MAR 19950003: BURMIS

Received date: May 12, 1995

Public release date: May 13, 1996

DISCLAIMER

By accessing and using the Alberta Energy website to download or otherwise obtain a scanned mineral assessment report, you ("User") agree to be bound by the following terms and conditions:

a) Each scanned mineral assessment report that is downloaded or otherwise obtained from Alberta Energy is provided "AS IS", with no warranties or representations of any kind whatsoever from Her Majesty the Queen in Right of Alberta, as represented by the Minister of Energy ("Minister"), expressed or implied, including, but not limited to, no warranties or other representations from the Minister, regarding the content, accuracy, reliability, use or results from the use of or the integrity, completeness, quality or legibility of each such scanned mineral assessment report;

b) To the fullest extent permitted by applicable laws, the Minister hereby expressly disclaims, and is released from, liability and responsibility for all warranties and conditions, expressed or implied, in relation to each scanned mineral assessment report shown or displayed on the Alberta Energy website including but not limited to warranties as to the satisfactory quality of or the fitness of the scanned mineral assessment report for a particular purpose and warranties as to the non-infringement or other non-violation of the proprietary rights held by any third party in respect of the scanned mineral assessment report;

c) To the fullest extent permitted by applicable law, the Minister, and the Minister's employees and agents, exclude and disclaim liability to the User for losses and damages of whatsoever nature and howsoever arising including, without limitation, any direct, indirect, special, consequential, punitive or incidental damages, loss of use, loss of data, loss caused by a virus, loss of income or profit, claims of third parties, even if Alberta Energy have been advised of the possibility of such damages or losses, arising out of or in connection with the use of the Alberta Energy website, including the accessing or downloading of the scanned mineral assessment report and the use for any purpose of the scanned mineral assessment report so downloaded or retrieved.

d) User agrees to indemnify and hold harmless the Minister, and the Minister's employees and agents against and from any and all third party claims, losses, liabilities, demands, actions or proceedings related to the downloading, distribution, transmissions, storage, redistribution, reproduction or exploitation of each scanned mineral assessment report obtained by the User from Alberta Energy.

Alberta Mineral Assessment Reporting System

19950003

MAY 1 2 1995

REPORT FOR ASSESSMENT
FOR
ALBERTA METALLIC MINERAL PERMITS
9389050002 AND 9389060001

OVERVIEW OF ASSESSMENT WORK DONE ON BEHALF OF 393466 ALBERTA LTD. BY WESTERN DIAMEX

As per our agreement with 393466 Alberta Ltd. we have undertaken work under our option agreement. This work to be applied towards the assessment requirements on the Burmis Leases in return for an 80% earned interest in the said permits for Western Diamex.
Western Diamex intends to determine if a mineable resource exists and then take that knowledge to the marketplace to find a potential buyer.
To this end we have carried out the following work:

1. Examination of the various types of Burmis Magnetite to determine mineral makeup and the type of mining method most suited to utilization of the resource.

2. On site examination of the permits.

3. Collection of ore samples for investigation of possible processing methods and product evaluation.

4. Lab study of the ore to determine if crushing and standard gravity processing could enrich the ore.

5. Examination of the concentrates to determine if a product could be produced.

6. Potential product identification and an evaluation of the processing methods most amenable to producing a marketable product.

7. Magnetite reserve calculations based on historical drilling and magnetometer work.

9. Evaluation of potential secondary products ie. secondary mineral products.

10. Preparation of report for assessment purposes to the Government.

COSTS TO BE APPLIED TO ASSESSMENT

FIELD COSTS

Sample acquisition and property examination (see maps of sample sites).

30 man days x $150.00 per day	= $4500.00
mileage	= $4900.00
meals	= $700.00
lodging	= $700.00
TOTAL	**=$10,800.00**

LAB COSTS

Sample processing and assay (see test tables)

TOTAL	**=$7000.00**

TOTAL COSTS TO BE APPLIED TOWARDS ASSESSMENT REQUIREMENTS

= $17,800.00

SUMMARY REPORT ON WORK DONE FOR
393466 ALBERTA LTD.

The purpose of this program was to gather samples of sufficient size that larger samples could be processed for product evaluation. The samples gathered were mostly dense magnetite sandstones but several exposures were found of a less rich ore. The less rich material was also gathered for examination to give relative concentration differences and to evaluate if different process systems would be needed to upgrade to a saleable product.

The first and most obvious method of enrichment is crushing and magnetic separation. The most important processing decision is the size to crush to in order to liberate the magnetic particles. This can be very important if a certain size of product is desirable. Excessive crushing can destroy a marketable product.

ORE EXAMINATION

The two types of ore are characterized by their relative darkness. The higher the magnetite level the darker the ore. The richest ore is very dark grey to black. Examination of samples with cut faces reveal a black, fine grained material with some veinlets of lighter material. There are obvious layers in the ore with slightly varying degrees of magnetite concentration. Some of the richest material gives little evidence of minerals other than magnetite. Though the deposit is classified as a sandstone sand grains are not immediately evident.

The poorer grade of ore is much lighter in colour. There are obvious mineral species other than magnetite. There is layering evident in cross section. Sand grains are more easily seen and the magnetite is not as densely packed.

CRUSHING AND MAGNETIC SEPARATION

A series of crushing and magnetic separation tests were carried out with the aim of establishing optimal crushing size.

Samples were processed in a plate type grinder after first being crushed to 3/8" minus in a jaw crusher. Follow up testing was done with a small scale jaw over rolls crusher capable of processing up to a ton of this material per hour.

All of the samples were crushed to minus 50 Tyler mesh as the first pass.

Magnetic separation was done with low intensity magnetic flux and the separated grains were examined microscopically to determine if the grains were discrete magnetite grains with a minimum of attached gangue minerals. After each examination the material was recrushed to the next finest size and then reexamined. As some material is crushed to a much finer size than the size to be examined there was some chance to "look ahead" of the actual test fraction. By examining those mineral grains that had been crushed finer we could begin to anticipate the optimal crushing size. The material was examined at the following

test sizes: 50, 100,150,180,200,220,250,300. In size ranges larger than 200 Tyler mesh too much of the recovered mineral had non magnetite mineral pollution. After many tests the optimal size seems to be minus 250 Tyler mesh.
Finer crushing would likely improve the recovered product with the attendant higher crushing costs. Our first tests were done with a dry grinding circuit. A series of samples were subjected to a wash circuit and it was observed that much of the material seen as pollution in the 200 to 225 mesh sizes was eliminated by washing the magnetite ore. Attempts to test this at production simulation exposed one major processing need. Washing the material in drum type washers, sand screws, elutriation towers etc. were only successful in eliminating lightweight pollution such as silica and slimes. The heavier mineral grains remained mechanically entrained with the magnetite. The most effective washing was done as the magnetic separation was done. Both high grade and low grade ore samples were amenable to this processing. It is felt that there will be little difference in the finished products other than the extra cost associated with having to process larger amounts of lower grade ore to produce the desired finished product.

POSSIBLE PRODUCTS

While there are several products that can be produced this titanium rich magnetite is not easily processed for iron. Nor is it suitable for use in photocopy toner or high grade electronic materials. From the standpoint of the ease in processing the most obvious product would be a fine grind magnetic product for the coal processing industry. This material is used to create a higher specific gravity liquid used to separate different grades of coal.
This industry typically needs their magnetic product crushed to minus 325 Tyler mesh which is finer than that needed for adequate liberation of most of the magnetite. Almost two thirds of the assayable titanium will report to the non magnetic fraction as illmenite, rutile, and anatase. The remaining titanium levels are not a problem for the coal industry and the ore is relatively easy to upgrade for their use.
The ore should be upgradeable through the use of fine grind and magnetic separation systems. There may be a use for a gravity concentration circuit to help upgrade the ore and to remove slimes.

SECONDARY PRODUCTS

There is the potential for the production of secondary minerals that could be of economic benefit. The two most prominent minerals would be titanium in the form of rutile, illmenite, and anatase and zircon in the form of zirconium.

Both of these minerals would report to the non magnetic fraction from magnetic separation and could be upgraded with a gravity circuit. Further upgrading is possible but it is hoped that a market could be found for the mineral sand concentrate.

Some preliminary work was carried out to determine if a mineral sand concentrate could be produced from the non magnetic fraction. Zircon and the titanium minerals were easily recovered with minimal loss to the mostly silica gangue. Some of the softer illmenite was lost as a result of degradation during crushing. The softer minerals, though heavy, were reduced to slimes and were lost on the vibrating table used to upgrade the mineral sands. If secondary minerals were to be produced as a result of the re-processing of the non magnetic reject from magnetite production it is unlikely that this loss to slime could be prevented as we would be dealing with a product after it had already been crushed to minus 325 mesh. Minerals other than the two previously mentioned do not seem to be in economic amounts unless there is sufficient upgrade as a result of secondary mineral production. The production of a secondary mineral concentrate may produce sufficient concentrations of minerals not seen as economic in the raw ore. To give an idea of the possible economic benefit of the secondary minerals of titanium and zircon we can use the following information.

Work done by Mellon in 1961 can give some idea of the minerals we should look for and the amounts that we should see.

On page 31 he talks about the difficulty with determining titanium and where it seems to report. Approx. 2/3 of the analyzed titanium reports to a non mag fraction while the magnetite appears to have some titanium bonded in solid solution accounting for the other 1/3. The total titanium detected was averaging about 3.47% of the total weight of ore. This is for Todd Creek and Burmis averaged. With the expected production of 38,000 tons of magnetite there will be a total of 138,000 raw tonnes processed at a 30% magnetite yield.

With 138,000 raw tons the titanium should be 2.29% (2/3 of 3.47%) or approximately 3160 tons. In 1980 rutile (a similar composition to anatase) was selling for eight cents American per pound. In todays Canadian dollars that would be over 10 cents without any price increases. **With this pricing the titanium value would be around $632,000.**

Zircon as zirconium is another valuable accessory mineral. Mellon did not do a direct analysis of the zircon but an examination of mineral grains suggested that zircon (page 33) was running 26% of the mineral grains in the heavy, non -mag, non-opaque fraction. For ease of estimation we will use the relationship between the known non mag titanium number and the zircon number. In this examination Mellon discovered zircon at 26% of the total sample and titanium at 64% of the total sample. This would place the zircon at 40.6% of the titanium. With a titanium production of 3160 tons the zircon would be 1264 tons. In 1980 zirconium was selling for 3 cents American per pound. In todays dollars that would be 3.9 cents Canadian without price increases. **With this pricing the 1264 tons of zirconium would be valued at $98,592.**

TESTING FOR PRECIOUS METALS

With this grade of concentration of an obvious heavy mineral (magnetite) it would be logical to assume that there may be precious metals also concentrated in with the "heavies". A program of assays was undertaken to evaluate that possibility. Tests for placer gold were carried out through examination of the non magnetic fractions from magnetic separation tests as well as assays. Assay by both fire and Neutron Activation revealed no economic potential for gold, silver or platinum. There were also several acid digest over Atomic Adsorption assays that gave confirmation of the above results.

This was a bit of a surprise as the host rocks for the magnetite have been confirmed as gold bearing. We are unsure where that gold could have gone as the magnetite was liberated and redeposited but there is the possibility that the gold is tied up with a lighter, softer mineral grain and was either degraded and/or disseminated throughout the deposit without the benefit of the mechanical concentration experienced by the magnetite. Some of the analytical work carried out on the host rocks would suggest that much of the gold is found in association with pyrite grains. If so this would fit the profile of a softer, lighter grain that was more easily broken down releasing its gold to be disseminated without concentration. If the pyrite were to have survived then it may be concentrated in zones in the sandstone and may have been missed in the initial examinations. A check of the assay work done to date shows that the assays were carried out on the raw ore as well as magnetic concentrates. If sufficient precious metals were in the raw ore they would certainly have been found. There may be some benefit to a re-examination of the non magnetic materials that would be rejected from the production of coal industry magnetite. This material would be the source of the secondary minerals and the same processes used to upgrade these minerals (gravity concentration) may produce a gold concentrate that could be of economic befit.

One factor that will be investigated in the future will be more work on evaluating the source rock. With current theory leaning towards the Crowsnest Volcanics as the source we note that there is a significant level of garnet in the Volcanics. We have not seen that reflected in the magnetite ore. As a beach sand deposit the garnet should have been deposited with the magnetite.

POSSIBLE FLOW CHART

With the possibility of secondary economic minerals the mineral processing flowchart should be designed to optimize recoveries. The basic circuit is very simple with low intensity magnetic separation of magnetite grains after crushing of the raw ore to minus 325 Tyler mesh. To optimize the secondary mineral production a gravity concentration circuit should be added.

There is some debate where the gravity circuit best fits into the process but the primary concern is water.

For the production of a magnetite concentrate the raw ore can be crushed dry or wet. Each has its advantages. Dry crushing can be easier to classify at a high rate of production but there is the need for dust suppression and later in the process the magnetic concentrate must be washed to clean slimes from the magnetic product. Wet crushing is slower but there is the benefit of dust suppression and continuous desliming without having a special circuit for washing. There is the need for having a wet magnetic separation circuit and the finished product will have to be dried.

