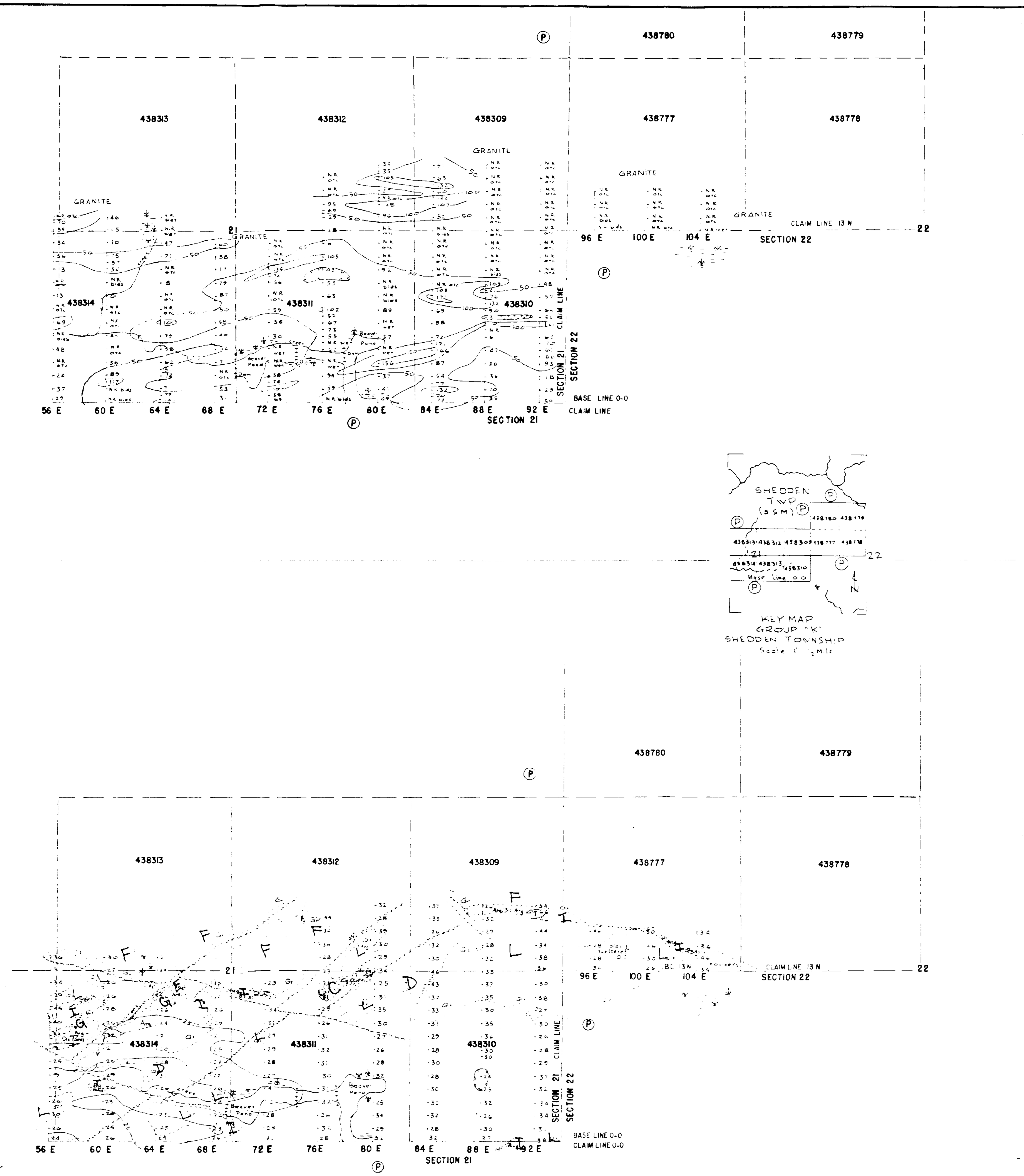


LEGEND

INSTRUMENT USED: E.D.A. RADON 200

OPERATORS: B. MACIEJ, J. KOREC, B. VAN DEUDEKOM & T. NOVAK

Values Shown Thus are:

1229 counts per minute

55 minus background

% 3rd reading x 100 / 1st reading

—50
—100
—150
—200

N.R. - No reading

OTC - Outcrop

wet - Too wet

blds - Boulders

(P) - Patented

Road

Creek

Swamp

Claim post

A Ga Gabbro

B Gw Greywacke

C Conglomerate (Oligomictic)

D Q Quartzite

E Vok Volcanic

F Granite

G Diabase

H Quartz

M - Micro conglomerate

Fg - Fine grained

Cg - coarse grained

I Arg Argillite

J Conglomerate Polymictic

K Ark Arkose

L Qf Feldspathic Quartzite

Schistosity

Bedding, tops unknown

Bedding, tops by crossbedding

Bedding, tops by grain gradation

Outcrop

Small outcrop

Fault

Geologic contact

INSTRUMENT USED: EXPLORANIUM - 101

OPERATORS: B. MACIEJ, J. KOREC, B. VAN DEUDEKOM & T. NOVAK

Values Shown Thus are

·26 counts per second

—25
—50
—75
—100

N

KERR ADDISON MINES LIMITED

ESPANOLA PROJECT "O-25"