For our needs the following circuit would be suggested:

- DRY CRUSH TO MINUS 1/2"
- OPTIONAL DRY CRUSH TO MINUS 100 MESH
- WET CRUSH TO MINUS 325 MESH
- WET, LOW INTENSITY MAGNETIC SEPARATION OF MAGNETITE
- TAILINGS FROM MAGNETIC SEPARATION TO VIBRATING TABLES FOR SECONDARY MINERAL UPGRADE

The magnetic separation of the magnetite would actually be several steps of cleaning and upgrade with some non magnetic tailings from each cleaning step. There would have to be some testing to determine if the tailings from the upgrading would contain sufficient secondary minerals to be worth bringing to the secondary mineral upgrade.

As the secondary mineral concentration uses water there would be no incompatibility with the primary process.

It is possible to further upgrade the secondary mineral concentrate by drying and using High Intensity Magnetic Separation followed by High Tension Electrostatic Separation but the higher production costs would have to be considered. It may well be better to sell the concentrate as a lower value raw product.

RESEARCH INTO MAGNETITE ORE RESERVES IN THE NORTH BURMIS AREA

With the expectation that our company would be marketing this resource for the production of a coal upgrading product we must have an idea of the size of the ore reserves._One very important consideration is the method used to determine "ore". The work done historically has been based on the production of an iron ore suitable for blast furnace feed. The assay systems were geared for determining total iron content and in our research it became evident that there was iron assayable that was not in the form of magnetite. We have been able to produce magnetite estimates by examining petrographic and mineral magnetic upgrade tests carried out by CANMET and Western Canadian Magnetic Ores Ltd._as well as our own testing.

With on site investigation our company began to suspect the ore reserve data as presented in the 1961 Research Council of Alberta Rept. #9 Titled: Sedimentary Magnetite Deposits of the Crowsnest Pass Region, Southwestern Alberta by G.B.

Mellon. The data as presented was based largely on located surface outcrop and seemed to be very much lower than our own observations has led us to expect. Mellon had determined an ore reserve of 1,886,000 tons.

This area had been under mineral exploration by a subsidiary of Western Canadian Collieries from the mid 1950's to mid 1960's. This subsidiary; Western Canadian Magnetic Ores did air and ground magnetometer work and extensive drilling of the property. Their work should be more valid than surface examination.

Our first challenge when examining the WCMO data was establishing common terms of reference. The property names were different than those used in contemporary reports and the outlines of exploration areas are not the same as those areas staked by our company.

Their North Burmis exploration area was broken into two main blocks. The north block extends from the south west corner of the south boundary of sec. 14 Twp. 8 to the north west quarter of sec. 27 Twp.8. This north west trending block actually incorporates the north half of our Middle Burmis Block and essentially all of our North Burmis Block.

The second exploration block WCMO worked on was referred to as the Boutry Block. This block was laid out from the middle of Sec. 24 Twp. 7 to the north west corner of Sec.25 Twp.7.

I can find drilling hole maps drawn in 1956 but I am unsure of the exact date of the drilling.

The North Burmis region that would be our North Burmis Block and the north half of our Middle Burmis Block. Is broken into two subblocks by WCMO "Marasek's"which corresponds to our North Burmis Block and Milvain's which corresponds to the north half of our Middle Burmis Block. Marasek's is referred to in a Report by Robert Steiner, P. Eng. in January, 1958. Titled: Report on the Iron Ore Underlying the Area Known as "Marasek's", Burmis, Alberta. [Document 2]. This report refers to a confirmed 6 - 7 million proven tons of ore and an expected 16 million tons. Steiner concludes in this report that there is much more ore available than was originally thought. His closing sentence says "the area is probably capable of producing hundreds of millions of tons of iron ore".

Marasek's is also referred to in a November 1956 report titled "Ore reserves of West Canadian Magnetic Ores".[Document 4]. This report, written by R.A. Diamond - Engineer indicates an ore reserve of:

Ore over 40%	2,570,000
30% to 40%	2,060,000
Less than 30%	3,050,000

This same report refers to continued drilling in the Milvain portion of the Block.

The WCMO Boutry Block which covers the North half of our South Burmis Block is not referred to in any one report but there is reference to the North Burmis Area in a report written in 1957 Titled: "Iron Prospecting Permit No.7 - Geological Report. [Document 1]. This Burmis North exploration effort covered from Sec. 13 Twp. 7 to Sec.25 Twp. 8. This would essentially cover our entire Burmis claim area and WCMO's Boutry, Milvain, and Marasek blocks. This report , written on

October 1, 1957, refers to a report written in February 1957. The excerpts from the February 1957 report state:

- Drilling in the two months before the February Report was carried out with one diamond Drill and two seismic drills.
- there is reference to summer drilling that may be associated with the 1956 Drill Hole Maps.
- eight areas drilled in the two month program.
- drilling proved 17,380,000 tons of ore with an estimated additional 11,840,000 tons. Bringing the WCMO reserves in the North Burmis area to 29,220,000 tons.

As this work comes after the work done in Document 4 it would be reasonable to assume that these tonnages are the result of the drilling in the Boutry Block and the Milvain area as the report [document 4] on the ore reserves done in November 1956 says that no further work will be done on drilling Marasek's. There is reference in the November 1956 report to drilling on Milvain's. We are not sure how this relates to the Boutry Block but it is certain that this drilling is part of that used to support the 17,380,000 ton proven ore data in the February 1957 report.

Since a 1958 report [Document 2] has not increased the reserve for Marasek's from the 1956 data [Document 4] it is logical to assume that the increased proven reserves are from Milvain and Boutry [our Middle and South Burmis]. Using the proven data from Marasek's we would have:

17,380,000 [Document 1] - 7,680,000 [Documents 2 and 4] = 9,700,000 tons of proven ore in our South Burmis and Central Burmis Blocks.

The 17,380,000 tons were proven with 194 drill holes but we have not found drill hole data for the drilling after 1956. This makes it very difficult to determine how much of the magnetite is in the four Patented Claims that are in our Claim Blocks.

The first thing we can be sure of is that the 7,680,000 tons in the Marasek Block is entirely ours as our North Burmis Block has no Patented Claims in it.

Drilling Data that we do have from 1956 shows a primary focus south of the Patented claim in our Central Burmis Block but in the Boutry Block(our South Burmis) the drilling is focused in the Patented Claim.

As we do not know yet where the drilling was done after 1956 it is virtually impossible to determine where the proven tonnage comes from.

One comment that is made in the 1957 report [Document 1] is that field observations indicate that the North Burmis area may contain 75 million tons of ore.

If we have lost 30% of our resource to the patent claims then we control:

7,680,000 tons in Marasek (North Burmis) and 9,700,000 tons minus 30% in the other two blocks = 7,680,000 + (9,700,000 - 2,910,000) = 14,470,000 tons

The work done previously had described strong confidence in an additional estimated tonnage.

The Marasek Block had an estimated additional 16 million tons while the drilling that concentrated in the Milvain and Boutry Blocks indicated an additional 11,840,000 tons. If the same formula is used to adjust for loss to the patented claims we have: 16,000,000 (North Burmis) + {11,840,000 (Middle and South

Burmis) - 30%} = 16,000,000 - {11,840,000 - 3,552,000 } = 24,288,000 tons estimated.

This places the total tonnage at

Proven	14,470,000
Estimated	24,288,000
	38,758,000 tons

If we have 30% magnetite content in the ore we have:
14,470,000 x 30% = 4,341,000 tons of magnetite proven.

Based on both proven and estimated: 38,758,000 x 30% = 11,627,400 tons of magnetite.

Lab Results

BURMIS ORE EXAMINATION PROGRAM

SAMPLE	ANALYSIS	AU RESULT	PT RESULT
MAG1A	FA	NIL	-
MAG1B	FA	NIL	-
MAG1C	FA	NIL	-
MAG1D	FA	NIL	NIL
MAG1E	FA	NIL	-
MAG1F	FA	NIL	-
MAG1G	FA	NIL	-
MAG1H	FA	NIL	NIL
MAG2A	FA	NIL	-
MAG2B	FA	NIL	-
MAG2C	FA	NIL	-
MAG2D	FA	NIL	-
MAG2E	FA	NIL	NIL
MAG2F	FA	NIL	-
MAG2G	FA	NIL	-
MAG2H	FA	NIL	-
MAG2F	FA	NIL	-
MAG3A	FA	NIL	-
MAG3B	FA	NIL	-
MAG3C	FA	NIL	NIL
MAG3D	FA	NIL	NIL

THE FOLLOWING ARE SCORIFICATION ASSAYS

MAG3E	SCR	NIL	NIL
MAG3F	SCR	NIL	NIL
MAG3G	SCR	NIL	NIL
MAG2I	SCR	NIL	NIL
MAG1I	(SAMPLE LOST)		
MAG1J	SCR	NIL	NIL

THE FOLLOWING WERE ACID DIGESTED FOLLOWED BY MICROSCOPIC EXAMINATION

MAG1K	AD-ME	NIL	NIL
MAG1L	AD-ME	NIL	NIL

THE FOLLOWING SAMPLES WERE ANALYZED USING NEUTRON ACTIVATION

MAG1M NA NIL AU - NIL PT

MAG2J	NA	NIL AU - NIL PT

EXAMINATION OF ORE FOR MAGNETITE

MAG1N	20 KG. SAMPLE CRUSHED TO MINUS 100 MESH SUBJECTED TO LOW INTENSITY MAGNETIC SEPARATION - 26% MAGNETIC. MICROSCOPIC EXAMINATION OF MAGNETIC FRACTION STILL SHOWS MAJOR POLLUTION OF MAGNETICS BY ENTRAINED MINERAL GRAINS.
MAG1O	20 KG. SAMPLE CRUSHED TO MINUS 150 MESH SUBJECTED TO LOW INTENSITY MAGNETIC SEPARATION - 17% MAGNETIC MICROSCOPIC EXAM STILL SHOWS NON MAG POLLUTION - FINER CRUSH REDUCES POLLUTION
MAG2K	20 KG.SAMPLE CRUSHED TO MINUS 150 MESH LOW INTENSITY MAGNETIC SEPARATION 20% MAGNETIC MICRO-EXAM SHOWS NON MAG CONTAMINATION
MAG3H	20 KG CRUSH TO MINUS 150 MESH LOW INTENSITY MAGNETIC SEPARATION 23% MAGNETIC NON-MAG POLLUTION IN EVIDENCE
MAG3I	20 KG. CRUSH TO MINUS 150 MESH LOW INTENSITY MAGNETIC SEPARATION 18% MAGNETIC NON-MAG POLLUTION IN EVIDENCE
BULK1	50 KG. CRUSH TO MINUS 150 MESH VIBRATORY TABLE CONCENTRATOR CONS PUT THROUGH LOW MAG SEPARATION 99% PLUS MAGNETIC BUT CUT ON TABLE DISCARDED SOME BLACK SAND TO MAINTAIN CLEAN BLACK PRODUCT. STILL SEE SOME NON MAG ENTRAINED PARTICLES THAT MAY BE BEST REMOVED BY FINER CRUSHING.
BULK2	50 KG SAMPLE CRUSH TO MINUS 150 MESH VIBRATORY TABLE CONCENTRATE LOW INTENSITY MAGNETICS 99% PLUS MAGNETIC SOME DISCARD ON TABLE TO KEEP CLEAN SPLIT OF BLACK SAND NON MAG PARTICLES ENTRAINED

BULK3	50 KG SAMPLE CRUSH TO MINUS 200 MESH VIBRATORY TABLE CONCENTRATE LOW INTENSITY MAGNETICS - 99% PLUS MAGNETIC SOME DISCARD ON TABLE TO KEEP CLEAN SPLIT OF BLACK SAND NON MAG PARTICLES SEEN BUT VERY MUCH LOWER
BULK4	50 KG. SAMPLE CRUSH TO MINUS 200 MESH VIBRATORY TABLE LOW INTENSITY MAGNETICS - 99% PLUS MAGNETIC SOME DISCARD ON TABLE TO KEEP CLEAN SPLIT SOME CONTAMINATION OF NON MAGNETIC GRAINS GREY COLOURED LINE SEEN ON TABLE JUST UNDER EDGE OF BLACKSAND LINE. NOT TESTED - POSSIBLY ZIRCON.
BULK5	50 KG. SAMPLE CRUSH TO MINUS 200 MESH VIBRATORY TABLE LOW INTENSITY MAGNETICS - 99% PLUS MAGNETIC SOME DISCARD ON TABLE TO KEEP CLEAN SPLIT SOME CONTAMINATION OF NON MAGNETIC GRAINS TWO POSSIBLE FLAKES OF FREE GOLD SEEN ON TABLE WAS RUN - EXAMINED NON MAG FRACTION BUT NO GOLD SEEN

FOR THE BALANCE OF THE TESTING ON THIS ORE ALL SAMPLES WERE CRUSHED TO MINUS 150 MESH AND SEPARATIONS DONE WITH LOW MAG. RESULTS GIVEN ARE BY PERCENT BY WEIGHT. SAMPLES WERE 1 KG. RAW.