SHEDDEN - TOWNSHIP ONTARIO

GEOLOGICAL - SCINTILLOMETER RADON SURVEY

SCALE 1" = 400'

AUGUST 1977

J. McKAY - M. THOUIN

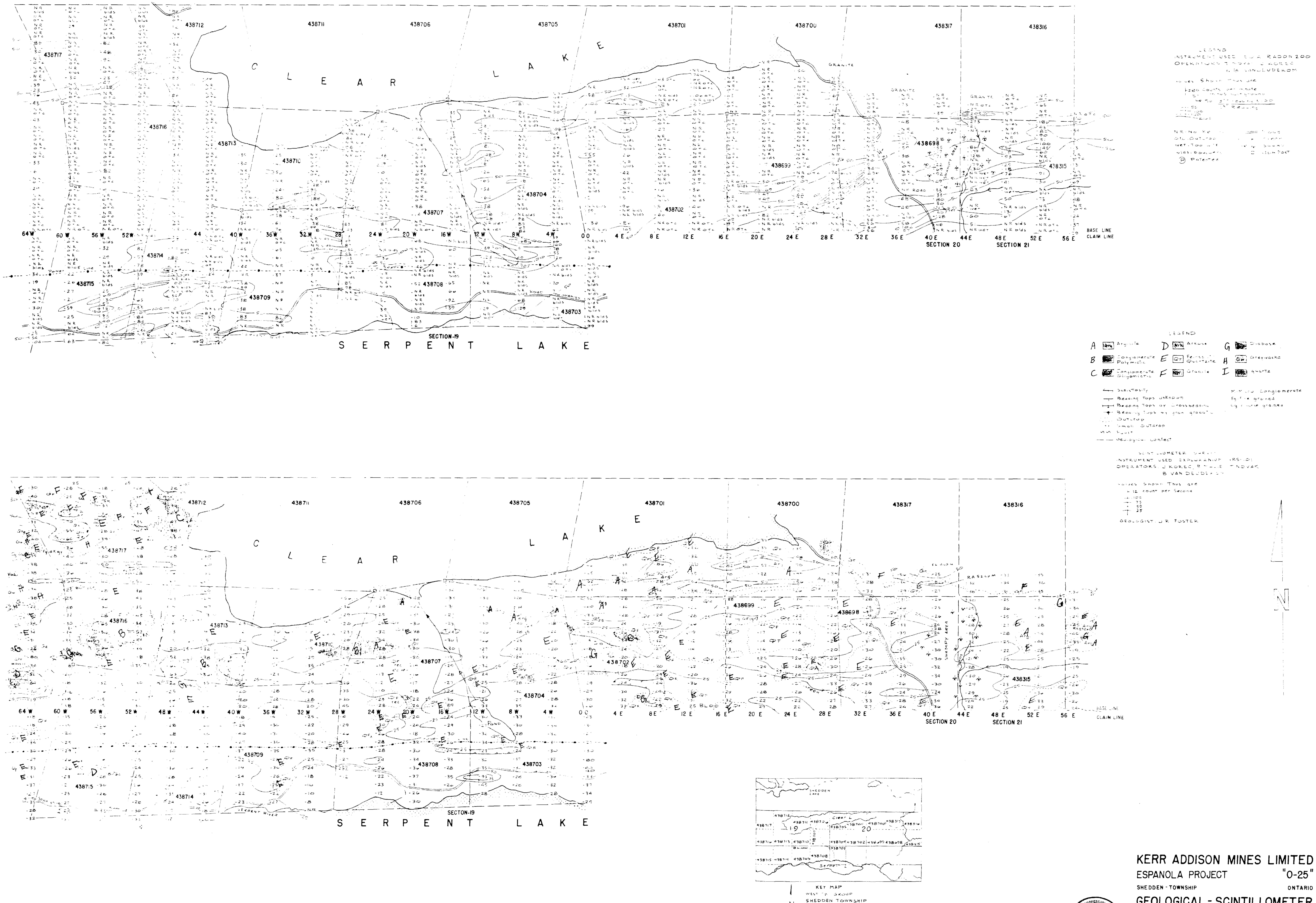
G.G. HINSE

Aug 13/77

0-25-18

GOUGH-0011, #5

240



KERR ADDISON MINES LIMITED
ESPANOLA PROJECT "O-25"
SHEDDEN - TOWNSHIP ONTARIO
GEOLOGICAL - SCINTILLOMETER RADON SURVEY
SCALE 1" = 400' AUGUST 1977
J. McKAY - M. THOUIN
0-25-19