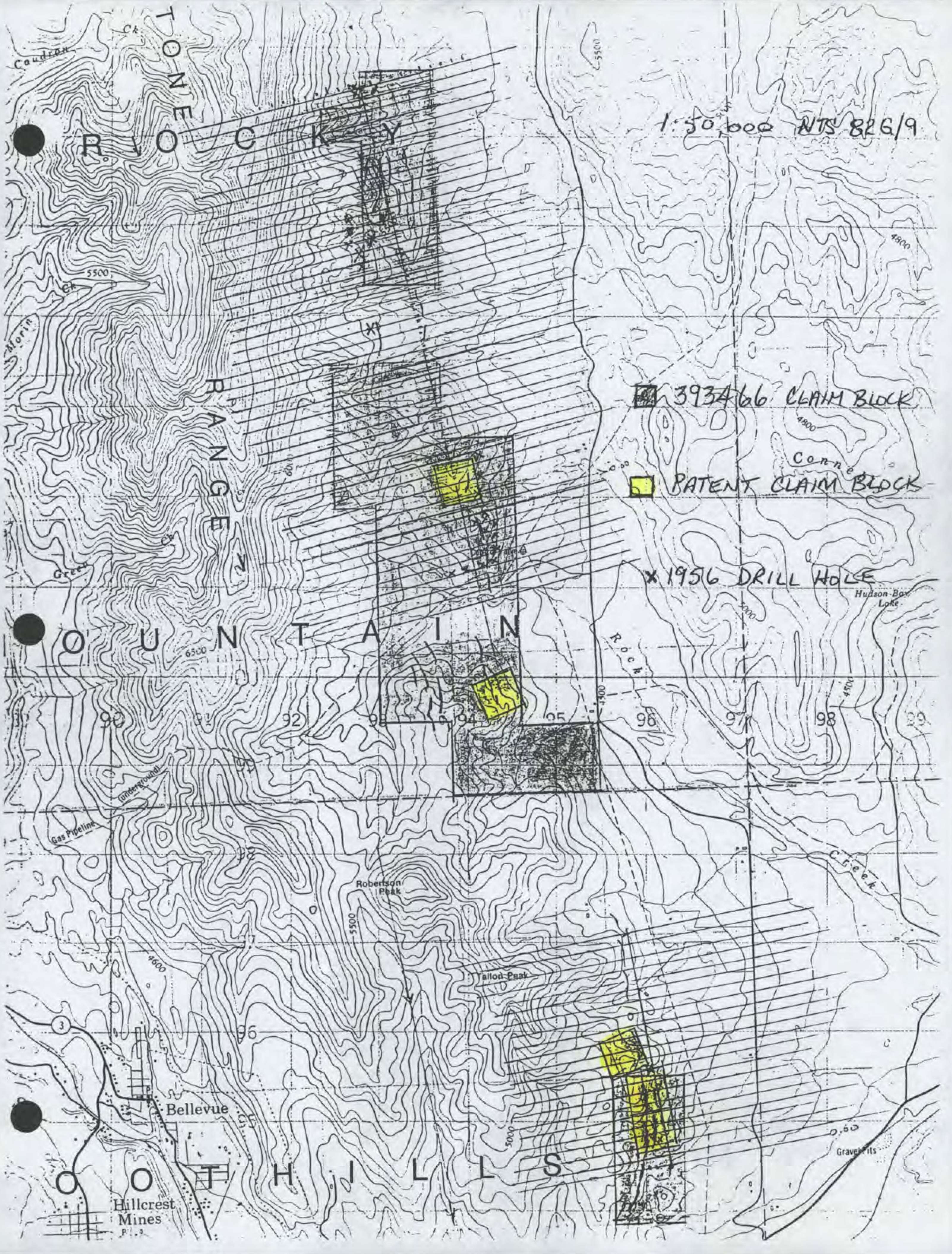
SAMPLE NUMBER	% TO MAGNETIC FRACTION
M1	17
M2	21
M3	20
M4	24
M5	20
M6	16
M7	22

SAMPLE NUMBER	% TO MAGNETIC FRACTION	
M8	24	
M9	24	
M10	19	
M11	7	NOT IN LOG - SAMPLE MAY NOT BE VALID
M12	16	
M13	26	
M14	22	
M15	28	
M16	23	
M17	19	
M18	22	
CTN1	18	
CTN2	22	
CTN3	27	
CTN4	21	
CTN5	18	
CTN6	22	
CTN7	25	
CTN8	19	
CTN9	20	
CTN10	28	
CTN11	17	
CTN12	19	RE-WORK OF 11
CTN13	22	
CTN14	31	
CTN15	28	
CTN16	33	
CTN17	30	
CTN18	21	
CTN19	16	
CTN20	27	
CTN21	24	
CTN22	20	
CTN23	25	
CTN24	---	SAMPLE NOT MAGNETITE ORE
CTN25	19	
CTN26	27	
CTN27	23	
CTN28	18	

SAMPLE NUMBER	% TO MAGNETIC FRACTION	
CTN29	19	
CTN30	36	
CTN31	12	METALLIC FLAKE - WHITE COLOUR - CRUSHER CONTAMINATION ?
CTN32	18	
CTN33	22	
CTN34	17	
CTN35	27	
CTN36	22	
SD1	12	
SD2	14	
SD3	8	
SD4	8	
SD5	28	
SD6	26	
SD7	34	
SD7a	37	
SD8	21	
SD9	26	
SD10	FLOAT ROCK - NO TEST	
SD11	29	
SD12	21	
SD13	27	
SD 14	22	
SAMPLES 15,16,18 MAPPED BUT NO SAMPLE TO LAB		
SD 17	26	
SD19	23	
SD20	30	
SD21	27	
SD22	19	
SD23	32	
SD24	25	
SD25	19	
SD26	17	
SD27	33	
SD28	28	
TOM1	33	
TOM2	19	
TOM3	22	
TOM4	30	

SAMPLE NUMBER	% TO MAGNETIC FRACTION
TOM5	27
TOM6	LOST - BROKEN BAG
TOM7	26
TOM8	29
TOM9	22
TOM10	26
TOM11	19
TOM12	21
TOM13	27
TOM14	27
TOM15	17
TOM16	35
TOM16a	31 RE-WORK OF 16
TOM17	26
TOM18	22
TOM19	27
TOM20	25
TOM21	18
TOM22	26
TOM23	20
TOM24	19
TOM25	NOT MAGNETITE ORE
TOM26	18
TOM27	28
BOB1	30
BOB2	25
BOB3	28
BOB4	25
BOB5	31
BOB6	29
THREE BAGS WITH NO NUMBER BUT ALL FROM SAME EXPOSURE - COMBINED AND LABELED - BOB7	
BOB7	12
BOB8	27

Claim Map


1:50,000 NTS 82G/9
393466 CLAIM BLOCK
PATENT CLAIM BLOCK
× 1956 DRILL HOLE
ROCKY
MOUNTAIN
STONE
RANGE
FOOTHILLS
Caudron Ck
Morin Ck
Green Ck
Rock Creek
Connelly
Hudson-Bay Lake
Robertson Peak
Tallon Peak
Bellevue
Hillcrest Mines
Gas Pipeline (underground)
Gravel Pits
3
90
91
92
93
94
95
96
97
98
99
5500
6000
6300
4800
4600
4300
5000

Document # 1

Blairmore, Alberta.
1st October 1957.

ECONOMIC MINERALS
FILE REPORT No.
EE-RE-007(02)

IRON PROSPECTING PERMIT NO. 7.

GEOLOGICAL REPORT

The area covered by this Permit extends from Township 4, Range 3, West 5th Meridian in almost a direct line north to Section 13, Township 10, Range 3, West 5th Meridian. Aerial Magnetometer and Ground Magnetometer surveys show that the most promising iron ore deposits are located in the area commencing about one mile north of the No. 3 Highway at Burmis in Section 13 Township 7, Range 3, West 5th Mer. and extending northward to Section 25, Township 8, Range 3, West 5th Meridian. consequently the greater portion of our exploratory efforts were concentrated within this area.

The following informations is taken from reports made by Mr. Robert Steiner, Professional Geologist, who with other geologists hired for the purpose, explored and prospected the areas covered by this Permit.

TOPOGRAPHY

The Burmis North area comprises a series of steep faced bluffs, sloping westerly, and terminating under the Livingstone Range. It is about 50% woodland, with the rest being made up of sparse grassland. In many places outwash has allowed only the hardiest of vegetation to grow, some parts may be considered good rangeland, but for the most part it is quite poor grazing land.

The topography apparently follows the sub-surface structure. Thus there are numerous streams cutting the formations transversely; and there are a number of small perennial lakes, which could be a supply of water. Summer water is estimated at about 5000 gallons per hour for most of the streams.

The land surface is quite rugged and broken. underlying sediments have a great influence on wet weather travel in that some parts become quite impassable where there are no roads.

The area is approximately 1[illegible] miles from Burmis, and 10 miles from Blairmore.

GEOLOGY

The area is made up of the western flank of a major anticline. This flank is deformed by northerly trending faults. The results is a series of step-like structures, sloping 30° to the west, and with steep, bluff-like faces to the east. There appear to be three major faults, which are important in that they determine the east-west extremities of the ore zone. These are from east to west, the Todd Creek and "Burmis" faults, and the Livingstone Thrust, between them are smaller local faults paralleling the main faults which further disrupt the terrain.

These faults have helped greatly in determining ore localities, generally the ore-bed can be seen quite readily on the bluff faces. It is apparently the most competent rock, and thus forms a cap-like skin over softer sediments. This cap is partially eroded

C

INDEXING DOCUMENT NO. 700634

Iron Prospecting Permit No. 7.

Geology (cont)

at the bluff-faces, but where the formation is cut by creeks, considerable thicknesses of ore are exposed. Lately a new trench has been cut in Section 24-7-3-5, where there is an exposure of ore 55' in depth, grading 47%. It is probable that this length is due to local thickening, since the section is very close to the "Burmis" fault. A trench put in by the Geological Survey at [illegible]' along the baseline shows a thickness of [illegible]'. Here the ore is at the edge of a bluff, and it is assumed that at greater depth the bed probably thickens to the average of [illegible]'. The ore is in bands and intercalations in a limonitic and/or sideritic matrix. It is not distinctly separate from the sideritic sandstone.

The average dip of the ore-bed is about [illegible]° west, at some points as in Sec 24-7-3-5 the ore dips 20° West at others as at Sec 12-6-3-5 it is 28° West.

Apparently the ore-bed extends [illegible] to the Livingstone Thrust, as the Belly River formation approaches the Thrust, the sediments tend to flatten. This may be due to drag folding on a major scale, if this feature holds for most of the area traversed by the [illegible] baseline, then it is valid to assume that a large portion of this area is relatively flat lying, and at a depth of burial of not more than 15[illegible]'.

The terrain between Sec 24-7-3-5 and 22-8-3-5 has been prospected systematically. This work has disclosed ore for a distance of 11 miles. The ore is most certainly not in a continuous outcrop, due to stratigraphic separations caused by faults, and erosional features, such as creeks.

There is evidence that many sections of the area have ore thicknesses of upwards of [illegible]', a sample from one such locality shows iron at 4[illegible].48% and titanium at [illegible].

It is estimated from field observations, that the above area may contain 75 million tons of ore grading [illegible] to [illegible]% iron.

The following excerpts taken from a report made [illegible] February 1957.

Two seismic drills and one diamond drill were employed, the seismic drills explored six areas and the diamond drill did detailed work in one area explored by the seismic drills.

omit

Climatic conditions were such that total drilling efficiency was reduced to less than [illegible] of that achieved in the summer months. i.e. summer drilling averaged 52' per day per rig, while winter drilling went as low as 1[illegible]' per day. This was mainly due to frozen ground, engines and [illegible].

Eight areas were drilled in the last two months. These areas were not all productive, however, no valid determinations can be made if they are based on a few holes, spaced widely in a very large area. Drilling indicated that much more intensive investigation should be carried out in Sections 26 [illegible], Tp [illegible], Rge [illegible] 5th [illegible] and Sections 2, [illegible], [illegible], in Tp [illegible]

In the 6 areas ~~[illegible]~~ we have by drilling proven 17,280,000 tons of ore, and estimated 11,[illegible],000 tons by surface examination, a potential of [illegible],[illegible],000 tons. It is known that nowhere in the exploration area is there a constant thickness of ore. Consequently the ore thickness may vary from three feet in a comparatively flat horizon to as much as 1[illegible]' in a plunging bed.

Iron Prospecting Permit No. 7.

Geology (cont) --
at the bluff-faces, but where the formation is cut by creeks,
considerable thicknesses of ore are exposed. Lately a new trench
has been cut in Section 24-7-3-5, here there is an exposure of
ore 55' in depth, grading 47%. It is probable that this depth is
due to local thickening, since the section is very close to the
"Burmis" fault. A trench put in by the Geological Survey at 6800'
along the baseline shows a thickness of 5'. Here the ore is at the
edge of a bluff, and it is assumed that at greater depth the bed
probably thickens to the average of 26'. The ore is in bands and
intercalations in a limonitic and/or sideritic matrix. It is not
distinctly separate from the sideritic sandstone.

The average dip of the ore bed is about 35° West, at some points
as in Sec 24-7-3-5 the ore dips 20° West at others as at Sec 22-
8-3-5 it dips 66° West.
apparently the ore-bed extends up to the Livingstone Thrust, as
the Belly River formation approaches the Thrust, the sediments
tend to flatten. This may be due to drag folding on a major scale,
if this feature holds for most of the area traversed by the [illegible]
baseline, then it is valid to assume that a large portion of this
area is relatively flat lying, and at a depth of burial of not
more than 150'.
The terrain between Sec 24-7-3-5 and 22-8-3-5 has been prospected
systematically. This work has disclosed ore for a distance of 12
miles. The ore is most certainly not in a continuous outcrop, due
to stratigraphic separations caused by faults, and erosional
features, such as creeks.
There is evidence that many sections of the area have ore thick-
nesses of upwards of 40', a sample from one such locality shows
iron at 42.48% and titanium at [illegible].

It is estimated from field observations, that the above area may
contain 75 million tons of ore grading [illegible] to 47% iron.

The following excerpts taken from a report made [illegible] February 1957.

Two seismic drills and one diamond drill were employed, the
seismic drills explored six areas and the diamond drill did detailed
work in one area explored by the seismic drills.
Climatic conditions were such that total drilling efficiency was
reduced to less than [illegible] of that achieved in the summer months. i.e.
summer drilling averaged 52' per day per rig, while winter drilling
went as low as 12' per day. This was mainly due to frozen ground,
engines and manpower.
Eight areas were drilled in the last two months. These areas
were not all productive. However, no valid determinations can be
made if they are based on a few holes, spaced widely in a very large
area. Drilling indicated that much more intensive investigation
should be carried out in Sections (6 [illegible], Tp 7, Rge 3 W 5th M.
and Sections 2, 10, 22, in Tp 8, Rge 3 W 5th M.)
In the 6 areas (~~[illegible]~~) we have by drilling proven
17,380,000 tons of ore, and estimated 11,840,000 tons by surface
examination, a potential of 29,220,000 tons. It is known that
nowhere in the exploration area is there a constant thickness of ore.
Consequently the ore thickness may vary from three feet in a
comparatively flat horizon to as much as 110' in a plunging bed.

omit

Iron Prospecting Permit No. 7

Geology (cont.)
The average thickness of 12.1' has been derived as a result of the
examination of 194 holes drilled wherever ore has been found to
date. I~~f this figure be applied to areas where ore has been found~~
~~to date~~. If this figure be applied to areas where ore has been
found, then the inferred potential can be placed around 20,000,000
tons, discovered by the winter's drilling.

Assays from trench samples show that the average grade of ore
is between 42 and 47%. Since this grade holds true over 7 square
miles, at widely separated collection points, it may be assumed
that it will hold for all the area under exploration. The ore so
far observed is mineable immediately. Drilling and magnetometer
work will only prove the figure given, or probably increase the
potential reserves. The titanium content appears to be appreciably
lower than any other area thus far explored.

24 - 7 - 3 - 5
22 - 8 - 3 - 5.

(c)

Document # 2

ECONOMIC MINERALS
FILE REPORT No.
FE-AF-003(M)
FE-AF-007(M)
FE-AF-009(S)
FE-AF-008(S)

Report on the Iron Ore Underlying the Area
Known as "MARUSEK'S", Burmis, Alberta

January, 1958

Robert Steiner, P. Eng.
700631
700648
700659
SUPPORTING DOCUMENTS TO 700672

Report on the Iron Ore Underlying the Area
Known as "Marasek's", Burmis Alberta

Location:

The Area is located in Sections 22 and 27 of Township 8, Range 3W5th Meridian.

Access:

"Marasek's" lies about one mile west of the North Burmis road about eight miles north of this road's junction with Highway #3. The junction is seven miles east of the town of Bellevue, Alberta. The North Burmis road is graveled from the junction with #3, and is in good condition at all times. The Crows Nest line of the C.P.R. parallels #3 Highway.

Climate and Geography:

This area is in the Foothills region of Southern Alberta. It is, consequently, about 4,200' to 6,000' above sea level. The Livingstone Range forms the western boundary and the Porcupine Hills occupy the eastern perimeter. The actual Marasek area forms a series of steep, high, fault scarps immediately below and to the east of the Livingstone Range.

The surface could be considered alpine tundra, in that there are large areas barren of trees. This is due to low precipitation and high winds. Generally, the prevailing winds are westerlies, and bring very little precipitation in the form of either rain or snow. Although the Livingstone Range gives some shelter, winds do get up around 50 to 60 m.p.h. mostly in May and June.

Most of the area is underlain by rolling hills, all trending northerly, or parallel to the Livingstone Range. Access to the western section is therefore easy. However, wherever ore outcrops, it tends to form steep bluffs. This applies to all parts of the area.

"Marasek's" is situated about 60 miles due south of Calgary, Alberta, and 50 miles due east of McLeod, Alberta.

General Geology:

The ore lies as a distinct horizon in the basal section of the Belly River formation, close to its contact with the Wapiabi formation. Both formations are of Cretaceous age. In many places the ore outcrops in either long ridges or steep bluffs, being the most weather resistant portion of the Belly River sediments. The general strike is N22W, and is so maintained throughout the report area. However, due to structural deformation, the dip varies from 10°W to vertical.

The apparent structure in the area is a series of northerly trending, western flank segments of a large anticline. This anticline has been faulted downwards on its western flanks and its crest may in part now occupy the floor of Burmis Valley. Ore exposures on the edges of these segments are present from the SE corner of Section 11, Township 8, Range 3W5 to the NE corner of Section 3, Township 9, R3W5. Ore thicknesses up to 42' are present, in instances where folding and faulting have combined to thicken the normal 12' depth of ore. Folding and faulting have also tilted the horizon from the normal 30° to 45° westerly dip to vertical or actually overturned beds.

An example is the "Marasek Tunnel". This tunnel was begun in the early part of the century, and left by the old-timers, and is still in remarkably good condition. Here there are five distinct ore horizon sections or segments. Each one is successively higher than the one to the east. Consequently, the fifth and most westerly is also the highest. Vertical displacement appears to be about 50' for each section. Drag folding is present at each fault. This has increased the apparent thickness of ore, so that undisturbed section of the bed is the usual 12' thickness, while at the fault-face it may be upwards of 50' deep and 18-22' thick. The sections are approximately 300' wide and 2,200' long.

The upper two sections consist mainly of magnetiferous sandstone. The magnetite contents is less than 10%. This is probably due to lateral thinning of the ore bed: Cross-faulting has also displaced the beds in an E-W direction. This has in some cases shortened the N-S extension of the bed to less than 1,000'. The brown, magnetiferous sandstone is replaced northwards by magnetite ore, about 3,500' north of the Tunnel. This implies that at about 1,800' north of the Tunnel another "dune" or lens of sand begins. In general, the faults form very prominent scarps, exposing the ore remarkably well, but at the same time they tend to create very complex structures.

The primary structural control appears to be the Livingstone Thrust, approximately 5,000' west of "Marasek's" Tunnel. The secondary control seems to be the Todd Creek Fault, 4,000' east. Movement between them has set up a system of westerly trending cross-faults or slips. These latter faults have created a step-like topographical system, with the heave vertical and the throw in an easterly direction. The cross-faults have enabled erosional forces to carve deep gullies in the scarps, (exposing the ore), and to deposit large fans of alluvium, (thereby burying ore in the lower segments). Both fault systems tend to be vertical.

Since the ore horizon is cut by vertical faulting in two directions, almost at right angles to each other, it is not always at positions, subsurface, as indicated by surface observations. On one of the "steps" closely spaced drill holes thus disclosed that while at one point the ore dips 30°W, 120' west, the ore has been drag-folded into a vertical position more than 110' deep. This abnormal change in attitude is quite common close to the northerly

Trending faults. The fact that the ore horizon has been deformed from a relatively flat position to vertical, implies that there may be a much greater potential than that presently assumed. This is because a series of "en echelon" type of faults, going downwards, could increase the ore horizon by "stretching" it into a vertical system some 500' deep from an original, horizontal, bed several thousand feet wide.

There are certain features characteristic of this area which lead to the assumption that the ore thus far developed represents a very minor portion of the total potential. Some of these features are:

1. The majority of the faults dip westerly.

a) The dips and strikes are parallel, the former averaging 50 deg. W and the latter trending NW.

b) in most cases the westerly blocks moved up.

2. The area of major disturbance can be limited to the Livingstone Range, with the Livingstone Thrust Fault being the easterly limit of major disturbance.

a) folding and tilting of the sediments is not as extreme east of Section 25, Township 7, Range 3, W. 4th.

b) thrusting, particularly of blocks between parallel faults, is non-existent easterly of the Livingstone thrust.

3. The Belly River formation appears to be much greater in stratigraphic extent than shown on available maps. It is also apparent that ~~were the various fault~~ segments relocated in their original undistrubed positions, then the presently located ore horizon could be extended latterally over a much greatur area.

Although faulting and folding have caused considerable and complex deformation, some of the features characteristic of original deposition remain. It is evident that the ore was laid down in quiet waters. This is indicated by the marked varving, from the top of the bed to the bottom. Usually the top of the bed is rather lean, that is, the iron does not run much higher than 20%. Below this layer is a much richer layer, up to 56% contained Fe. Then another lean layer is found, and so on to the bottom of the bed. The bottom is generally quite lean. The rich and lean layers are not uniform in thickness, but the richer layers tend to be thicker toward the centre.

Trending faults. The fact that the ore horizon has been deformed from a relatively flat position to vertical, implies that there may be a much greater potential than that presently assumed. This is because a series of "en echelon" type of faults, going downwards, could increase the ore horizon by "stretching" it into a vertical system some 500' deep from an original, horizontal, bed several thousand feet wide.

There are certain features characteristic of this area which lead to the assumption that the ore thus far developed represents a very minor portion of the total potential. Some of these features are:

1. The majority of the faults dip westerly.

    a) The dips and strikes are parallel, the former averaging 50 deg. W and the latter trending NW.

    b) in most cases the westerly blocks moved up.

2. The area of major disturbance can be limited to the Livingstone Range, with the Livingstone Thrust Fault being the easterly limit of major disturbance.

    a) folding and tilting of the sediments is not as extreme east of Section 25, Township 7, Range 3, W. 4th.

    b) thrusting, particularly of blocks between parallel faults, is non-existant easterly of the Livingstone thrust.

3. The Belly River formation appears to be much greater in stratigraphic extent than shown on available maps. It is also apparent that were the various fault segments relocated in their original undistrubed positions, then the presently located ore horizon could be extended latterally over a much greatur area.

Although faulting and folding have caused considerable and complex deformation, some of the features characteristic of original deposition remain. It is evident that the ore was laid down in quiet waters. This is indicated by the marked varving, from the top of the bed to the bottom. Usually the top of the bed is rather lean, that is, the iron does not run much higher than 20%. Below this layer is a much richer layer, up to 56% contained Fe. Then another lean layer is found, and so on to the bottom of the bed. The bottom is generally quite lean. The rich and lean layers are not uniform in thickness, but the richer layers tend to be thicker toward the centre.

Former reports maintain that the iron ore deposit was originally a beach sand. The writer does not agree with this hypothesis for the following reasons:

1. The deposit is present almost continuously from the Gulf of Mexico to the Arctic Ocean.

2. In the Foothills region the deposit has been traced for at least 16 miles easterly, while in Montana the deposit may be upwards of 50 miles wide. It is also present west of the Front Range.

3. There are no typical beach features, such as conglomerate.

4. There are no marine fossils, and any fossiliferous material noted has been coaly, freshwater plant material.

5. A beach deposit should not exhibit the remarkable varving noted throughout the ore horizon.

Core examination has also shown that there is an old erosional surface at the top of the ore horizon. This zone of brecciation suggests an old fault plane, along which the breccia has been cemented by calcite, and occasionally magnetite. Thus far, although the magnetite has the characteristics of water-lain deposits, there is no evidence that it is a deltaic deposit. Some cross-bedding has been noted, particularly in the overlying sandstone, but this feature ceases some time before the ore horizon. Cross-bedding in the ore is rare, and might have been mistaken for healed fault structures. Even though the ore is a sedimentary deposit, microscopic examination has shown that both the magnetite and its matrix are relatively little water-worn. The magnetite is in haggly particles and crystals, the quartz is rarely in any other form than nearly complete crystals.

In some core sections the deposition of magnetite has been so concentrated that the ore appears massive; and consequently these sections are also very dense. The cement appears to be calcite. In sections of intense faulting the magnetite has been transformed to hematite or marcasite. The marcasite appears as globs on the fault planes. There has been no other evidence of any sulfide. Some sections show a glauconitic matrix, which suggests an ultra-basic ancestral host rock. The ore as a whole appears rather unique in its homogeneity of texture, and is generally fine grained.

Document # 3

ECONOMIC MINERALS
FILE REPORT No.
FE-AF-009(10)

(Original Copy in FE-AF-005(2))

November 19th, 1955.

ORE RESERVES OF WEST CANADIAN MAGNETIC ORES.

DRILLING for Iron Ore is now confined to the Hilvain area. There will be no further drilling done either at Iron Flats or the Marasek Area this year. With the exception of a slight number of assays pertaining to the Marasek Area, complete assay information has been received. It is therefore possible to arrive at final estimates of ore outlined in these two areas during the exploration program carried out in 1955. This has been done and the results are tabulated below.

Marasek

Ore over 40% Fe	2,570,000 tons
Ore between 30 and 40% Fe..........	2,080,000 tons
Ore less than 30% Fe...............	3,030,000 tons

The average grade of the ore over 40% is 46.2% and that of the 30 to 40% is 35%. Therefore a reserve of 4,650,000 tons of ore averaging 40% iron has been defined.

Iron Flats

Ore over 40%	5,100,000 tons
Ore between 30 and 40% Fe	4,100,000 tons
Ore less than 30% Fe	6,200,000 tons

The average grade of the ore over 40% is 45.0%.

Hilvain's

Drilling is progressing as rapidly as possible in this area with the purpose of determining the westerly extension of the ore horizon. As soon as the results of the drilling are known, similar estimates will be made of the area.

Respectfully,

[redacted]

....
R. A. Diamond,
Engineer.

[illegible]

Modsenson Kreusel. July 25. 1956 (original copy in FE-AF-005(13))
by Robt Steiner.

Iron Flats (after drilling).

immediately available - 5 - 14 m. tons.
potential - upwards of 25 m. tons.
* "siderite ss" underlying the ore which could be mined.

Bonnie North. (before drilling)

area between Bowsby's and Marmot Tunnel. may contain 78 million tons grading 42 to 47% iron. 'A conservative estimate' Possible potential close to 195 m. tons.

Todd Creek. (before drilling)

around 38 million tons

Document # 4

ECONOMIC MINERALS
FILE REPORT No.
FE-AF-005(07)
FE-AF-[illegible]
FE-AF-005(08)

INTERPRETATION OF LOGARITHMIC CURVES OF
RELATIONSHIPS OF Fe, Ti, Insoluble and L.O.I. FE-AF-005(08)
BY ROBERT STEINER
"Hiranack's" January, 1957

1. Data derived from 167 core samples, average length 5.0'.

2. Assays by Lerch Bros. Inc., Steep Rock Lake, Ontario.

3. Assays averaged to give ore grade, (Fe):
    - (a) 0-20%
    - (b) 20-40%
    - (c) 40% or over

4. Sections 3a, 3b, 3c were broken into
    - (a) Fe:Ti
    - (b) Fe: Insol.
    - (c) Fe: L.O.I.
    - (d) Ti: Insol.
    - (e) Ti: L.O.I.

5. The mean averages were:

Fe	Fe%	Ti%	Insol%	L.O.I.%	No. of Samples
0-20%	13.07	2.63	47.83	12.27	46
20-40%	29.03	5.76	29.31	13.18	84
40+	45.69	7.37	16.32	7.05	37

6. The averages of (5) were plotted logarithmically and the following observations made:

    (a) The Ti content varies directly as the Fe content; e.g. as the grade of iron increases, so does the titanium.

    (b) The Insolubles vary inversely as the iron; e.g. as the grade of iron increases the insolubles decrease.

    (c) The loss on Ignition varies inversely as the iron content; e.g. as the grade of iron increases the L.O.I. decreases

    (d) The insolubles vary inversely as the titanium contents; e.g. as the titanium content increases, the insolubles decrease

    (e) The L.O.I. varies inversely as the titanium content; e.g. as the titanium content increases the L.O.I. decreases.

ANCILLARY DOCUMENT NOS 700636
700641
700651
700667

Conclusions:

The methods of analysis are not known to the observer. However some procedures are standard. Thus, to get the Fe, the sample is dissolved in a suitable solvent and measured by some type of quantitative analysis. This may or may not also apply to the Ti. The insolubles are probably those parts of the sample, which, for practical purposes, are not affected by the common solvents, or are inert to any usual chemical method of decomposition. The loss on ignition represents that part of the sample which literally goes up in smoke, i.e. becomes a gas or vapour at specific temperatures.

In the normal assay the solubles would be dissolved selectively, then the iron would be dissolved. The residue would then be heated, and the remnant would then constitute the insoluble. There would be variations in the procedure to determine such characteristics as which part of the sample could be retrieved or driven off by heating; which could only be dissolved; and which part would have to be separated mechanically.

As an example, the magnetite could be heated, to drive off the oxygen, and the resultant iron would then be either weighed as such, or dissolved in a solvent acting only on iron. If there was some foreign material with the magnetite it would be taken out next. The most common material could be silica, as quartz. To heat the quartz to the point where the oxygen would be driven off would be impractical, since the iron would melt long before this point was reached. Quartz is also insoluble in nearly all solvents. Thus, after the magnetite was roasted, to drive off the oxygen, the quartz would remain as a residue, and removed after the iron was either dissolved, or removed magnetically. And so on. The above is only a hypothetical example. Now consider the following information.

Dana:-
- (1) Ilmenite: fusible with bisulfate of sodium or potassium; soluble in H Cl.
- (2) Titanite: Fusibility of 3 (very low): Imperfectly soluble in H Cl: completely soluble in sulfuric or hydrofluoric acid.
- (3) Rutile: Infusible: insoluble in acids; soluble by fusion with alkali (Ca, Th) carbonates.

Now compare the above to the graph: (d) suggests that the titanium is soluble, if H Cl, H2 SO4 or HF were used. The titanium could either be ilmenite or titanite. It is certain that in part analyses only H Cl was used. This indicates ilmenite. (e) suggests that the titanium is lost (driven off) on ignition. The titanium could be either ilmenite or rutile. It is known that the next most important constituents are the alkali minerals CaO and MgO. This indicates that if rutile were present, it would burn off with the alkalies. The assay by the Department of Mines and Technical Surveys, Ottawa, October 12, 1956, mentions a high iron content in the tailings. This seems to imply that some of the iron in the tailings may be due to ilmenite, Fe Ti O3, or rutile with iron.

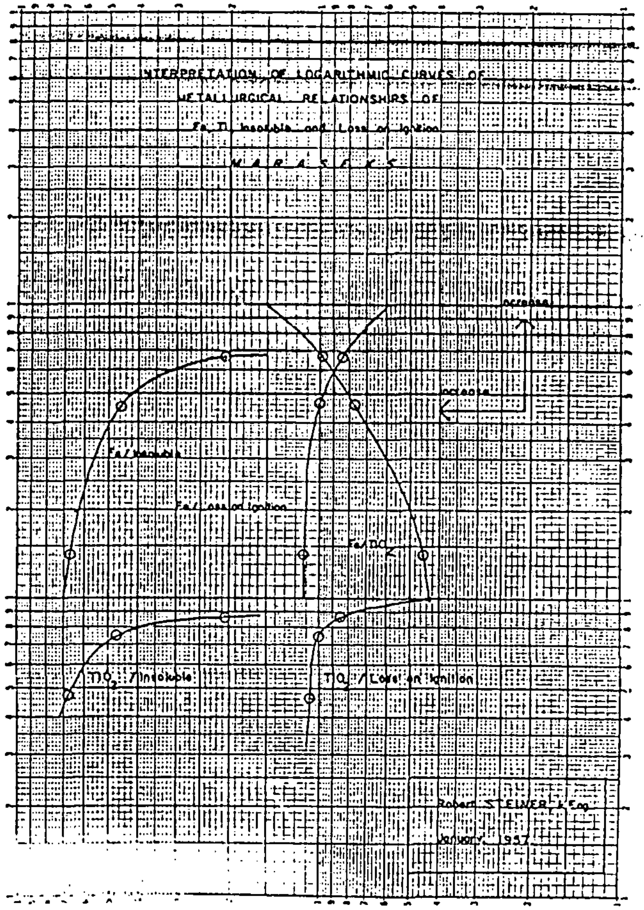
If solubility means self-soluble, e.g. melts, then rutile is most certainly present. If solubility means action through a solvent then ilmenite is indicated. Thus far petrological examination has shown only ilmenite. Only further tests will prove which of the titanium minerals is most prevelant.

However the case may be, the curves show that the titanium appears to be easily separated from the iron, either as a "smoke" or as a solution. It is expected that the major separation of iron from the other constituents in the ore will be by magnetic means. Thus, although solubility increases with increase in grade, since magnetite is soluble in H Cl, the separation of iron from titanium should not be difficult, since it is assumed that H Cl will not be used in winning the iron from the ore.

A low loss on ignition can be expected with the higher grade ore. This suggests that if iron is lost on a high loss on ignition, it cannot be magnetite. The Survey suggests that iron could be in the form of carbonates. These would certainly be burned off. If this is the case, then a precipitator would have to be employed to retrieve the iron from the smoke, (fumes).

As mentioned above, curve (b) indicates a progressively higher solubility as the Fe content increases. If solubility means soluble iron, then the higher the grade, the more soluble it is. But it also implies that the higher the grade of ore, the lower the amount of such foreign constitutents as quartz and feldspar. Referring again to the Surveys Report, decreasing solubility indicates less iron, and this suggests that either there is little iron at this end of the curve, or the iron is insoluble. Siderite therefore cannot be in quantity in this ore, since if it were, it would be quite soluble. And the iron mentioned by the Surveys must be some other type of iron mineral. These may be non-magnetic iron oxides, such as some varieties of hematite or limonite.

It is interesting to note that the iron: insoluble and L.O.I. appear to be similar to titanium: insoluble and L.O.I. curves. Such a unique parallelism should be an aid in the successful solution to metallurgical problems which may be encountered in the future.



[illegible]

The strip ratio for this area must be calculated on the basis of the following information:

(1) There are three ore horizons (the result of faulting.)

(2) Due to topography and structural deformation the two highest horizons (elevation wise) have comparatively little overburden.

(3) The number 3 horizon (lowest) will be considered to be overlain by a total overburden minus that are contained in No. 1 and No. 2 horizons.

(4) The overburden will therefore be calculated from the highest elevation to the top of No. 3 horizon.

(5) Calculations are based on type area : Harasek Section 112 + 00, over an area of 600,000 sq ft.

Area = 600,000 ft.^{2}

Average depth of overburden to top of No. 3 (lowest elevation) horizon is 91.

This interval of overburden is further reduced by a total of 26' of ore (No. 1 and 2 horizons). Therefore the net thickness of overburden is

$$91 - 26 = 65'$$

Therefore the volume of overburden over the type area is $\frac{600,000 \times 65}{27} = 1,440,000$ cu. yds.

The tonnage of ore contained is $\frac{600,000 \times 3 \times 13}{10} = 2,340,000$ tons.

The ratio thus becomes $\frac{1.44 \times 10^5}{2.34 \times 10^6} = 0.61$ cu. yds. per ton.

The the type area Harasek Section 112+00 be applied to the presently outlined ore limits, the ratio for the recovery of the proven tonnage of 6.68 x 10^6 short tons should not vary significantly from the figure of 0.61 derived above.

ORE CALCULATIONS FOR THE "[illegible]"

These estimates are subject to further revision as additional information is accumulated.

Calculations are based on the formula $T = \frac{A \times D}{V}$

where T - short tons
A - area
D - depth or thickness (See [illegible])
V - volumetric weight (HANDBOOK OF MINING ENG.)

Using Section 112 + 00 as the type - section and assuming that this holds true for all other sections drilled, the following takes place.

(1) Number of horizons = 3 to 6
(2) Number of fault sets = 3
  a) dip 10 deg. east, trending northerly
  b) dip 60 deg. west, " "
  c) dip 10 deg. east " southerly
Order of faulting is a) to c)

a) (1) displacement is 13 feet vertically and 28 feet horizontally.
b) (1) displacement is 26 feet vertically and 13 feet horizontally.
c) (1) displacement is 6 feet vertically and 140 feet horizontally.

This displacement applies for 100 feet horizontally for all three fault sets. Probable length of ore horizons is 248 feet per 142 feet dip - strike distance on fault - set (c)

(3) Limits of ore disposition
  a) North-south 6,000 feet
  b) East-West 1,500 feet

Area enclosed = 6,000 x 1,500
= 9 x 10^6 sq. ft.
less barren area (e.g. erosional features)
400' x 2,000 = 0.8 x 10^6
= 1,500 x 700 $\underline{1.05 \times 10^6}$ sq. ft.
Total 1.85 x 10^6

Total potential producing area = 9.0 x 10^6 minus 1.05 x 10^6
= 7.15 x 10^6 sq. ft.

- Continued

[illegible] FOR THE "[illegible]"

[illegible] are subject to further revision as
[illegible] accumulated.

[illegible] are based on the formula $T = \frac{A \times D}{V}$

T - short tons
A - area
D - depth or thickness (See [illegible])
V - volumetric weight ([illegible])

Section 112 + 00 as the type - section and assuming true for all other sections drilled, the following

umber of horizons = 3 to 6
umber of fault sets = 3
dip 10 deg. east, trending northerly
dip 60 deg. west, " "
dip 10 deg. east " southerly
of faulting is a) to c)

) displacement is 18 feet vertically and 28 feet

) displacement is 26 feet vertically and 13 feet

) displacement is 6 feet vertically and 140 feet

displacement applies for 100 feet horizontally for sets. Probable length of ore horizons is 248 feet - strike distance on fault - set (c)

Limits of ore disposition

) North-south	6,000 feet
) East-West	1,500 feet

enclosed = 6,000 x 1,500
= 9×10^6 sq. ft.
barren area (e.g. erosional features)
400' x 2,000 = 0.8×10^6
= 1,500 x 700 1.05×10^6 sq. ft.

Total 1.85×10^6

potential producing area = 9.0×10^6 minus 1.05×10^6
= 7.15×10^6 sq. ft.

- Continued

Continued - ORE CALCULATIONS FOR THE "HARASEKS"

(4) Average thickness of ore as per logs.

a)	b)	c)
6	2	56
23	18	3
13	1	6
13	25	9
18	23	
	10	
	6	
	3	
	1	
73	89	74

Averages a) 14.6 b) 9.9 c) 18.5

Total Average = 13.1 feet

Total inferred tonnage as per formula = $T = \frac{A \times D}{V}$

$$T = \frac{7.15 \times 10^6 \times 13.1}{8.8}$$

= 10.65×10^6 short tons

(5) Area drilled = 3,000 x 1,500
= 4.5×10^6 sq. ft.

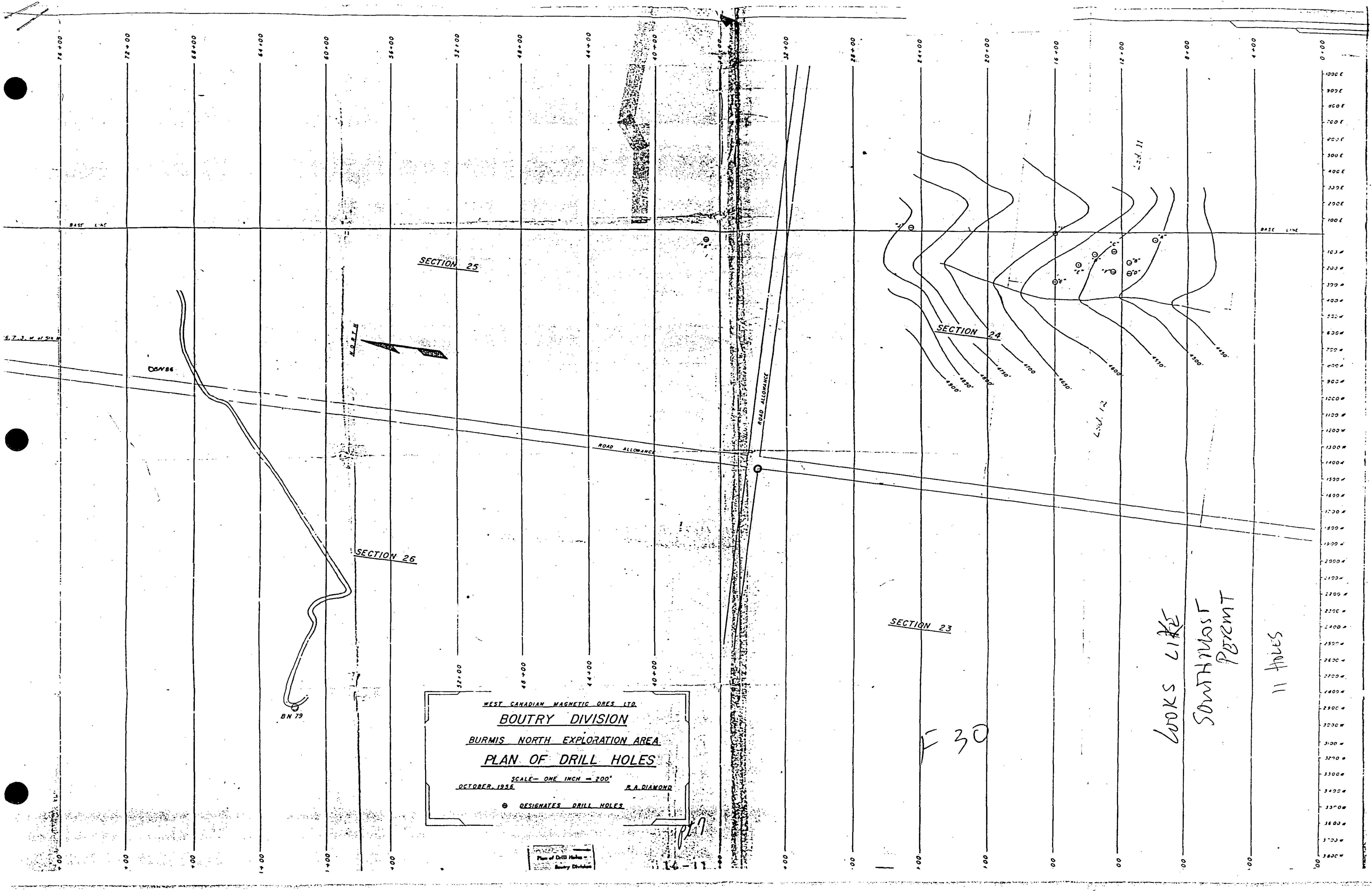
Applying : Section 112 + 00 by $A = \frac{T \times D}{V}$

<u>proven</u> tonnage is $\frac{3,000 \times 1,500 \times 13.1}{8.8}$

= 6.68×10^6 short tons

(6) Inferred tonnage to be expected by further drilling is 10.65 million less 6.68 million = 3.97 million short tons between the limits outlined above.

Drill Hole Maps 1956 - 57



WEST CANADIAN MAGNETIC ORES LTD.

BOUTRY DIVISION

BURMIS NORTH EXPLORATION AREA

PLAN OF DRILL HOLES

SCALE— ONE INCH = 200'

OCTOBER, 1956

R. A. DIAMOND

⊕ DESIGNATES DRILL HOLES

F 30

LOOKS LI~~KE~~ SOUTHWEST PERMIT

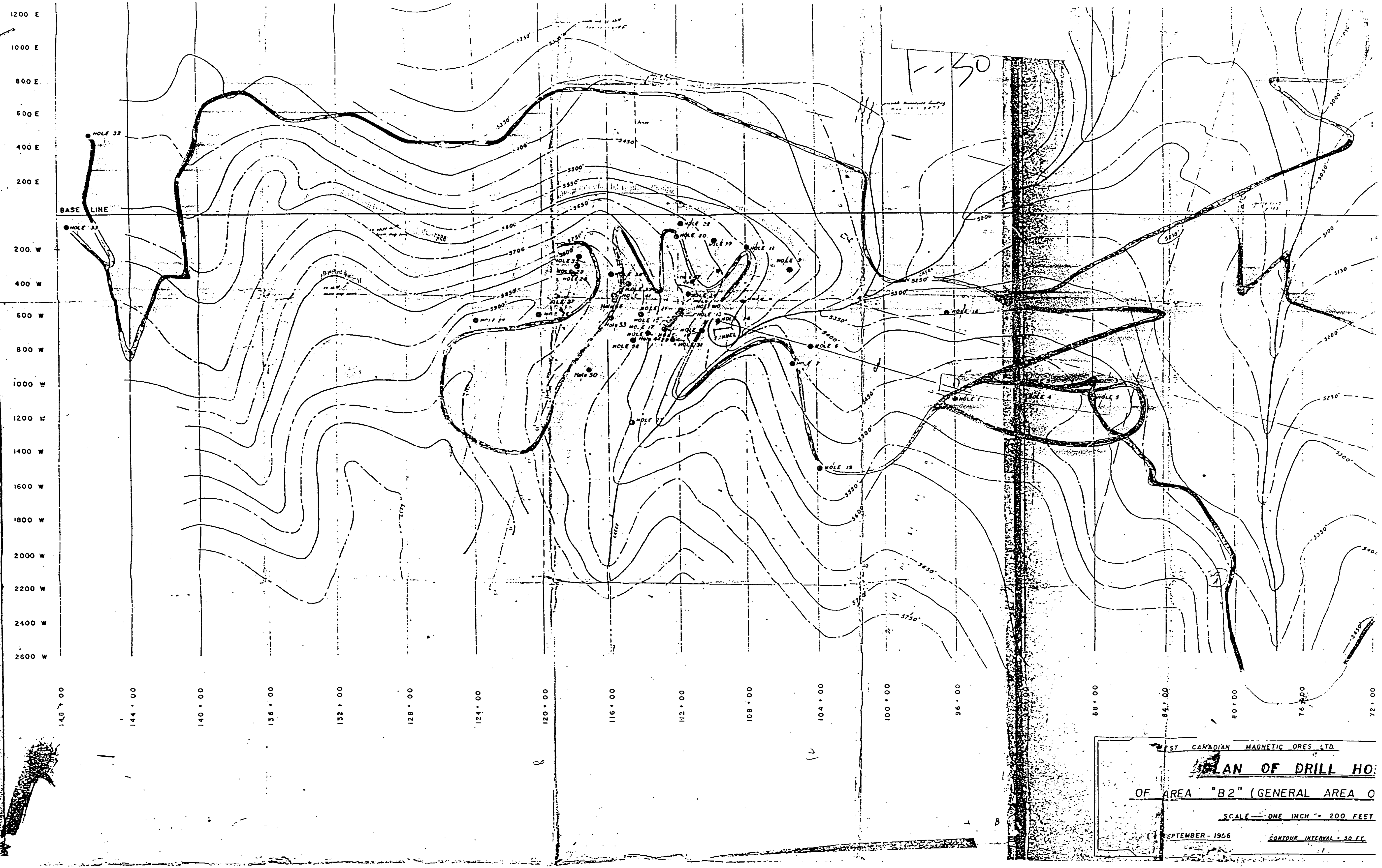
11 HOLES

PL7

16-11

LOOKS LIKE THE ONE NORTHMOST

= 45 Holes



WEST CANADIAN MAGNETIC ORES LTD.

PLAN OF DRILL HO

OF AREA "B2" (GENERAL AREA O

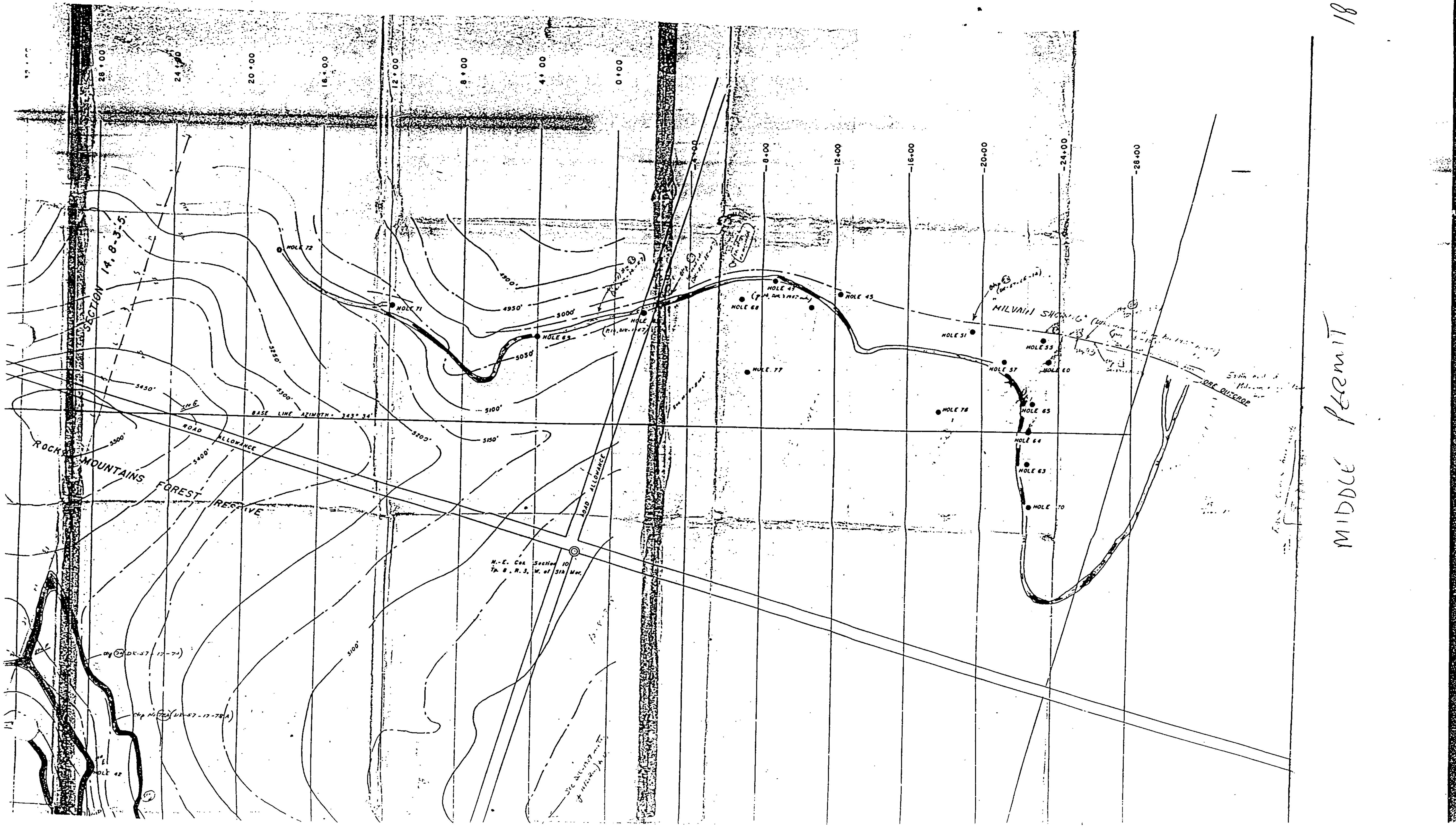
SCALE — ONE INCH = 200 FEET

SEPTEMBER - 1956

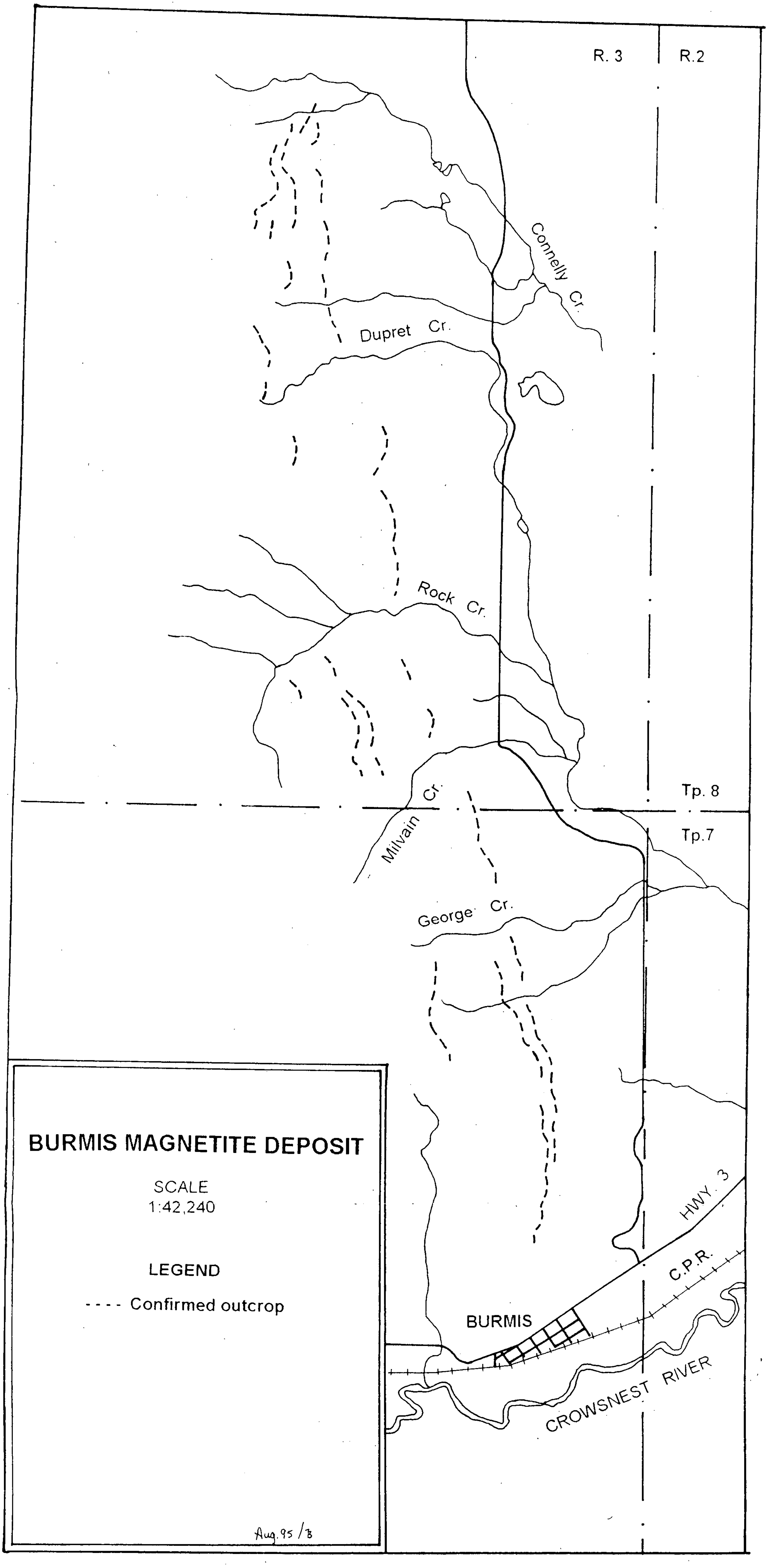
CONTOUR INTERVAL = 50 FT.

F-30

18 HOLES


28+00
24+00
20+00
16+00
12+00
8+00
4+00
0+00
-8+00
-12+00
-16+00
-20+00
-24+00
-28+00
SECTION 14, 8-3-5
HOLE 72
HOLE 71
HOLE 69
HOLE 68
HOLE 47
HOLE 45
HOLE 51
HOLE 55
HOLE 57
HOLE 60
HOLE 65
HOLE 64
HOLE 63
HOLE 70
HOLE 77
HOLE 78
HOLE 42
"MILVAIN SHOWING"
ORE OUT-CROP
4900'
4950'
5000'
5050'
5100'
5150'
5200'
5250'
5300'
5400'
5450'
5500'
BASE LINE AZIMUTH 349° 34'
ROAD ALLOWANCE
ROAD ALLOWANCE
ROCKY MOUNTAINS FOREST RESERVE
N.-E. Cor. Section 10 Tp. 8, R. 3, W. of 5th Mer.
MIDDLE PERMIT

Sample Site Maps



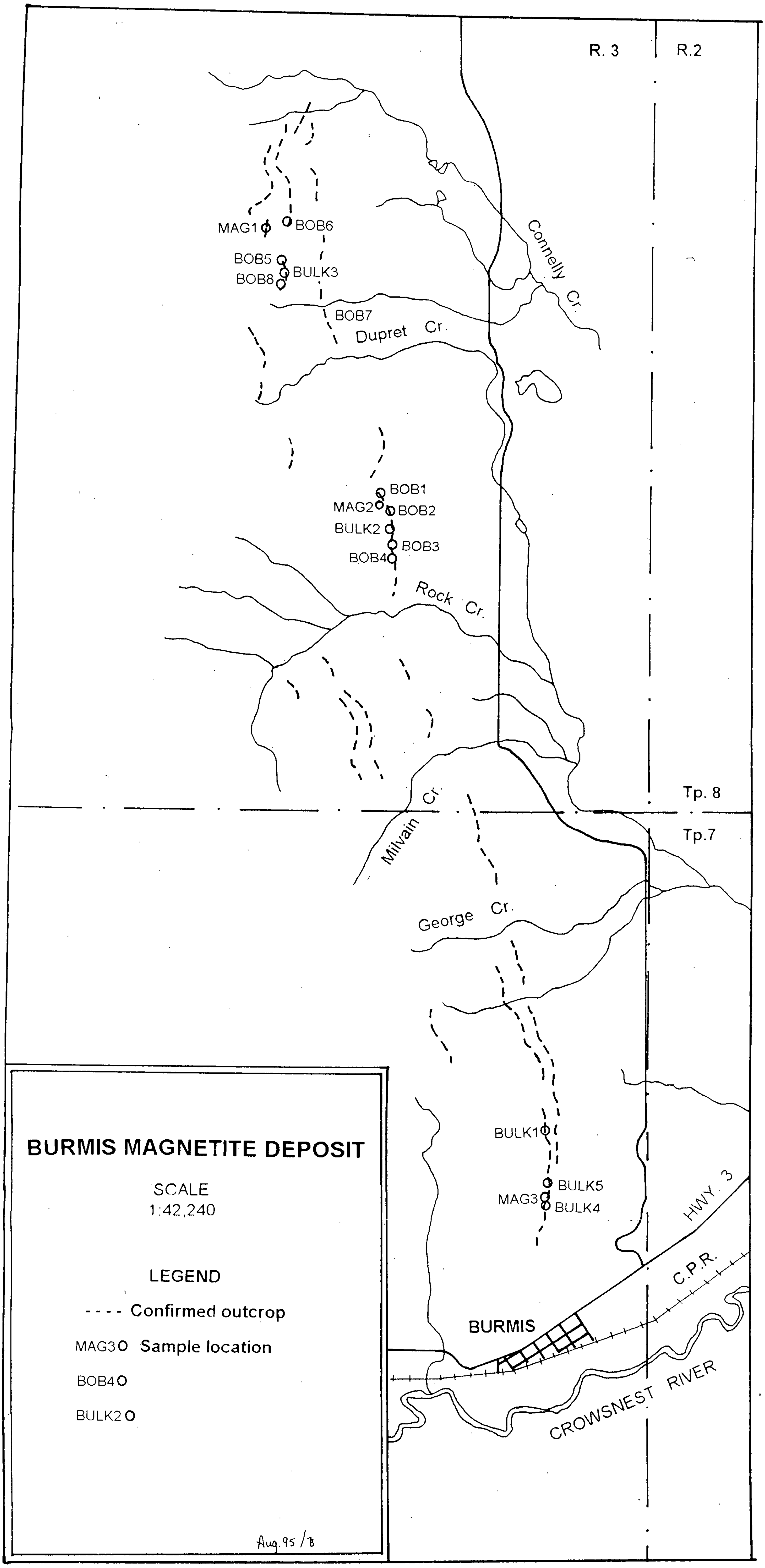
BURMIS MAGNETITE DEPOSIT

SCALE
1:42,240

LEGEND

- - - - Confirmed outcrop

Aug.95 / B



BURMIS MAGNETITE DEPOSIT

SCALE
1:42,240

LEGEND

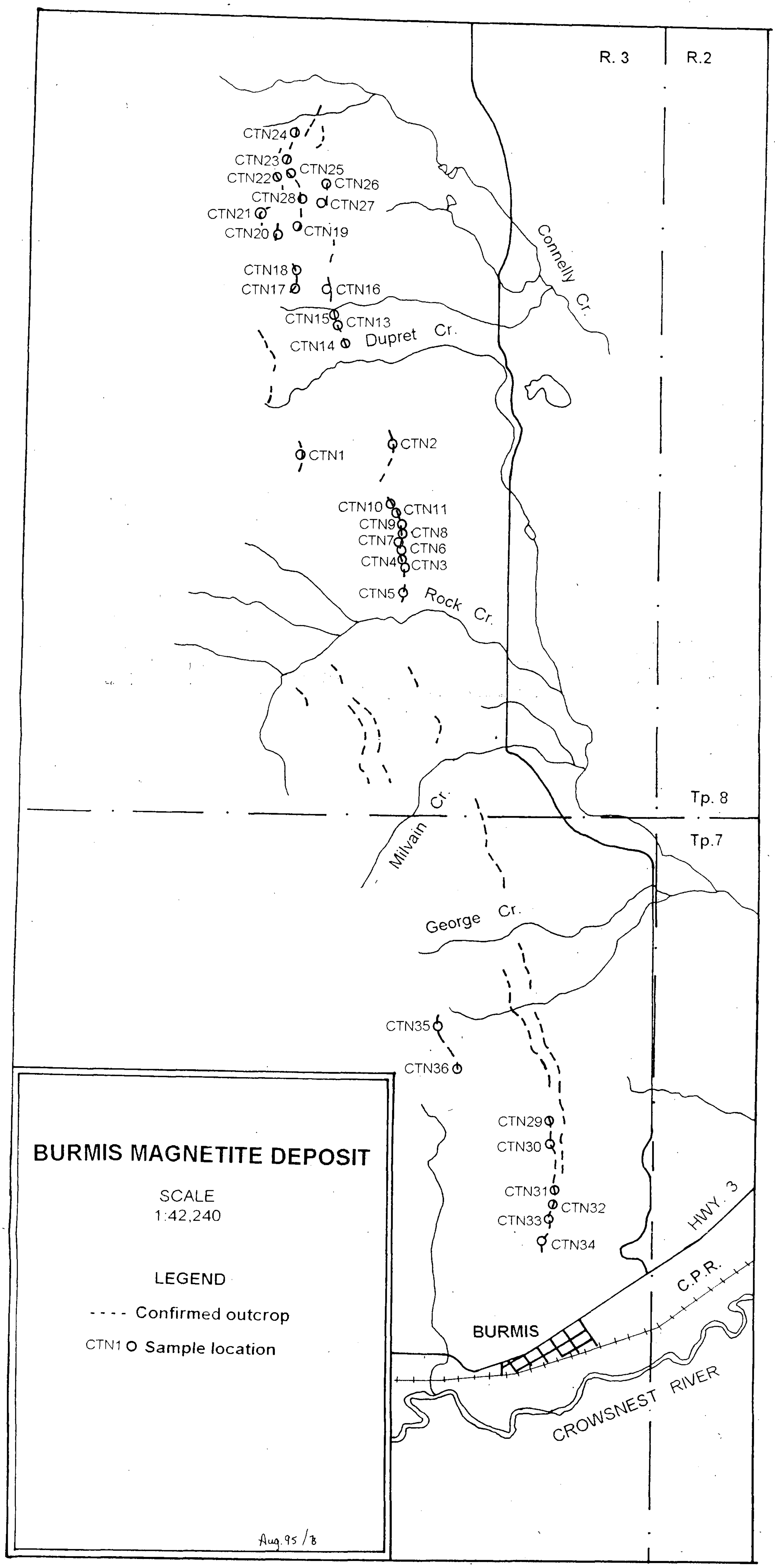
- - - - Confirmed outcrop

MAG3 ○ Sample location

BOB4 ○

BULK2 ○

Aug. 95 / 8



BURMIS MAGNETITE DEPOSIT

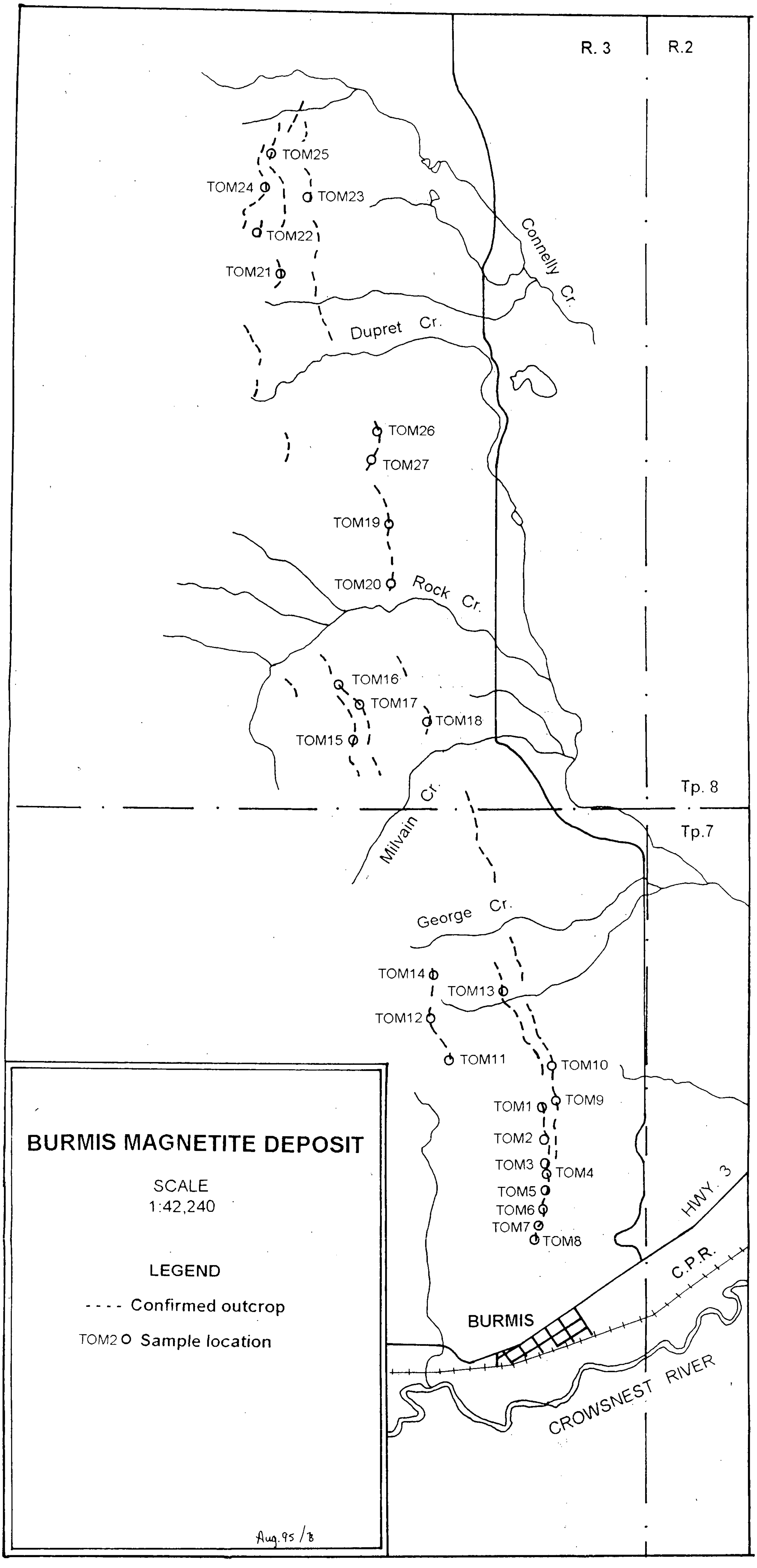
SCALE
1:42,240

LEGEND

- - - - Confirmed outcrop

CTN1 O Sample location

Aug.95 / 8



BURMIS MAGNETITE DEPOSIT

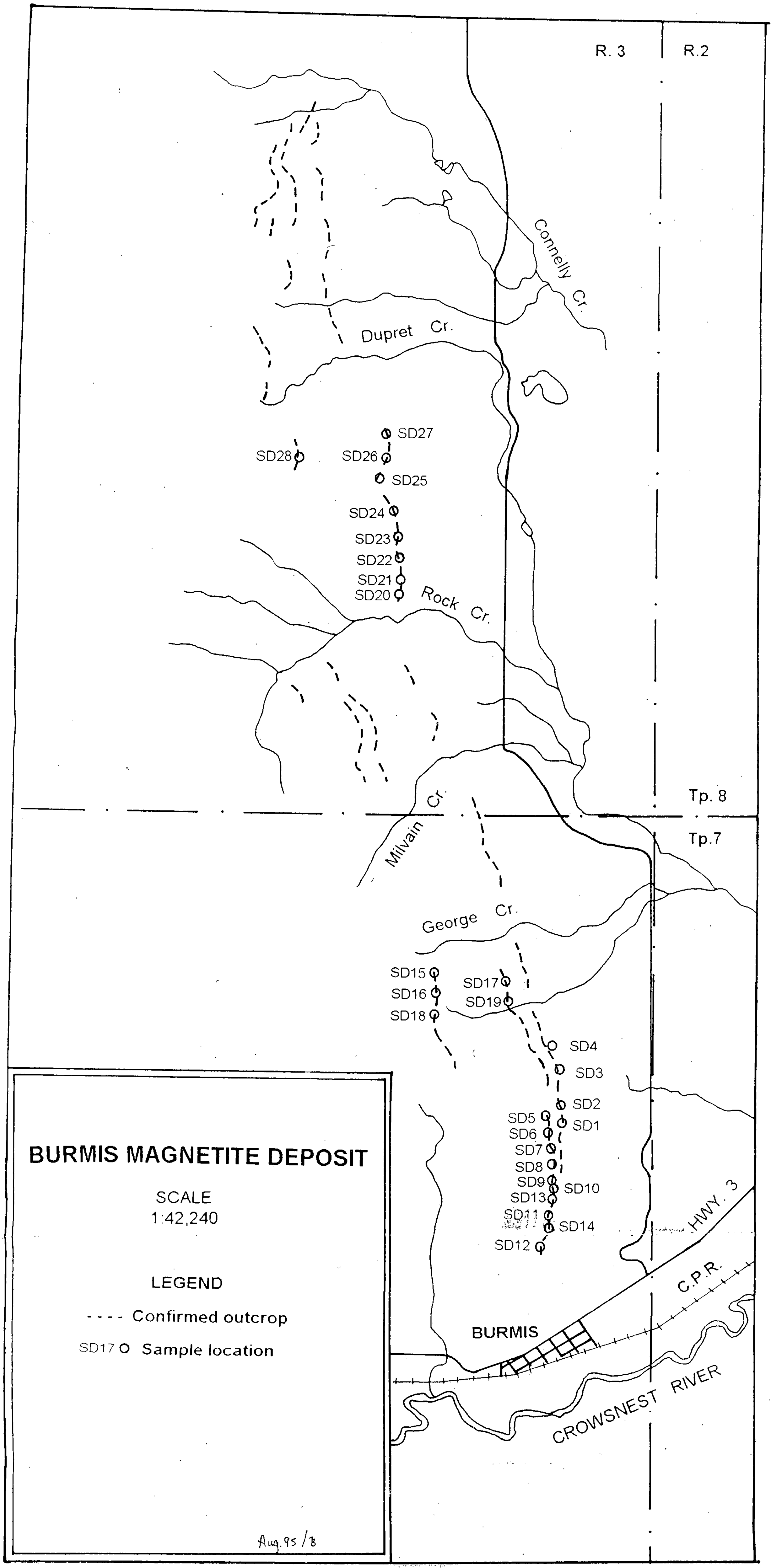
SCALE
1:42,240

LEGEND

- - - - Confirmed outcrop

TOM2 ○ Sample location

Aug.95/8



BURMIS MAGNETITE DEPOSIT

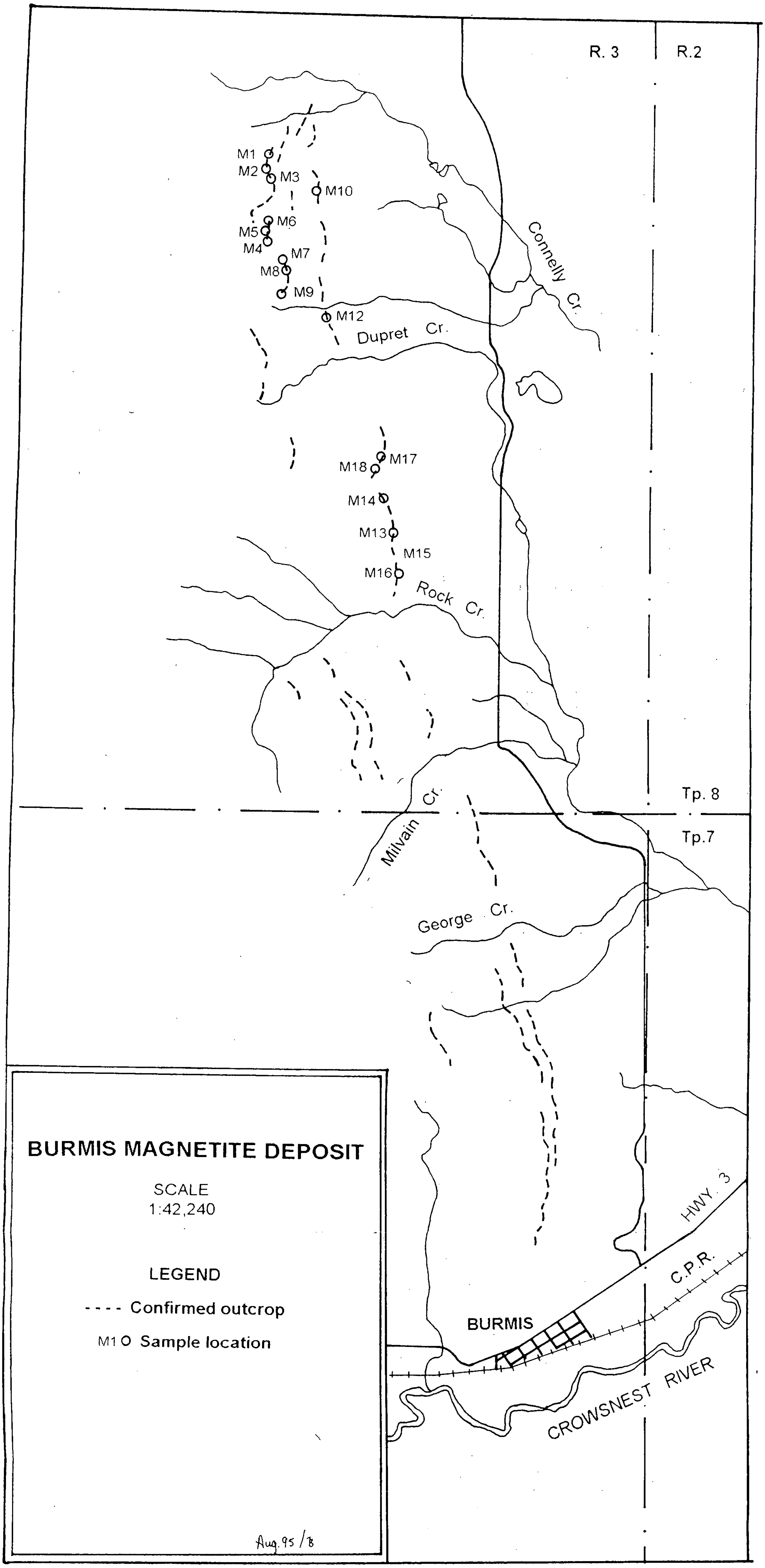
SCALE
1:42,240

LEGEND

- - - - Confirmed outcrop

SD17 ○ Sample location

Aug. 95 / B



BURMIS MAGNETITE DEPOSIT

SCALE
1:42,240

LEGEND

- - - - Confirmed outcrop

M1 ○ Sample location

Aug. 95 / B